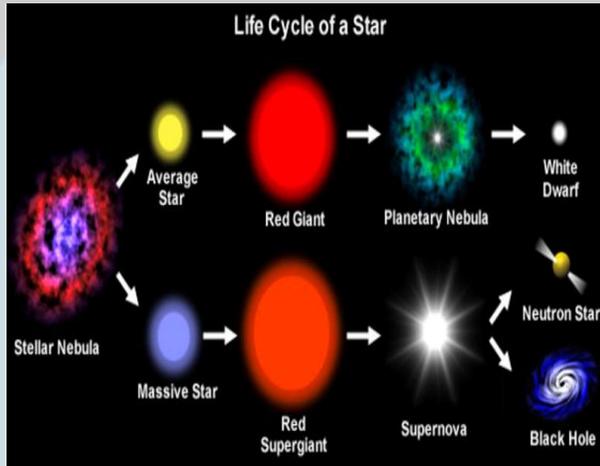


## Neutron star and pulsar

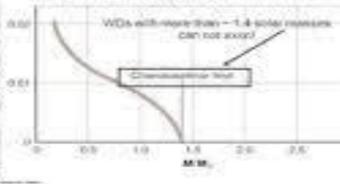


**DEFINITION OF CHANDRASEKHAR LIMIT:** THE MAXIMUM MASS AT WHICH A STAR NEAR THE END OF ITS LIFE CYCLE CAN BECOME A WHITE DWARF AND ABOVE WHICH THE STAR WILL COLLAPSE TO FORM A NEUTRON STAR OR BLACK HOLE: A STELLAR MASS EQUAL TO ABOUT 1.4 SOLAR MASSES.

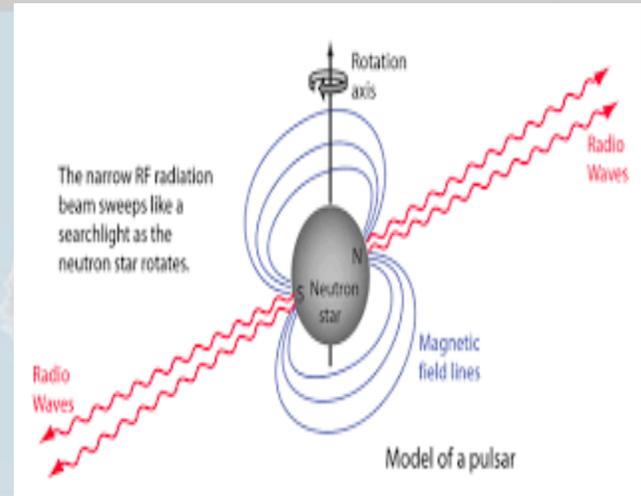


### The Chandrasekhar Limit

The more massive a white dwarf, the smaller it is. → Pressure becomes larger, until electron degeneracy pressure can no longer hold up against gravity.

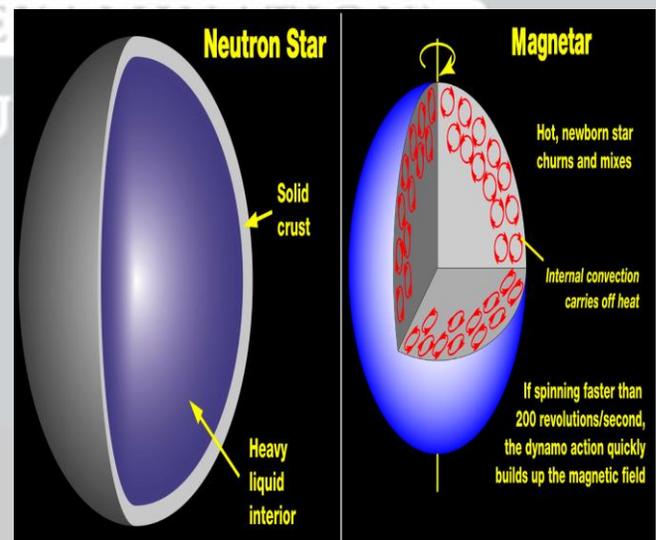


narrow cone that sweeps past the earth with every rotation.

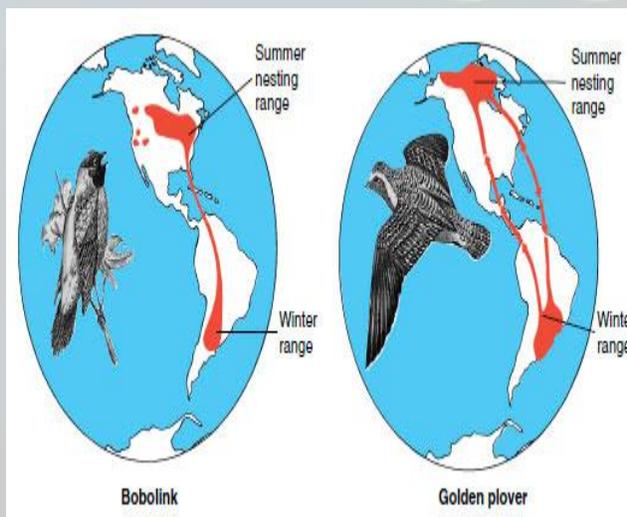
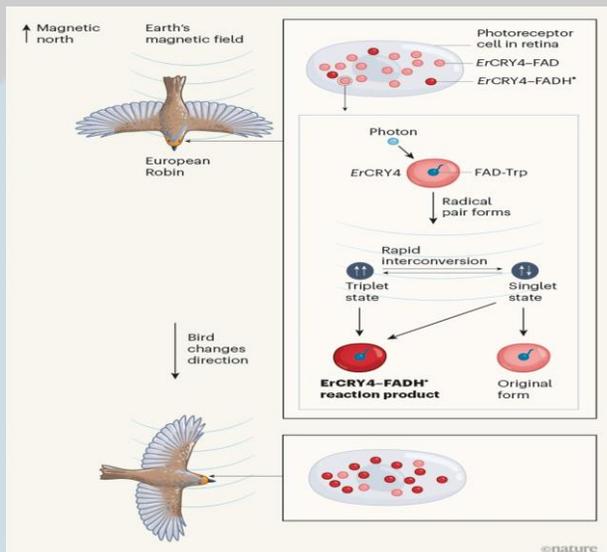


- The fact that the signals came from a very small patch of the sky and that they repeated frequently led scientists to identify pulsars as rotating neutron stars
- The rotation of these neutron stars slowed over time; physicists found that the energy 'saved' by reducing the rotation rate was used to accelerate electric charges outside the star, producing the radio signals.

- When heavy stars die, their cores implode.
- If they're heavy enough, they become black holes; but if not, they collapse just enough to form a ball of neutrons, with gravity not being strong enough to overwhelm their outward pressure.
- This compact, super-dense object is called a neutron star
- Radio signals emitted from near the poles of such a star would form a



## Navigation by birds



- How do birds find their way home after long journeys?
- **A1:** There are many theories explaining this capability of birds.
- According to one of them, the sun's rays and the direction of winds help them navigate.
- **Birds'** extrasensory capabilities assist them in this task and direct them with the help of the earth's magnetic field.
- Another theory suggests these winged wonders 'read' and understand star maps well enough to find their way.
- **A2:** Birds have the ability to detect changes in atmospheric pressure, weather, and the earth's magnetic field.
- Based on these, they locate specific regions and find their home.
- But the most important navigational aid is said to be an internal magnetic compass they are said to possess in their brains.
- The compass works in relation to the earth's magnetic field.
- The magnetic currents generated here are turned into flight paths.
- **The Hindu**

## Humpback whale

BIG SHOT



The tail of a humpback whale at the Gerlache Strait in Antarctica, on January 19. Researchers from various countries are collaborating on projects analysing the current condition of the Antarctic sea and monitoring the species inhabiting the region, during the X Antarctic Expedition aboard the Colombian research vessel ARC Simon Bolivar. AFP

### 6 Fascinating Facts ABOUT HUMPBACK WHALES

- 1 A fully grown humpback whale can weigh more than 5 adult elephants, which measure in at 15,000 lbs. each.
- 2 Humpback whales fast during the winter living off of fat stores they've acquired during their feeding season.
- 3 It is estimated that as much as 90% of the humpback whales population was eliminated during the whaling era.
- 4 The only known natural predator to hunt humpback whales is a pack of hungry killer whales.
- 5 During mating season only the male humpback whales produce whale songs.
- 6 Consuming a large variety of fish and krill these marine mammals have the most diverse eating habits of all baleen whales.

Source: <http://www.whalefacts.org/humpback-whale-facts/>



**WHALE WATCHING AKUREYRI**

### HUMPBACK WHALE

Megaptera novaeangliae

**POPULATION**  
80 000

**LENGTH**  
13 - 17 meters

**WEIGHT**  
up to 40 tonnes

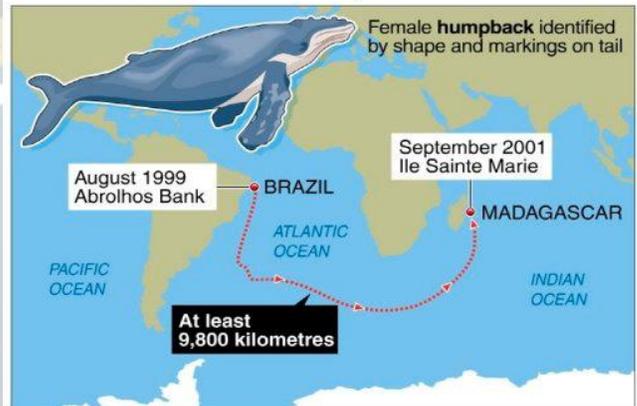


- They can live up to 100 years
- They are called 'the guardians of the oceans' due to increased number of cases of Humpback whales saving other species of animals from predators like killer whales, even helping humans
- They are very vocal, both male and female but only male whales sing. Their songs are passed through generations but they also change with time. They do 'covers' of the good songs.
- They are recognised by their flukes (tails), each is unique like a human fingerprint

The latin name refers to their long flippers. 'Megaptera' means 'big wings' and they can be 1/3 of the size their full body length

## Epic whale migration

World record for distance travelled by a mammal



- ▶ Previously thought that only male humpbacks travelled long distances to find mates
- ▶ Offers insight into migration patterns previously reckoned to be limited to a north-south movement

AFP



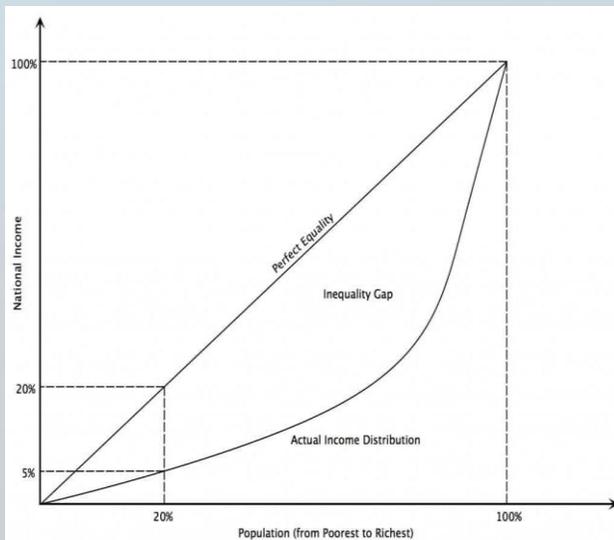
## The Hindu BRILLIANCE

### Examining taxpayer data

- According to a recent report by the State Bank of India (SBI), India has witnessed a significant fall in inequality over the last decade.
- Examining taxpayer data, the report claims that the Gini coefficient a

standard measure of inequality that ranges from 0, indicating perfect equality, to 1, indicating perfect inequality has fallen from 0.472 in 2014-15 to 0.402 in 2022-23.

- A fall of almost 15% in the Gini coefficient indicates a significant reduction in inequality.
- The fall in the Gini coefficient is more or less empirically established by the SBI report, but this has been accompanied by polarization in incomes.
- Such polarization is not seen in taxpayer data since the bottom 10% do not earn enough to be included in the tax net.

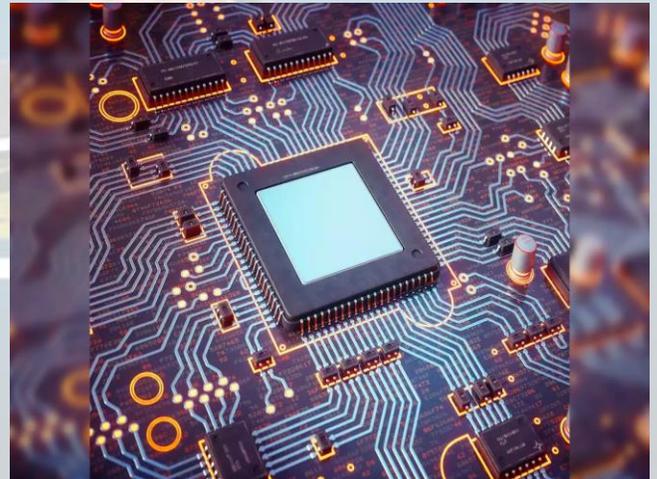


The Hindu

## Semiconductor industry

**6 REASONS WHY INDIA IS AN INVESTMENT HUB FOR SEMICONDUCTORS, AS PER PM MODI**

- India's ambitious push for using tech to transform governance in all sectors
- India is investing in developing capabilities in 5G, IoT, clean energy technologies, data, AI, etc.
- India is headed for robust economic growth.
- India's semiconductors consumption is expected to cross \$80 billion by 2026; \$110 Billion by 2030.
- Undertaken wide ranging reforms for ease of doing business in India.
- Undertaken several measures towards transforming the Indian manufacturing sector.



- Semiconductor Design Linked Incentive (DLI) scheme. There are three goals of India's semiconductor strategy.
- The first is to reduce dependence on semiconductor imports, particularly from China, and especially in strategic and emerging sectors, ranging from defence applications to Artificial Intelligence development.
- The second is to build supply chain resilience by integrating into the

semiconductor global value chain (GVC).

- The third is to double down on India's comparative advantage: India already plays host to the design houses of every major global semiconductor industry player and Indian chip design engineers are an indispensable part of the semiconductor GVC.
- These goals will help cement India's status as a semiconductor powerhouse.
- However, resources are limited.
- Therefore, priorities for industrial policy should ensure that we reap disproportionate benefits from our investments. Stimulating the design ecosystem is less capital-intensive than the foundry and assembly stages of the semiconductor GVC.
- Bolstering this stage can help establish strong forward linkages to an up-and-coming fabrication and assembly industry in India.

### Issues with the scheme *Prima facie*

- The DLI scheme fares well with its focus on providing access to design infrastructure, such as electronic design automation (EDA) tools, alongside financial subsidies for different steps of the chip design process.

- But there has been lack lustre uptake of the scheme. First, the scheme mandates that beneficiary startups maintain their domestic status for at least three years after receiving incentives, and for this they cannot raise more than 50% of their requisite capital via foreign direct investment.
- This is a significant barrier. Costs for semiconductor design startups are also significant.
- Semiconductor R&D usually only pays off in the longer term, and the funding landscape for chip start-ups in India continues to be challenging.
- The primary aim of the DLI scheme should be to cultivate semiconductor design capabilities in India, with the understanding that homegrown IP will organically evolve as local talent fosters the creation of indigenous companies over time.
- The Centre for Development of Advanced Computing's role as the nodal agency appraising proposals by applicants under the DLI scheme merits a relook too.

- [The Hindu](#)

## China maritime dominance and India



- The Houthi terror attacks on MV Chem Pluto, an oil and chemical tanker, on its way to the New Mangalore port from the Al Jubail port in Saudi Arabia, and MV Sai Baba, a Gabon owned, Indian-flagged crude oil tanker, with predominantly Indian crew, forced India's External Affairs Minister S. Jaishankar to rush to Tehran to persuade the principal Houthi sponsor to help cease the attacks.
- India's military response to the Red Sea situation has also been swift: the Indian Navy deployed the guided missile destroyers, INS Mormugao, INS Kochi, and INS Kolkata in the broader region.
- A different 'new' two front situation India's new two front challenge is not Pakistan and China posing a nutcracker situation for India, but a combination of its continental and maritime challenges.
- Having an aggressive and rising China attempting to contain India on its continental and maritime fronts is a classic two-front situation.
- While India has been allowing itself to be obsessed with the Line of Control with Pakistan in the west, defending the Line of Actual Control with China in the north, and picking needless quarrels with its neighbours, Beijing was quietly building its empire of influence in

the eastern, southern and western oceanic planks.

- While the People's Liberation Army keeps up the pressure on the LAC, the People's Liberation Army Navy (PLAN) has been increasing its presence in the Indian Ocean Region (IOR) at an alarming rate.
- Beijing today has a military base in Djibouti. Growing Chinese activities in Pakistan's Gwadar and Sri Lanka's Hambantota should worry Indian strategists, even if they are not yet military bases.
- In Myanmar, the Kyaukpyu port which China is constructing will enable PLAN to inch closer to the Indian Navy in the Bay of Bengal a maritime space India hereto enjoyed unrivaled.

Beijing is reportedly expanding an artificial island in Maldives and the China-Maldives strategic partnership is bound to increase due to tensions between Male and New Delhi.

- One had the visit of the anti-India Maldivian President to China recently.
- China is also exploring strategic investment options in the Seychelles and is also building a naval base in Ream, Cambodia.
- The small Indian Ocean island nation of Comoros is the latest to

join China's fan club in the Indo-Pacific.

- The emerging picture is this: from the Horn of Africa (Djibouti) to Myanmar, Sri Lanka, the Seychelles, the Maldives in the Indian Ocean to Gwadar in the Arabian Sea, China's actions will amount to a containment of India in the Indo Pacific.
- Read these developments alongside China's expanding outreach to the global South, its port-building efforts around the world, and its strengthening of relations with West Asia and Africa.
- The Hindu

### India need to consider

- The good news is that the Indian Ocean is too important for the rest of the world to let China take over.
- If China poses a challenge to India's regional security and interests in the broader IOR, it also poses a challenge to the commercial and security interests of the United States and its allies.
- Every major country is today interested in the Indo-Pacific and its future trajectory as is India, which provides an opportunity for New Delhi to make coalitions with like-minded countries, especially at a time when Beijing has little great

power backing in the maritime theatre.

- **Second, India cannot balance against the growing Chinese power in the Indian Ocean all by itself.**
- **India occupies a pivotal location in the Indo-Pacific moment just as it is the heart of the Chinese attempts to create an empire of influence.**
- **Creating, and enhancing, partnerships with like minded countries is perhaps an important way forward.**

**The Hindu**



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**FROM BASICS TO UPSC BRILLIANCE**