

Department Seminar

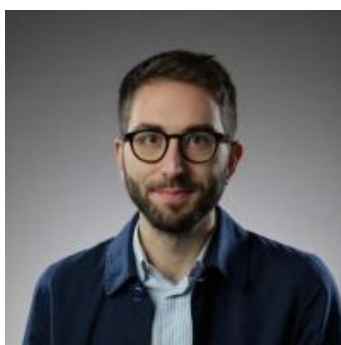
Dear Colleagues & Students,
You are cordially invited to a special seminar on

Date: 16 July 2026, Thursday

Time: 11am - 12pm

Venue: EA-06-03 Seminar Room, Block EA, 9 Engineering Dr 1, Singapore 117575 ([Map](#))

Tuning the electronic phases of graphene nanoribbons



By Prof. Michele Pizzochero

Department of Physics, University of Bath, United Kingdom

Hosted by Assistant Professor Ahmet Avsar

Abstract:

Graphene nanoribbons (GNRs) are a fascinating class of quasi-one-dimensional semiconductors consisting of nanometer-wide strips of hexagonally bonded carbon atoms [1]. Recent advancements in fabrication techniques have enabled the realization of atomically precise GNRs with complex edge geometries and widths [2]. In this talk, I will present graphene nanoribbons as a promising platform for controlling and manipulating unconventional electronic phases, drawing on both *ab initio* and model-Hamiltonian calculations. First, I will demonstrate the formation of half-semimetallic phases in zigzag-edged nanoribbons upon incorporation into a lateral heterostructure [3,4]. Second, I will discuss the formation of ultra-flat bands and π -electron magnetism in chevron-edged graphene nanoribbons under an external electric field [5]. Third, I will show that localized states induced by nitrogen doping can drive a topological phase transition in armchair-edged nanoribbons [6]. These findings may open new possibilities for engineering quantum phases in one-dimensional carbon nanostructures, even beyond graphene [7], with potential applications in spintronics and related device concepts.

[1] O. V. Yazyev, *Account of Chemical Research* 46, 2319 (2013)

[2] A. Narita, K. Müllen, *Advanced Materials* 32, 2001893 (2020).

[3] N. V. Tepliakov, R. Ma, J. Lischner, E. Kaxiras, A. A. Mostofi, M. Pizzochero, *Nano Letters* 23, 6698 (2024); M. Pizzochero, N. V. Tepliakov, J. Lischner, A. A. Mostofi, E. Kaxiras, *Nano Letters* 24, 6521 (2024).

[5] R. Ma, N. V. Tepliakov, A. A. Mostofi, M. Pizzochero, *The Journal of Physical Chemistry Letters* 16, 1680 (2025)

[6] P. H. Jacobse, M. Pizzochero, et al, *ACS Nano* 19 13029 (2025)

[7] B. Peng & M. Pizzochero, *ACS Nano* 19, 29637 (2025); B. Peng & M. Pizzochero, *Nano Letters* 26, 6034 (2026).

Biography:

Michele Pizzochero is an Assistant Professor of Theoretical Physics at the University of Bath (UK). His research focuses on understanding and engineering unconventional electronic phases in low-dimensional crystals. Prior to joining the University of Bath, he was a Research Associate at Harvard University (USA), supported by a fellowship from the Swiss National Science Foundation. He received his PhD in Physics from EPFL (Switzerland).