

My Notes....

NATIONAL

INDIA'S FIRST PNEUMOCOCCAL VACCINE LAUNCHED

Union Health Minister **Dr Harsh Vardhan** on 28 December 2020 launched **India's first fully indigenously developed pneumococcal vaccine "Pneumosil"**. It was developed by **Serum Institute of India** with **PATH** and **Bill and Melinda Gates Foundation**.

What

- Pneumococcal disease** is a significant contributor to the **under-five mortality rate worldwide**.
- Annually **India witnesses an estimated 71 per cent of pneumonia deaths** and **57 per cent of severe pneumonia cases**.
- Every year, nearly 67,800 children under five years of age die from pneumococcal diseases and **recognising its widespread fatality**, WHO recommended the inclusion of **pneumococcal conjugate vaccines (PCV)** in routine **childhood immunisation programmes** in all countries
- PCVs have helped reduce pneumococcal deaths** but are difficult for many countries to afford. "Pneumosil addresses a need for a more affordable option".
- Pneumosil would be available at an affordable competitive price**, with an advantage of presence of serotypes 6A and 19A in the vaccine.
- The **unique feature of the WHO pre-qualified PCV** is its composition, which is specially tailored to the prevailing serotype prevalence of **S Pneumoniae in India** and other regions of the world.

Flashback

- Serum Institute of India (SII)** had conducted the **Phase 1, 2 and 3 clinical trials** of the vaccine in **India and Gambia**.
- The vaccine also **makes SII the world's third supplier of pneumococcal conjugate vaccines (PCV)** under the pneumococcal Advance Market Commitment and the first developing country vaccine manufacturer to access the global PCV market.

NCMC FACILITY INTRODUCED

The **Delhi Metro Rail Corporation** has introduced the **National Common Mobility Card service** on its Airport Express Line. The **National Common Mobility Card (NCMC) is an inter-operable transport card**, which will allow Airport Express Line commuters to save the time that they spend standing in queue for Delhi Metro tickets.

What

- Under this facility**, a person carrying a **RuPay- Debit Card** that has been issued by **23 banks in the last 18 months**, will be able to travel on the Airport Express Line of the Delhi Metro rail network using that card.

2. The NCMC facility will be made available on the entire Delhi Metro rail network by the year 2022.
3. The **NCMC is an indigenous automatic fare collection system**. It will **use a phone to avail metro services** and to enter or exit metro lines.
4. Apart from Delhi Metro travel on Airport Express Line, the NCMC will also allow passengers or the public to pay for **bus services, toll taxes, parking, retail shopping, and even to withdraw money**.
5. The NCMC, which was launched with the purpose to provide people with integrated access to all public transports, is also known as **'One Nation One Card'**.
6. The **NCMC facility on the Airport Express Line** along with the country's first driverless train on Magenta Line was inaugurated on 28 December 2020 by PM Narendra Modi.



PSLV-C50/CMS-01 MISSION SUCCESSFUL

The **Indian Space Research Organisation (Isro)** on 17 December 2020 marked its **second successful mission of the year** by launching **country's 42nd communication satellite CMS-01**. PSLV-C50 carrying CMS-01 lifted off into the cloudy skies over Sriharikota.

What

1. It was **PSLV's 52nd flight** from the Sriharikota spaceport and the **rocket's 22nd flight with an XL variant** of strap-ons.
2. Around 20 minutes after lifting off from the second launch pad at the Satish Dhawan Space Centre, **PSLV-C50 successfully injected the satellite** into a **geosynchronous transfer orbit (GTO)**.
3. The satellite will be later raised to its final position through a series of **orbit raising manoeuvres** using its propulsion system.
4. **CMS-01**, which has a **lifespan of seven years**, is envisaged to provide services in the **extended-C band of the frequency spectrum**.
5. The **extended-C band coverage** would include the **Indian mainland** and **Andaman-Nicobar and Lakshadweep islands**.

- CMS-01 is India's 42nd communication satellite
- Will replace GSAT-12 satellite, launched in 2011
- Will provide telecom services in the Extended-C Band of the frequency spectrum
- Extended-C Band coverage will include Indian mainland, Andaman-Nicobar and Lakshadweep Islands
- Mission life: 7 years

6. On 17 December 2020 launch was the **77th launch vehicle mission** from Sriharikota spaceport.
7. It is also the **second launch this year after the launch of PSLV-C49**, which placed **all-weather earth imaging satellite EOS-01** and **nine other foreign satellites** in orbits on 7 November 2020.

INDIA IN HFI 2020

India has placed 111 out of 162 countries in the **Human Freedom Index (HFI) 2020**. It is a **global ranking of personal, civil and economic freedom** released on 17 December 2020. The **Human Freedom Index 2020**, which uses **data from 2008 to 2018**, by the **Cato Institute in the United States** and **Fraser Institute in Canada**, noted a decrease in **personal freedoms since 2008 globally**.

What

1. The index **covered 76 indicators of personal, civic and economic freedom**.
2. **India was ranked 110 in terms of personal freedom and 105 on economic freedom**, with an **overall score of 6.43 out of 10**.
3. **New Zealand was ranked one in the index**, followed by **Switzerland and Hong Kong**.
4. The **three least-free countries** in descending order are **Venezuela, Sudan, and Syria**.
5. The index put **China at 129 ranks, Bangladesh at 139** and **Pakistan at 140**.

Flashback

1. The **Human Freedom Index** presents the **state of human freedom in the world based on a broad measure** that encompasses personal, civil, and economic freedom.
2. **Human freedom is a social concept** that recognizes the **dignity of individuals** and is defined here as **negative liberty** or the **absence of coercive constraint**.
3. This is the **sixth annual index** uses **76 distinct indicators** of personal and economic freedom.

NEW ELECTRICITY RULES 2020

Electricity (Rights of Consumers) Rules, 2020 notified by the Minister of Power and New and Renewable Energy, R K Singh. In the New Rules, **Consumers across the country** will now have the **right to a minimum standard of service for supply of electricity**. This will also include the **right to round-the-clock electricity supplies**, unless stated otherwise for a specific category, such as an agricultural connection.

What the Rules said?

1. These rules provide for **Rights of consumers and Obligations of Distribution licensees**, release of new connection and modification in existing connection, metering arrangement, Billing and Payment among others.

2. The **distribution licensee shall supply 24x7 powers** to all consumers. However, the Commission may specify lower hours of supply for some categories of consumers like agriculture.
3. This relaxation has been allowed since **pumps do need to be run 24x7 for supplying water to fields.**
4. The rules said that **it is the duty of every distribution licensee to supply electricity on request made by an owner or occupier** of any premises in line with the provisions of Act.
5. A **new connection** has to be given **within a maximum time period of seven days in metro cities, 15 days in other municipal areas,** and **30 days in rural areas.**
6. These **rules are based on the draft issued in September this year** that nearly 100 suggestions were received on the draft and they have been incorporated in the final rules.

INDIA'S FIRST SOCIAL IMPACT BOND

The **Pimpri-Chinchwad Municipal Corporation (PCMC)** has **signed a MoU with UNDP India** to co-create **India's 'first Social Impact Bond (SIB)'**. As part of the unique investment tool, the PCMC administration will bear the cost of a public welfare project associated with the bond, if the pre-defined project targets are fulfilled. According to UNDP, **this type of bond lays down outcome-based targets** to be achieved at the start of the contract.

What

1. This feature **allows for tracking the progress of the outcome**, thus ensuring transparency for investors.
2. This mechanism also ensures that **funds are used effectively and efficiently towards the project.**
3. This **SIB will support the PCMC** in improving healthcare services for local residents, especially with respect to the pandemic, while **incurring minimum investment risks**, said UNDP.
4. **This is the first time that a government body will act as the 'outcome funder'** in a bond, whereas traditionally most government-funded public projects require large and early investments by the government with a **substantial gestation period of outcomes** and involve various kinds of risks.
5. **UNDP India will support the PCMC** in its efforts to **strengthen the public healthcare system**, using **innovative financing models**, such as **social impact bonds.**



REVISION IN DTH GUIDELINES APPROVED

The Union Cabinet, chaired by the Prime Minister, has **approved the proposal for revision of the guidelines for obtaining license for providing Direct-To-Home (DTH) broadcasting service in India.**

The salient features of the decision are:

1. **License for the DTH will be issued for a period of 20 years** in place of **present 10 years**. Further the period of License may be renewed by 10 years at a time.
2. **License fee has been revised from 10% of GR to 8% of AGR**. AGR will be calculated by deduction of GST from GR.
3. **License Fee will be collected on quarterly basis** in lieu of presently annual basis.
4. DTH operators shall be permitted to operate .to a **maximum of 5% of its total channel carrying capacity** as permitted platform channels. A one-time non-refundable registration fee of Rs.10, 000 per PS channel shall be charged from a DTH operator.
5. **Sharing of Infrastructure between DTH operators**; DTH operators, willing to share DTH platform and transport stream of TV channels, on voluntary basis, will be allowed.
6. **Distributors of TV channels will be permitted to share the common hardware** for their **Subscriber Management System (SMS)** and **Conditional Access System (CAS)** applications.
7. The **cap of 49% FDI in the existing DTH guidelines will be aligned** with the extant Government (DPIIT's) policy on FDI as amended from time to time.

BEST-PERFORMING STATE UNDER PMAY- URBAN

Tripura has been selected the best performing state in implementation of the Pradhan Mantri Awas Yojana – Urban, under the North Eastern and Hilly States category. The **PMAY (Urban) Awards -2019** have been categorised under **three levels** and various categories.

What

1. **‘Agartala’** under **‘Best Performing Municipal Corporation’** and **Belonia** under **‘Best Performing Municipal Council’** categories have been selected for **PMAY (U) awards**; they will also be felicitated in this event.
2. PM Modi had announced 2019-20 as the **‘Construction Technology Year’** and as part of it, **54 globally proven innovative technologies** were shortlisted for various projects.
3. Of these, six were selected for constructing **six Light House Projects** of about 1,000 houses each at six places, including **Indore, Rajkot, Chennai, Ranchi, Lucknow and Agartala**.
4. On 1 January 2020, PM Modi will also **lay the foundation stone of the Light House Project in Agartala**, jointly with Chief Minister Deb.

5. The **Ministry of Housing and Urban Affairs (MoHUA)** initiated the **Global Housing Technology Challenge India (GHTC – India)** in January last year to identify and mainstream proven construction technologies that are sustainable, green and disaster-resilient.
6. The **'Light House Project'** is a one of a kind project under which 1000 cost-effective, sustainable and climate resilient flats are to be built across Tripura.

INTERNATIONAL

CAIRN ENERGY WINS ARBITRATION AGAINST INDIA

Cairn Energy Plc said 23 December 2020 that **it has won the arbitration against the Indian government over a tax dispute** arising from **demand of \$1.2 billion from tax department** on listing of Indian operations back in 2007. The oil-major said that **the tribunal had announced the award unanimously** following which the Indian government will have to pay the UK-based company damages of **\$1.2 billion and interest**.

What

1. The **tribunal ruled unanimously** that **India had breached its obligations** to Cairn under the **UK-India Bilateral Investment Treaty** and has awarded to Cairn damages of US \$1.2 billion plus interest and costs, which now becomes payable, the company said.
2. The development comes close on the **heels of Vodafone Group winning a separate arbitration on retrospective amendment to tax laws**.
3. India is yet to challenge the arbitration award. In the case of Cairn Energy, the government can challenge the award as well.
4. Cairn's claim was brought under the terms of the **UK-India Bilateral Investment Treaty**, the **legal seat of the tribunal was the Netherlands** and the proceedings were under the registry of the **Permanent Court of Arbitration**.
5. **Cairn Energy** had filed a **dispute in 2015 against the demand raised by the tax department** of Rs 10,247 crore **relating to re-organisation of the group in 2006**.

GANDHI-KING SCHOLARLY EXCHANGE INITIATIVE

US President Donald Trump has signed into law the **Gandhi-King Scholarly Exchange Initiative** that among other things paves the way for establishing an **educational forum between America and India** to study the work and legacies of **Mahatma Gandhi and Martin Luther King Jr.** The **new law authorises USD one million a year** through fiscal 2025 for the Gandhi-King Scholarly Exchange Initiative. It also **authorises USD 2 million for just FY 2021** for the **Gandhi-King Global Academy**, and USD30 million for 2021 for the **US-India Gandhi-King Development Foundation**.

What

1. The **new law also authorises the United States Agency for International Development (USAID)** to **establish a US-India development foundation** that would leverage the Indian private sector to address development priorities in India.

2. The **development foundation would receive USD 15 million per year from 2022 through 2025** - but only if India's private sector commits to match US government contributions.
3. The **Congressional Budget Office (CBO)** estimates that the bill would cost USD51 million over five years.

INDIA, BANGLADESH SEAL 7 PACTS

India and Bangladesh on 17 December 2020 **sealed seven agreements** to expand **cooperation in diverse areas**, and restored a **cross-border rail link** which was in **operation till 1965**. The restoration of the **Chilahati-Haldibari railway link** and signing of the pacts, providing for cooperation in areas of **hydrocarbons, agriculture and textiles** among others, came at a virtual summit between Prime Minister Narendra Modi and his Bangladeshi counterpart Sheikh Hasina.

More about Haldibari-Chilahati rail link

1. This rail link was part of the **Broad Gauge main route from Kolkata to Siliguri**.
2. The **war of 1965**, however, effectively cut off all the railway links. And now, to revive the erstwhile rail link, and connecting people of the two countries, the rail link has been restored.
3. The **Karimganj – Mahisashan rail link** which is on the Assam side is expected to be operational by 2022.
4. And, the **new rail link between Akhaura (Bangladesh) and Agartala** which is being financed under grant assistance from India, is likely to be operational by end 2021.
5. India has as per its commitment to Bangladesh in 2019, has handed over ten Broad Gauge locomotives in July 2020.

ECONOMY

EXPORT OF AKASH MISSILE SYSTEM APPROVED

The government on 30 December 2020 approved the **export of indigenously-developed surface-to-air Akash missile system** and **set up a high-level committee** to authorise the sale of major platforms to various countries. The defence ministry said a committee comprising **defence minister Rajnath Singh, external affairs minister S Jaishankar** and **National Security Advisor Ajit Doval** has been set up to authorise exports of major indigenous platforms.

What

1. The decision to **export the missile systems** was taken at a Cabinet meeting presided by Prime Minister Narendra Modi.
2. The **Akash missile systems have over 96 per cent indigenous components** and the weapon can hit targets at a **range of 25km**.
3. The ministry said many "**friendly countries**" have shown interest in procuring the missile during international exhibitions like the '**DefExpo**' and '**Aero India**'.

4. The **export version of Akash missiles would be different** from the system currently deployed with Indian armed forces.
5. The approval by the cabinet **will facilitate Indian manufacturers** to participate in the tendering process (Request for Information and Request For Proposal) by various countries.
6. The government has been **majorly focusing on boosting domestic defence production** and **set a target of Rs 1.75 lakh crore (\$25 billion) turnover** in defence manufacturing by 2025.
7. According to estimates, **the Indian armed forces** are projected to **spend around \$130 billion in capital procurement** in the next five years.

MOD APPROVES NEW AWACS

The **defence ministry** on 17 December 2020 accorded **initial approvals to military acquisition plans** worth Rs 28,000 crore, including the major indigenous project to develop **six airborne warning and control system (AWACS) aircraft** to **boost surveillance capabilities** along the **China and Pakistan borders**.

What

1. The Rajnath Singh-led **Defence Acquisitions Council** also gave the “**acceptance of necessity (AoN)**” for **11 next-generation offshore patrol vessels** (around Rs 9,000 crore), **38 extended 400-km range BrahMos supersonic cruise missiles** (Rs 1,800 crore) and **ship-borne unmanned aerial systems for the Navy** as well as around 40 new modular bridges for the Army.
2. **Majority of the AoNs** were in the ‘**Buy Indian-IDDM (indigenously designed, developed and manufactured)**’ category.
3. The project envisages **mounting indigenous 360-degree coverage AESA (active electronically scanned array) radars** on six A-320 aircraft, which will be acquired from the existing Air India fleet.
4. The new project, which will involve **cost-sharing between the IAF and DRDO**, is actually a recast of an earlier plan to mount the AESA radars on two new A-330 wide-body jets, which was hanging fire for well over five years.

Flashback

1. IAF currently has just **three Israeli Phalcon AWACS**, with a **400-km range** and **360-degree radar coverage**, and two indigenous “**Netra**” AEW&C aircraft.
2. The latter have indigenous **240-degree coverage radars**, with a **250-km range**, fitted on smaller **Brazilian Embraer-145 jets**.
3. The acute operational need for additional AWACS was felt during the **Balakot strikes** and the subsequent aerial skirmish with Pakistani fighters in February last year.
4. **AWACS can detect incoming fighters, cruise missiles and drones** much before ground-based radars, direct friendly fighters during air combat with enemy jets, and keep tabs on enemy troop build-ups and warships.

INDIA INK PACT FOR GREEN HIGHWAY CORRIDORS

The government inked a \$500 million loan pact with the World Bank (WB) to develop safe and green national highway corridors in the states of Rajasthan, Andhra Pradesh, Himachal Pradesh and Uttar Pradesh, on 22 December 2020.

What

1. The Green National Highways Corridors project will support the Ministry of Road Transport and Highways (MoRTH) in constructing 783 km of highways by integrating technology designs such as local and marginal materials, industrial byproducts and other bioengineering solutions.
2. This project will provide efficient transportation for road users in the four states, connect people with markets and services, promote efficient use of construction materials and water to reduce the depletion of scarce natural resources, and help lower GHG (greenhouse gases) emissions, said WB country director for India.
3. The loan comes with a tenor of 18.5 years along with a five year grace period.

SCIENCE AND TECHNOLOGY

FIRST POTENTIAL RADIO SIGNAL DETECTED

An international team of scientists has collected the first possible radio signal from a planet beyond our solar system, emanating from an exoplanet system about 51 light-years away. Using the Low Frequency Array (LOFAR), a radio telescope in the Netherlands, the Researchers uncovered emission bursts from the Tau Bootes star-system hosting a so-called hot Jupiter, a gaseous giant planet that is very close to its own sun. The team led by researchers from the Cornell University in the US also observed other potential exoplanetary radio-emission candidates in the constellation Cancer and Upsilon Andromedae systems.

ONEWEB'S SATELLITES LAUNCHED

Bharti Global and UK government on 18 December 2020 said their joint venture OneWeb — a Low Earth Orbit (LEO) satellite communications operator — launched 36 satellites from the Vostochny cosmodrome in Russia. This takes the total in-orbit constellation to 110 satellites, part of OneWeb's 648 LEO satellite fleet that will deliver high-speed, low-latency global connectivity.

What

1. The UK government and Bharti Global have taken over the reins of OneWeb, which recently announced new management with telecom czar Sunil Mittal at the helm as executive chairman.
2. Today's launch is one of many steps we have taken to operationalise one of the world's first LEO constellations, Bharti Enterprises Chairman Sunil Mittal said.
3. The company claimed that the launch puts OneWeb on track to offer global services to customers from late 2021, starting with the United Kingdom, Alaska, Northern Europe, Greenland, Iceland, the Arctic Seas, and Canada, with global service in 2022.

4. In July, satellite networks and services company **Hughes Network Systems** announced \$50 million investment in the UK government and Bharti Enterprises-led consortium.
5. **Hughes' India arm Hughes Communications India (HCIL)** and **Bharti Airtel** are also combining their **satellite broadband operations in India**.
6. **OneWeb is a global communications network** powered from space, **headquartered in London**, enabling connectivity for governments, businesses, and communities.

INDIA'S 1ST HWT FACILITY

Defence Minister Rajnath Singh on 19 December 2020 inaugurated the **advanced Hypersonic Wind Tunnel (HWT) test facility** in Hyderabad, making **India the third country** after the **US and Russia** to have such a facility. The **state-of-the-art HWT Test facility** is "**pressure vacuum driven enclosed free jet facility** having nozzle exit diameter of 1 metre and will simulate **Mach No 5 to 12** (Mach represents the multiplication factor to the speed of sound)".

What

1. After America and Russia, **India is the third country** to have such a large facility in terms of size and operating capability.
2. It is an **indigenous development** and an **outcome of synergistic partnership** with Indian industries.
3. The facility has the capability to "**simulate hypersonic flow over a wide spectrum** and will play a major role in the realization of highly complex futuristic aerospace and defence systems.

INDIA OWN CLOUD STORAGE PLATFORM

India now has **its own cloud storage platform, DigiBoxx**. A **potential alternative to Google Drive**, Dropbox, and Microsoft OneDrive, the **indigenous cloud service** is seen as a step that furthers the initiative of '**Atmanirbhar Bharat**.' The homegrown data storage and management platform has been **launched by NITI Aayog** and it will provide affordable services to both regular users as well as businesses. All the data will be **encrypted** and **stored in servers in India**.

Features of DigiBoxx

1. The **most interesting feature** of the service **DigiBoxx** is that it **allows users to share files even when they don't have a DigiBoxx account**.
2. The feature has been named **InstaShare** and **allows users to share up to 2GB of content for free**.
3. Once you upload your file, a link will be generated that can be used by the recipient to download the content.
4. The data remains available on the link for **45 days post** which it will be deleted and the link becomes invalid.
5. Users can search for their content using tags and can even edit it in real-time.

6. **DigiBoxx supports several popular file formats** and gives users a filter option that will allow them to better organise their personal files.

INDIA'S FIRST LITHIUM REFINERY

India's first Lithium refinery which will process Lithium ore to produce battery-grade material will be set up in Gujarat. **Manikaran Power Limited**, one of the country's largest power trading and renewable energy company will be investing over Rs 1,000 crore to set up this refinery. They are currently exploring a couple of places in Sanand and Dholera to set up this refinery.

What

1. **Lithium is a rare element** not usually found in India.
2. The company will be **importing Lithium ore from Australia** and will be processing it here.
3. Last year, **Manikaran Power had collaborated with Australian firm Neometals** to tap the **Mount Marion Lithium mine** in Western Australia.
4. The proposed project is expected to help Gujarat secure the raw material supply for domestic **manufacturing of Lithium batteries** as it looks to promote electric vehicles.
5. There are already a **few Lithium ion battery manufacturing plants** which are being set up in Gujarat.

GREEN PROPULSION FOR GAGANYAAN

Indian Space Research Organisation was developed '**green propulsion**' for its ambitious human space flight mission, '**Gaganyaan**', Chairman K Sivan said on 26 December 2020. It may be adopted **for use in every stage of a rocket**. ISRO has made **space grade lithium-ion batteries** and this technology is useful for mass adoption of electric vehicle.

What

1. **Eco-friendly solid propellant** based on **Glycidyl Azide Polymer (GAP) as fuel** and **Ammonium Di-Nitramide (ADN) as oxidizer** at the laboratory level, which will eliminate the emission of **chlorinated exhaust products from rocket motors**.
2. In addition, ISRO is also carrying out various technology demonstration projects involving green propellant combinations such as **Hydrogen Peroxide (H2O2), Kerosene, Liquid Oxygen (LOX), Liquid Methane, ADN-Methanol-water, ADN-Glycerol-water** etc.
3. ISRO has already begun the move towards environment-friendly and green propellants with the acceptance of **Liquid Oxygen (LOX)/Liquid Hydrogen (LH2)** and LOX/Kerosene based propulsion systems for launch vehicles, and use of electric propulsion for spacecraft.
4. The **LOX/LH2 combination is already being used in the cryogenic upper stages** of GSLV and GSLV Mk-III launch vehicles.

- ISRO has successfully developed **ISROSENE**, which is a rocket grade version of kerosene as an alternative to conventional hydrazine rocket fuel.
- ISRO has successfully demonstrated **electric propulsion system** for station keeping operations in the South Asia Satellite, launched on May 5, 2017.

NANOMICELLES FOR CANCER TREATMENT

Researchers across the globe have been exploring **how to use nanoparticles for efficient drug delivery**. Now a **multi-disciplinary, multi-institutional team** has created a **nanomicelle** that can be used to deliver a drug named **docetaxel**, which is **commonly used to treat various cancers** including **breast, colon and lung cancer**.

What

- Similar to **nanoshells and nanovesicles**, **nanomicelles are extremely small structures** and have been noted as an **emerging platform in targeted therapy**.
- Nanomicelles are globe-like structures** with a hydrophilic outer shell and a hydrophobic interior.
- This dual property makes them a perfect carrier for **delivering drug molecules**.
- The **ideal goal for cancer therapy is destroying the cancer cells without harming healthy cells** of the body, and chemotherapeutics approved for treatment of cancer are highly toxic.
- The currently used **docetaxel is a highly hydrophobic drug**, and is **dissolved in a chemical mixture (polysorbate-80 and alcohol)**. This aggravates its toxic effects on liver, blood cells, and lungs.

Flashback

- The nanomicelles are less than 100nm in size** and are **stable at room temperature**.
- Once injected intravenously these nanomicelles can easily escape the circulation and enter the solid tumours where the blood vessels are found to be leaky. These leaky blood vessels are absent in the healthy organs.
- The team tested the effectiveness of the **nanomicelles in a mice breast tumour model** and was found to help in tumour regression.

SOLAR ORBITER MAKES VENUS FLYBY

The **joint US-European Solar Orbiter spacecraft** has completed its first of many **gravity assist flybys of Venus**, to start **bringing it closer to the Sun** and tilting its orbit in order to observe our star from different perspectives. The spacecraft's closest approach to Venus took place at 12.39 Coordinated Universal Time (UTC) on 27 December 2020. A **partnership between NASA and the European Space Agency (ESA)**, the **probe was launched in February to study the Sun**.

What

1. Its mission is to perform unprecedented **close-up observations of the Sun** and from high-latitudes, **providing the first images of the uncharted polar regions of the Sun**, and investigating the **Sun-Earth connection**.
2. The **Solar Orbiter's path** around the Sun has been chosen to be "in resonance" with Venus, which means that it will return to the planet's vicinity every few orbits and can again use the planet's gravity to alter or tilt its orbit. The **next encounter will be in August 2021**.
3. Initially, **the spacecraft will be confined to the same plane as the planets**, but each encounter of Venus will increase its orbital inclination.
4. **By 2025 it will make its first solar pass at 17 degree inclination**, increasing to 33 degree by the end of the decade, bringing even more of the Polar Regions into direct view.

DRDO DEVELOPS QRNG

After successfully testing the **Quantum Key Distribution technology (QKD)**, the **Defence Research and Development Organisation (DRDO)** has achieved another milestone in quantum technology by successfully developing a **Quantum Random Number Generator (QRNG)**, the Ministry of Defence said on 29 December 2020.

What

1. The **DRDO Young Scientist Laboratory for Quantum Technologies (DYSL-QT)**, a **DRDO facility based in Mumbai has developed a QRNG** which has the ability to **detect random quantum events and convert those into a stream of binary digits**. The facility has developed a **fiber-optic branch path based QRNG**.
2. Branch path-based **QRNG relies on the principle that if a single photon falls on a balanced beam splitter**, it will take **either of the beam-splitter output paths randomly**.
3. As the path chosen by the **photon is random**, the **randomness is translated to a sequence of binary digits**, also called bits.
4. **Random numbers** have essential roles in various fields ranging from **quantum communication, cryptography applications** like key generation, key wrapping, and authentication along with scientific simulations, lotteries and fundamental physics experiments.
5. The **generation of perfect randomness** is generally **considered impossible with classical methodologies**.
6. **Quantum mechanics** has the inherent potential of providing true random numbers and thus has become the preferred option for scientific applications requiring randomness.
7. The generated random numbers are also evaluated and verified using **DRDO's indigenously developed Randomness Testing Statistical Test Suite of SAG**.

- With this development, **India enters the club of countries which have the technology** to achieve the **generation of random numbers based on the Quantum Phenomenon**.

About DYSL-QT

- DYSL-QT is one of the five YSLs** (Young Scientist Laboratories) of the DRDO which are working on **five different technologies**.
- The other facilities are **Artificial Intelligence (DYSL-AI) Bengaluru, Cognitive Technologies (DYSL-CT) Chennai, Asymmetric Technologies (DYSL-AT) Kolkata, Smart Materials (DYSL-SM) Hyderabad**.

What is QKD?

- QKD is primarily a mechanism to undertake secure communication**, which utilises a **cryptographic protocol** involving various components of quantum mechanics.
- The technology enables two communicating sides to come up with **random secret keys** shared by both of them and known exclusively to them, and only they can use it to **encrypt and decrypt messages**, thus achieving **highly secure communication**.

- These five facilities were dedicated to the nation by Prime Minister Narendra Modi in January this year.

HST CAPTURES EINSTEIN RING

The **National Aeronautics and Space Administration (NASA)** and **European Space Agency (ESA)** operated **Hubble Space Telescope (HST)** has captured the **GAL-CLUS-022058s** in a stunning image. The narrow galaxy is curved around a spherical companion, depicting a **highly rare phenomenon**.

What

- The **GAL-CLUS-022058s is located in Fornax** or the **Furnace's southern hemisphere constellation**.
- The space agency has called this one of the most complete as well as the **largest Einstein Ring** that has ever been discovered by us in the vast universe.
- Astronomers who have been observing this particular **Einstein Ring have started calling it the "Molten Ring"**, alluding to both its appearance as well as the host constellation.
- The **phenomenon was first theorised by great scientist Albert Einstein** in his **general theory of relativity**.
- The object has an unusual shape due to the **gravitational lensing**, a process that causes light coming from a faraway place to bend due to an object's gravity between the source of the light and the observer.
- In this particular case, the agency said, **the light was originating from the galaxy in the background and it was distorted and made into a curve** due to the gravitational pull of the galaxy cluster in front of it.

7. It is the **almost exact alignment of the galaxy** in the background with the cluster's central elliptical galaxy that has caused the image of the background galaxy to be warped and magnified it to look like an almost perfect ring.

MISCELLANEOUS

MAIDEN TRIAL OF SAHAYAK-NG

The **DRDO along with the Indian Navy** has conducted a successful **maiden trial of the SAHAYAK-NG air-droppable container** from an **IL-38SD aircraft** off the coast of Goa, an official statement said on 30 December 2020. **SAHAYAK-NG is India's first indigenously** designed and developed **air droppable container**.

What

1. It is **aided by GPS**, can **carry a payload of up to 50 kg** and can be dropped from a heavy aircraft.
2. **Two labs of the Defence Research and Development Organisation (DRDO)** and **private company Avantel** were involved in **its design and development**.
3. The trial was conducted by the **Indian Navy** to enhance its operational logistics capabilities and **provide critical engineering stores to ships** which are deployed **more than 2000 km from the coast**.
4. It **reduces the requirement of ships** to come close to the coast to collect spares and stores.
5. **SAHAYAK-NG** is an **advanced version of SAHAYAK Mk I** air droppable container.

UN'S YOUNG CHAMPIONS OF THE EARTH PRIZE

A **29-year-old Indian entrepreneur Vidyut Mohan** is among the seven winners of the prestigious "**Young Champions of the Earth**" **2020 prize** given by the **UN environment agency** to global change-makers using innovative ideas and ambitious action to help solve some of the world's most pressing environmental challenges.

What

1. **Vidyut Mohan**, an engineer, is the **co-founder of "Takachar"**, a social enterprise enabling farmers to prevent open burning of their waste farm residues and earn extra income by converting them into **value-added chemicals like activated carbon on-site**, **UN Environment Programme (UNEP)** said in a statement on 15 December 2020.
2. **Takachar buys rice husks, straw and coconut shells** from farmers and turns them into charcoal, saving the debris from the fires, which are also a driver of climate change.
3. Since **Takachar was launched in 2018**, Mohan and its co-founder Kevin Kung have worked with about 4,500 farmers and processed 3,000 tonnes of crops, UNEP said.

4. The **Young Champions of the Earth prize** is awarded every year to seven entrepreneurs under the **age of 30** with bold ideas for **sustainable environmental change**.

SPACE OBJECT TRACKING CENTRE INAUGURATED

The **Indian Space Research Organisation (Isro)** on 16 December 2020 formally declared its **SSA (Space Situational Awareness) Control Centre** in Bengaluru operational. In view of the **ever-growing population of space objects** and the recent trend towards **mega-constellations**, SSA has become an integral and indispensable part of safe and sustainable space operations, Isro said adding it has been carrying out **SSA activities**, mainly **focused on safeguarding India's space assets** for the last few decades.

What

1. The **supporting infrastructure** includes additional **observation facilities for space object monitoring**, and a **control centre for centralized SSA activities**.
2. The **NETwork for space object TRacking and Analysis (NETRA) project** is initiated as a first step towards meeting this goal, its main elements are radar, an optical telescope facility, and a control centre.
3. The SSA Control Centre, "**NETRA**", is within the **ISTRAC campus** at Peenya.

'MOST INNOVATIVE INSTITUTE OF THE YEAR' AWARD

The **Indian Institute of Technology (IIT-Madras)** has bagged the **most innovative institute award** of this year. The **Confederation of Indian Industry (CII)** conferred the '**The Most Innovative Institute of the Year**' award to the institute for its innovations in the field of Healthcare, Technology other sectors.

What

1. The award was given for the innovations- **VITALSENS platform** for clinical-grade wearable health monitoring, which includes the '**Wireless Continuous Multi-parameter Patient Monitoring Device**' and related **smartphone apps**, developed by Mohanasankar Sivaprakasam, Faculty Head, Healthcare Technology Innovation Centre (HTIC).
2. The other awards are for '**Arise**,' India's first standing wheelchair by Prof. Sujatha Srinivasan, faculty head, TTK Center for Rehabilitation Research and Device Development and Shakti, first indigenous microprocessor, developed by Prof. V. Kamakoti, Department of Computer Science and Engineering.
3. The institute was awarded the '**top innovative institution**' in the **Atal Ranking of Institutions on Innovation Achievements (ARIIA)** in 2019 and 2020.

INDIAN SCIENTIST RECEIVES UNDP FIRST PRIZE

The **innovation of plant-based mock egg** by Prof Kavya Dashora, Centre for Rural Development and Technology, IIT Delhi has secured **first prize at Innovate4SDG contest** by '**UNDP (United Nation Development Program) Accelerator Lab India**'. The

award includes a sum of \$5000. According to the UNDP, the mock egg innovation will **help in accelerating progress towards the SDGs**.

US HONOUR 'LEGION OF MERIT' TO PM

US President Donald Trump on 21 December 2020 presented the prestigious **Legion of Merit to Prime Minister Narendra Modi** for his **leadership in elevating strategic partnership** of the two countries and emergence of India as a global power. India's Ambassador to the US, **Taranjit Singh Sandhu**, accepted the award on **behalf of the prime minister**.

What

1. He was given the award **in recognition of his steadfast leadership and vision** that has **accelerated India's emergence as a global power** and elevated the strategic partnership between the United States and India to address global challenges.
2. Trump also presented the Legion of Merit to Australian Prime Minister Scott Morrison and the former Japanese Prime Minister Shinzo Abe.
3. **The United States is the latest country to confer its highest award** to the prime minister.
4. Other awards include **Order of Abdulaziz Al Saud by Saudi Arabia in 2016, State Order of Ghazi Amir Amanullah Khan (2016), Grand Collar of the State of Palestine Award (2018), Order of Zayed Award by United Arab Emirates (2019), Order of St Andrew by Russia (2019), Order of the Distinguished Rule of Nishan Izzuddin by Maldives (2019)**.

BENGAL BASIN DEDICATED TO NATION

Union Minister for Petroleum, Natural Gas and Steel Dharmendra Pradhan on 22 December 2020 **dedicated the Bengal Basin**, the **eighth producing basin of India**, to the **nation** at Asokenagar, West Bengal and said that the **discovery would play a role for India's energy security**. The discovery would definitely add to the commitment towards Prime Minister Narendra Modi's clarion call for **reducing oil import dependence**. The **discovery was made by ONGG**, around **seven decades of relentless endeavours by scientists and engineers of India** have borne fruits, giving new hope for robust development of West Bengal.

MRSAM TEST FIRED SUCCESSFULLY

India on 23 December 2020 **conducted the first launch** of the **Army version** of the **Medium Range Surface to Air Missile (MRSAM)**, which is an **Air and Missile Defence system** developed by the **Defence Research and Development Organisation (DRDO)** in collaboration with the **Israel Aerospace Industry (IAI)**. The successful test was conducted off the coast of Odisha from the **Integrated Test Range (ITR)**, in which the missile hit an unmanned aerial target mimicking an aircraft.

What

1. **In April 2017, India had signed a contract with Israel** for supply of the MRSAM, which is a **land-based medium-range Air Defence surface-to-air missile system**.
2. The **MRSAM Army version** consists of a command and control post, **multi-function radar** and mobile launcher system.
3. The **MRSAM** has been **manufactured by Bharat Dynamics Limited, India**.

'PASSAGE EXERCISE' CONDUCTED

An **Indian Navy warship** undertook a "**passage exercise**" with the **Vietnamese Navy in the South China Sea** as part of efforts **to boost maritime cooperation** between the two countries, an official statement said on 27 December 2020. **Indian naval ship INS Kiltan** was sent to deliver relief material for flood-affected people in central Vietnam and it participated in the exercise on its return journey.

What

1. The exercise has been conducted at a time when **China has been expanding its military assertiveness in the South China Sea** notwithstanding mounting global concerns and criticism.
2. **INS Kiltan** had arrived at the **Nha Rhang port of Ho Chi Minh City** with 15 tonnes of relief materials for the flood-affected people of central Vietnam.
3. The defence ministry had said the ship would undertake a passage exercise with the Vietnam People's Navy in the South China Sea on its departure from Ho Chi Minh City.
4. More than **230 people died in central Vietnam** due to the floods that ravaged the region in October-November this year.
5. Recently, Prime Minister held a virtual summit with his Vietnamese counterpart Nguyen Xuan Phuc during which **both the sides vowed to boost overall defence and security cooperation** including in the **maritime sphere**.

KSTAR'S 'ARTIFICIAL SUN' BREAKS WORLD RECORD

Reaching an **ion temperature of over 100 million degrees Celsius** for 20 seconds, South Korea's magnetic fusion device, the **Korea Superconducting Tokamak Advanced Research (KSTAR)** has set a **new world record for fusion**. The magnitude of the experiment can be understood from the fact that the **Sun burns at 15 million degrees Celsius**. By comparison, the **KSTAR was able to achieve a temperature of over 6.6 times more than that of Sun's**.

What

1. The KSTAR has often been referred to as **South Korea's "artificial sun"**.
2. It achieved the same temperature in 2018 too, but only for one and a half seconds.

3. **In 2019**, it reached that **temperature for eight seconds**. This is also a great achievement because no one has been **able to sustain plasma** nearly as hot as this for a long period of time. The feat was achieved on 24 November 2020.
4. The newly developed **Internal Transport Barrier Mode** was crucial to achieving this record-breaking time.
5. Starting from August 2020 and ending on December 10, a total of **110 plasma experiments were conducted to test** what the device can do. This included various methods and techniques to inject and try to stabilise the plasma.
6. The technologies required for **long operations of 100 million-degree plasma** are the key to the realization of fusion energy.

HARSH VARDHAN NOMINATED TO GAVI BOARD

Union Health Minister **Harsh Vardhan** has been **nominated by the Global Alliance for Vaccines and Immunisation (GAVI)** as a member on the **GAVI Board**, said a release by the Ministry on 29 December 2020. **Dr. Vardhan** will be **representing the South East Area Regional Office (SEARO)/ Western Pacific Regional Office (WPRO)** constituency on the **GAVI Board**.

What

1. The seat is **currently held by Myint Htwe of Myanmar**.
2. Dr. Vardhan will be **representing India from 1 January 2021 till 31 December 2023**.
3. The **GAVI Board is responsible for strategic direction and policymaking**, oversees the operations of the Vaccine Alliance and monitors programme implementation.
4. With membership drawn from a range of partner organisations, as well as experts from the private sector, the **Board provides a forum for balanced strategic decision making, innovation and partner collaboration**.

Flashback

1. **GAVI was created in 2000**; Gavi is an **international organisation - a global Vaccine Alliance**.
2. **GAVI, the Vaccine Alliance as part of its mission to save lives, reduce poverty and protect the world against the threat of epidemics**, has helped vaccinate more than 822 million children in the world's poorest countries, preventing more than 14 million future deaths.
3. **Dr Ngozi Okonjo-Iweala** presently **serves as Chair of the GAVI Alliance Board**.