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Current Affairs: 2017

Science & Tech

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Fumigation



- Mixture of Plumes of diesel and malathion
- one part of malathion is to be mixed with 19 parts of diesel.

Microplastics

STAINED SPARKLE?

Risks associated with exfoliating agents used in personal care products has alarmed green panel

What are microbeads?

Microbeads are plastic pieces or fibre measuring less than 1 mm

What are microbeads made of?

Microbeads used in personal care products are mainly made of polyethylene (PE), but can be also made of polypropylene (PP), polyethylene terephthalate (PET), polymethyl methacrylate (PMMA) and nylon

What are they mainly used in?

They are widely used in cosmetics as exfoliating agents and in personal care products such as toothpaste, as well as in biomedical and health science research. In layman's language, these microbeads are so small that a person can barely feel them. Their roundness and particle size create a ball-bearing effect in creams and lotions, resulting in a silky texture and spread ability



Why is it used?

Microbeads have been used to replace natural exfoliating materials. Microspheres in different colors add visual appeal to cosmetic products because of which their usage is becoming more rampant

What is the danger from them?

Microbeads — largely non-biodegradable — flow through sewer systems and end up in seas and oceans, where they contribute to the huge chunk of plastic soup in the environment

Microbeads are also likely to be transported to wastewater treatment plants. Due to their small size, a substantial proportion passes through the filtration system and enters aquatic environments

- less than one millimeters in length
- larger plastic debris, polyethylene plastic , Beauty products, synthetic textiles.

NOBEL

• CHEMISTRY

- Award for design and synthesis of molecular machines.
- An assembly of a distinct number of molecular components that are designed to perform machinelike movements (output) as a result of an appropriate external stimulation (input)”

- Topological Phase Physics Nobel Prize
- Topology Describes properties of matter at large and small scales.
- Discovery to explain strange physical effects in rare states of matter, such as superconductors, superfluids and thin magnetic films.
- Bose Einstein condensate(BEC)

• BIOLOGY

- **Autophagy:** Process whereby cells “eat themselves
- Plays a housekeeping role in removing misfolded or aggregated proteins, clearing damaged organelles, such as mitochondria, endoplasmic reticulum and peroxisomes, as well as eliminating intracellular pathogens.



The 2016 **Nobel Prize in Physiology or Medicine** has been awarded to:

Yoshinori Ohsumi

for his discoveries of **mechanisms for autophagy.**

Dhara Mustard Hybrid-11



- Genetically modified mustard
- By DU
- Opposition: A gene called '**bar**' confers herbicide tolerance.
- Difficulty of Hybridisation in Mustard?
- GEAC

E-cigarettes



- **Battery-operated devices By DU**
- **Delivers Nicotene**
- **Vapor instead of smoke.**
- **No Ash & tabbaco Smell**

Bismuth & Superconductivity

- Bismuth semi-metal in bulk form becoming a superconductor when the temperature is lowered to 530 microKelvin
- Tradiational theory unable to explain
- Bardeen-Cooper-Schrieffer (BCS) theory explain in most Tc superconductors
- BI: Unlike other elements in the periodic table, bismuth has unusual phenomenon – while metallic superconductors have one mobile electron per atom, bismuth has only one mobile electron per 100,000 atoms

Diseases

- **Avian Influenza** viral disease of birds
- **JE:** Mosquito-borne flavivirus, and belongs to the same genus as dengue, yellow fever and West Nile viruses
- **PfSPZ:** **New Malaria Vaccine**

- **Chikungunya:** Mosquito-borne virus Disease
- **Measles:** By a virus, leading causes of death among young children globally.
- **Rubela** : Toga virus
- **Ebola:** Caused by infection with a virus , Ebola virus remains unknown
- **TB:** Bacteria

Some terms

- **Sunway TaihuLight**
- **Watson: IBM**, A cognitive system, Q&A
- **FDC: Fixed dose combination** → cocktail of two or more active drug ingredients in a fixed ratio of doses.
- **Jarvis: FB AI**
- **Method-2: Korean Man like Robot**

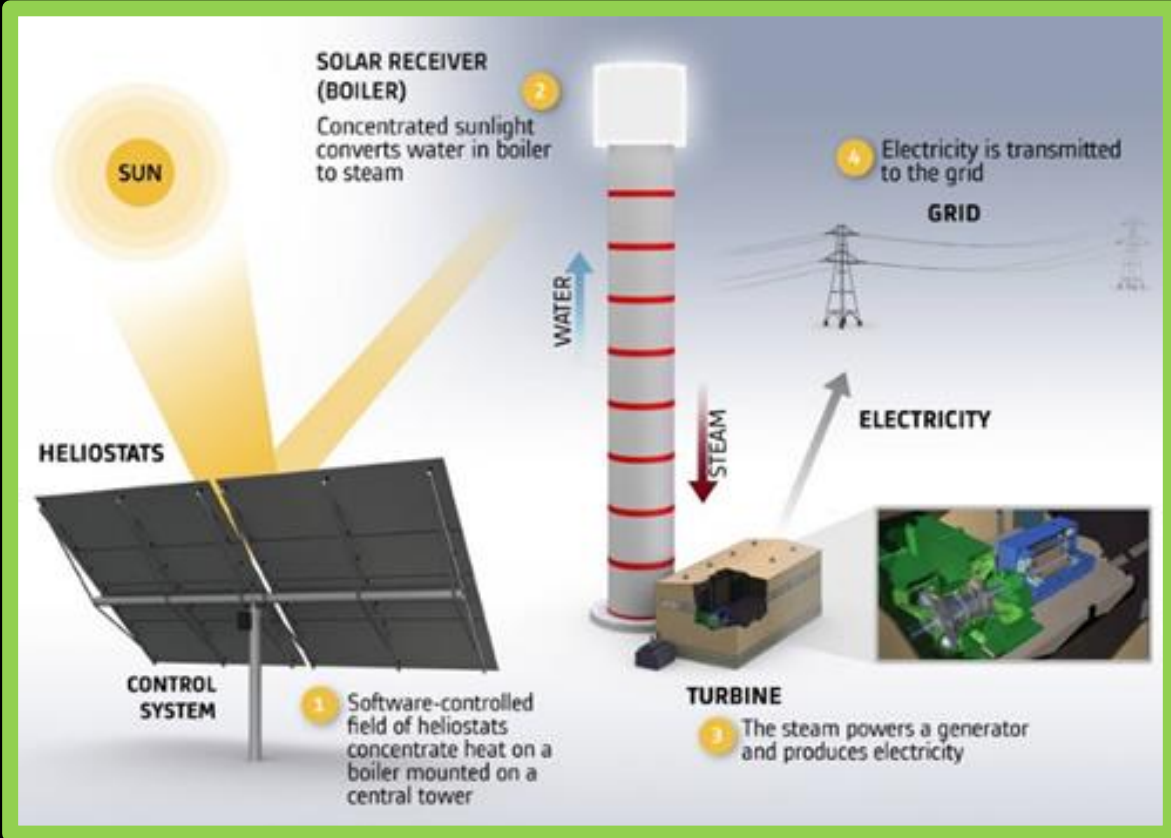
- **Omega-3 Fatty acid:**
Family of essential fatty acids ; polyunsaturated
- **Source:** fish oils, especially from salmon and other cold-water fish
- **ALA (Plants); DHA & EPA(Animal Food)**
- **RFID & JLN**

Some terms

- **JCVI syn-3.0**: First Self-Replicating, Synthetic Bacterial Cell
- **Species choosan**:
Mycoplasma genitalium
- lack of a cell wall
- **Why this**: This was chosen as it was the species with the smallest number of genes known at the time when research began.

- **Bedaquiline**: MDR TB Drug
- To patient not treated by rifampicin
- Trade name of Sirturo.
- **Graphene**: Allotrope of carbon , ultra-light yet immensely tough
- Superb Conductor

Anshlin



- Israel's largest renewable energy
- Different from Traditional

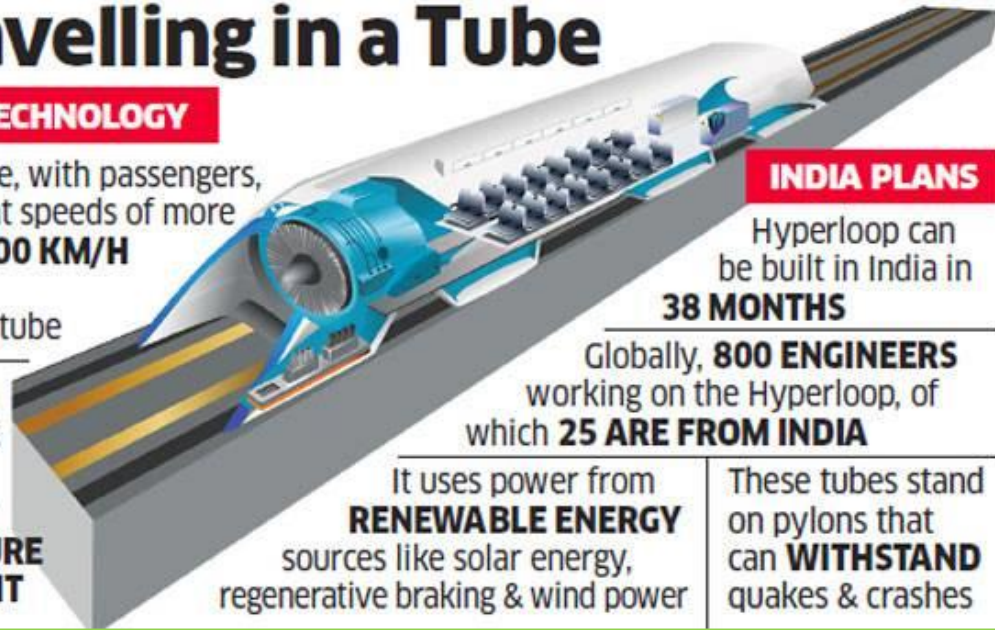
Hyperloop

Travelling in a Tube

THE TECHNOLOGY

A capsule, with passengers, travels at speeds of more than **1200 KM/H** inside a vacuum tube

Vacuum tube has an area of **LOW PRESSURE** INSIDE IT



INDIA PLANS

Hyperloop can be built in India in **38 MONTHS**

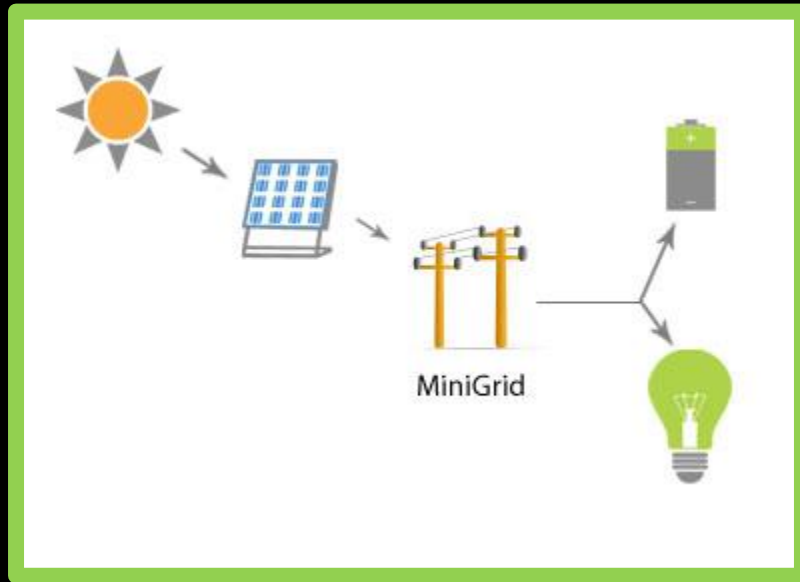
Globally, **800 ENGINEERS** working on the Hyperloop, of which **25 ARE FROM INDIA**

It uses power from **RENEWABLE ENERGY** sources like solar energy, regenerative braking & wind power

These tubes stand on pylons that can **WITHSTAND** quakes & crashes

- Proposed mode of passenger and freight transportation
- A near-vacuum tube at more than airline speed

Mini Grid & Micro Grid



- **Mini grid :10 KW and 500 KW**
- **Micro Grid:below 10KW.**
- **Source their power from renewable energy sources**

Biosimilar Drug

- Roche's Trastuzumab V/s Biocon and Mylan
- Made by a living cell, typically an engineered bacterium or a yeast.

FDA U.S. Food and Drug Administration
Protecting and Promoting Public Health
www.fda.gov

Drugs vs. Biological Products - Generally

Small Molecule Drugs	Biological Products
Generally low molecular weight	Generally high molecular weight
Usually made by organic or chemical synthesis	Made with/from live cells/organisms → <i>inherent & contamination risk</i>
Fewer critical process steps	Many critical process steps
Well-characterized	Less easily characterized
Known structure	Structure may or may not be completely defined or known
Homogeneous drug substance	Heterogeneous mixtures → <i>May include variants</i>
Usually not immunogenic	Often immunogenic

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SPACE Technology

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PAD ABORT TEST

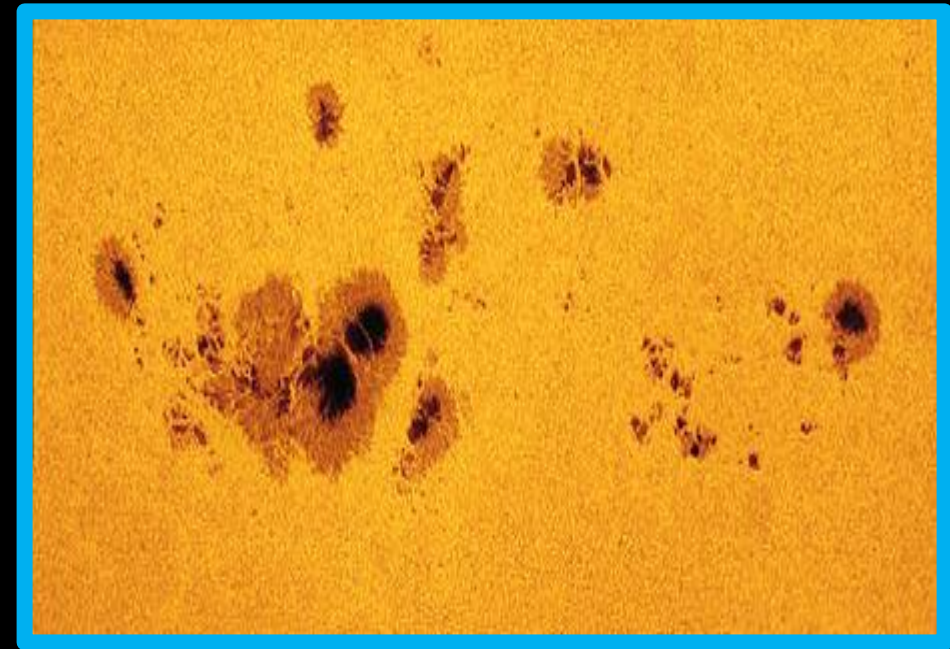
- **Test by ISRO to conduct a critical 'crew bailout test'**
- **aims at rescuing the crew**

Shenzhou-11

- **Manned spaceflight**

- **Kuiper Belt: Beyond Neptune**
- **Supermoon: Perigee-Syzygy**
- **Team Indus**
- **Resourcesat 2A**
- **Kounotori: Japan Space junk**
- **Gaofen: Earth Observation Satellite**

- **TANSAT: Chinese Mission to Detect Co₂**
- **LUCY & Psyche:** To know history of our solar system
- **Sun SPOT: Cooler area, Due to Magnatic Activity**
- **Kirameki-2: X band Satellite of Japan**



Atomic Clocks

- NavIC developed snag
- constellation of seven satellites
- India and to about 1,500 km beyond its borders.
- : Cs & Rb Atomic clocks

PROVIDES INDIA WITH ASSURED NAVIGATION SERVICE FOR VITAL CIVILIAN & MILITARY APPLICATIONS WITHOUT HAVING TO DEPEND ON ANOTHER COUNTRY; FIRST SATELLITE TO BE LAUNCHED ON JULY 1; REMAINING 6 BY 2015

www.indiandefensenews.in

NAVIC : INDIAN REGIONAL NAVIGATION SATELLITE SYSTEM

7 SATELLITES

3 GEOSTATIONARY **ORBIT ALTITUDE** 36,000 KM

4 GEOSYNCHRONOUS **COST** ₹ 1,420 CRORES



Covers India and up to 1,500 km beyond its borders	3 extremely accurate rubidium atomic clocks in each satellite	GPS receivers will not work; need special receivers (yet to be developed)
IRNSS provides Standard Positioning Service	Open to all users	Accuracy better than 20 metres

3 satellites in geostationary orbit – appear from ground to be at fixed positions in the sky

4 satellites in geosynchronous orbit – in pairs, move in two inclined orbits – appear from ground to travel in figure '8' – assist in accurate position determination

PSLV C37 & Records

- **Dove satellites: Planet Labs**
- **In constellation**
- **Miniature**
- **39th flight**
- **Cartosat-2 Series Satellite along**
- **USA (96), The Netherlands (1), Switzerland (1), Israel (1), Kazakhstan (1) and UAE (1).**
- **2 (nano) +1 of India**

- **Cratosat**
- **Earth observation satellite/ Remote sensing**
- **Earlier Cartosat-2, 2A and 2B**
- **Sun synchronous**
- **cartographic applications**
- **urban and rural applications, coastal land use and regulation, utility management like road network monitoring, water distribution, creation of land use maps, change detection to bring out geographical and manmade features and various other Land Information System (LIS) and Geographical Information System (GIS) applications.**

Defense

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- **Dhruv:** Indigenous Developed
- Advance light helicopter
- Twin engine
- First exported to Nepal & Israel

- **Kaveri:** Deal with Snecma
- Vital system for LCA
- **Nirbhay:** Long range, subsonic
- **Agni Missiles**
- **Quantum Cryptography**

Khanderi Scorpene submarine

- Under Project 75
- **Pinaka II**: Guided version
- **INS Sarvekshak**
- **TAPAS**: UAV, meeting the surveillance needs of the forces

BILI- Bio Indicator

- Detect life on Mars
- By NASA
- Instead of using radio waves use light to detect and ultimately analyse the composition of particles in the atmosphere.

Ballistic Missile Defence

- Indigenously developed interceptor missile Programme
- TWO Tier:
- PAD & AAD
- US, Russia, China and Israel have effective BMD
- No system is 100% full-proof.

