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1. Mapping the 'Indian' Genome

Why in News?

The Ministry of Science and Technology, Government of India has Cleared 'Genome India' Project to map India's genetic diversity.

- The Genome India Project is inspired by the Human Genome Project.

Human Genome Project

- It was an international research effort to determine the sequence of the human genome and identify the genes that it contains.
- It was a 13-year-long, publicly funded project that ended in 2003.
- The HGP has revealed that there are probably about 20,500 human genes.
    - This information can be thought of as the basic set of inheritable "instructions" for the development and function of a human being.

'Genome India' Project

- Genome India Project is a collaboration of 20 institutions which includes the Indian Institute of Science and some IITs.
- It is being spearheaded by the Centre for Brain Research at Bengaluru-based Indian Institute of Science as the nodal point.
- **Objectives**
    - To form a grid after collecting 10,000 samples across India, to arrive at a representative Indian genome.
    - To understand the type and nature of diseases and traits that comprise the diverse Indian population.

Benefits of Genome India Project

- **Precision Healthcare:** Genome India Project will help in the development of personalised medicine, anticipating diseases and modulating treatment according to the genome of patients.
- **Sustainable Agriculture:** It will help in better understanding of the genetic basis of susceptibility to blights, rusts and pests in agriculture.
- **International Cooperation:** Global science would also benefit from a mapping project in one of the world's most diverse gene pools.

Concerns:

- **Data & Storage**: After collection of the sample, the anonymity of the data and questions of its possible use and misuse would need to be addressed.
- **Fear of Scientific Racism:** The question of heredity and racial purity has obsessed civilisations, and more scientific studies of genes through this project could reinforce stereotypes and allow for politics and history to acquire a racial twist.

- **Medical Ethics**: In a project that aims only to create a database of genetic information poses a risk of doctors privately performing gene modification.

Genome

- Genome refers to an organism's complete set of Deoxyribose Nucleic Acid (DNA), which includes all its genes.
- Each genome contains the information which is needed to build and maintain that organism.
- In humans, a copy of the entire genome — more than 3 billion DNA base pairs — is contained in all cells that have a nucleus.

2. Yaravirus

Why in News?

- Researchers have discovered a virus from Lake Pampulha, Brazil.

Key Points

- It has been named Yaravirus as a tribute to Yara, the "mother of waters" in the mythological stories of the Tupi-Guarani indigenous tribes.
- The Yaravirus does not infect human cells.

Significance:

- The Yarra Virus infects amoeba and has genes that have not been described before, something that could challenge how Deoxyribonucleic Acid (DNA) viruses are classified.

DNA

- Deoxyribonucleic acid is a two-stranded molecule that contains our unique genetic.
- This double helix structure was first discovered by Francis Crick and James Watson with the help of Rosalind Franklin and Maurice Wilkins.
- DNA contains four basic building blocks or 'bases': adenine (A), cytosine(C), guanine (G) and thymine (T).
- The bases always pair together in the same way, A with T, C with G.
- Each base pair is joined together by hydrogen bonds.

3. Thwaites Glacier

Why in News?

Recently, a new study has detected the presence of warm water at a vital point beneath the Thwaites glacier as the cause of its melting.

Key Points of Study

- The amount of ice flowing out of the Thwaites Glacier has nearly doubled over the past 30 years.
- Thwaites's melting already contributes 4% to global sea level rise each year.
- It is estimated that it would collapse into the sea in 200-900 years.
- The study reported water at just two degrees above freezing point at Thwaites's "grounding zone" or "grounding line".
- **Grounding line**
    - Grounding line is the place below a glacier at which the ice transitions between resting fully on bedrock and floating on the ocean as an ice shelf.
    - The location of the line is a pointer to the rate of retreat of a glacier.
    - When glaciers melt and lose weight, they float off the land where they used to be situated.
    - When this happens, the grounding line retreats.
    - That exposes more of a glacier's underside to seawater, increasing the likelihood it will melt faster.
    - This results in the glacier speeding up, stretching out, and thinning, causing the grounding line to retreat ever further.

Thwaites Glacier

- Thwaites Glacier is an Antarctica glacier flowing into Pine Island Bay, part of the Amundsen Sea.
- It contains enough water to raise the world sea level by more than half a metre.
- Thwaites is important for Antarctica as it slows the ice behind it from freely flowing into the ocean.
    - Because of the risk it faces and poses — Thwaites is often called the Doomsday Glacier.

4. Thanatotheristes

Why in News?

The scientists have revealed that a dinosaur fossil, found in Alberta in Canada (2010), belongs to a new species of tyrannosaur.

- The new species has been named 'Thanatotheristes degrootorum'.
- The species is the oldest tyrannosaur known from northern North America.

Thanatotheristes

- Thanatotheristes means "reaper of death".

- Thanatotheristes has been identified from fragmentary fossil parts of the skull and the upper and lower jaw bones.
- Thanatotheristes preyed on large plant-eating dinosaurs such as the horned xenoceratops and the dome-headed colepiocephale.

Significance

- The fossil specimen is important to understand the Late Cretaceous period, which is the period when tyrannosaurs roamed the Earth.

Tyrannosaurs

- Tyrannosaurs, or "tyrant lizards", were the dominant predators on land before the extinction of dinosaurs some 65 million years ago.
- These were one of the largest meat-eating dinosaurs to have ever lived on earth.
- They have very large and high skulls.

5. Coronavirus Disease Named Covid-19

Why in News?

The World Health Organisation (WHO) has named the new coronavirus disease **'Covid-19'**.

- The new name is taken from the words "corona", "virus" and "disease", with 2019 representing the year when it emerged
  - The outbreak was reported to the WHO on 31st December, 2019
- The WHO wanted to avoid stigmatizing a country or particular group, so it chose a name that did not refer to a geographical location, an animal, an individual or a group of people.
- Moreover, the word coronavirus refers to the group of viruses it belongs to, rather than the latest strain.
  - The latest strain **has been designated 'Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)'** by the International Committee on Taxonomy of Viruses.
- The new strain has killed over 1,000 people in China and sickened more than 43,000 others globally.

WHO Guidelines on 'How to Name a New Disease'- 2015

- The WHO identified the best practices to name new human diseases in consultation and collaboration with the World Organisation for Animal Health (OIE) and the Food and Agriculture Organization of the United Nations (FAO).
- The main aim behind this exercise was to "minimise unnecessary negative impact of disease names on trade, travel, tourism or animal welfare, and avoid causing offence to any cultural, social, national,

regional, professional or ethnic groups".

6. Integrated Air Defence Weapon System

Why in News?

The U.S. Department of State has approved the sale of an **Integrated Air Defence Weapon System (IADWS)** to India at an estimated cost of $1.9 billion.

- It will be deployed as the **air defence shield** for the **National Capital Delhi**.
- It will also modernise India's armed forces and expand its existing air defence architecture to counter threats posed by air attacks.

Integrated Air Defence Weapon System

- The **Integrated Air Defence Weapon System**, also known as the **National Advanced Surface to Air Missile System (NASAMS)**, provides integrated air missile defence.
- It includes:
  - Advanced medium-range air-to-air missile (AMRAAM)
  - NASAMS II
  - Radars
- AMRAAM
  - It is an American beyond-visual-range air-to-air missile capable of all-weather day-and-night operations.
- NASAMS II
  - It is an upgraded version of the NASAMS air-defence system.
  - A distributed and networked medium to long range air-defence system.

Significance:

- It will strengthen the US - India strategic relationship.
- It is important for India to modernise its weapon systems, as China is undertaking massive military modernisation.

7. Solar Orbiter Mission

Why in News?

NASA has launched **European Space Agency's (ESA) Solar Orbiter** to space on an Atlas 5 rocket from Florida.

- The orbiter mission is dedicated to solar and heliospheric physics.

About Solar Orbiter

- The Solar Orbiter Mission is a cooperative mission between **NASA** and the **European Space Agency (ESA)**.
- It will be a minimum seven-year mission.

- Objectives:
    - The probe will map the Sun's poles with high spatial resolution telescopes.
    - To study Sun's 11-year solar cycle.
    - Understand periodic outpouring of solar storms.
    - Study the impact of stars on the solar environment.
    - Observe the concentrated source of solar wind that permeates our solar system.
- Significance:
    - Sun's magnetic field and solar wind impacts space weather, networked systems like GPS, communications and even astronauts on the International Space Station.
    - The mission will help us better understand these interactions.

8. 11th Expedition of an Indian Mission to the Southern Ocean

Why in News?

The **South African** oceanographic research vessel **SA Agulhas** has started its journey for the **11th expedition of an Indian mission to the Southern Ocean, or Antarctic Ocean** from Port Louise (Mauritius).

- Currently, the research vessel was located at **Prydz Bay,** in the coastal waters of **"Bharati", India's third station in Antarctica**.

Key Points

- **The Expedition consists of six core projects:**
    - **Hydrodynamics and biogeochemistry of the Indian Ocean sector of the Southern Ocean** at different depths.
        - It will help to understand the formation of Antarctic bottom water.
    - **Observations of movement of trace gases** (halogens and dimethyl sulphur) **from the ocean to the atmosphere**
        - It will help to improve parameterisations that are used in global models.
    - **Study of organisms namely, coccolithophores** (existed in the oceans for several million years).
        - The study of their concentrations in sediments will create a picture of past climate.
    - **Investigate atmospheric aerosols and their optical and radiative properties.**
        - Its continuous measurements will quantify the impact on Earth's climate.
    - **Study the Southern Ocean's impact on Indian monsoons.**
    - **Dynamics of the food web in the Southern Ocean**
        - It will help to implement sustainable fishing.

Significance:

- The mission's objective is to understand "the role and response of the Southern Ocean to the regional and global climate variability".
- It will investigate air-sea-ice interactions and aerosols over the Southern Ocean (also known as the Antarctic Ocean).
- The vessel will explore the waters between India and Antarctica.

India's Research Stations at Antarctica:

- Bharti (active)
- Maitri (active)
- Dakshin Gangotri (used as a supply base)

9. Cancer Gene Mapping

Why in News?

A series of new papers has revealed the **most comprehensive gene map** ever of the genes causing cancer.

- It shows departures from normal behaviour- mutations trigger a cascade of genetic misbehaviours that eventually lead to cancer.

Key Points

- This is the **largest genome study** ever of primary cancer.
- Previous studies had focused on the 1% of the genome that codes for proteins.
- It explored, in considerably greater detail, the remaining 99 % of the genome, including key regions that control switching genes on and off.
- This switching on and off of genes is the most important regulatory mechanism in the body so that it functions normally and diseases are kept at bay.
- It has discovered:
    - causes of previously unexplained cancers,
    - pinpointed cancer-causing events and zeroed in on mechanisms of development,
    - opening new vistas of personalised cancer treatment to strike at the root of the problem.
- The mutations identified by the team have been catalogued.
    - The catalogue, which is already available online, allows doctors and researchers from all over the world to look things up, consult and find information about the cancer of a given patient.

Cancer Burden

- Cancer is the second most-frequent cause of death worldwide, killing more than 8 million people every year; incidence of cancer is expected to increase by more than 50% over the coming decades.

- One in 10 Indians will develop cancer during their lifetime, and one in 15 Indians will die of cancer, according to a recent World Health Organization (WHO) report.

10. AJEYA WARRIOR - 2020

Why in News?

The fifth edition of Exercise AJEYA WARRIOR-2020 between India and the United Kingdom Army will be held recently at Salisbury Plains, United Kingdom.

- The exercise has been conducted since 2005.

Key Points

- The exercise is conducted alternatively in the United Kingdom and India.
- The aim of exercise is to conduct training of troops in counter insurgency and counter terrorist operations in both Urban and Semi Urban areas.
- Both the armies will also share their valuable experiences in countering such situations as also refine drills and procedures for joint operations wherever the need arises.
- The exercise is a great step for the armies of the two democratic countries to train together and gain together from each other's rich operational experiences.
- **Other joint exercises between India and UK:**
    - Navy: Konkan
    - Air Force: Indradhanush

11. SuperCam

Why in News?

NASA is sending a new laser-toting robot, **SuperCam**, as one of the instruments aboard the Mars 2020 rover.

- SuperCam is **used for studying mineralogy and chemistry** from up to about 7 metres away.
- It might help scientists find signs of fossilised microbial life on Mars.

SuperCam

- SuperCam packs several sizable pieces of equipment into something no bigger than a cereal box.
- It fires a pulsed laser beam out of the rover's mast to vaporise small portions of rock from a distance, providing information that will be essential to the mission's success.
- From more than 7 m away, SuperCam can fire a laser to study rock targets smaller than a pencil point.
- SuperCam includes a microphone so scientists can listen each time the laser hits a target.

- **Advantages of SuperCam:**
    - SuperCam looks at **rock textures and chemicals** to find those that **formed or changed in water on Mars** long ago.
    - SuperCam looks **at different rock and "soil" types** to find ones that **could preserve signs of past microbial life on Mars**- if any ever existed.
    - For the benefit of future explorers, SuperCam **identifies** which **elements in the Martian dust may be harmful to humans.**
    - Scientists can learn about how atmospheric molecules, water ice, and dust absorb or reflect solar radiation. This **helps predict Martian weather better.**

Mars Rover 2020

- Mars 2020 rover will be launched by NASA in July-August 2020.
- It has been designed to **better understand the geology of Mars** and seek signs of ancient life.
- The mission **will collect and store a set of rock and soil samples** that could be returned to Earth in the future.
- It will also **test new technology to benefit future robotic and human exploration of Mars.**

12. NASA: Discovery Program

Why in News?

- NASA has selected four Discovery Program investigations to develop concept studies for possible new missions.
    - Discovery Program is a series of Solar System exploration missions by NASA.

The proposals were chosen based on their potential scientific value and feasibility:

- **DAVINCI+**
    - Deep Atmosphere Venus Investigation of Noble gases, Chemistry, and Imaging Plus (DAVINCI+).
    - This will analyse Venus's atmosphere, it's formation and evolution.
    - It will help in understanding the formation of terrestrial planets.
    - It will determine whether Venus ever had an ocean.
- **Io Volcano Observer (IVO):**
    - This will explore Jupiter's moon Io.
    - It aims to find how magma is generated and erupted in IVO.
    - The findings could further knowledge about the formation and evolution of rocky, terrestrial bodies and icy ocean worlds in the Solar System.

- **TRIDENT**
  - This aims to explore Neptune's icy moon Triton for the study of development of habitable worlds in the Solar System.
- **VERITAS**
  - Venus Emissivity, Radio Science, InSAR, Topography, and Spectroscopy(VERITAS)
  - It will aim to map Venus's surface to find out why Venus developed so differently from Earth.