



MECHANICAL & MATERIAL COLLOQUIUM

Forged in Pressure: A Materials Scientist's Journey to the Center of the Earth

by Jiuhua Chen (MME/FIU)

This presentation explores how cutting-edge materials science helps us probe the inaccessible depths of our planet. It highlights experimental investigations into the mechanical strength of deep-Earth minerals under extreme pressure and temperature conditions. These studies provide critical insights into the puzzling global distribution of deep-focus earthquakes, revealing how mineral strength varies with depth and influences seismic behavior far beneath the surface.

The talk also delves into the stability and composition of iron oxyhydroxide (FeOOH_x) at the core-mantle boundary—a region where immense pressures and temperatures create exotic chemical environments. The presence and behavior of FeOOH_x at these depths raise a compelling question: *Is Earth's core rusting?* Findings from this research offer new clues into the planet's early oxygenation events, linking deep-Earth processes to the evolution of surface environments during Earth's formative history.

Together, these studies show how materials science can uncover the physical limits of Earth's interior and connect atomic-scale properties to planetary-scale phenomena—making a journey to the Earth's center possible not through science fiction, but through scientific discovery.

Dr. Jiuhua Chen, a professor of Mechanical and Materials Engineering, earned his Ph.D. from the Graduate University for Advanced Studies, SOKENDAI, in Japan. Before joining Florida International University (FIU), he was a faculty member at the Mineral Physics Institute at Stony Brook University (SUNY), where he also held leadership roles as the institute's deputy director and the university's associate dean of admission.



His research focuses on crystal structures, phase transformations, and the mechanical and rheological properties of materials under extreme conditions. He has published over 130 peer-reviewed scientific papers, including in high-impact journals such as *Nature*, *Science*, *Physical Review Letters*, and *PNAS*.

As director of the Center for the Study of Matter under Extreme Conditions (CeSMEC) at FIU, he led an international research team that discovered a unique elemental compound—boron borate (B_{28}), a high-pressure polymorph of boron—which was featured in a publication in *Nature*. His work relies extensively on large-scale synchrotron radiation facilities around the world to advance materials science research.

Place:
EC 1113

Time:
2:00-3:15 PM
Oct. 7, 2025

<https://mme.fiu.edu/seminar-schedule>

For questions or suggestions, contact Colloquium Organizers Dr. Jiuhua Chen (chenj@fiu.edu) or Dr. Pezhman Mardanpour (pmardanp@fiu.edu)