

**16 APRIL 2019**

**World’s first 3D-printed heart with human tissue**

**In news:**

Scientists at Tel Aviv University in Israel unveiled a 3D print of a heart with human tissue and vessels.

**In brief:**

It marked the first time anyone anywhere has successfully engineered and printed an entire heart replete with cells, blood vessels, ventricles and chambers.

Earlier scientists have managed to 3D-print the structure of a heart in the past, but not with cells or with blood vessels.

The heart produced by researchers is about the size of a rabbit’s heart.

The cells are currently able to contract, but do not yet have the ability to pump. Then they plan to transplant them into animal models, hopefully in about a year.

**Importance of 3D heart printing:**

Cardiovascular disease is the world’s leading cause of death, according to the World Health Organization, and transplants are currently the only option available for patients in the worst cases.

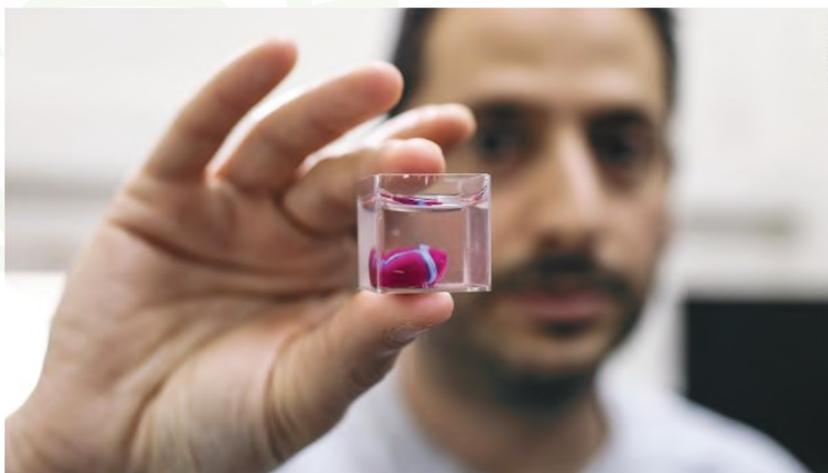
But the number of donors is limited and many die while waiting.

When they do benefit, they can fall victim to their bodies rejecting the transplant — a problem the researchers are seeking to overcome.

Research involved taking a biopsy of fatty tissue from patients that was used in the development of the “ink” for the 3D print.

Current 3D printers are also limited by the size of their resolution and another challenge will be figuring out how to print all small blood vessels.

Researchers at the University of Toronto are working on using such technology to print skin over wounds, and the University of Minnesota has developed a transparent mouse skull that helps its researchers to better understand brain activity.



**More GSLV launch vehicles in the offing**

**In news:**

The Union Cabinet approved five more GSLV satellite launch vehicles for the period 2021-24 under the next phase 4 of the ongoing GSLV continuation programme. One of them could be used for the second Mars mission which is being considered.

**Note**





### GSLV

Geosynchronous Satellite Launch Vehicle is used to launch satellites to Geosynchronous Transfer Orbit. It is a three-stage launch vehicle and the largest launch vehicle developed by India, which is currently in operation. The indigenously developed cryogenic Upper Stage (CUS), which is flight proven, forms the third stage of GSLV.

GSLV-MK III is 43 meters tall and even though it is the heaviest among India's operational launch vehicles, it is also the shortest. GSLV-Mk III weighs 641 tonnes.

It is fifth generation launch vehicle, is designed to carry 4-tonne satellites into geosynchronous transfer orbit or 10-tonne satellites into low earth orbit. This is about twice the capability of GSLV-Mk II.

**First Stage:** The first stage of GSLV was derived from the PSLV. The 138 tonne solid rocket motor is augmented by liquid strap-ons. Its fuel is Hydroxyl-terminated polybutadiene (HTPB)

**Second Stage:** Vikas engine is used in the second stage of GSLV. The stage was also derived from the PSLV where the Vikas engine has proved its reliability. Its fuels are Unsymmetrical dimethylhydrazine (UDMH) + N<sub>2</sub>O<sub>4</sub>

**Third Stage:** Developed under the Cryogenic Upper Stage Project (CUSP), it is developed by the Liquid Propulsion Systems Centre. Its fuels are Liquid Oxygen and Liquid Hydrogen.

### Monsoon likely to be near normal

According to India Meteorological Department (IMD), India is likely to have 'near normal' monsoon this year with a well-distributed rainfall which could be beneficial for the agriculture sector in the ensuing Kharif season.

The seasonal rainfall is likely to be 96% of the Long Period Average (LPA) with a model error of plus or minus 5% according to Ministry of Earth Sciences (MoES).

The IMD defines average, or normal rainfall as between 96% and 104% of Long Period Average for the entire four-month season beginning June.

The IMD's optimism stems from global climate models projecting a 'weakening El Nino'.

A temperature rise greater than 1 degree C for three months at a trot, is considered a 'strong' El Nino (and threatening to the monsoon). A 0.50C -10C rise is called 'weak El Nino conditions.' Currently the El Nino is 0.9 0C.

Another factor, called a positive Indian Ocean Dipole (IOD) (which refers to a warming in the western Arabian ocean) could neutralise the potential negative impact from the El Nino.

### What is LPA?

LPA is the average rainfall received by the country as a whole during the south-west monsoon, for a 50-year period. The current LPA is 89 cm, based on the average rainfall over years 1951 and 2000. This acts as a benchmark against which the rainfall in any monsoon season is measured.

### Rainfall distribution on All India scale

- **Normal** - percentage departure of realised rainfall is within  $\pm 10\%$  of the Long Period Average

### Note



- **Below Normal** - percentage departure of realised rainfall is < 10% of the Long Period Average
- **Above Normal** - percentage departure of realised rainfall is > 10% of the Long Period Average
- **All India Drought Year** - When the rainfall deficiency is more than 10% and when 20 to 40% of the country is under drought conditions, then the year is termed as All India Drought Year
- **All India Severe Drought Year** - When the rainfall deficiency is more than 10% and when the spatial coverage of drought is more than 40% it is called as All India Severe Drought Year

**El-Nino:**

The term El Niño refers to the large-scale ocean-atmosphere climate interaction linked to a periodic warming in sea surface temperatures across the central and east-central Equatorial Pacific.

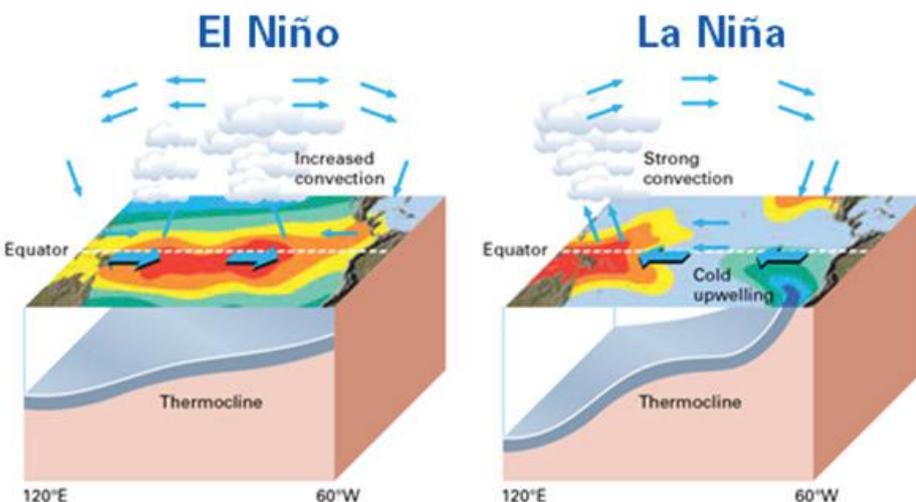
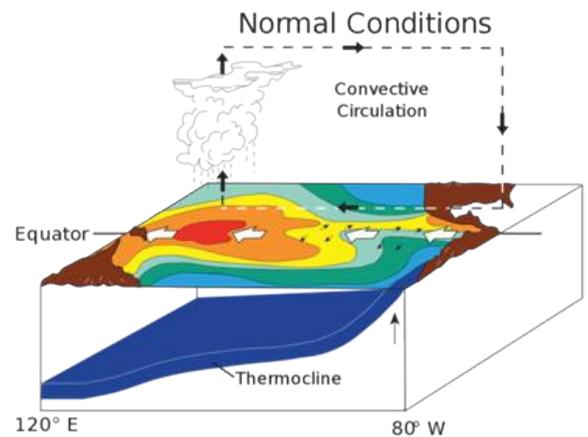
Normally, strong winds along the equator push the warm surface water near South America westward toward Indonesia. When this happens, the cooler water underneath rises up towards the surface of the ocean near west coast of South America.

During an El Niño event, the surface waters in the central and eastern Pacific Ocean become significantly warmer than usual. That change is intimately tied to the atmosphere and to the winds blowing over the vast Pacific. Easterly trade winds (which blow from the Americas toward Asia) falter and can even turn around into westerlies. This allows great masses of warm water to slosh from the western Pacific toward the Americas. It also reduces the upwelling of cooler, nutrient-rich waters from the deep—shutting down or reversing ocean currents along the equator and along the west coast of South and Central America.

In El Niño years, lots of rain clouds forms over this warm part of the ocean. These clouds move inland and dump much more rain than usual in South and Central America and in the United States. Meanwhile, other parts of the world can suffer drought.

Many fish that live in the normally cooler waters off the coast of South America move away or die. The fishermen call this condition of warm coastal waters and poor fishing “El Niño” meaning “the Christ Child,” because in the occasional years it comes, it comes at Christmas time.

**La-Nina:**



**Note**



La Niña events sometimes follow El Niño events, which occur at irregular intervals of about two to seven years. La Niña means The Little Girl in Spanish.

La Niña is caused by a build-up of cooler-than-normal waters in the tropical eastern Pacific ocean. Unusually strong, westward moving trade winds move warm surface water to the west pacific and ocean currents bring cold water to the surface by a process known as upwelling. Upwelling can cause a drastic drop in sea-surface temperature. Coastal sea-surface temperatures near Ecuador and Peru may drop nearly 4 degrees Celsius than normal levels.

La Niña is characterized by lower-than-normal air pressure over the western Pacific. These low-pressure zones contribute to increased rainfall. Rainfall associated with the summer monsoon in Southeast Asia tends to be greater than normal, especially in northwest India and Bangladesh. This generally benefits the Indian economy, which depends on the monsoon for agriculture and industry. However, strong La Niña events are associated with catastrophic floods in northern Australia.

La Niña usually has a positive impact on the fishing industry of western South America. Upwelling brings cold, nutrient-rich waters to the surface. Nutrients include plankton eaten by fish and crustaceans. Higher-level predators, including high-value fish species such as sea bass, prey on the crustaceans.

**Indian Ocean Dipole:**

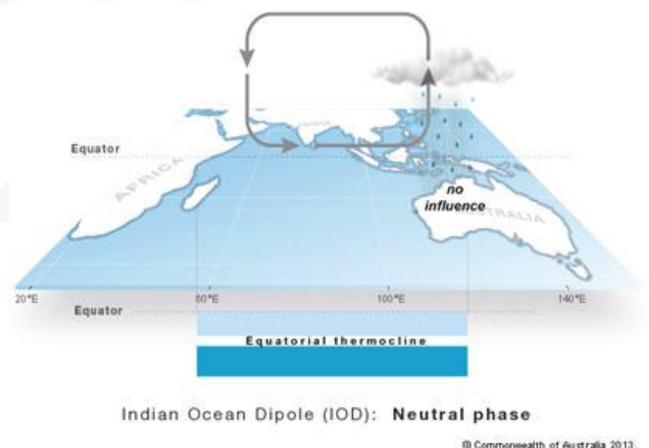
Sustained changes in the difference between sea surface temperatures of the tropical western and eastern Indian Ocean are known as the Indian Ocean Dipole or IOD.

The IOD has three phases: neutral, positive and negative. Events usually start around May or June, peak between August and October.

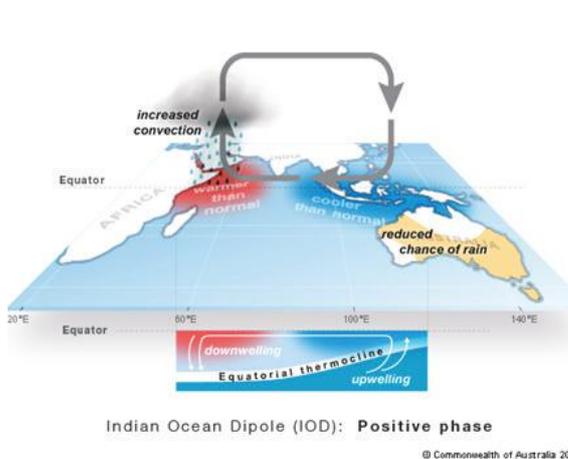
**Neutral IOD phase**

Water from the Pacific flows between the islands of Indonesia, keeping seas to Australia’s northwest warm. Air rises above this area and falls over the western half of the Indian Ocean basin, blowing westerly winds along the equator.

Temperatures are close to normal across the tropical Indian Ocean, and hence the neutral IOD results in little change to Australia’s climate.



**Positive IOD phase**



Westerly winds weaken along the equator allowing warm water to shift towards Africa. Changes in the winds also allow cool water to rise up from the deep ocean in the east. This sets up a temperature difference across the tropical Indian Ocean with cooler than normal water in the east and warmer than normal water in the west.

**Note**

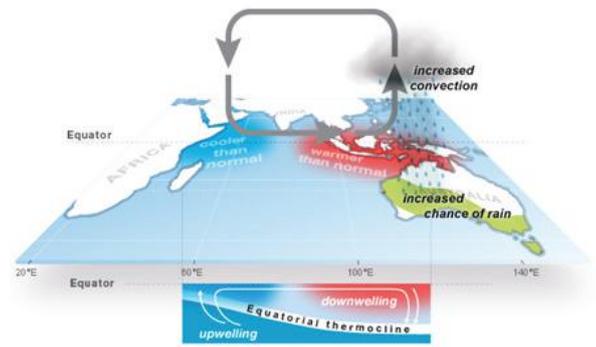


Generally this means there is less moisture than normal in the atmosphere to the northwest of Australia and more rainfall in India and east Africa region.

**Negative IOD phase**

Westerly winds intensify along the equator, allowing warmer waters to concentrate near Australia. This sets up a temperature difference across the tropical Indian Ocean, with warmer than normal water in the east and cooler than normal water in the west.

A negative IOD typically results in above-average winter–spring rainfall over parts of southern Australia and less monsoon rains over India.



Indian Ocean Dipole (IOD): Negative phase

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**Nirbhay Cruise Missile**

- The sub-sonic Nirbhay missile recently test fired successfully off the Odisha coast.

**About Nirbhay Cruise Missile:**

- It is a long range, all-weather, subsonic cruise missile designed and developed in India by the Defence Research and Development Organisation.
- The missile can be launched from multiple platforms and is capable of carrying conventional and nuclear warheads.
- It has an operational range of about 1000 – 1500 km.
- It has a speed range of about 0.6-0.7 Mach.
- It is two stage missile powered by solid rocket motor booster.
- It will eventually supplement the role played by Brahmos missile for the Indian Armed Forces by delivering warheads farther than the 450 km range of Brahmos.



**ICG Ship veera**

**Why in news?**

- Chief of Army Staff General Bipin Rawat on Monday commissioned the Indian Coast Guard Ship Veera at a ceremony held at Naval Jetty at Vishakapatnam.

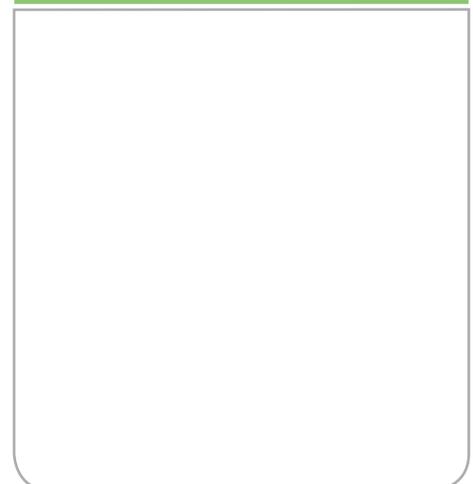
**About ICG Veera:**

- Veera, is third in the series of offshore patrol vessels of the Coast Guard, was built by L&T at its shipbuilding facility at Kattupalli in Chennai.
- Veera is equipped with the state-of-the-art machinery comprising an integrated bridge system, which includes advanced navigation and communication technology and integrated platform management system.

**About Indian Coast Guard:**

- The Indian Coast Guard (ICG) is an armed force that protects India's

**Note**



maritime interests and enforces maritime law, with jurisdiction over the territorial waters of India, including its contiguous zone and exclusive economic zone.

- The Indian Coast Guard was formally established on 18 August 1978 by the Coast Guard Act, 1978 of the Parliament of India as an independent armed force of India.
- It operates under the Ministry of Defence.



## Uighur muslims

### Why in news?

The Chinese government uses facial recognition technology to keep a tab on China's 11 million Uighur Muslims.

### In Brief:

- The practice makes China a pioneer in applying next-generation technology to watch its people, potentially ushering in a new era of automated racism.
- Chinese authorities already maintain a vast surveillance net, including tracking people's DNA, in the western region of Xinjiang.

### About Uighurs:

- The Uighurs are Turkic people who live in Central and East Asia.
- They primarily live in Xinjiang Province of China.
- Uighurs are one of China's fifty-five officially recognized ethnic minorities.
- They primarily practice Islam.
- Uyghurs in Xinjiang suffer under a "fully-fledged police state" with extensive controls and restrictions upon their religious, cultural and social life.
- It is reported that more than 1 lakh Uighurs are detained in mass detention camps by the Chinese government, aimed at changing the political thinking of detainees, their identities, and their religious beliefs.

## The Human Exploration Rover Challenge

### Why in news?

- Days earlier, 3 Indian teams from Mumbai, Punjab and Ghaziabad win awards at NASA Rover Challenge.



### About The Human Exploration Rover Challenge:

- It is NASA's annual competition for high school and college students to design, build, and race human-powered, collapsible vehicles over simulated lunar or Martian terrain.

### Note

