TUESDAY
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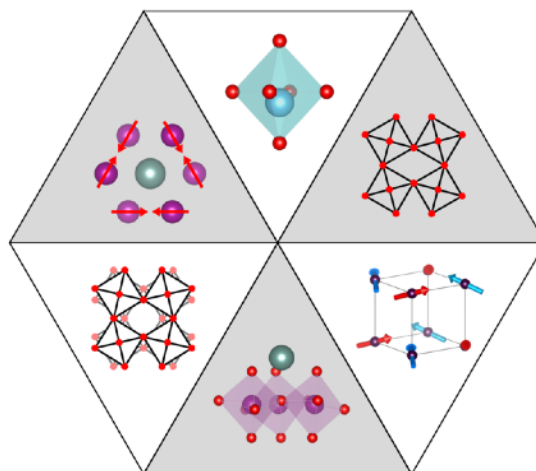**JANUARY**

Mads C. Weber

Institut des Molécules et Matériaux du Mans, UMR 6283
CNRS, Le Mans Université, Le Mans, France.

Domain Morphologies in Multi-Order-Parameter Ferroics: From Coupled Domain Walls, Vortices to Dimensional Conversion

11am - 12am (Salle des thèses GR L 0130 - Grandmont - Tours)

Multi-order-parameter ferroelectrics and multiferroics enable domain patterns and nontrivial domain morphologies driven by the interplay of independent structural, magnetic, and electric orders. Here, we discuss several surprising domain patterns resulting from the co-existence of multiple ferroic orders. In hybrid improper ferroelectrics, two non-polar structural distortions, i.e. octrahedral tilts, drive trilinearly the ferroelectric order. The domain patter is dominated by the structural distortions and not by the ferroelectricity. This allows for nominally charged head-to-head and tail-to-tail domain walls. In hexagonal manganites hex-RMnO$_3$, the antiferrodistortive order is responsible for both polar and the magnetic order. As such, the structural distortion pins the polar and magnetic order and hence its domain walls together. Therefore, polar and magnetic order are bound to form the nontrivial topological domain vortices of the antiferrodistortive order. In Dy$_{0.7}$Tb$_{0.3}$FeO$_3$, trilinear coupling between transition-metal magnetization, rare-earth antiferromagnetism, and improper polarization enforces the formation of domain-wall couples. While we can freely choose the different domain wall couples, single order or triple order domain walls are forbidden. Importantly, domain walls themselves can acquire multiproperty character. Taking Dy$_{0.7}$Tb$_{0.3}$FeO$_3$ as example, we show that domain walls themselves can host simultaneously stable, switchable magnetization and polarization. Finally, the 2D domain walls are not only static separators but can dynamically convert into 3D bulk domains. We will discuss the requirements for such a dimensional conversion using Dy$_{0.7}$Tb$_{0.3}$FeO$_3$ as a magnetic example and outline how such domain – domain-wall transfer may take place in ferroelectric and elastic domain walls.

📓 Upcoming GREMAN Seminars:
- ✦Tuesday, January 27, 2026 (11AM): *Vijaya BHASKER - Journal Club* (SDM site)
- ✦Thursday, February 12, 2026 (13:30PM): *Aurélien ROTARU - Seminar* (EMA site)
- ✦Tuesday, March 10, 2026 (11AM): *Barbara MALIC - Seminar* (SDM site)