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Tardigrade Survival in Extreme Environments: Proxima Centauri b, Neptune and Pluto by using Shibastra theory.

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Abstract-

Tardigrades, microscopic extremophiles have sparked interest in astrobiology due to their remarkable survival capabilities in extreme conditions. This research explores the possibility of tardigrades inhabiting Proxima Centauri b, Neptune and Pluto by using my Shibastra Theory which I invented. I examine the habitability of these environments and assess tardigrade resilience to radiation, temperature and pressure extremes. As my results indicate tardigrades could potentially survive on Proxima Centauri b with adequate shielding, but Neptune and Pluto pose significant challenges. The implications for panspermia and astrobiological research are discussed.

Introduction-

Tardigrades, also known as water bears, are renowned for their extraordinary ability to withstand extreme conditions- High radiation, dehydration, freezing temperatures and high pressures. These microscopic animals inhabit various environments, from deep oceans to alpine regions. Their survival mechanisms include cryptobiotic states, DNA repair and antioxidant defenses.

Proxima Centauri b, an exoplanet orbiting the closest star to the Sun, experiences extreme stellar activity and tidal locking, potentially creating habitable zones. Neptune's moon Triton and Pluto, icy bodies in our solar system, offer insights into survival in cryogenic environments. Applying the Shibastra Theory, I assess tardigrade habitability on these worlds.

Methods of Prediction by Shibastra Theory-

Previous studies applied the Shibastra Theory to assess tardigrade habitability on-

- Proxima Centauri b-By evaluating radiation shielding and temperature extremes
- Neptune-By examining cryogenic temperatures and high pressures
- Pluto-By assessing extreme cold and atmospheric conditions

Parameters included-

- Habitat adaptability score (H) for tardigrade cryptobiotic states
- Radiation resistance score (R) for tardigrade DNA repair
- Temperature resilience score (T) for tardigrade freezing survival
- Atmospheric tolerance score (A) for tardigrade desiccation resistance.

Shibastra Theory Parameters and Tardigrade Habitability-

The Shibastra Theory assessed tardigrade potential on Proxima Centauri b, Neptune and Pluto by using parameters:

- Habitat adaptability score (H): Tardigrades' cryptobiotic states enable survival in diverse environments.
- Interaction with environment score (I): Tardigrades interact via osmoregulation and substrate adhesion.
- Atmospheric tolerance score (A): Tardigrades withstand desiccation and low pressures.
- Temperature resilience score (T): Tardigrades survive -200°C to 150°C extremes.
- Radiation resistance score (R): Tardigrades resist up to 5,000 Gy radiation.
- Spectral adaptation need (S): Tardigrades don't require specific light spectra.

- Biotic interaction need (B): Tardigrades can survive without symbiotic relationships.

Shibastra Index (SI) calculations-

- Proxima Centauri b: $SI \approx 0.755$ (tardigrades possible with shielding)
- Neptune: $SI \approx 0.06$ (tardigrades unlikely due to extreme conditions)
- Pluto: $SI \approx 0.03$ (tardigrades highly unlikely due to extreme cold)

The Shibastra Theory suggests tardigrades could potentially inhabit Proxima Centauri b with adequate shielding, but Neptune and Pluto pose significant challenges.

Results and Discussion -

Shibastra Index (SI) calculations:

- Proxima Centauri b: $SI \approx 0.755$ (possible extremophilic life)
- Neptune: $SI \approx 0.06$ (life unlikely)
- Pluto: $SI \approx 0.03$ (life highly unlikely)

Tardigrades show potential for surviving Proxima Centauri b's radiation if shielded. Neptune and Pluto's extreme conditions challenge survival, though subsurface oceans might support life.

The Shibastra Theory's application to tardigrades on Proxima Centauri b, Neptune and Pluto yielded notable findings:

- Proxima Centauri b ($SI \approx 0.755$): Tardigrades could potentially inhabit this exoplanet with adequate radiation shielding. By their cryptobiotic states and DNA repair mechanisms might enable survival in extreme stellar flares and temperature fluctuations.
- Neptune ($SI \approx 0.06$): Tardigrades are unlikely to survive Neptune's extreme pressures (up to 100 GPa) and cryogenic temperatures (-201°C). Subsurface oceans might support life, but tardigrade adaptation seems improbable.
- Pluto ($SI \approx 0.03$): Tardigrades are highly unlikely to inhabit Pluto's extreme cold (-233°C) and tenuous atmosphere. The dormant states might preserve tardigrade viability, but active life seems implausible.

These results suggest:

- Tardigrades' resilience makes them candidates for Proxima Centauri b's potential biosphere
- Neptune and Pluto's conditions challenge even extremophilic survival
- Subsurface exploration might reveal more habitable zones on these worlds

Implications for astrobiology:

- Tardigrade like life could indicate panspermia possibilities
- Targeted exploration should focus on subsurface environments
- The Shibastra Theory provides a framework for assessing life potential on icy worlds.

Conclusion-

My Shibastra Theory suggests tardigrades could survive on Proxima Centauri b with shielding, but Neptune and Pluto pose significant challenges. These findings inform astrobiological research and potential biosignatures in icy worlds.

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