Genomics era welcomes Bangladesh to go ahead

M.A. Bari Miah

GENOMICS is the study of an organism's genome and the use of genes. It deals with the systematic use of genome information, associated with other data, to provide answers to problems in biology, medicine, and industry. Genomics can offer new therapeutic methods for the treatment of some diseases, as well as new diagnostic methods. It also has applications in food and agriculture sectors. The major tools and methods related to genomics are bioinformatics, genetic analysis, measurement of gene expression and determination of gene function.

The term genome represents the total content of genes in an organism. A gene is a unit of heredity in a living organism, and a particular segment of DNA molecule that is coded for a type of protein in the organism. All proteins are specified by genes.

DNA is made up of four similar chemicals -- nucleotide bases -- adenine (A), guanine (G), cytosine (C), and thymine (T), which are inserted repeatedly for millions or billions times throughout a genome. Genomes vary widely in size: the smallest known genome, bacterium, contains about 600,000 DNA base pairs, while human and mouse genomes have some 3 billion. The order of insertion or occurring sequence in a DNA molecule is unique for each chromosome in each organism. The particular order of As, Ts, Cs, and Gs is extremely important. The order underlies all of life's diversity, even dictating whether an organism is human or another species such as yeast, rice, or fruit fly, all of which have their own genomes and are themselves the focus of genome projects.

DNA sequencing, the process of determining the exact order of the 3 billion chemical building blocks (called bases and abbreviated A, T, C, and G) that make up the DNA of the 24 different human chromosomes. Yeast (Saccharomyces cerevisiae) has long been an important model organism for the eukaryotic cell, which was the first eukaryotic genome that was completely sequenced and released on April 24, 1996.

The flowering plant Arabidopsis thaliana is an important model system for identifying genes and determining their functions, and its genome was the first to be sequenced among the flowering plants. The small size of its genome makes Arabidopsis thaliana useful for genetic mapping and sequencing -- with about 157 million base pairs and five chromosomes, and it was the first plant genome to be sequenced completed.

Arabidopsis thaliana has no economic value. Thus, world scholars in plant molecular biology concentrated their efforts on rice (Oryza sativa). The International Rice Genome Sequencing Project (IRGSP), a consortium of public funded laboratories, was constituted in September 1997 at a workshop held in conjunction with the International Symposium on Plant Molecular Biology in Singapore. It was completed on August 10, 2005.

Researchers of IRGSP published the "finished" DNA blueprint in the journal Nature on August 11. It included the location and sequence of over 37,500 protein-encoding genes in 389 million bases of DNA. Rice is the first crop whose genome has been sequenced. Rice is considered a model system for plant biology largely due to its compact genome (430 million base pairs on its 12 chromosomes) and evolutionary relationships with other large-genome cereals, such as sorghum (750 Mb), maize (2,500 Mb), barley (5,000 Mb) and wheat (15,000 Mb).

The genome project which gave birth to the new genomic era is the Human Genome Project (HGP). Begun in October 1990, HGP was a 13-year, multinational effort undertaken by 20 groups from six countries coordinated by the US Department of Energy and the National Institutes of Health. It is the largest single biological project ever undertaken, and the completion of the HGP marks the beginning of a new era, and a major scientific milestone of the 21st century. Genomics is one of the more fundamental advances in human history. The main goals of the project were to identify approximately 30,000 genes in human DNA and to determine the sequences of the 3 billion chemical base pairs and make them freely accessible for biological research.

Thanks to the leaders of the Green Revolution that contributed much in the 20th century, the number of people in danger of malnutrition worldwide has decreased significantly in the past 30 years. However, an estimated 800 million people still lack adequate access to food. The world now sits at the cusp of a second agricultural revolution, the "Gene Revolution," in which modern biotechnology could enable enhancement of agricultural productivity that could be tailored to meet the needs of the regions that still face food shortages.

A consortium of researchers in Bangladesh, made up of Dhaka University, Bangladesh Jute Research Institute and Software Company DataSoft Systems Bangladesh Ltd. in collaboration with Centre for Chemical Biology, University of Science Malaysia, and University of Hawaii at Manoa, USA, has successfully decoded the Jute Plant Draft Genome Sequencing.

On June 16, 2010, Prime Minister Sheikh Hasina disclosed in the parliament that Bangladeshi researchers had successfully done draft genome sequencing of jute, which would contribute to improving jute fibre. In 2010, Bangladeshi scientists had succeeded in unveiling the genome sequencing of tossa jute. This year the team successfully decoded the genome sequence of a local variety of jute plant, opening up a new venture in the development of the golden fibre.

Such decoding opened up a new vista in the development of a variety of the biodegradable natural fibre. With the successful sequencing of jute genome, Bangladesh becomes only the second country after Malaysia among the developing nations that could do so.

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EXTRA TERRESTRIAL

New alien life claim far from convincing

A new study that claims to present evidence of alien life is being met with a healthy dose of scepticism in the scientific community.

On July 31, a team of British researchers sent a balloon into the stratosphere over England, where it collected samples at an altitude range of 14 miles to 17 miles (22 to 27 kilometers). The balloon's scientific payload returned to Earth toting the cell wall, or frustule, of a type of microscopic algae called a diatom, the scientists report in the Journal of Cosmology.

While bacteria and other tiny life-forms have been found high above the planet before -- storm clouds are teeming with microbes, for example -- the new discovery is potentially of monumental importance, study team members say.

"Most people will assume that these biological particles must have just drifted up to the stratosphere from Earth, but it is generally accepted that a particle of the size found cannot be lifted from Earth to heights of, for example, 27 km. The only known exception is by a violent volcanic eruption, none of which occurred within three years of the sampling trip," lead author Milton Wainwright, of the University of Sheffield in the United Kingdom, said in a statement.

"In the absence of a mechanism by which large particles like these can be transported to the stratosphere, we can only conclude that the biological entities originated from space," Wainwright added. "Our conclusion then is that life is continually arriving to Earth from space, life is not restricted to this planet and it almost certainly did not originate here."

The diatom fragment may have been delivered to Earth by a comet, Wainwright and his colleagues write in the paper, which can be read in the Journal of Cosmology.

Extraordinary claims require extraordinary evidence

The idea that life is widespread throughout the universe and has been spread to many worlds by objects such as comets -- a notion known as panspermia -- is credible, at least over relatively short cosmic distances, said astronomer Seth Shostak of the Search for Extraterrestrial Intelligence (SETI) Institute in Mountain View, California.

However, that doesn't necessarily mean the new study will stand up to the intense scientific scrutiny it's likely to receive, he said.

"In the past, most members of the astrobiology community have found it easier to ascribe these claims to terrestrial contamination than to extraterrestrial hitchhikers," Shostak told SPACE.com via email. "It remains to be seen whether that opinion will be changed by these new results."]

Indeed, other scientists said they would like to see more convincing evidence of a cosmic origin for the organism snagged by the balloon.

"There is probably truth to the report that they find curious stuff in the atmosphere," Chris McKay, an astrobiologist at Nasa's Ames Research Center in Moffett Field, Calif., told SPACE.com via email. "The jump to the conclusion that it is alien life is a big jump and would require quite extraordinary proof. (The usual Sagan saying: extraordinary claims require extraordinary evidence.)"

McKay gave an example of what might constitute such extraordinary evidence.

"If they were able to show that it was composed of all D amino acids (proteins in Earth life are made of L amino acids), that would be pretty convincing to me," he said. "So some sort of biochemical indication that it does not share Earth biochemistry. If it does indeed share Earth biochemistry, proving that it is of alien origin is probably impossible."

Further study needed

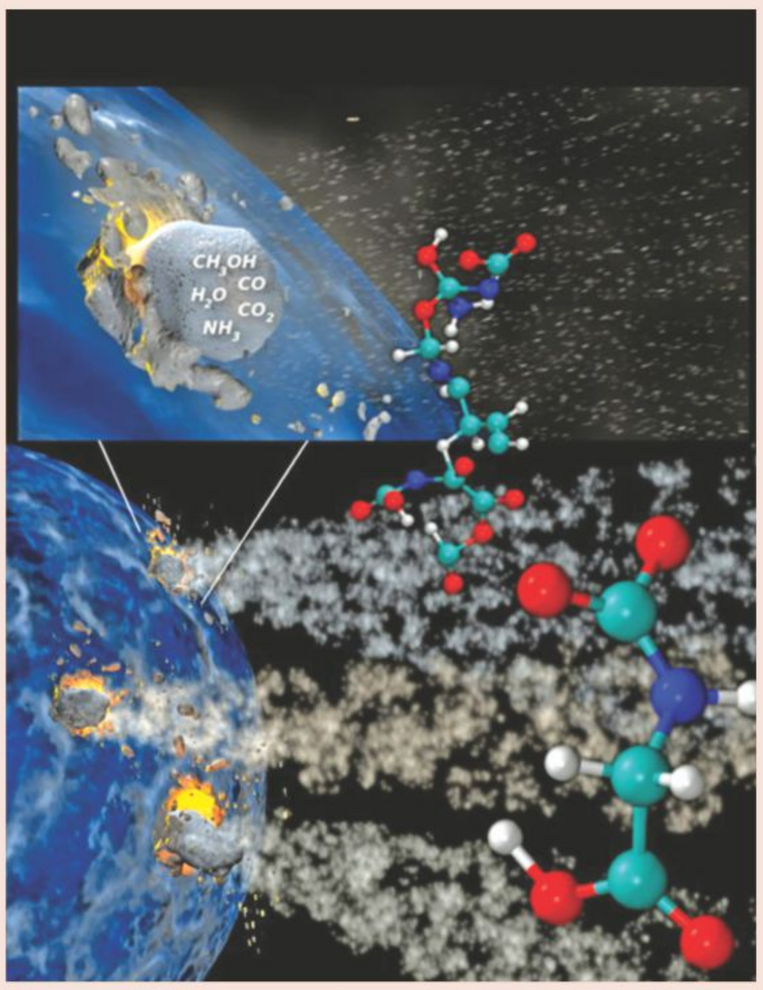
Wainwright and his team plan to study their stratospheric samples further in an attempt to find a smoking gun for an off-Earth origin. For example, the researchers will analyse the ratios of various isotopes, which are varieties of an element that have different numbers of neutrons in their atomic nuclei.

"If the ratio of certain isotopes gives one number, then our organisms are from Earth; if it gives another, then they are from space," Wainwright said.

However, astrobiologist Dirk Schulze-Makuch of Washington State University thinks the study team should have performed such follow-up analyses, and consulted diatom experts, before publishing its provocative claim.

"Perhaps the fragment came actually from the stratosphere and is not contamination, but basing this conclusion only on one particle and very limited analysis seems quite odd to me, and inferring an extraterrestrial origin completely off-base," Schulze-Makuch told SPACE.com via email.

Schulze-Makuch also thinks comets are unlikely incubators for life, suspecting that life first arose on a planetary body. And the presence of a diatom on a comet would be especially surprising, he said.



Comets contain elements such as water, ammonia, methanol and carbon dioxide that impacted on early Earth.

"Diatoms are actually relatively advanced life forms on Earth and developed most likely sometime at the beginning of the Mesozoic (probably Jurassic time period), thus very late during evolution (probably at least 3 billion years after the origin of life on Earth)," Schulze-Makuch said, adding that diatoms are typically aquatic and there is no liquid water on a comet, except during the brief periods when the icy objects approach the sun.

"Besides, I would expect an extraterrestrial organism or even remnant of an organism to be quite different from what we see on Earth in some significant ways (as the environment around it, its 'habitat,' will affect the form and function of the organism), and certainly not be linked to some kind of diatom species on Earth," Schulze-Makuch said.

Other controversial claims

The Journal of Cosmology is no stranger to bold claims. Two years ago, for instance, it published a controversial study that purported to have found evidence of fossilized life in meteorites.

That paper was not well received by outside scientists, some of whom questioned the journal's credibility as well.

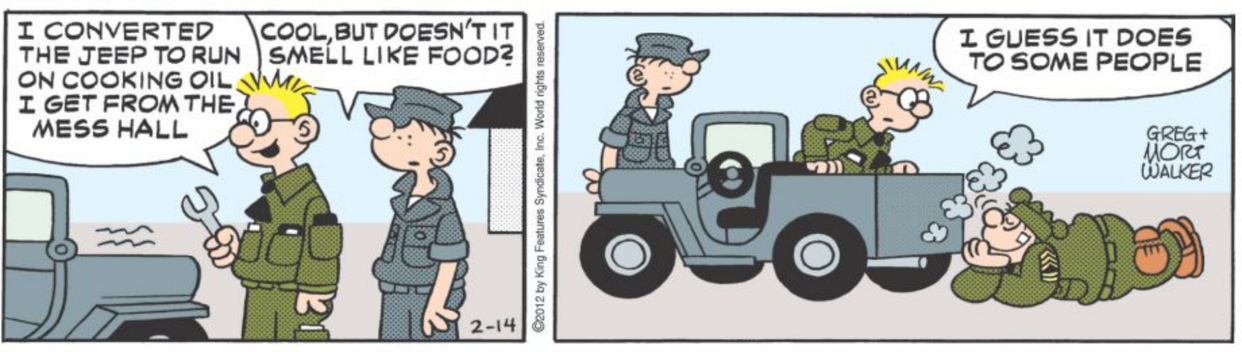
"It isn't a real science journal at all, but is the ginned-up website of a small group of crank academics obsessed with the idea of [Fred] Hoyle and [Chandra] Wickramasinghe that life originated in outer space and simply rained down on Earth," P.Z. Myers, a biologist at the University of Minnesota, Morris, wrote on his popular science blog Pharyngula at the time.

Wickramasinghe is a co-author of the new stratospheric diatom paper, a fact that could color its reception in the wider scientific community.

"I don't have any expertise in this area," Rosie Redfield, a microbiologist at the University of British Columbia, told SPACE.com via email. Redfield was among the outspoken critics of the Journal of Cosmology's 2011 meteorite announcement. "But neither the Journal of Cosmology nor Dr. Wickramasinghe have any scientific credibility, and one fragment of a diatom frustule is hardly significant evidence."

Source: **Live Science**

BEETLE BAILY by Mort Walker



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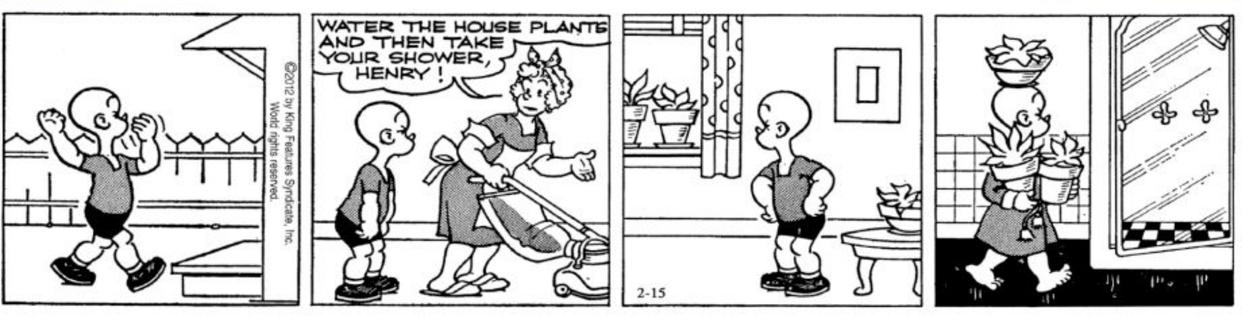

FOR LONGER LIVES

Slashing GHG emissions can save millions of lives

SIMULATIONS suggest reduced air pollution would improve public health

Cutting greenhouse gas emissions should improve air quality and thereby save millions of people's lives by the end of the century, new simulations find.

Burning fossil fuels emits both climate-warming gases and other air pollutants such as particulate matter. Greenhouse gases also contribute to the formation of ground-level ozone, the main component of smog. Because particulate matter and ozone can cause heart and lung disease, researchers think that reducing greenhouse gases would improve public health.

J. Jason West of the University of North Carolina at Chapel Hill and colleagues simulated climate and air quality through 2100. In a simulation with reductions in fossil fuel use, the model found 2.2 million premature deaths per year could be avoided by the beginning of the next century, compared with a simulation without climate change mitigation.

The greenhouse gas cuts also make economic sense, the researchers say. The benefit of reducing pollution-related deaths, compared with the costs of mitigation, equals $50 to $380 per metric ton of carbon dioxide, the team reports September 22 in Nature Climate Change..

Reducing smog and other pollution in Shanghai and other cities may save lives in the long run.

Source: **Science News**

By THOMAS JOSEPH

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Yesterday's answer

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