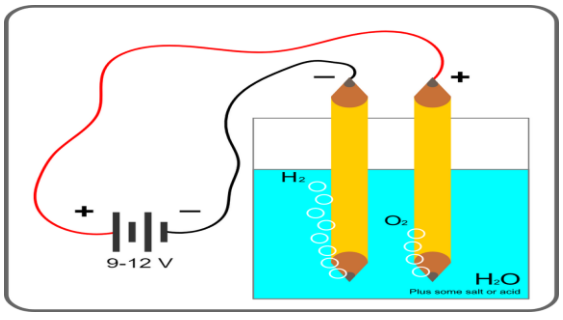
Electrolysis of water

- Researchers at the Indian Institute of Technology (IIT), Mandi, have developed a novel carbon based catalyst to make water electrolysis more efficient, as well as more stable and affordable than other catalysts that perform the same function.
- The electrolysis of water to split it into its constituent atoms using electricity consumes a lot of energy. The traditional solution is to use a catalyst to induce the water molecules to split at lower energy. Common catalysts are based on iridium and ruthenium, which are expensive and in great demand in other sectors.
- In the new study, research groups of Assistant Professor Swati Sharma and Associate Professor Aditi Halder reported a porous carbon material containing nitrogen that functions both as a catalyst and as the anode in electrolyzers and could substitute the metal-based catalysts.



- The researchers produced this material, called 'laser carbon', by exposing a sheet of a polyimide polymer to a laser beam, carbonizing the exposed bits, and leaving the remainder rich in nitrogen.
- In an electrolyzer, the nitrogen atoms drew electron clouds towards themselves, encouraging nearby carbon atoms to bond with atoms or molecules containing electron pairs.
- So, the location of these atoms became active sites for the oxygen evolution reaction (OER).

THE HINDU

Osteology

- Indigenous cultures of the American Great Plains and northern Rockies had integrated domestic horses of Spanish ancestry into their lifeways long before the arrival of European colonizers to the region (Science).

Osteology

- Osteology means the study of bones and comprises studies of both human and animal material. Osteological material forms the largest amount of finds at archaeological excavations, regardless of the site contains burials or settlement structures.

THE HINDU

Intergalactic space

- Radio telescope observations have revealed a cold stream of intergalactic atomic carbon gas feeding star formation in a massive radio galaxy in the young Universe.
- The findings provide observational evidence supporting theoretical cosmological models and offer new insights into the origins of the cosmic materials that enable galaxy and star formation.

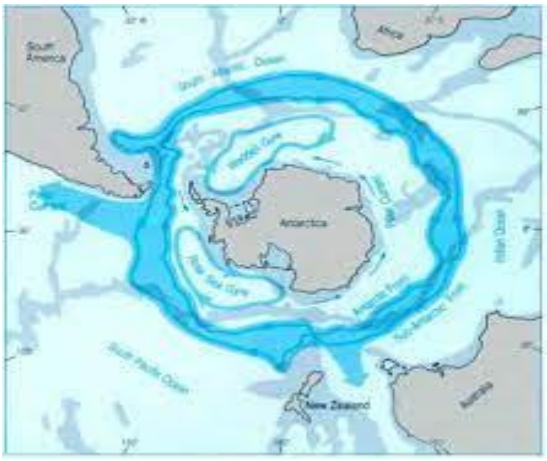
What is intergalactic space??

- The space between stars is known as interstellar space, and so the space between galaxies is called intergalactic space.
- These are the vast empty spaces that sit between galaxies.
- For example, if you wanted to travel from the Milky Way to the Andromeda galaxy, you would need to cross 2.5 million light-years of intergalactic space.
- Intergalactic space is as close as you can get to an absolute vacuum. There's very little dust and debris, and scientists have calculated that there's probably only one hydrogen atom per cubic meter.
- The density of the material is higher near galaxies and lower in the midpoint between galaxies.
- Galaxies are connected by a rarefied plasma that is thought to possess a cosmic filamentary structure, which is slightly denser than the average density of the Universe. This material is known as the intergalactic medium, and it's mostly made up of ionized hydrogen.

THE HINDU

Antarctica circulation

- Antarctic circulation could slow by more than 40% over the next three decades, with significant implications for the oceans and climate. Such a decline of ocean circulation will stagnate the bottom of the oceans and generate further impacts, affecting climate and marine ecosystems for centuries to come.
- Coldwater that sinks near Antarctica drives the deepest flow of the overturning circulation a network of currents that spans the world's oceans. The overturning carries heat, carbon, oxygen, and nutrients around the globe. This influences climate, sea level, and the productivity of marine ecosystems.

- 

THE HINDU

Marburg virus

- The Marburg virus was first identified in 1967 during outbreaks in Germany and Serbia and is known to cause severe and fatal viral hemorrhagic fevers in humans.
- The virus is closely related to another deadly virus, Ebola, and is rated as a high-risk pathogen by the WHO.
- Marburg virus is transmitted to humans through contact with infected animals such as fruit bats, and further human -to human transmission can occur through direct contact with the bodily fluids of an infected patient or contaminated surfaces resulting in outbreaks.
- Since its initial detection in 1967, several outbreaks of the Marburg virus have been detected between 1975 and 2023, with African countries being the most affected and often with high fatality rates of up to 90%, depending on the early access to quality ca.

Kala azar

About kala-azar

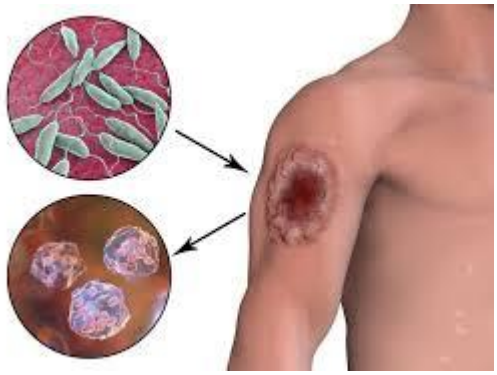
- Kala-azar is a vector borne (sand-fly) neglected tropical disease caused by the protozoan parasites of the genus leishmania that afflicts the world's poorest populations in over 90 countries.
- Current annual estimates of kala-azar are about 1,00,000, with more than 95% of cases reported to the World Health Organization

(WHO) from India and other tropical countries, most importantly coinfection with HIV, which leads to an immunocompromised state.

- The four States endemic for kala-azar in India are Bihar (33 districts), Jharkhand (4 districts), West Bengal (11 districts), and Uttar Pradesh (six districts).

New Research

- Experimental work undertaken in mice has shown a novel quinoline derivative to be effective in sharply reducing the load of Leishmania donovani in both the spleen and liver of lab grown mice.
- The quinoline derivative is a potent inhibitor of an enzyme called topoisomerase 1 (LdTop1), which is essential for the maintenance of DNA architecture in parasites; this enzyme is distinct from the one found in humans.
- Poisoning of LdTop1 imparts a significant level of cytotoxicity to both the Leishmania parasites found in the gut of sand fly vectors (promastigotes) as well as the form found in the infected humans (amastigotes) of both the wild type and the antimony-resistant isolates without inducing any lethality to human and mice host cells.



THE HINDU

Resolution (A/77/L.58)

- On March 29, the United Nations General Assembly passed a resolution that asked the International Court of Justice at The Hague to provide an opinion on what kind of obligations countries have towards climate change reduction, based on the promises they have made to the UN Framework Convention for Climate Change (UNFCCC)
- What made it particularly important was that the resolution passed by consensus had been pushed through by one of the smallest countries in the world, the Pacific Island of Vanuatu, an island that was devastated in 2015 by the effects of Cyclone Pam, believed to have been spurred by climate change, that wiped out 95% of its crops and affected two-thirds of its population.

”What does the resolution seek?

- The draft resolution (A/77/L.58) invoked article 96 of the UN Charter to ask the ICJ to deliberate on two questions:
- What are the obligations of states under international law to ensure the protection of the climate system for present and future generations?
- What are the legal consequences under these obligations for states where they, by their acts and omissions, have caused significant harm to the climate system, particularly for Small Island Developing States (SIDS) and for people who are harmed?
- ICI measures combined and individual performance of production of eight core industries viz. Coal, Crude Oil, Natural Gas, Refinery Products, Fertilizers, Steel, Cement, and Electricity.
- The Eight Core Industries comprise 40.27 percent of the weight of items included in the Index of Industrial Production IIP.

THE HINDU