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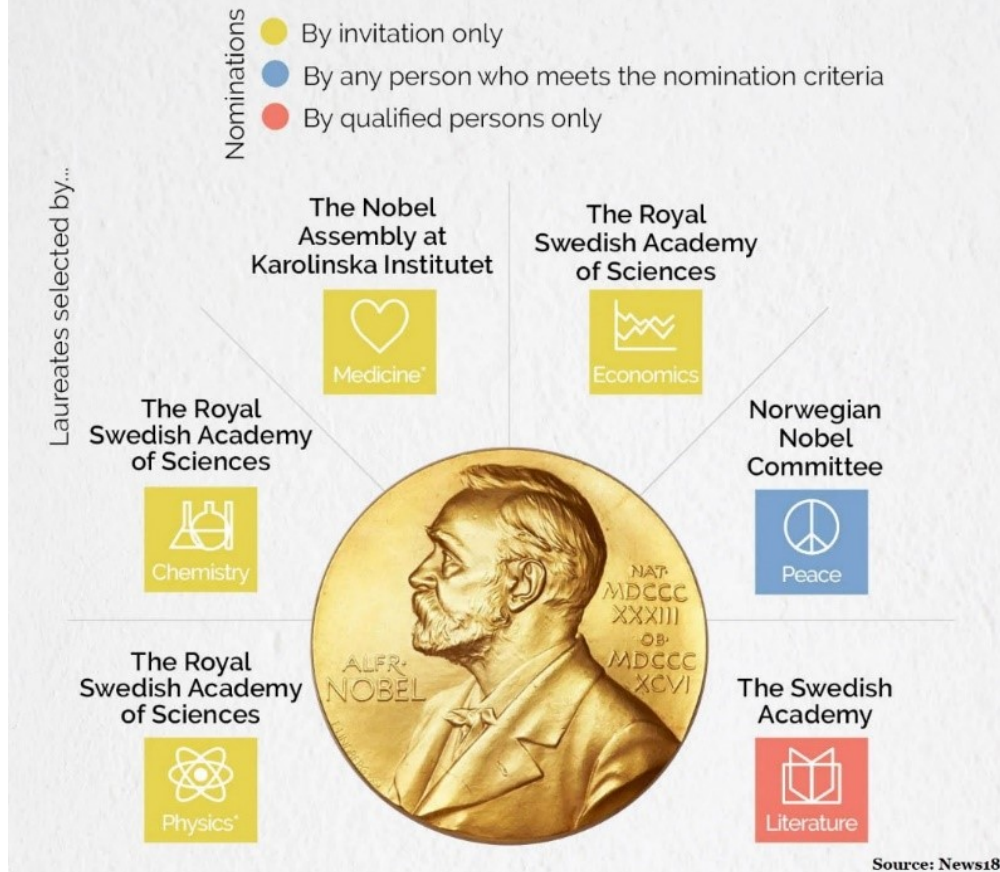
Prelim Bits 12-10-2022 (Nobel Special) | UPSC Daily Current Affairs

History of Nobel Prize

- The Nobel Prize was set up when businessman Alfred Nobel died and left the majority of his fortune to establish prizes in
 1. Physics,
 2. Chemistry,
 3. Physiology/Medicine,
 4. Literature and
 5. Peace.
- Nobel's will stated that the prizes should be awarded to those who shall have conferred the greatest benefit to humankind.
- The first set of awards were handed out in 1901, five years after Nobel's death.
- Since the 1st Nobel Prizes were awarded in 1901, they have been awarded annually.
- It was not awarded mostly during World War I and II.
- A Nobel Prize cannot be awarded posthumously.
- **Fund** - When Alfred Nobel died leaving the majority of his fortune to the establishment of the Nobel Prize, he stated that the money should be converted into a fund and invested in "safe securities."
- Today the interest earned on that money is used to fund the Nobel Prizes.
- As per Alfred Nobel's wishes, the Nobel Peace Prize is presented in Norway while the other awards are handed out in Sweden.

HOW DO YOU WIN A NOBEL?

Nomination to most of the Nobel prizes is by invitation only

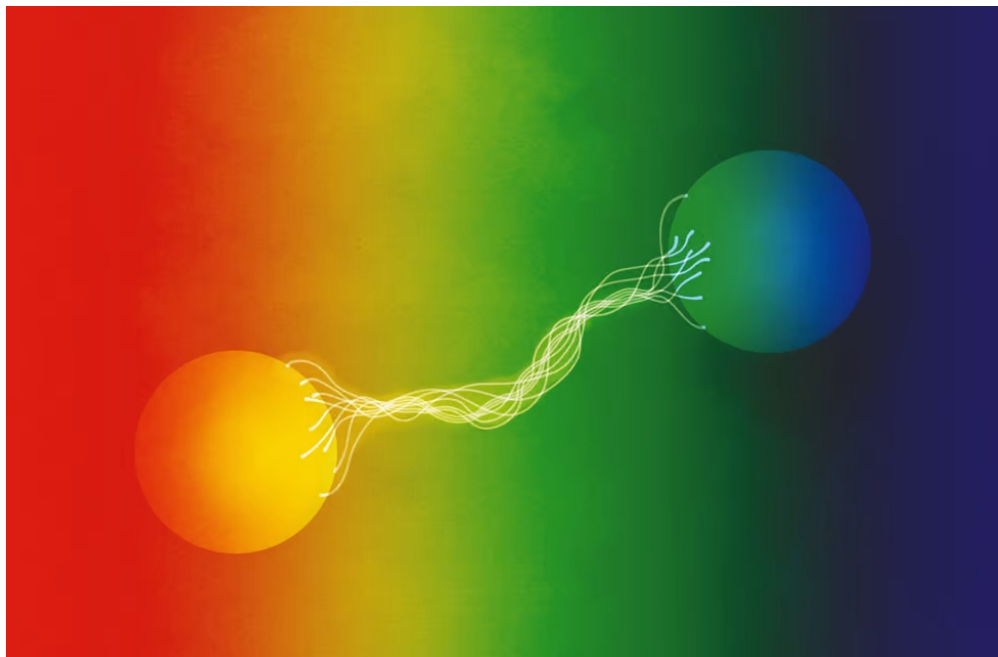


Nobel Prize in Physics 2022

The Nobel Prize in Physics 2022 was awarded to Alain Aspect, John F Clauser and Anton Zeilinger for their work in quantum entanglement.

Quantum mechanics is the physics of the sub atomic particles.

- **Quantum entanglement** is a counterintuitive phenomenon that explains how two subatomic particles can be intimately linked to each other even if separated by billions of light years of space.
- Despite their vast separation, a change induced in one will affect the other, if both are quantum entangled.
- Einstein called entanglement “spooky action at a distance”.
- The idea of quantum entanglement dates back to the very foundations of quantum mechanics, which began with Albert Einstein, Neils Bohr and Erwin Schrodinger.



- **Bell's theorem** - In the 1960s, John Stewart Bell developed the Bell's theorem of mathematical inequality.
- Bell theorem states if there are hidden variables, the correlation between the results of a large number of measurements won't exceed a certain value.
- However, quantum mechanics predicts that a certain type of experiment will violate Bell's inequality.
- This has resulted in a stronger correlation than would otherwise be possible.
- **John Clauser** developed a practical experiment (based on Bell's ideas) that supported quantum mechanics by clearly violating a Bell inequality.
- This means that quantum mechanics cannot be replaced by a theory that uses hidden variables.
- **Alain Aspect** developed the setup that was able to switch the measurement settings after an entangled pair had left its source, so the setting that existed when they were emitted could not affect the result.
- Among other things, **Anton Zeilinger** has demonstrated a phenomenon called quantum teleportation, which is a way of conveying information from one place to another without the actual transport of material.
- **Applications** - The work of the three laureates can help in developing quantum technologies of the future, for example, quantum cryptography, and precise timekeeping as is done in atomic clocks.
- **Related Links** - [Quantum Technology](#)

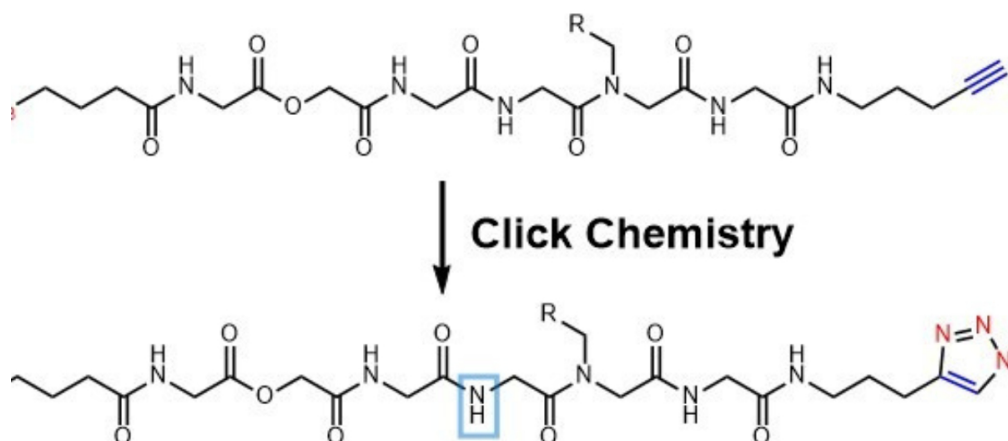
Nobel Prize in Chemistry 2022

The Nobel Prize in Chemistry 2022 was awarded to Carolyn R. Bertozzi, Morten Meldal, K. Barry Sharpless for the development of click chemistry and bioorthogonal chemistry.

- The three scientists have made a strong case for adopting an alternative approach to producing new complex molecules in the laboratory or industry, which minimises waste and increases overall efficiency.
- **Click chemistry** - Around the year 2000, Karl Barry Sharpless coined the concept of

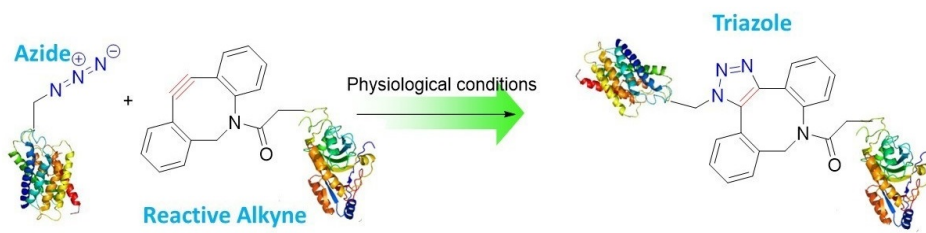
'click chemistry'.

- The click chemistry is a functional form of chemistry, where reactions occur quickly and the unwanted by-products are avoided.
- In click chemistry, molecular building blocks snap together quickly and efficiently.



- Independently, Barry Sharpless and Morten Meldal presented the crown jewel of click chemistry - *the copper catalysed azide-alkyne cycloaddition*.
- Sharpless discovered that the use of copper as a catalyst eliminated the by-products altogether and only the desired chemical was produced.
- Among many other uses, this efficient chemical reaction is utilised in the development of pharmaceuticals, for mapping DNA and creating materials that are more fit for purpose.
- Karl Barry Sharpless has now won the Nobel Prize for the second time, making him only the fifth scientist to achieve this distinction.
- His previous Nobel Prize had come in 2001 in recognition of a different kind of work.
- Meldal came up with the useful chemical structure called triazoles, which are stable and are found in pharmaceuticals, dyes and agricultural chemicals, says the Nobel website.
- He also found that the reaction he used could bind together numerous different molecules.
- **Bioorthogonal Chemistry** - Carolyn Bertozzi has taken click chemistry to a new dimension and started utilising it in **living organisms**.
- She developed click reactions that work inside living organisms, in order to map an elusive biomolecule on the surface of cells - glycans (carbohydrate-based polymers made by all living organisms.)
- Her *bioorthogonal reactions* take place without disrupting the normal chemistry of the cell.
- **Applications** - These reactions are now used globally to explore cells and track biological processes.
- Using bioorthogonal reactions, researchers have improved the targeting of cancer pharmaceuticals, which are now being tested in clinical trials.

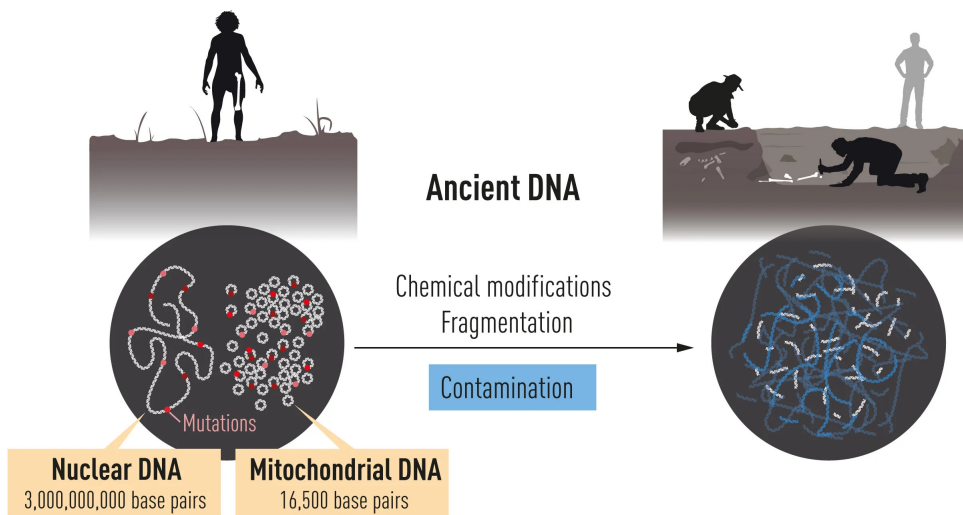
Copper free Bioorthogonal Click Reaction



Nobel Prize in Medicine 2022

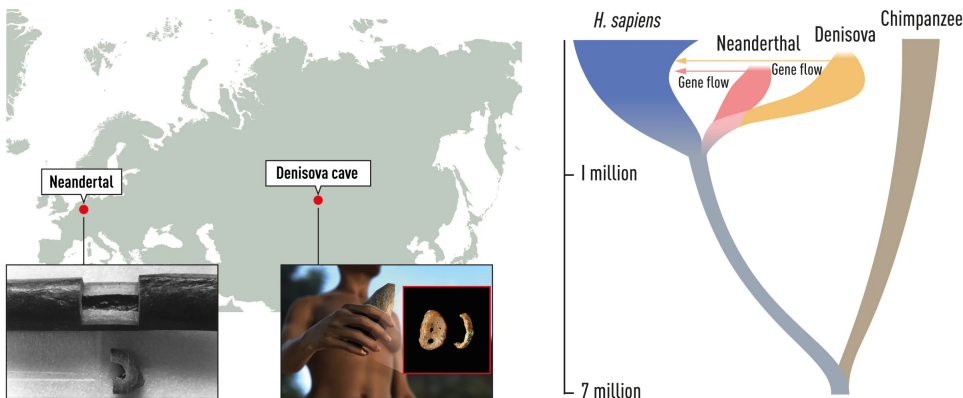
The Nobel Prize for Physiology or Medicine 2022 has been awarded to Swedish geneticist for his research in the field of genomes of extinct hominins and human evolution.

- Svante Pääbo through his ground-breaking research, established an entirely new scientific discipline called, *Paleogenomics*.
- **Palaeogenomics** - It is the study of ancient hominins by extracting their DNA.
- It is the science of reconstructing and analyzing the genomes of organisms that are not alive in the present day.
- Svante Pääbo pioneered the use of DNA to examine questions about relatedness of ancient human species.
- He proved that Neanderthals, a cousin of the human species that evolved 1,00,000 years before humans, interbred with people.
- Comparative analyses with the human genome demonstrated that the most recent common ancestor of Neanderthals and Homo sapiens lived around 8,00,000 years ago.

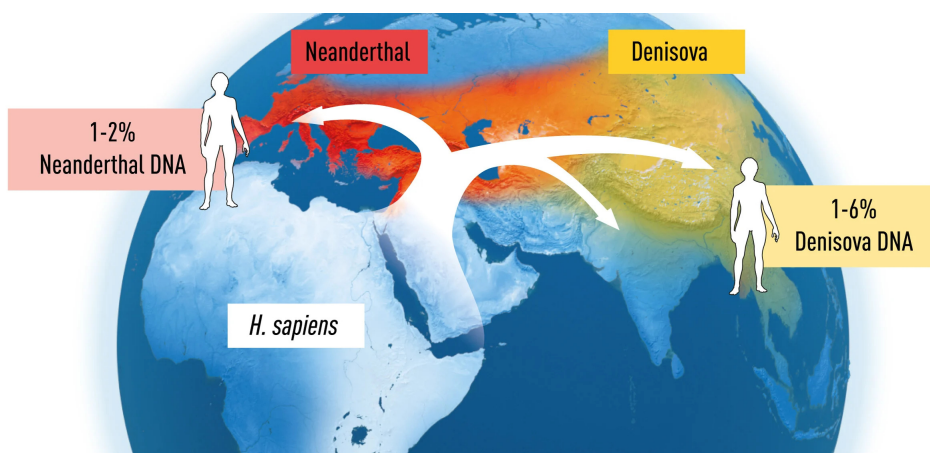


- **Discovery of Denisova** - After analysing a 40,000-year-old finger bone from a Siberian cave, Pääbo proved that it belonged to a new species of hominin called Denisova.
- This was the first time that a new species had been discovered based on DNA analysis and this species too had lived and interbred with humans.
- He found that the populations in Melanesia and other parts of South East Asia carry up to 6% Denisova DNA.

- He found that the Neanderthals lived in western Eurasia, whereas Denisovans populated the eastern parts of the continent.
- During the expansion of *Homo sapiens* outside Africa and their migration east, they interbred with Neanderthals and Denisovans.



- Pääbo also found that gene transfer had occurred from these now extinct hominins to *Homo sapiens* following the migration out of Africa around 70,000 years ago.
- This ancient flow of genes to present-day humans has physiological relevance today, for example affecting how our immune system reacts to infections.

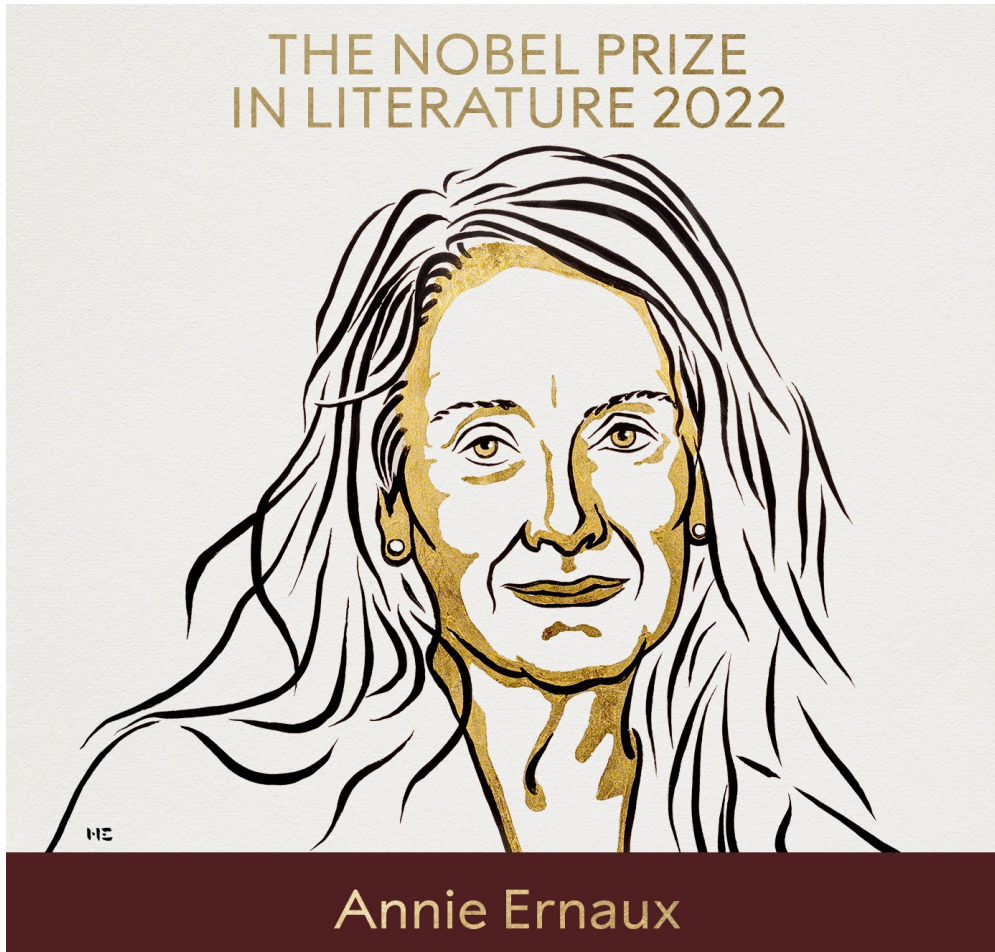


Nobel Prize in Literature 2022

The Nobel Prize for Literature 2022 has gone to French author Annie Ernaux for the courage and clinical acuity with which she uncovers the roots, estrangements and collective restraints of personal memory.

- Ernaux, née Duchesne, was born in Lillebonne Normandy in 1940.
- She was often described as the “truth-teller” of France.
- Ernaux’s popularity has increased sharply in the English-speaking world since 2019, after her work ‘The Years’ was shortlisted for the Man Booker international prize.
- Her book on her illegal abortion in the 1960s, ‘Happening’ (2001) has also been in the limelight after abortion rights were curtailed in the US.
- Her work ranges from a history of France to her first sexual experience and the shame around it to her mother’s illness and death to her abortion to her class-linked shame.
- Some of her famous works:

1. Cleaned Out (1974)
2. Shame (1997)
3. Happening (2001)
4. Getting Lost (2001)
5. The Years (2008)
6. A Girl's Story (2016)



Nobel Peace Prize 2022

The Nobel Peace Prize for 2022 has been awarded to one individual and two organisations.

- Nobel Peace Prize 2022 is awarded to
 1. Human rights advocate Ales Bialiatski from Belarus,
 2. The Russian human rights organisation Memorial and
 3. The Ukrainian human rights organisation Center for Civil Liberties.
- The Nobel Peace Prize 2022 was awarded to honour three outstanding champions of human rights, democracy and peaceful co-existence in the neighbour countries Belarus, Russia and Ukraine.



- **Ales Bialiatski** was one of the initiators of the democracy movement that emerged in Belarus in the mid-1980s.
- He devoted his life to promote democracy and peaceful development in his home country, Belarus.
- He founded the organisation Viasna (Spring) in 1996 in response to the controversial constitutional amendments that gave the president dictatorial powers and that triggered widespread demonstrations.
- **Memorial** - The memorial organisation was established in 1987 by human rights activists in the former Soviet Union who wanted to ensure that the victims of the communist regime's oppression would never be forgotten.
- Nobel Peace Prize laureate Andrei Sakharov and human rights advocate Svetlana Gannushkina were among the founders.
- Memorial is based on the notion that confronting past crimes is essential in preventing new ones.
- After the collapse of the Soviet Union, Memorial grew to become the largest human rights organisation in Russia.
- **The Center for Civil Liberties** - It was founded in Kyiv in 2007 for the purpose of advancing human rights and democracy in Ukraine.
- The center has taken a stand to strengthen Ukrainian civil society and pressure the authorities to make Ukraine a full-fledged democracy.
- To develop Ukraine into a state governed by rule of law, Center for Civil Liberties has actively advocated that Ukraine become affiliated with the International Criminal Court.
- After Russia's invasion of Ukraine in February 2022, Center for Civil Liberties has engaged in efforts to identify and document Russian war crimes against the Ukrainian civilian population.
- In collaboration with international partners, the center is playing a pioneering role with a view to holding the guilty parties accountable for their crimes.

Sveriges Riksbank Prize in Economic Sciences

- In 1968, Sveriges Riksbank (Sweden's central bank) established the Prize in Economic Sciences in Memory of Alfred Nobel.
- While Alfred Nobel did not mention the economics prize in his will, the Sveriges Riksbank established the award in 1968.
- The Prize is based on a donation received by the Nobel Foundation from Sveriges Riksbank in 1968.
- The Royal Swedish Academy of Sciences was given the task of selecting the Laureates in Economic Sciences, starting in 1969.
- The first Prize in Economic Sciences was awarded to Ragnar Frisch and Jan Tinbergen in 1969.
- The Prize in Economic Sciences is awarded by the Royal Swedish Academy of Sciences, Stockholm, Sweden, according to the same principles as for the Nobel Prizes that have been awarded since 1901.



Sveriges Riksbank Prize in Economic Sciences 2022

The Royal Swedish Academy of Sciences has decided to award the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2022 to three people for their research on banks and financial crises.

- The Nobel Prize in economics 2022 has been given to US economists Ben S. Bernanke, Douglas Diamond, Philip H. Dybvig.
- The trio's research reduces the risk of financial crises developing into long-term depressions with severe consequences for society.
- **Bernanke's work** - Former US Federal Reserve chairman Ben Bernanke analysed the Great Depression of the 1930s.
- Among other things, he showed how bank runs were a decisive factor in the crisis becoming so deep and prolonged.
- Using historical sources and statistical methods, his analysis showed which factors were important in the drop in gross domestic product.
- He found factors that were directly linked to failing banks accounted for the lion's share of the downturn.
- **Diamond and Dybvig's work** - Diamond and Dybvig developed theoretical models that explain
 1. Why banks exist,

2. How their role in society makes them vulnerable to rumours about their impending collapse,
 3. How society can lessen this vulnerability.
- They showed a solution to bank vulnerability, in the form of deposit insurance from the government.
 - When depositors know that the state has guaranteed their money, they no longer need to rush to the bank as soon as rumours start about a bank run.
 - Diamond also showed how banks perform a societally important function.
 - As intermediaries between savers and borrowers, banks are better suited to assessing borrowers' creditworthiness and ensuring that loans are used for good investments.

Other Nobel Prize Related Facts

- As of 2022, 61 Nobel Prizes have been awarded to 60 women.
- **Youngest Nobel Laureate** - Malala Yousafzai (at the age of 17 years).
- **Oldest Nobel Laureate** - John B Goodenough (at the age of 97 years).
- **Two Nobels** - Marie Curie, John Bardeen, Linus Pauling, Frederick Sanger, and Karl Barry Sharpless have won the Nobel Prize twice.
- **Three Nobels** - Switzerland-based International Committee of the Red Cross is the only three-time recipient of the Nobel Prize (Peace Prize in 1917, 1944, and 1963)
- Mother Teresa, Amartya Sen, and Kailash Satyarthi were three of the laureates who were citizens of the Republic of India.
- Ronald Ross and Rudyard Kipling are the two of the Nobel laureates who were of foreign origin, but were born in India.
- Hargobind Khorana, Subrahmanyam Chandrasekhar, Venkatraman, and Abhijit Banerjee were four of the laureates, who were Indian by birth but subsequently non-citizens of India.



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