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Type: **Focus session invited talk**

Bimerons and Antibimerons in Magnetic Topological Materials

Monday 1 December 2025 13:30 (30 minutes)

I will discuss topological magnetic textures, such as skyrmions, merons, and (anti)bimerons, which constitute tiny chiral whirls in the magnetic order. They are promising candidates as information carriers for next generation electronics, as they can be efficiently propelled at very high velocities employing current-induced spin torques [1]. First, I will talk about bimerons [2] and antibimerons [3] in ferromagnetic systems coupled to heavy metals and topological materials. Then I will show that antiferromagnets can also host a variety of these textures, which have gained significant attention because of their potential for terahertz dynamics, deflection free motion [4], and improved size scaling due to the absence of stray fields. Finally, I will demonstrate that topological spin textures, merons and bimerons, can be generated at room temperature and reversibly moved using electrical pulses in antiferromagnets [5] and ferromagnets [6].

References:

- [1] B. Göbel, I. Mertig, and O. A. Tretiakov, Phys. Rep. 895, 1 (2021).
- [2] B. Göbel, A. Mook, I. Mertig, and O. A. Tretiakov, Phys. Rev. B 99, 060407(R) (2019); K. Ohara, Y. Chen, J. Xia, M. Ezawa, O. A. Tretiakov, et al., Nano Lett. 22, 8559 (2022).
- [3] P. A. Vorobyev, D. Kurebayashi, and O. A. Tretiakov, ArXiv:2410.10557 (2024).
- [4] J. Barker and O. A. Tretiakov, Phys. Rev. Lett. 116, 147203 (2016).
- [5] O. J. Amin, O. A. Tretiakov, K. W. Edmonds, and P. Wadley et al., Nature Nano. 18, 849 (2023).
- [6] J. Chen, L. Shen, Y. Zhou, O. A. Tretiakov, and X. Li, ArXiv:2505.00959 (2025).

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Session Classification: Focus Session - From edge states to emergent phases

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