Chandrasekhar Limit & Chandrasekhar Number

Ever wondered how heavy a star can get before it explodes? Or how fluids behave in space? Well, both of these cosmic and curious questions have something in common: they're linked to one man's brilliant mind, Subrahmanyan Chandrasekhar. He won the Nobel Prize in Physics in 1983 for his work.

The Chandrasekhar Limit: When Stars Say "Enough!"

Let's start with something massive, like a dying star. When a star burns through all its fuel, what happens next depends on its mass. If it's small, it quietly shrinks into a white dwarf. But if it's too massive, boom! Supernova.

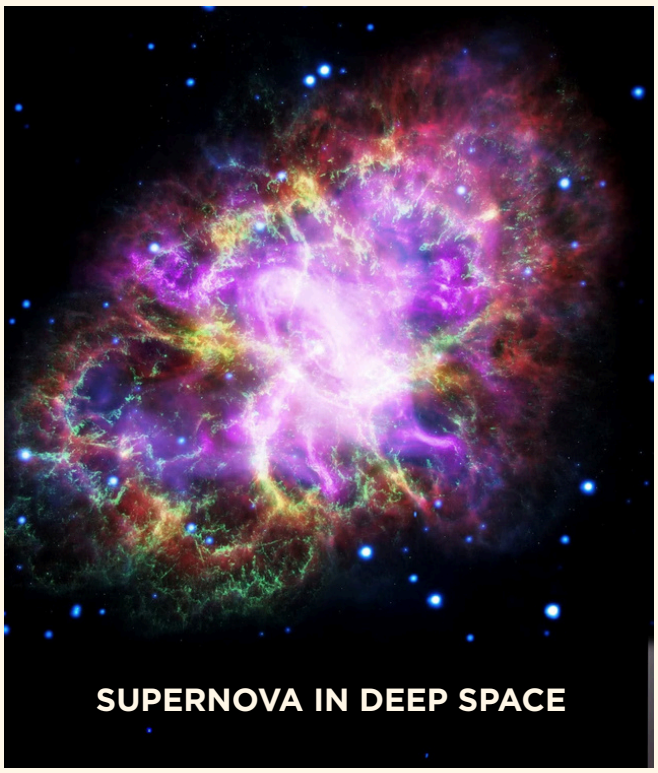
Where's the Tipping Point?

Chandrasekhar calculated that this critical mass is about 1.4 times the mass of our Sun, and this is known as the Chandrasekhar Limit. If a star is heavier than that, it can't become a white dwarf. Instead, it collapses into a neutron star or even a black hole.

The Chandrasekhar Number: Fluid Chaos

Now let's shift gears, from exploding stars to swirling fluids. Ever noticed how hot soup circulates in a pot, even without stirring? That motion is due to convection, heat rising, and fluids flowing. But add a magnetic field to that mix (like in the Sun or Earth's outer core), and things get complicated.

Here's where the Chandrasekhar Number comes in. It measures the effect of magnetic – forces on fluid motion, especially in magnetohydrodynamics (which studies the behavior of electrically conductive fluids interacting with magnetic fields).



Why Does this Matter?

It helps scientists understand how magnetic fields influence the flow of hot fluids, like plasma inside the Sun or molten metal in Earth's core. This insight is super useful for predicting solar storms, improving nuclear fusion reactors, and even designing advanced cooling systems for high-tech machinery!

Why did Chandrasekhar have two groundbreaking discoveries named after him?

Because he was brilliant, persistent, and didn't shy away from big, messy questions whether about stars, math, or magnetism.