**COSMOLOGY**

**3 Cosmic Stages**

-Big Bang Nucleosynthesis

-Stellar Formation and Evolution

-Stellar explosion, or supernova

**Big Bang Theory**

**Stages of Big Bang Theory**

-SINR

**COSMIC MICROWAVE BACKGROUND**

**Atom**

**Isotopes**

**Ion**

**WE ARE ALL MADE OF STAR STUFF**

**THE COSMIC CONNECTION (BOOK) BY CARL SAGAN**

**Fusion**

In **nuclear** physics, **nuclear fusion** is a reaction in which two or more atomic nuclei are combined to form one or more different atomic nuclei and subatomic particles (neutrons or protons). The difference in mass between the reactants and products is manifested as either the release or absorption of energy.

**Stellar Evolution**

**Stellar evolution** is the process by which a **star**changes over the course of time. Depending on the mass of the **star**, its lifetime can range from a few million years for the most massive to trillions of years for the least massive, which is considerably longer than the age of the universe.

**Stellar Nucleosynthesis**

**Stellar nucleosynthesis** is the theory explaining the creation (**nucleosynthesis**) of chemical elements by nuclear fusion reactions between atoms within stars. **Stellar nucleosynthesis** has occurred continuously since the original creation of hydrogen, helium and lithium during the Big Bang.

**Supernova Nucleosynthesis**

"**Supernova nucleosynthesis**" is a theory of the production of many different chemical elements in **supernova** explosions, first advanced by Fred Hoyle in 1954. The **nucleosynthesis**, or fusion of lighter elements into heavier ones, occurs during explosive oxygen burning and silicon burning.

**Proton-proton chain reaction**

The **proton**–**proton chain reaction** is one of two known sets of**nuclear** fusion **reactions** by which stars convert hydrogen to helium. It does not produce particles that go on to induce the **reaction** to continue (such as neutrons given off during fission).

**Triple alpha process nucleosynthesis**

The **triple**-**alpha process** is a set of nuclear fusion reactions by which three helium-4 nuclei (**alpha**particles) are transformed into carbon.

**Alpha ladder/process**

The **alpha process**, also known as the **alpha ladder**, is one of two classes of nuclear fusion reactions by which stars convert helium into heavier elements, the other being the triple-**alpha process**.

**CNO Cycle**

The **CNO cycle** (for carbon–nitrogen–oxygen) is one of the two known sets of fusion reactions by which stars convert hydrogen to helium, the other being the proton–proton chain reaction (pp-chain reaction). Unlike the latter, the **CNO cycle**is a catalytic **cycle**.

**Main-Sequence Star**

Main sequence stars fuse hydrogen atoms to form helium atoms in their cores. About 90 percent of the stars in the universe, including **the sun**, are main sequence stars. These stars can range from about a tenth of the **mass of the sun** to up to 200 times as massive. Stars start their lives as clouds of dust and gas.

**Red Giant Star**

A red giant star is a dying star in the last stages of stellar evolution. In **only** a few billion years, our own **sun** will turn into a red giant star, expand and engulf the inner planets, possibly even Earth.

**Supernova**

A **supernova** plural: **supernovae** or **supernovas**, abbreviations: **SN** and **SNe**) is an event that occurs upon the death of certain types of stars.

Supernovae are more energetic than [novae](https://www.wikiwand.com/en/Nova). In [Latin](https://www.wikiwand.com/en/Latin_language), *nova* means "new", referring astronomically to what appears to be a temporary new bright star. Adding the prefix "super-" distinguishes supernovae from ordinary novae, which are far less luminous. The word *supernova* was coined by [Walter Baade](https://www.wikiwand.com/en/Walter_Baade) and [Fritz Zwicky](https://www.wikiwand.com/en/Fritz_Zwicky) in 1931.

**R-Process/Rapid neutron capture process**

The **rapid neutron-capture process**, or so-called ***r*-process**, is a set of nuclear reactions that in [nuclear astrophysics](https://www.wikiwand.com/en/Nuclear_astrophysics) is responsible for the creation ([nucleosynthesis](https://www.wikiwand.com/en/Nucleosynthesis)) of approximately half the abundances of the [atomic nuclei](https://www.wikiwand.com/en/Atomic_nucleus) [heavier than iron](https://www.wikiwand.com/en/Heavy_metals), usually synthesizing the entire abundance of the two most neutron-rich stable isotopes of each heavy element. Chemical elements heavier than iron typically are enabled by the force between nucleons to be capable of six to ten stable isotopic forms having the same nuclear charge Z but differing in neutron number N, each of whose natural abundances contribute to the natural abundance of the chemical element. Each isotope is characterized by the number of neutrons that it contains.

**S-process/slow neutron capture process**

The **slow neutron-capture process** or ***s*-process** is a series of [reactions](https://www.wikiwand.com/en/Nuclear_reactions) in [nuclear astrophysics](https://www.wikiwand.com/en/Nuclear_astrophysics) that occur in stars, particularly [AGB stars](https://www.wikiwand.com/en/AGB_stars). The *s*-process is responsible for the creation ([nucleosynthesis](https://www.wikiwand.com/en/Nucleosynthesis)) of approximately half the [atomic nuclei](https://www.wikiwand.com/en/Atomic_nucleus) [heavier than iron](https://www.wikiwand.com/en/Heavy_metal_(chemical_element)).