

S.S. COLLEGE, JEHANABAD  
( GEOGRAPHY DEPARTMENT )

**B.A. PART - 1 ( PHYSICAL GEOGRAPHY : PAPER - 1 )**

**TOPIC : BINARY STAR HYPOTHESIS OF ORIGIN OF SOLAR SYSTEM**

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### **Binary Star Hypothesis of Russell:**

It may be pointed out that the hypothesis based on dualistic concept failed to explain the high amount of angular momentum of the planets of present solar system, high atomic weight of the constituent elements of the planets of inner circle and lighter atomic weight of the planets of outer circle of the solar system and the distances of different planets from the sun. In order to solve these problems the scientists tried to explain the origin of the earth and the solar system with the help of three heavenly bodies.

H.N. Russell, an American astronomer, propounded his 'binary star hypothesis' in the year 1937 to remove the shortcomings of tidal hypothesis of Sir James Jeans. Russell opined that there were two stars near the primitive sun in the universe. In the beginning the 'companion star' was revolving around the primitive sun.

Later on one giant star (the third one) named as 'approaching star' came near the companion star but the direction of revolution of the approaching star was opposite to that of the companion star. It was believed that the distance between two stars might have been about 48,00,000 to 64,00,000 km.

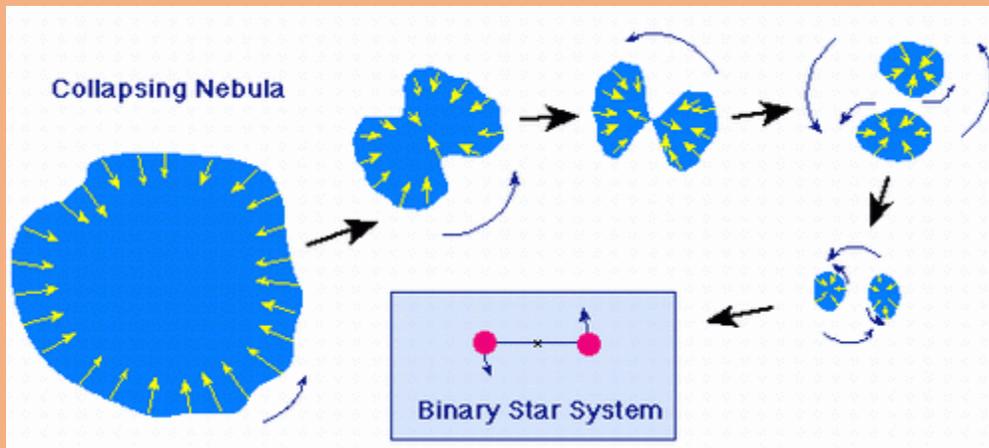
It means that the approaching star might have been at a far greater distance from the primitive sun. Thus, there would have been no effect of tidal force of the giant approaching star on the primitive sun but large amount of matter of the companion star was attracted towards the giant approaching star because of its massive tidal force (gravitational pull).

As the giant approaching star came nearer to the companion star, the gravitational and tidal force continued to increase and hence the bulge on the outer surface of the companion star started growing towards the giant approaching star. When the giant approaching star came nearest to the companion star, large amount of matter was ejected from the companion star due to maximum gravitational force exerted by the giant approaching star.

The ejected matter started revolving in the direction of the giant approaching star and thus opposite to the direction of revolution of companion star. Later on planets were formed from the ejected matter. In the beginning the planets might have been nearer to each other and thus matter might have been ejected from these planets due to their mutual attraction and thus satellites might have been ejected from these planets due to their mutual attraction and thus satellites might have been formed from these matter.

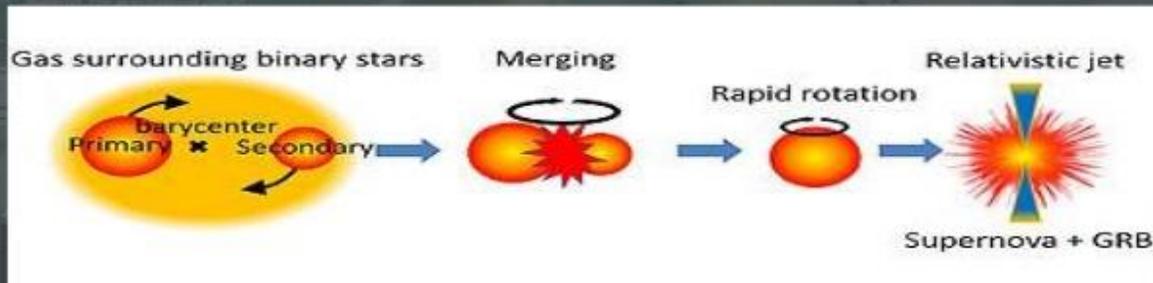
### **Evaluation:**

Though Russell solved, to some extent, the problems of distances between the planets and the sun and angular momentum of different members of the solar system by assuming the origin of the earth with the help of two stars besides the sun and by ejecting the required matter from the companion star (and not from the sun as assumed by James Jeans) to form planets.



## Russell's binary star hypothesis

- ✓ In the beginning the planets were closer together and the satellites owe their birth to the mutual gravitational attraction between them.
- ✓ The third star pass close to the companion star of the sun which resulted in the ejection of gaseous matter from the latter in the form of filament which ultimately separated from it.



1. Stars spiral together  
2. Merging with the Sun  
3. Forming a planetesimal  
4. Gravitational collapse

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