Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **125** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

Memory formation using local deformations in a disordered aggregate of droplets

Tuesday 10 June 2025 11:30 (15 minutes)

The formation of memory in jammed, disordered systems through cyclic global deformation has been observed in both simulations and experiments in recent years. Using a novel experimental approach, we demonstrate that local deformations can also drive memory formation. In our setup, we create a bidisperse aggregate of frictionless, cohesive oil droplets confined to a 2D coral. A single intruding ferrofluid droplet is introduced and manipulated with a magnet. As this ferrofluid intruder moves in a uniaxial, oscillatory manner, the aggregate rearranges and encodes the memory of the oscillation's amplitude. This stored amplitude can be recovered by probing the system after memory encoding. We observe that the aggregate's response is trained over several training cycles, with larger deformation amplitudes requiring more cycles to encode the memory.

Keyword-1

Memory formation

Keyword-2

Disordered system

Keyword-3

Intruder

Author: GAZI, Marzuk

Co-authors: KHATTAK, Hamza; HOGGARTH, Johnathan; Prof. DALNOKI-VERESS, Kari (McMaster University)

Presenter: GAZI, Marzuk

Session Classification: (DCMMP) T1-4 Quantum and Soft Materials | Matériaux quantiques et mous (DPMCM)

Track Classification: Technical Sessions / Sessions techniques: Condensed Matter and Materials Physics / Physique de la matière condensée et matériaux (DCMMP-DPMCM)