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PRELIM POINTERS

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What are Nanobubbles?



Overview:

The Union Minister of State for Forest, Environment, and Climate Change recently launched 'Nano Bubble Technology' for cleaning and purifying the water of the National Zoological Park, Delhi, to promote the health of aquatic animals.

About Nanobubbles:

- Nanobubbles are **70-120 nanometers in size**, 2500 times smaller than a single grain of salt.
- They can be **formed using any gas and injected into any liquid**.
- Nanobubbles have unique physical and chemical properties and are **superior to other aeration methods**.
- Therefore, nanobubble technology is used in a **variety of applications**, including **water treatment, agriculture, aquaculture, food processing**, and other industrial areas.
- **Properties:**
 - **Large Surface Area:** Nanobubbles have a high surface area to volume ratio, allowing for a **greater amount of gas to be in contact with water**. This, combined with their ability to remain suspended in water due to their small size and high buoyancy, results in **increased gas transfer efficiency** between the gas and water phases.
 - **Brownian Motion:** Nanobubbles **stay in the water for a long time**. This unique feature **enables nanobubbles** to provide a **homogenous distribution of oxygen throughout an entire body of water** and dissolved oxygen levels are maintained for a very long time.



- **High Oxygen Transfer Efficiency:** Nanobubble can efficiently deliver oxygen into water **due to the very large surface area and their Brownian motion**. Oxygen transfer **efficiency** with nanobubble is reached to **around 90%**.
- **Surface charge:** Nanobubble has a **strong surface charge**. This **negative charge improves separation efficiency in the floating process**. This feature floats more suspended matter than through conventional methods in the wastewater, oil, and gas operators.
- **Benefits:** Due to the various inherent physical properties of nanobubbles, the ability to transfer gas to liquid is very high, and thus has the following advantages.
 - **Improved Water Treatment:** Nanobubbles can **effectively remove organic pollutants, bacteria,** and other contaminants from water.
 - **More Efficient Cleaning:** Nanobubbles can **penetrate surface pores and crevices,** providing a more **thorough cleaning** that is effective against stubborn dirt and grime.
 - **Enhanced Agriculture and Aquaculture: Supplying oxygen nanobubbles to plants** and aquatic organisms can improve their growth, health, and resilience. Nanobubbles can also **enhance nutrient absorption,** reduce the need for pesticides and other chemicals, and improve crop yields.
 - **Enhanced Oil and Gas Recovery:** Nanobubbles can increase the efficiency of oil and gas recovery **by improving the flow of fluids** and reducing the amount of chemicals needed in the process.
 - **Improved Skin and Hair Health:** Nanobubbles can help **enhance the absorption of skincare products,** leading to healthier skin.

Q1: What is Brownian Motion?

Brownian motion is the random motion of particles suspended in a fluid (a liquid or a gas) resulting from their collision with the fast-moving atoms or molecules in the gas or liquid. It was first observed by the Scottish botanist Robert Brown (1773-1858); this 1827 serendipitous discovery has sparked a plethora of important developments in many branches of science, fluids included.



SheSTEM 2024



Overview:

Atal Innovation Mission (AIM), under the NITI Aayog and the Office of Science & Innovation, at the Embassy of Sweden, are pleased to announce the successful conclusion of SheSTEM 2024.

About SheSTEM 2024:

- SheSTEM is an **annual event by Atal Innovation Mission (AIM), and the Office of Science and Innovation**, at the **Embassy of Sweden**.
- It **celebrates the contributions of women in STEM** and serves as a **catalyst to inspire the next generation of innovators** by encouraging young minds **to explore careers in science, technology, engineering, and mathematics (STEM)**.
- The **SheSTEM 2024 challenge invited students from grades 6–12 across India to submit innovative ideas focused on Battery Technology and Energy Storage (BEST) systems**.
- **Part of the India-Nordic BEST project**, the challenge aims to foster sustainability by advancing energy solutions.
- Participants were tasked with presenting their prototypes or concepts for energy storage and sustainability in a two-minute video format.
- The competition received an exceptional response, with over 1000 submissions demonstrating the creativity, problem-solving skills, and forward-thinking mindset of India's youth.
- SheSTEM 2024 provided a platform for students to engage with critical STEM topics and contribute to global sustainability efforts.

Key Facts about Atal Innovation Mission (AIM):

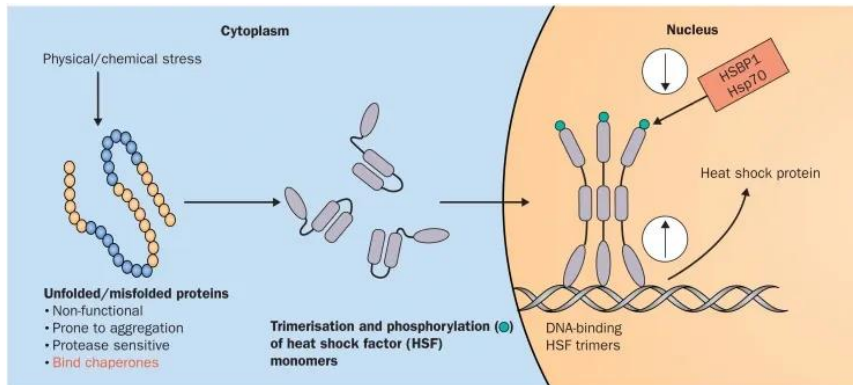


- AIM is a flagship initiative set up by the NITI Aayog in 2016 with an objective to create and encourage an environment of **innovation and entrepreneurship across schools, educational organisations, research institutes, and industries**, including MSMEs.
- AIM has two functions:
 - Promote entrepreneurship by encouraging innovators to become entrepreneurs through financial support as well as mentorship.
 - Promote innovation by creating a platform where ideas are generated through like-minded individuals.
- AIM has created **four programs** to support these functions:
- **Atal Tinkering Labs**
- **Atal Incubation Centres**
- **Atal New India Challenges and Atal Grand Challenges**
- **Mentor India**
 - Apart from these programs, AIM also seeks and **collaborates with academia, industries, NGOs**, and individuals to enable an atmosphere of innovation.
- **All the initiatives** of AIM are currently **monitored and managed systematically using real-time MIS systems and dynamic dashboards**.

Q1: What are Atal Tinkering Labs?

Atal Tinkering Labs are state-of-the-art space established in a school with a goal to foster curiosity and innovation in young minds, between grade 6th to 12th across the country through tools and technologies such as Internet of Things, 3D printing, rapid prototyping tools, robotics etc.

Heat Shock Protein 70 (HSP70)



Overview:

The team from JNU's Special Centre for Molecular Medicine, identified a human protein, Hsp70, as a critical factor in the spread of diseases like malaria and Covid-19.

About Heat Shock Protein 70 (HSP70):

- Hsp70 is a type of **molecular chaperone**, a protein that plays a vital role in helping other proteins fold into their proper shapes and preventing misfolding.
- It plays a crucial **role in regulating protein synthesis** and protecting proteins from stress.
- It becomes **elevated during times of cellular stress** and they help to shield cells from further insults.
- **Role in human body:** It played an important **role in protein folding, preventing protein aggregation and transport of proteins** across membranes. These functions enabled HSP to play critical roles in regulation of protein homeostasis and cell survival.
- In condition of cell stress, including **environmental** (i.e., elevated temperature, oxidative stress, and heavy metal exposure), **biological** (i.e., cell proliferation and differentiation), and **pathological** (i.e., inflammation and tumor growth) stress HSP gets elevated,

Highlights of the research

- The team discovered that **Hsp70 interacts with the spike protein** of SARS-CoV-2—the virus responsible for Covid-19—and human ACE2 receptors, which the virus uses to enter cells.
- They hypothesised that during fever, Hsp70 levels rise and help stabilise this interaction, making it easier for the virus to infect cells. By inhibiting Hsp70, they successfully blocked viral replication in lab tests.
- The research suggests that targeting Hsp70 **might help prevent drug resistance**, a growing problem in treating infections.



Q1: What is a protein?

It is a naturally occurring, extremely complex substance that consists of amino acid residues joined by peptide bonds. Proteins are present in all living organisms and include many essential biological compounds such as enzymes, hormones, and antibodies.



Trouessartia thalassina and Proterothrix sibilla



Overview:

In the subtropical forests of Meghalaya, a Romanian-led research team has uncovered two previously unknown species of feather mites named Trouessartia thalassina and Proterothrix sibilla.

About Trouessartia thalassina and Proterothrix sibilla:

- The mites were **identified on the Verditer Flycatcher** (*Eumyias thalassinus*) and the **Small Niltava** (*Niltava macgrigoriae*), two **bird species native to the East Khasi Hills** district.
- *Trouessartia thalassina* is notable for its semi-ovate terminal lamellae and lanceolate setae in males, while females exhibit unique non-sclerotized lacunae.
- Meanwhile, *Proterothrix sibillae*, part of the wolffi species group, is distinguished by its larger size, circular lacunae on the prodorsal shield, and distinctive male genital structures.
- **Trouessartia thalassina: Named after the Verditer Flycatcher**, whose sea-green plumage inspired the Latin word *thalassina*, meaning "sea-green."
- **Proterothrix sibillae: Honoring Maria Sibylla Merian**, a trailblazing **German naturalist** known for her pioneering work in insect taxonomy and her meticulous scientific illustrations.

What Are Feather Mites?

- Feather mites are **microscopic arachnids** that **inhabit bird feathers, feeding on oils, skin flakes, and organic debris.**
- **Typically**, they maintain a **symbiotic relationship with their avian hosts**, helping to keep feathers clean and healthy.
- **However, under stress**, they can **become parasitic**, causing irritation or feather damage.



- **Found worldwide**, feather mites **are transferred between birds** through close contact, especially during nesting.

Q1: What are arachnids?

Arachnids are a group of animals that belong to the Chelicerata subphylum of the Arthropoda Phylum. These invertebrates are joint legged with a distinct characteristic of having eight legs although in some species, the front pair is used for sensory purposes. Some species also have appendages that have grown big enough to be confused with another pair of legs. Spiders are the most populous of the Arachnida class with 40,000 species, alongside solifuges (900 species), mites (32,000 species), scorpions (2,000 species), ticks (12,000 species), and harvestmen (6,300 species).



Gharcholas Saree



Overview:

Recently, Gujarat's 'Gharcholas' received the Geographical Indication tag.

About Gharcholas Saree:

- It is also known as **Ghatchola and Gharcholu** which has finest bandhani work of Gujarat
- It has traditionally been used for years in **Gujarati weddings**.
- The name 'Gharchola' means '**Outfit for Home**', which symbolizes a newly wedded bride joining her new home.
- **Features**
 - It is **woven on Cotton or Silk fabric** in large checks of using Silk and Zari threads.
 - This is further colored in **Bandhani or tie & dye technique**. These checkered patterns are filled with small golden motifs of peacocks, lotus, human figures, and floral designs.
 - These are traditionally crafted in auspicious **colours such as red, maroon, green, and yellow**, which hold special significance in Hindu customs.
 - A Gharchola Saree with 12 squares is known as '**Bar Bagh**', while the one with 52 squares is known as '**Bavan Bagh**'.
 - The designs often incorporate **symbols of fertility and prosperity**, such as the kalash and the paan.
 - In recent times **weavers are infusing modern designs** and techniques into their gharcholas, blending tradition with contemporary appeal.
- Gharchola saris are sourced from generational clusters of artisans in Gujarat, who have been preserving and passing down this intricate craft for centuries.
- This is the **27th GI tag** that **Gujarat** has received.

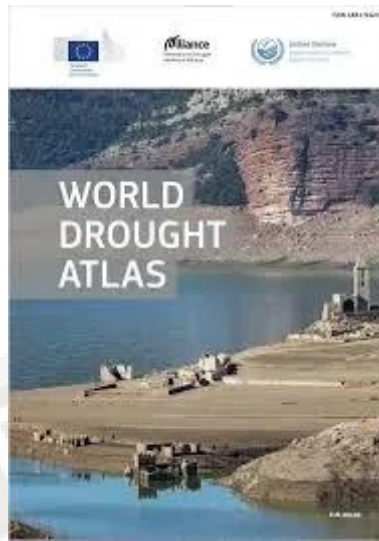


Q1: What is Geographical Indications (GI tag)?

These are signs used on products that have a specific geographical origin and possess distinctive qualities, reputation, or characteristics attributable to that place of origin. GI tags serve as intellectual property rights that identify a product's unique geographical source, providing legal protection and preventing unauthorised use.



World Drought Atlas



Overview:

According to the World Drought Atlas around 75 per cent of the population will be affected by drought by 2050.

About World Drought Atlas:

- It was launched by the **United Nations Convention to Combat Desertification (UNCCD)** in collaboration with the European **Commission Joint Research Centre**.
- It explains how worsening **drought risks are linked to human activities** and then delves into the impacts of drought in five key areas—water supply, agriculture, hydropower, inland navigation, and ecosystems.
- It features 21 case studies from around the world, underscoring that no country—whatever its size, GDP, or latitude—is immune to drought and all can better prepare for it.
- It describes concrete measures and pathways to **manage, reduce, and adapt to systemic drought risks**; underscores the co-benefits of these actions for different sectors; and showcases best practices from different regions.
- The measures highlighted in the Atlas fall into three categories:
 - **Governance** (e.g. early warning systems, microinsurance for smallholder farmers, pricing schemes for water usage);
 - **Land-use management** (e.g. land restoration and agroforestry);
 - **Management of water supply and use** (e.g. wastewater reuse, managed groundwater recharge and conservation.)



Q1: What is the United Nations Convention to Combat Desertification?

It is the only legally binding international agreement linking environment and development to sustainable land management. The Convention addresses the arid, semi-arid and dry sub-humid areas, known as the drylands, where some of the most vulnerable ecosystems and peoples can be found.





International Social Security Association



Overview:

Recently, the Employees' State Insurance Corporation (ESIC) has been awarded one certificate of merit with special mention from the jury for its mobile application (Ask An Appointment - AAA+) at the Regional Social Security Forum for Asia and the Pacific (RSSF Asia-Pacific), organized by the International Social Security Association (ISSA) in Riyadh, Saudi Arabia.

About International Social Security Association:

- It was **founded in 1927**, under the auspices of the [International Labour Organization](#) (ILO).
- It is the principal international organisation for social security organisations, governments and departments of social security.
- It **promotes excellence in social security administration** through professional guidelines, expert knowledge, services and support to enable its members to develop dynamic social security systems.
- **Governance**
 - **General Assembly:** It is actually the constituent assembly of the Association and is the highest statutory body. It consists of all **members of the ISSA who are** directly represented. It meets **every three years**.
 - **Council:** It constitutes the **electoral body of the Association**, composed of the titular delegates of each country in which the ISSA has at least one affiliate member, with each of these countries having one titular delegate.
 - **Bureau:** It constitutes the **administrative authority** of the Association, composed of the President of the ISSA, the Treasurer, the Secretary General, and elected members representing the different geographical regions of the world.



- **Control Commission:** It examines the **financial records of the Association** and the annual report and statements presented to the Bureau by the Treasurer, and verify that all financial transactions have been carried out in conformity with the Financial Regulations.
- **India is a member** country of this organization
- **Headquarters:** Geneva, Switzerland

Key facts about the Ask An Appointment app

- It serves insured persons, beneficiaries, staff, and ESI pensioners, and is accessible in 8 languages, including **English, Hindi, and six regional languages.**
- It is designed to streamline healthcare services, the app allows users to book online appointments, check in without waiting in queues, and access their e-Health records.
- Other features such as **Aadhaar seeding for beneficiaries**, home sample collection requests, and eligibility checks for various ESI benefits have been added.
- Additionally, prescriptions are prioritized at pharmacy counters, ensuring efficient service for AAA+ appointments.

Q1: What is the International Labour Organization (ILO)?

It is a specialized agency of the United Nations (UN) dedicated to improving labour conditions and living standards throughout the world.

What is Homo juluensis?



Overview:

Researchers have identified a new species of ancient humans, which they have named *Homo juluensis*, meaning "big head," based partly on a very large skull found in China.

About Homo juluensis:

- It is a new **species of ancient humans** with **distinctively large skulls**.
- The species, known as "big head people," **lived 300,000 years ago** and survived in **small groups across eastern Asia** before **disappearing around 50,000 years ago**.
- *Homo juluensis* **includes mysterious groups like the Denisovans**—ancient human relatives whose histories are still being uncovered.
- **Fossils** attributed to *H. juluensis*, primarily consisting of facial and jaw remains, **exhibit dental characteristics reminiscent of Neanderthals**.
- Initial measurements indicate that their **braincases were up to 30% larger than those of Homo sapiens**.
- They **hunted wild horses in small groups**, and **made stone tools** and possibly **processed animal hides for survival**.

Key Facts about Neanderthals:

- They were an **extinct relative of modern humans** once **found across Europe, extending into Central and Southwest Asia**.
- **Species: Homo neanderthalensis**
- They are **our closest extinct human relative**.
- Current evidence from both fossils and DNA suggests that Neanderthal and modern human **lineages separated at least 500,000 years ago**.



- The **last populations** of Neanderthals are thought to have **died out roughly 40,000 years ago**, several thousand years or so after a wave of modern humans migrated deeper into Europe.
- Although they are long extinct, **their genes are still present in modern human DNA.**

Q1: Who are Denisovans?

Denisovans are an extinct species of hominid and a close relative to modern humans. They're a recent addition to the human family tree—scientists first identified Denisovan remains from a cave in Siberia in 2010. Denisovans lived across a wide range of areas and conditions, from the cold mountains of Siberia and Tibet to the jungles of Southeast Asia during the last Ice Age. DNA evidence suggests Denisovans are related to both Neanderthals and modern humans, and may have interbred with both.



SVAGRIHA Rating



Overview:

Recently, the Inland Waterways Authority of India's Intermodal Terminal (IMT) at Kalughat in Bihar has received five star SVAGRIHA rating from GRIHA council.

About SVAGRIHA Rating:

- SVAGRIHA rating that stands for **Simple Versatile Affordable GRIHA** – supports the concept of green buildings and sustainability under [Green Rating for Integrated Habitat Assessment \(GRIHA\)](#).
- It is a **guidance-cum-rating system** being developed for small stand alone buildings like residences, commercial offices, motels, dispensaries, schools etc.
- It has been developed in order to help reduce the environmental impact of these small developments.
- **Rating system**



- It will be **applicable only for projects** which are **less than 2500 sq.m. built-up area.**
- The rating system **has 14 criteria.**
- **Criteria:** The **criteria** are divided into **5 broad sub-groups** namely: **architecture & energy, water & waste, materials, landscape and lifestyle.**
- It will be mandatory to attempt certain points under each sub-group. The total points that a project can **achieve are 50**
- The rating will be done on a **1-5 star scale.**
- It has been designed as a simple online tool with guiding parameters which will evaluate the performance of the project with respect to SVAGRIHA in a simple, easy to understand manner.

Key facts about Kalughat Intermodal Terminal

- It is one among several infrastructural interventions made by the Inland Waterways Authority of India (IWAI) for capacity augmentation of **National Waterway 1 – River Ganga.**
- It has **received five star rating** for its efforts to ensure environmental sustainability by ensuring usage of recyclable materials like fibre, recyclable glasses, paint, sanitary fixtures etc during the building of the terminal.

Q1: What is the GRIHA Rating system?

It is an acronym for Green Rating for Integrated Habitat Assessment. GRIHA is a Sanskrit word meaning – 'Abode'. It is a rating tool that helps people assesses the performance of their building against certain nationally acceptable benchmarks.



Tikhir Tribe



Overview:

In a historic first, the Tikhir tribe of Nagaland held its first-ever Log Drum Pulling Ceremony on the third day of the ongoing 25th Hornbill Festival 2024.

About Tikhir Tribe:

- The Tikhir tribe is one of the **indigenous Naga tribes** found in the northeastern Indian state of **Nagaland**.
- **Some live across the border in Myanmar.**
- They speak a **language called Naga Yimchungru**, which is part of the Tibeto-Burman language family, like most Naga languages.
- **At one time**, the Tikhir **were headhunters** and a man's prestige depended upon the number of enemies he had killed.
- They make their living from **agriculture and hunting**.
- Since the Tikhir are a **small tribe** in Nagaland, **some of the larger tribes harass them**.
- **Beliefs:**
 - With the coming of the Christian missionaries to Nagaland, most Tikhirs converted to **Christianity**.
 - Many of the Tikhir practice **elements of folk religion with their Christianity**.
- **"Tsonglaknyi"** the **main Tikhir Festival**, is observed from 9th to 12th Oct. every year. It is basically a festival of the sanctification of Shield.

Q1: Who are Nagas?

Nagas are a hill people who are estimated to number about 2.5 million (1.8 million in Nagaland, 0.6 million in Manipur and 0.1 million in Arunachal states) and living in the remote and mountainous country between the Indian state of Assam and Burma. There are also Naga groups in Burma. Nagas are divided into sixteen main tribal groups, each with its own name and distinct language.