

Science & Technology

Balon Protein: A Breakthrough in Microbiology

Context: Recently, scientists made a significant advancement in microbiology with the discovery of a special protein called Balon. This protein enables the bacterium *Psychrobacter urativorans* to enter and exit a dormant state in response to environmental changes.

- ❖ The study, published on February 14 in the journal *Nature*, highlights how bacteria adapt to survive in harsh conditions.



Balon in Bacterial Dormancy

- ❖ Researchers found that Balon, an unstudied protein, functions uniquely compared to previously known proteins. The study induced cold shock in *P. urativorans* to simulate adverse conditions.

- ❖ Subsequent tests revealed that Balon binds to the active centers of ribosomes, halting protein synthesis by preventing the addition of amino acids.
- ❖ This process effectively renders the ribosomes inactive, causing the bacteria to enter dormancy.

Implications and Significance

- ❖ This discovery not only enhances our understanding of bacterial survival mechanisms but also has potential applications in controlling bacterial populations across various environments, from industrial settings to the Arctic permafrost.
- ❖ Additionally, the ability of some *Psychrobacter* species to thrive in cold environments is significant as they are known to spoil food in refrigerators.
- ❖ Future research may explore how manipulating these processes affects bacterial behavior, with potential industrial and environmental applications.

Reports & Indices

India Ranks 129th on Global Gender Gap Index

Context: India ranks 129th out of 146 countries in the 2024 Global Gender Gap Index. This position is consistent with its placement in the bottom 20 for the past few years, indicating persistent challenges in closing the gender gap across various sectors despite some progress.

- ❖ Iceland has retained its top position in the Global Gender Gap Index, continuing to lead in gender equality.



About the Global Gender Gap Index

- ❖ The Global Gender Gap Index, introduced in 2006, assesses gender equality across four key dimensions: economic participation and opportunity, educational attainment, health and survival, and political empowerment.

- ❖ The index scores range from 0 (no parity) to 1 (complete parity), highlighting gender inequality rather than women's performance.

Regional Comparison

- ❖ In South Asia, India ranks fifth out of seven countries, with Bangladesh leading the region at 99th globally. India's performance on gender equity is generally below that of its regional neighbors.
- ❖ Gender discrimination imposes a significant economic cost globally, estimated at up to \$12 trillion annually. Enhancing gender equality can substantially boost GDP growth rates, underscoring the importance of incorporating gender equity into economic policy decisions.

Geography

Energy Imbalance in Saturn

Context: Researchers at the University of Houston have discovered a significant energy imbalance in Saturn's climate. This discovery, published in "Nature Communications," sheds light on planetary evolution and climate changes, particularly for gas giants like Saturn.



About Energy Imbalance

- ❖ Using data from the Cassini probe, the study found that Saturn's significant orbital eccentricity causes substantial seasonal variations in its energy supply.
- ❖ As Saturn orbits the sun, the amount of solar energy it receives fluctuates greatly.
- ❖ Both solar radiation and internal heat sources contribute to Saturn's complex thermal structure and climate system.

Cassini Mission's Contribution

- ❖ The Cassini probe, launched in 1997 and operational until 2017, played a crucial role in this discovery.
- ❖ A collaboration between NASA, the European Space Agency, and the Italian Space Agency, Cassini provided valuable data on Saturn's energy budget and atmospheric phenomena.

Infrastructure

Chenab Bridge: Indian Railways Successfully Conducts Trial Run on World's Highest Rail Bridge

Context: On June 20, Indian Railways conducted a successful trial run of an eight-coach MEMU train on the Chenab Bridge, the world's highest railway bridge, located in Jammu and Kashmir. This trial marks a significant milestone in the initiation of train services on the route from Reasi to Baramulla.



Chenab Bridge Specifications

- ❖ The Chenab Bridge, known for its architectural marvel, spans the Chenab River between the Dugga and Bakkal stations.
- ❖ It measures 1315 meters in length, features an arch span of 467 meters, and stands 359 meters above the riverbed, surpassing the height of the Eiffel Tower by approximately 35 meters.

Historical and Strategic Importance

- ❖ The Chenab Bridge is a crucial component of the Udhampur-Srinagar-Baramulla Rail Link (USBRL) project, designated as a "National Project" in 2002 due to its strategic importance in connecting Jammu and Kashmir.
- ❖ The project has been developed in phases, with Prime Minister Narendra Modi inaugurating the 48.1 km stretch between Banihal and Sangaldan in February 2024.
- ❖ Following the successful trial run, the route is expected to be operational for train services in the near future.

International News

Russia – North Korea: New Defense Pact Deal

Context: During a significant visit by Russia's President Vladimir Putin to Pyongyang, a major defense pact was established between Russia and North Korea. The agreement stipulates "immediate military assistance if either nation faces armed aggression."

- ❖ This development marks a notable shift in global politics and reinforces the alliance between Russia and North Korea amid increasing global isolation for both countries.



Historical Background

- ❖ Following World War II, the Soviet Union played a crucial role in establishing a communist government in North Korea, providing substantial military support during the Korean War.
- ❖ The 1961 Treaty of Friendship, Cooperation, and Mutual Assistance between Russia and North Korea formalized their relationship, including a clause for mutual defense. However, ties weakened after the dissolution of the USSR in 1991.

Details of the Latest Pact

- ❖ The new agreement encompasses various areas of cooperation, particularly in defense aid and technology. It includes a mutual defense clause, reminiscent of the 1961 treaty. Article 4 mandates immediate military assistance in the event of armed aggression.
- ❖ This pact heightens concerns in South Korea and Japan about North Korea's military capabilities, prompting them to enhance their defense strategies and strengthen military ties with the US. NATO and other Western allies view this agreement as a potential threat to global peace and security.

Renewed Relations in the 21st Century

- ❖ Since Vladimir Putin assumed office in the early 2000s, Russia has renewed and strengthened its relationship with North Korea's regime.
- ❖ Despite this, Russia remains critical of North Korea's nuclear ambitions and has supported sanctions aimed at curbing Pyongyang's nuclear capabilities.



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