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DUST BUILDUP IN NOVA EMISSIONS

Why in Newspapers?

Scientists from the S. N. Bose National Centre for Basic Sciences observed the imploding nova, named Nova V1280 Scorpii, and found that after a month a thick dust formed around it and existed for about 250 days.

Quick Issue?

- A nova is an astronomical event in which a massive explosion occurs temporarily on a stellar surface, increasing their brightness millions of times, and then gradually darkening over weeks or months.
- It occurs in a binary system consisting of a white dwarf and a main sequence star.
- A binary star system occurs when two stars orbit around the same centre of mass.
- The brightest star is officially classified as the primary star, while the faint star between the two is a secondary one.

Other Key Facts?

Importance of Study

- Space-dust collisions can motivate organisms to start life on the planet even after the great distance between different planets.
- Their study of new star dust may help to understand the nature and characteristics of such dust and the processes associated with them.
- The team suggests that as V1280 Scorpii Nova's dust cover continues to expand, these dust particles will eventually mix with interstellar/interstellar matter. But this process would take thousands of years, which is a short period of time in the cosmic time scale.

Historical Background?

- White dwarfs are stars in which all the hydrogen once used as nuclear fuel has fused.
- The density of such stars is very high. A normal white dwarf is half the size of our Sun and has a surface gravity 100,000 times greater than that of Earth.
- Cosmic dust consists of tiny particles of solid matter floating in the space between stars.
- The formation of cosmic dust or extra-terrestrial dust in an environment unfavourable to nova emission has been a complex question for many years. Hundreds of kilograms of such dust fall on the earth every day.
- Scientists built simple models to estimate dust parameters such as hydrogen density, temperature, brightness and abundance of elemental elements there during and after dust formation.
- They found an abundance of small amorphous carbon dust particles and large dust particles of celestial silicate, along with some elements such as carbon, nitrogen and oxygen in the ejecta.
- The formation of dust in the emission of new stars (nova ejection) is not a common phenomenon.



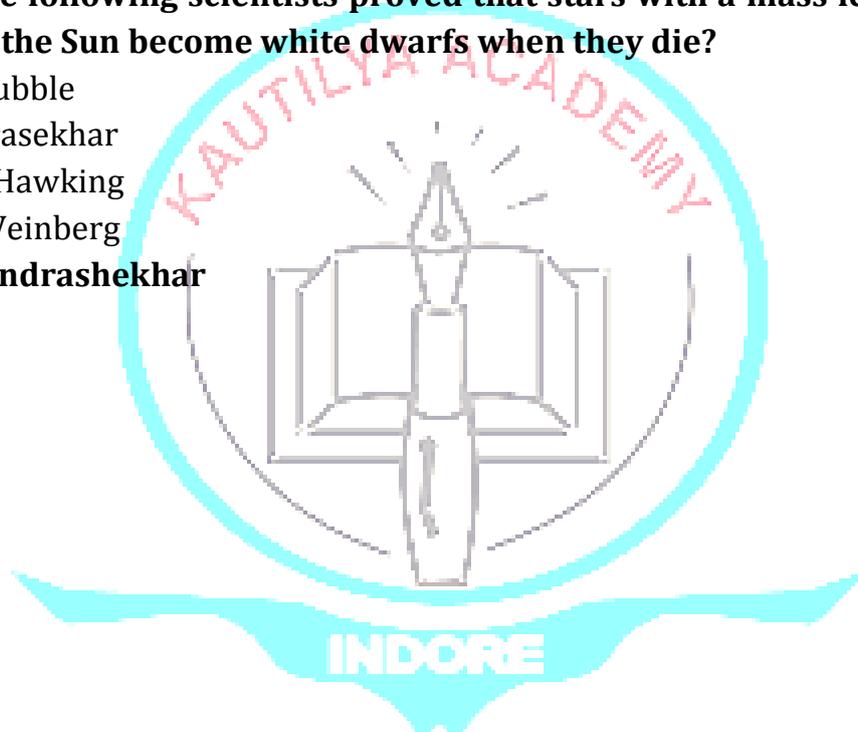
- Interstellar dust, which usually takes a few thousand years to form, has been observed in only a few new stars (novae) within 30 to 100 days after an explosion, so dust in the nova from such events get Opportunity to study the process of becoming.
- The dust phase/pre-dust was found to contain isotopes of certain elements such as carbon, nitrogen and oxygen.
- The post-dust phase ejecta have been found to contain a mixture of small amorphous carbon dust particles and large astronomical silicate dust particles.
- Mixed aromatic – Some complex organic compounds such as amorphous organic solids with aliphatic structure were also found which play an important role in the formation of molecular clouds in stars and planets.

Likely Question Asked In Preliminary Exam

Que. Which of the following scientists proved that stars with a mass less than 1.44 times the mass of the Sun become white dwarfs when they die?

- (a) Edwin Hubble
- (b) S Chandrasekhar
- (c) Stephen Hawking
- (d) Steven Weinberg

Answer: (b) S Chandrasekhar



Creation of Continents

Why in Newspapers?

According to a new study published in the famous journal 'Nature', the continents on Earth were formed by the collision of giant meteorites. The events of these giant meteorites hitting Earth continued during the first one billion years of our planet's four-and-a-half billion year history.

Quick Issue?

- The theory of the 'origin of continents by the impact of giant meteorites' had been discussed for decades, but until now, there was little concrete evidence to confirm it. The collision of meteorites generated enormous energy, which led to the formation of 'oceanic plates', which later developed into continents.
- Current Theory: Currently, the most commonly accepted theory is the 'Plate Tectonics' theory, according to which, continents are formed as a result of the movement of tectonic plates.

Other Key Facts?

Importance of Study

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Historical Background?

- Presence of Zircon Crystals in Pilbara Craton: Researchers have discovered evidence in 'Zircon Crystals' embedded in the rocks of 'Pilbara Craton' in Western Australia. This 'Craton' is the remnant of an ancient crust / crust, which began to form about three billion years ago.
- Cratons: 'Cratons' are an old and stable part of the 'continental lithosphere' made up of the Earth's two uppermost layers, the crust and the topmost mantle.
- Zircon Crystals: - "Studying the composition of oxygen isotopes in these zircon crystals revealed a 'top-down' process that begins with the melting of rocks located near the surface, the process below This process is consistent with the geological effects of large meteorite impacts.
- 'Zircons' are formed by the 'crystallization' of magma and are commonly found in metamorphic rocks. The 'zircon crystals' act as microscopic time capsules, recording periods of geological activity. With the passage of time new zircon crystals are added to the 'original crystal'.
- Understanding the formation and evolution of continents is important, as it is the key to deposits of metals such as lithium, tin and nickel.

