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Faster Degradation of Poly Lactic Acid

Researchers have developed a novel method to degrade plastics. They found that adding sugar units to polymers increases their degradability when exposed to just ultraviolet (UV) radiation.

> The Ultra Violet (UV) radiation has a wavelength of 10 nanometres (nm) to 400 nm, shorter than that of visible light, but longer than X-rays.

- **PLA** - Created using lactic acid from the fermentation of sugars, Poly Lactic Acid (PLA), is a renewable, sustainable alternative to polymers made from crude oil.
- PLA is used in everything from throwaway cups and teabags to three dimensional (3D) printing and packaging.
- Although PLA is sometimes advertised as biodegradable, it only dissolves under **industrial composting conditions** of high temperatures and humidity, which are not possible in residential compost heaps.
- It is also not easily degradable in natural environments, such as soil or the ocean.
- **New research** - The research demonstrated that incorporating as little as 3% of sugar polymer units into PLA can cause it to degrade by 40% in only 6 hours when exposed to UV light.
- Most PLA plastics are made up of long polymer chains which can be difficult for water and enzymes to break down.
- This new method weakens the plastic, breaking it down into smaller polymer chains that are then more sensitive to hydrolysis.
- This could make the plastic much more biodegradable in the natural environment, for example in the ocean or in a garden compost heap.
- The technology is compatible with existing plastic manufacturing processes, so it may be adopted quickly by the plastics industry.

Reference

1. https://www.thehindu.com/sci-tech/science/researchers-develop-method-that-make-plastics-more-degradable-under-uv-light/article6560221ece
2. https://www.sciencedaily.com/releases/2022/05/220524110646.htm

Critical Minerals

India and Australia are expanding their strategic ties to critical minerals in a bid to create a bulwark against China's dominance over raw materials ubiquitous in military and commercial applications.

> India-Australia critical minerals investment partnership envisages joint investment for viable lithium and cobalt projects in Australia, which is critical for India's transition

towards clean energy ambitions.

- Critical minerals are elements that are the **building blocks** of essential modern-day technologies.
- Generally, these minerals have important uses and **no viable substitutes**, and are at risk of supply chain disruptions.
- These minerals are now used everywhere from making mobile phones, computers to batteries, electric vehicles and green technologies like solar panels and wind turbines.
- Aerospace, communications and defence industries also rely on several such minerals as they are used in manufacturing fighter jets, drones, radio sets and other critical equipment.
- Based on their individual needs and strategic considerations, different countries create their own lists.

Most Common Critical Minerals	**Purpose**
Graphite, lithium and cobalt	To make EV batteries
Rare earths	To make magnets
Silicon	To make computer chips and solar panels

- **Reason for criticality -** As countries around the world scale up their transition towards clean energy and digital economy, these critical resources are key to the ecosystem that fuels this change.
- They are critical as the world is fast shifting from a fossil fuel-intensive to a mineral-intensive energy system.
- **Risk** - Any supply shock can severely imperil the economy and strategic autonomy of a country over-dependent on others to procure critical minerals.
- But these supply risks exist due to rare availability, growing demand and complex processing value chain.
- Many times the complex supply chain can be disrupted by hostile regimes, or due to politically unstable regions.

Reference

1. https://timesofindia.indiatimes.com/business/india-business/india-oz-bring-critical-minerals-into-strategic-ties/articleshow/92642824.cms
2. https://indianexpress.com/article/explained/explained-what-are-critical-minerals-the-centerpiece-of-a-new-india-australia-collaboration-8010268/
3. https://www.americangeosciences.org/critical-issues/faq/what-are-critical-minerals-and-why-are-they-important

Nairobi Flies

Around 100 students of a college in East Sikkim have reported skin infections after coming in contact with Nairobi flies.

- Also known as Kenyan flies or dragon bugs, the Nairobi flies are native to East Africa.
- These flies are small, beetle-like insects that belong to two species - Paederus eximius and Paederus sabaeus.
- These flies are not native to India but can overwhelm new areas in search of breeding grounds and ample food supply.
- They thrive in areas with high rainfall.
- Like most insects, the beetles are attracted by bright light.

- **Pederin** - These flies do not bite, but if disturbed while sitting on anyone's skin, they release a potent acidic substance that causes burns.
- This acidic substance is called pederin, and can cause irritation if it comes in contact with the skin, leading to lesions or unusual marks or coloring on the skin.
- The skin begins to heal in a week or two, but some secondary infections can occur, especially if the victim scratches the irritated skin.
- Outside Africa, outbreaks have happened in India, Japan, Israel, and Paraguay in the past.
- **Protection** - Sleeping under mosquito nets can help.
- If a fly lands on a person, it should be gently brushed off, and should not be disturbed or touched to reduce the chances of it releasing pederin.
- The area where the fly sits should be washed with soap and water.
- If they are squelched and end up leaving toxic fluids on the skin, care should be taken that unwashed hands do not touch any other part of the body, particularly the eyes.

Reference

1. https://indianexpress.com/article/explained/explained-what-are-nairobi-flies-which-are-causing-disease-in-sikkim-8010813/
2. https://timesofindia.indiatimes.com/india/100-students-at-sikkim-college-infected-by-nairobi-flies/articleshow/92673938.cms
3. https://www.ndtv.com/india-news/100-students-in-sikkim-suffer-severe-skin-infections-due-to-nairobi-flies-3129147

Compact Total Irradiance Monitor

NASA will dispatch a shoebox-sized satellite called the Compact Total Irradiance Monitor (CTIM) to measure the Total Solar Irradiance (TSI) or all the Earth-directed energy coming from the Sun.

- **TSI -** Total solar irradiance is defined as the amount of **radiant energy emitted by the Sun** over all wavelengths that fall each second on 11 sq ft (1 sq m) outside the earth's atmosphere.
- TSI is a major component of the Earth's radiation budget that describes the overall balance between incoming and outgoing solar energy.
- Increasing amounts of greenhouse gases trap increasing amounts of solar energy within the atmosphere.
- That increase is what causes climate change and subsequently rising sea levels and severe weather.
- Missions like the Earth Radiation Budget Experiment and instruments like CERES from NASA have helped climate scientists maintain an unbroken record of TSI going back the last 40 years.
- The unbroken nature of this record helps detect small fluctuations in the amount of solar radiation Earth receives during the solar cycle while emphasising the impact GHG emissions have on Earth's climate.
- **CTIM** - The Compact Total Irradiance Monitor (CTIM) will help scientists understand how that energy influences our planet's severe weather, climate change and other global forces.
- The CTIM is the smallest satellite ever to do this task.
- Reducing a satellite's size will reduce the cost and complexity of deploying that satellite into low-Earth orbit.
- CTIM has a novel bolometer (radiation detector), which is made of miniscule carbon nanotubes arranged vertically on a silicon wafer, the material absorbs 99.995% of incoming light.
- This means that CTIM's two bolometers together take up less space than the face of a rupee coin. This allowed engineers to develop a tiny instrument fit for gathering TSI data from a

small CubeSat platform.
- **CSIM** - The Compact Spectral Irradiance Monitor (CSIM) used the same bolometers to successfully explore variability within bands of light present in sunlight.
- In the future, NASA envisions merging CTIM and CSIM into one compact tool that can both measure and dissect solar radiation.

Reference

1. https://indianexpress.com/article/technology/science/nasa-ctim-satellite-total-solar-irradiance-climate-change-8010659/
2. https://www.ncei.noaa.gov/products/climate-data-records/total-solar-irradiance

State Ranking Index for NFSA 2022

The Ministry of Consumer Affairs, Food & Public Distribution has released the 1st edition of the State Ranking Index for NFSA 2022.

The National Food Security Act (NFSA) 2013 aims to provide for food and nutritional security in the human life cycle approach, by ensuring access to adequate quantities of quality food at affordable prices to people.

- The "State ranking Index for NFSA" attempts to document the status and progress of implementation of NFSA and various reform initiatives across the country, post consultation with states.
- It highlights the reforms undertaken by the States and UTs and create a cross-learning environment and scale-up reform measures by all states and union territories.
- The current version of the Index measures the effectiveness of NFSA implementation majorly through operations and initiatives under the Targeted Public Distribution System (TPDS).
- The Index denotes only the efficiency of TPDS operations, it does not reflect the level of hunger, if any or malnutrition, or both.
- **Pillars** -The Index for ranking the states and UTs is built on 3 key pillars which covers the end-to-end implementation of NFSA through TPDS.
- These pillars are:
    1. NFSA - Coverage, targeting and provisions of the Act,
    2. Delivery platform, and
    3. Nutrition initiatives.
- **Findings** - Amongst the General Category States, Odisha, Uttar Pradesh and Andhra Pradesh have topped the ranking of States for implementation of the NFSA for the year 2022.
- Among the Special Category states/UTs (North-eastern States, Himalayan States, and Island States), Tripura stood first followed by Himachal Pradesh and Sikkim respectively.
- Further, among the 3 UTs where Direct Benefit Transfer (DBT) - Cash is operational, Dadra and Nagar Haveli & Daman and Diu topped.
- **Related Links** - National Food Security Act, 2013

Reference

1. https://pib.gov.in/PressReleasePage.aspx?PRID=1839388
2. https://www.thehindu.com/news/national/odisha-tops-state-ranking-for-implementation-of-national-food-security-act/article65602447.ece
3. https://indianexpress.com/article/delhi/odisha-tops-first-national-food-security-ranking-tripura-

best-among-smaller-states-8010129/

