Supercomputer simulation on Mpemba effect

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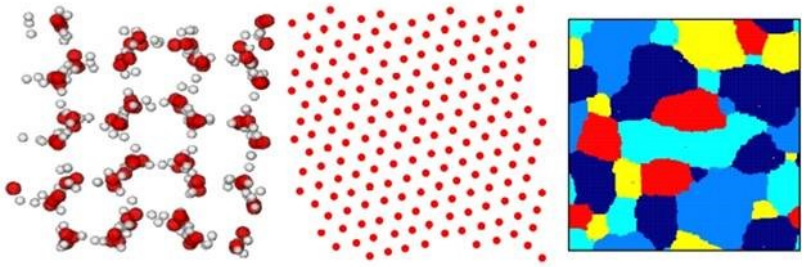
Why in News?

Recently, a supercomputer simulation of ice formation has given evidence of the paradoxical phenomenon of water.

- **Mpemba Effect –** It is a phenomenon in which a ***hotter sample of water may freeze faster than a colder one***, under certain conditions.
- **Nomenclature –** The effect is named after ***Erasto Mpemba,*** who rediscovered the phenomenon.
    - It dates back to an early reference by Aristotle in the Meteorological.
- **Research done by –**
    - Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR).
    - JNCASR is an autonomous institute of the Department of Science and Technology (DST).
- **Recent Simulation–** It has used supercomputers to develop the first simulation of ice formation proving the Mpemba effect of water.
- It also demonstrating that it can appear during **fluid-to-solid** transitions in systems other than water.
- They have explained that when water cools, it can get stuck in intermediate states of short-lived molecular arrangements before true ice begins to grow.
- Different starting temperatures get stuck for varied lengths of time.
- Hotter water can sometimes choose a quicker path to nucleation, the birth of ice, bypassing the delays that colder water suffers.
- **New insights -** Out-of-equilibrium phenomena, like material relaxation due to sudden temperature changes, can inspire new approaches in thermal management for next-generation electronics and improved cooling strategies.
- **Significance –** It is the *first-ever* supercomputer-based simulation of ice formation.



Reference

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