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International Centre for Integrated Mountain Development (ICIMOD)

ICIMOD recently launches air quality dashboard to track and forecast pollution across Indo-Gangetic plain.

- ICIMOD is an ***intergovernmental organization*** that works to improve the lives of people in the Hindu Kush Himalaya (HKH) region and protect the resources and culture that define it.
- **Founded in -** 1983.
- **Location -** ICIMOD is based in Kathmandu, Nepal.
- **Associated countries –** 8 regional countries associated with ICIMOD because Hindu Kush Himalaya mountain range spans those countries.

- **Working**
  - Promoting the development of a sustainable mountain ecosystem
  - Improving the living standards of people in the mountains
  - Conserving and managing the region's biodiversity
  - Preparing for disasters and monitoring the environment
- **Funding -** ICIMOD's activities are supported by
  - The governments of Austria, Denmark, Germany, Netherlands, Norway, and Switzerland
  - Regional member countries
  - Over thirty project co-financing donors
- **India's role in ICIMOD** - India is a founding member country of ICIMOD. The Ministry of Environment, Forests and Climate Change (MoEF&CC) is the nodal Ministry in India.

Hindu Kush Himalaya mountain range

- The HKH region extends 3,500 km over all or part of 8 countries from Afghanistan in the west to Myanmar in the east.
- It is the source of 10 large Asian river systems

Amu Darya	Salween (Nu)
Indus	Mekong (Lancang)
Ganges	Yangtse (Jinsha)
Brahmaputra (Yarlungtsanpo)	Yellow River (Huanghe)
Irrawaddy	Tarim (Dayan)

- It provides water, ecosystem services, and the basis for livelihoods to a population of around

240 million people in the region.
- The basins of these rivers provide water to ***1.9 billion people, a 4th of the world's population.***
- A considerable volume of water resources is stored as snow and glacier ice in the HKH.
- Cryosphere components including permafrost and glacial lakes provide various ecosystem services for mountain and downstream communities.

References

1. Down to Earth | ICIMOD
2. ICIMOD | About US

extrachromosomal DNA (ecDNA)

A research team called eDyNAmiC recently revealed a study showing how ecDNA is formed and contributes to cancer and drug resistance progression.

- **ecDNA -** In normal human cells, the nucleus contains ***23 pairs*** of chromosomes that enclose the DNA.
- There are some natural processes that can damage DNA. For example, in ***chromothripsis***, which occurs in some cancers, the chromosomes are broken and rearranged.
- Cells can also make mistakes in the DNA when making copies of it to imbue in new cells.
- Such processes could cause a small part of the DNA to break away from the main chromosome and form a circular structure that floats freely inside the nucleus. This is ecDNA.
- A study published in 2017 revealed ecDNA is present in nearly 40% of cancer cell lines and in up to 90% of patient-derived brain tumour samples, revealing its pivotal role in cancer biology.
- **Recent Findings –** The team analysed the mutation patterns in tumours before and after the formation of ecDNA.
- They identified various environmental factors, including smoking, exposure to certain substances, and genetic mutations, to be triggers of DNA damage that could lead to the formation of ecDNA.
- They validated their findings using a method called ***fluorescence in-situ hybridisation (or FISH)***, which specifically looks for certain cancer-related genes in tissue samples.
- They found that ecDNA was present in about 17% of tumour samples but more so in liposarcomas, brain tumours, and breast cancers.
- They also reported that the prevalence of ecDNA rose after treatments like chemotherapy, and correlated with metastasis and worse patient outcomes.
- **The association of ecDNA with cancer growth** - ecDNA present in tumours often contain multiple copies of oncogenes, mutated genes capable of causing cancer, required to activate tumour growth.
- But these oncogenes are not present in chromosomes.
- While chromosomal DNA is fixed within specific regions in the cell, ecDNA moves freely and can interact with other ecDNA to form hubs, concentrated zones where oncogenes are expressed more.
- Cells transcribe DNA to mRNA to use the latter to manufacture proteins.
- It has been found that when cells transcribe ecDNA to mRNA, the process causes specific oncogenes to become four-times more common in the cell than if the DNA came from the chromosomes.
- This anomaly has the potential to accelerate the evolution of tumours and help the cancer

resist drugs.

- **Violation of Mendel's third law -** Typically, when cells divide, they duplicate the chromosomes and distribute it equally among their daughter cells.
- In this process the genes on the same chromosome are inherited together while those on different chromosomes are distributed independently of one another.
- This basic genetic principle is called Mendel's third law of independent assortment (named after Gregor Mendel).
- However, ecDNA is passed on in clusters to the daughter cells during cell division is a violation of the third law.
- This clustering gives some cancer cells an advantage because it allows them to enhance gene interactions, support cancer growth, and preserve favorable genetic combinations over multiple life-cycles.

Reference

The Hindu | ecDNA challenges law of genetics

Hitler Beetle (Anophthalmus hitleri)

Many researchers suggested the species Anophthalmus hitleri be renamed, the International Code of Zoological Nomenclature's principle of priority holds that the first name validly published for a species is its correct name.

- It is a species of small brown ***blind cave beetle*** found only in about 15 humid caves in ***Slovenia.***
- **Genus – Anophthalmus**, shares its genus with 41 other species and 95 different subspecies.
- **Nomenclature -** The species was named by amateur Austrian entomologist Oskar Scheibel as a tribute to Adolf Hitler.
- **Appearance -** The species exhibits no notable characteristics, such as extravagant colors or unusual antennae.
- **Diet -** larvae of A. hitleri are presumed to be predators on smaller cave inhabitants.
- **Status -** Though the IUCN has not yet evaluated the species, it is critically endangered due to its declining population.

The issue behind naming of the species

- Taxonomy is a carefully structured process governed by strict international rules such as the International Code of Nomenclature for algae, fungi and plants.
- Based on these rules, each species receives a unique scientific name, often derived from Latin or Greek.
- One of the most important features of taxonomy is binomial nomenclature.
- This two-part naming system was introduced by the renowned Swedish taxonomist Carl Linnaeus in the 18th century.
- When scientists discover a new species, they are responsible for naming it, following the international naming conventions.
- These names frequently reflect the species' physical characteristics, habitat or behaviour.
- Others are inspired by cultural or historical events. They may honour a person, place, or even a mythological figure.
- It makes taxonomy not just a technical field but also a fascinating narrative about the natural world.
- Some species have recently been named after politicians and musical celebrities.

Species	Named after
Scaptia beyonceae	A horsefly named for singer Beyoncé Knowles
Singafrotypa mandela	A spider, named for global statesman Nelson Mandela
Neopalpa donaldtrumpi	A moth, named for incoming US president Donald Trump
Anophthalmus hitleri	A beetle species was named as a tribute to Adolf Hitler
Hottentotta jayakari jayakari	A species of scorpion was named to denigrate the Khoekhoe people of south-western Africa, mocking their language by Europeans.

- There is a growing call by scientists to revise species names that are offensive, outdated, or linked to colonialism, social injustice or prejudice.
- Potential method to address problematic eponyms, species named for individuals is to take a symbolic approach, replacing them with neutral placeholders.
- The enduring legacy of racist, offensive terms in scientific nomenclature raises important questions about ethics and the power of language in maintaining or dismantling colonial legacies.

References

1. The Hindu | Hitler Beetle
2. Animalia | Anophthalmus hitleri

Toxins of the Bhopal disaster

Hundreds of tonnes of toxic waste have yet to be removed from the premises of Union Carbide even after 40 years of the Bhopal disaster.

- Bhopal plant is built in late 1960s to manufacture an insecticide called ***carbaryl*** using a reaction of methyl isocyanate (MIC) with 1-naphthol.

- **Methyl Isocyanate (MIC)** - MIC (C_2H_3NO) is a highly toxic compound, volatile colorless liquid that used in the manufacture of pesticides such as carbofuran, carbaryl, and aldicarb.
- It is extremely flammable, and potentially explosive when mixed with air.
- It reacts with water at high temperatures and its reaction with water also releases heat.
- **Effect on Humans**
    - It doesn't have a particular smell at concentrations at which other gases may become noticeable.
    - It is irritating to the eyes, respiratory tract, and skin.
    - High vapor concentrations cause severe pulmonary edema and injury to the alveolar walls of the lung, severe corneal damage, and death.
- It is responsible for the gas leaked from a pesticide plant.
- Union Carbide Corporation has never officially specified which gases were leaked from the plant, including MIC.
- Greenpeace released a report in 1999, which reported the presence of,

Heavy Metals	Organic Compounds
Mercury	Hexachlorobutadiene
Chromium	Chloroform
Copper	Carbon tetrachloride
Nickel	Trichlorobenzene
Lead	Persistent Organic Pollutants (POPs)

Toxics of Heavy Metals

- Heavy metals' density is at least ***5 times that of water***.
- **Mercury** – It damages multiple organs even at low concentrations by accumulating in soft tissue and preventing normal cellular function.
- **Chromium** – The high doses cause various cytotoxic and genotoxic reactions that affect the immune system and also cause cancers in the lungs.
- **Copper** - It damages the liver, the kidneys, and the gastrointestinal system at high concentration.
- **Nickel** – Its high exposure effects lung fibrosis, kidney and cardiovascular diseases and cancer in the respiratory tract**.**
- **Lead** – It damaging chlorophyll and disrupting photosynthesis in the plants and rendering structural damage to cells.
- Lead from inorganic compounds correlated with cancers on the stomach, lungs, kidneys, and brain.

Harmful organic compounds

- **Hexachlorobutadiene -** It is a carcinogen and corrosive in humans which destroy cells in the kidneys involved in producing urine, and inhibit brain activity.
- **Chloroform -** It is also a carcinogen and at a sufficient concentration, it caused an adult to faint, and at higher concentrations cause death.
- **Carbon Tetrachloride** – It damages the liver, nerves, and causing blur vision, cancer, heartbeat irregularity.
- **Trichlorobenzene -** It is a volatile and spread easily through the air, and also found in groundwater and surface water bodies like lakes.
- These build up in the body's fatty tissues and at high concentrations damage the liver and kidneys.
- **Persistent Organic Pollutants (POPs) –** It doesn't break down easily and last for many

years in the environment.
- It effects include cancer, allergies and hypersensitivity, damage to the central and peripheral nervous systems, reproductive disorders, and disruption of the immune system.

Reference

The Hindu| Toxins of the Bhopal disaster

World AIDS Day

According to the Tamil Nadu State AIDS Control Society (TANSACS), the State had declined in the HIV prevalence from 1.18% in 1997 to 0.16% during 2023-2024.

- **HIV** - Human Immunodeficiency Virus (HIV) is a retrovirus that targets the body's white blood cells, and weaken the immune system.
- **AIDS** - Acquired Immunodeficiency Syndrome (AIDS) is occurred at the late stage of HIV Infection.
- It occurs when the body's immune system is badly damaged because of the virus.
- **Transmission of HIV & AIDS** – It is transmitted by the exchange of body fluids from people, including blood, breast milk, semen, and vaginal secretions.
    - It is not spread by kissing, hugging, shaking hands, or sharing personal objects, food or water.
- **Treatment of HIV & AIDS** – There is no cure for this infection.
- **Prevention of HIV & AIDS** – It is a preventable disease which is treated with antiretroviral drugs.
- Current antiretroviral therapy (ART) does not cure HIV infection but allows a person's immune system to get stronger.
- **World AIDS Day -** It has observed every year on ***1st December*** since 1988 after a recommendation by the World Health Organization (WHO) and the United Nations (UN).
- It serves as a global movement to unite people in raising awareness about HIV and AIDS.
- The ***first known cases of aids*** were reported in 1981.
- It is an opportunity for every community and individual to honor the more than 32 million people who have died worldwide from AIDS-related illness.
- **World AIDS Day, 2024 - Theme** - Take the Rights Path, My Health, My Right.
- It seeks to foster inclusivity, reduce stigma, and encourage global cooperation to eradicate AIDS as a public health threat.
- **Global response** - The Joint United Nations Programme on HIV/AIDS (UNAIDS) is leading the global effort to end AIDS as a public health threat ***by 2030*** as part of Sustainable Development Goals.
- **India's Response – *National AIDS and STD Control Programme (NACP)*** launched on 1992 for prevention and control of HIV/ AIDS.
- Over 35 years, it has become one of the largest HIV/AIDS control programs in the world.
- HIV Estimation in 2012, has demonstrated an overall reduction of 57% through this programme.
- The adult HIV prevalence has decreased from 0.41% in 2001 to 0.27% in 2011.
- ***Wider access to Anti-Retroviral Therapy (ART)*** has resulted in 29% reduction in estimated annual deaths due to AIDS.
- It is committed to achieving ***Millennium Development Goals (MDG)*** in reducing HIV mortality.

- Efforts are being made to reduce the number of HIV cases to zero and there is a long way to go for an "AIDS Free India".

References

1. The Hindu| World AIDS Day 2024
2. PIB| World AIDS Day 2024
3. UNAIDS| World AIDS Day 2024