

Fizikus Témaválasztó Nap
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Spin waves in exotic magnetic nanostructures

Levente Rózsa

HUN-REN Wigner Research Centre for Physics, Department of Theoretical Solid State
Physics

BME TTK Institute of Physics, Department of Theoretical Physics

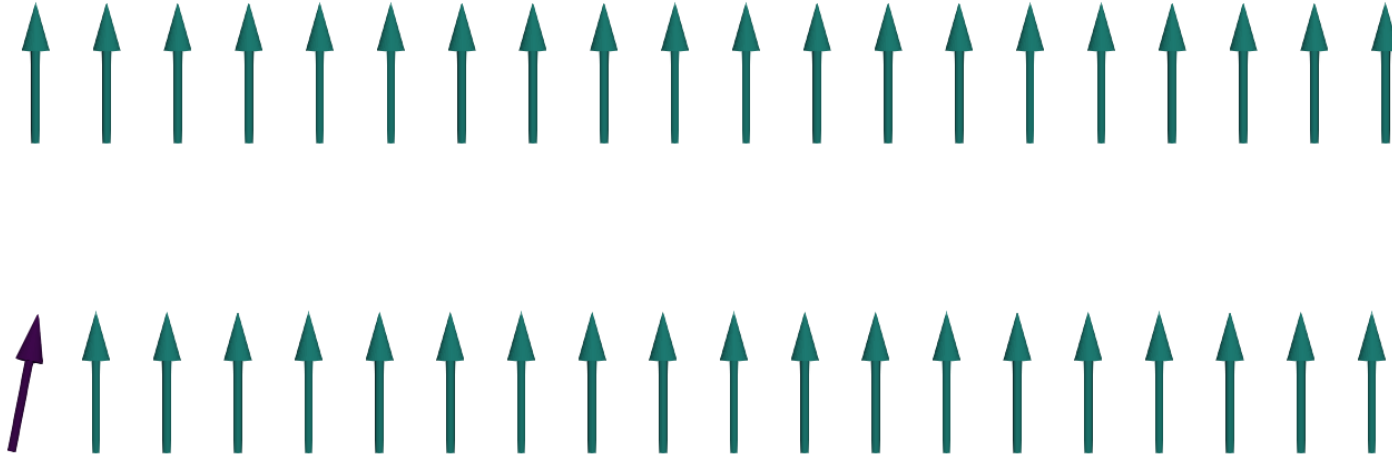
rozsa.levente@wigner.hun-ren.hu

Spin waves



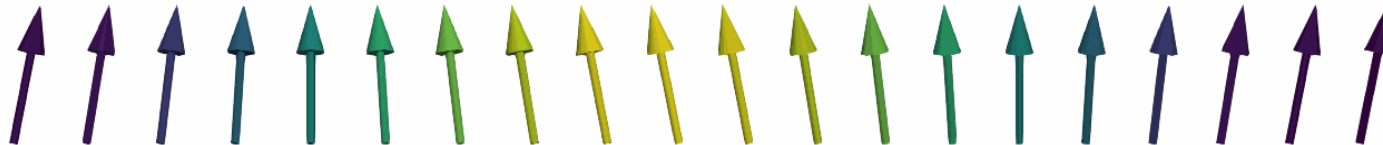
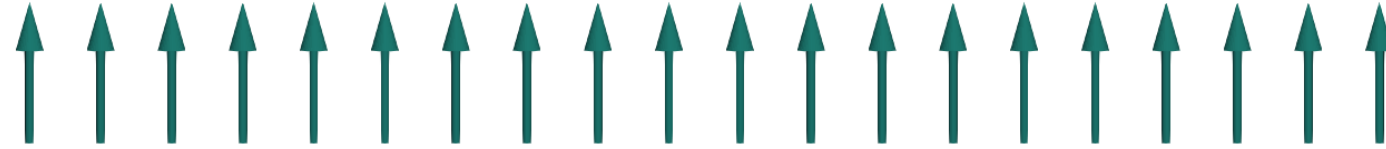
- spin waves are small-amplitude excitations of magnetically ordered systems

Spin waves



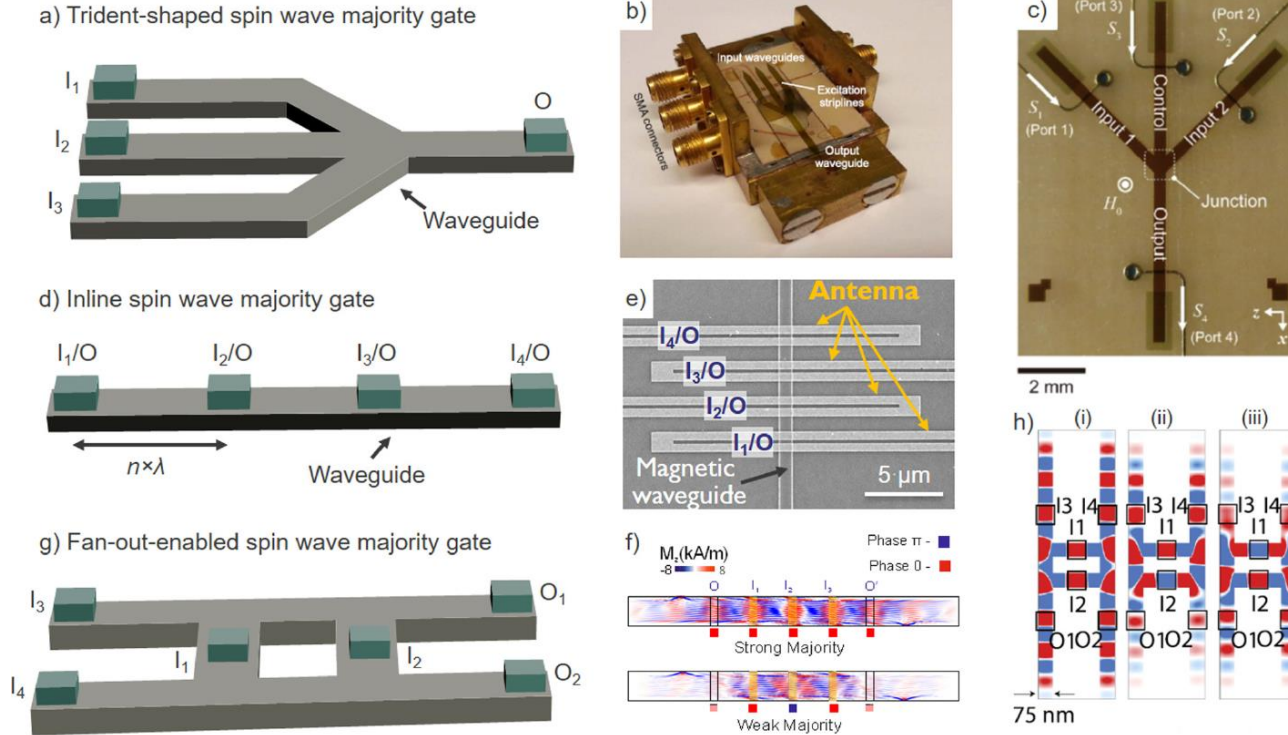
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Spin waves



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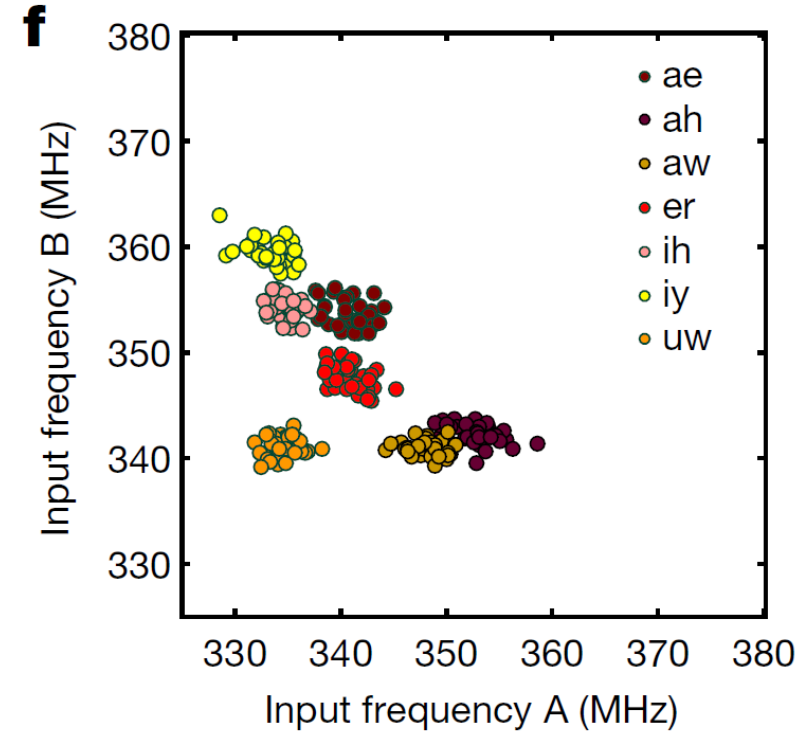
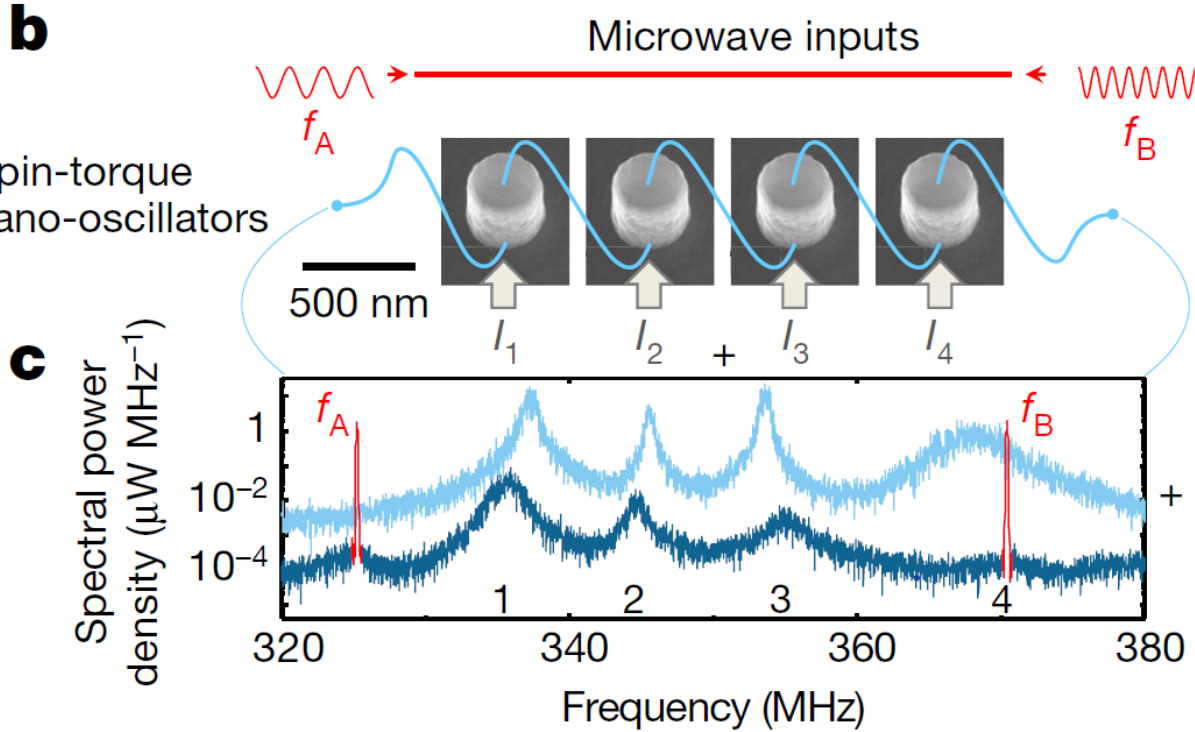
Spin waves in logical circuits



(1) A. Mahmoud *et al.*, J. Appl. Phys. **128**, 161101 (2020)

- their frequency and wavelength makes them integrable in current devices
- different logical gates may be realized due to wave property

Spin waves in machine learning

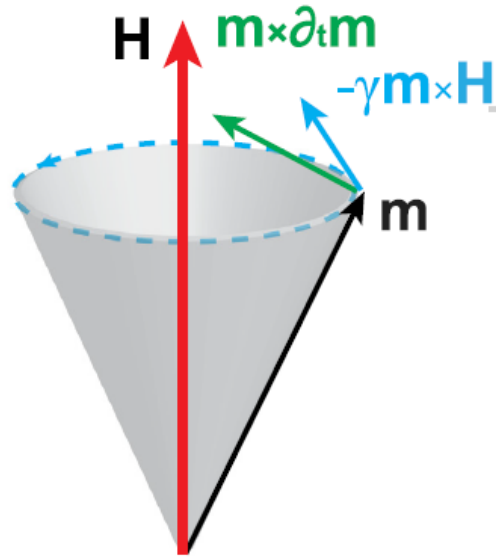


(2) M. Romera *et al.*, Nature **563**, 230 (2018)

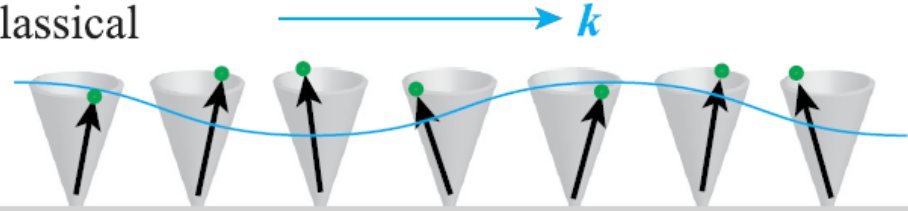
- unconventional computing architectures may also be realized
- magnetic nanooscillators used for distinguishing vowels

Spin waves in quantum systems

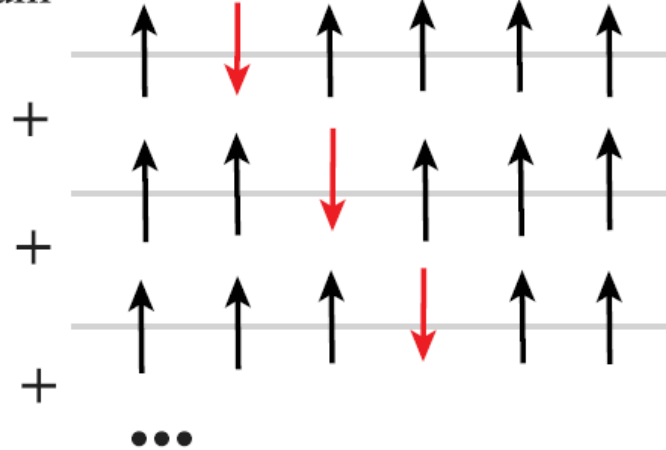
(a)



(b) classical



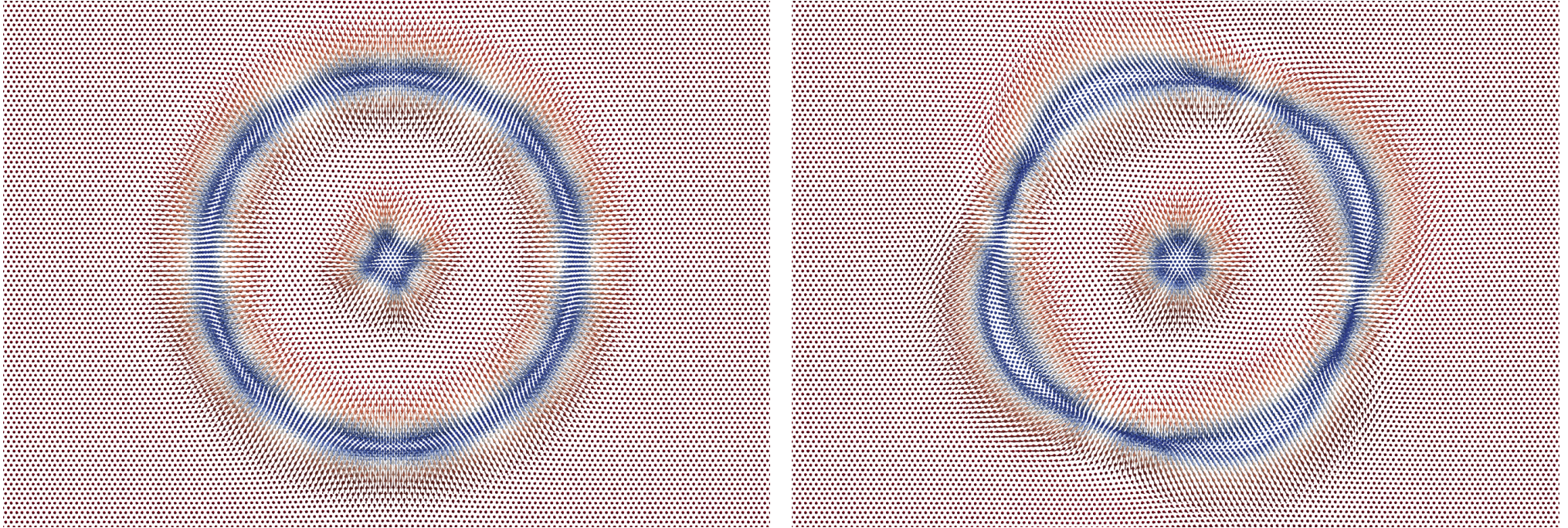
quantum



(3) H. Y. Yuan *et al.*, Phys. Rep. **965**, 1 (2022)

- magnons are quantum counterparts of spin waves
- entanglement of magnons may be used for quantum computing

Spin waves in nanostructures

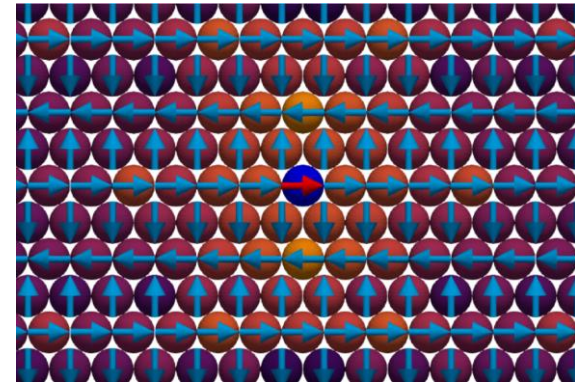
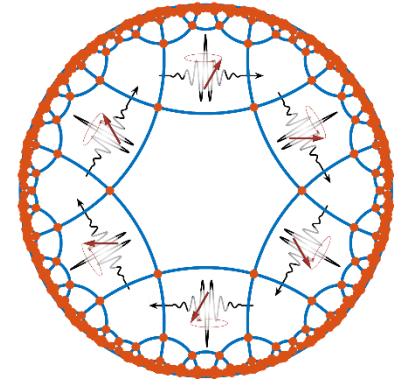


(4) L. Rózsa *et al.*, Phys. Rev. B **98**, 224426 (2018)

- different interactions between magnetic moments leads to diverse magnetic structures
- spin-wave excitations of magnetic nanostructures may be investigated

Research topic

- **BSc topic** (physicist): Magnon band structure in non-Euclidean lattices
- **MSc topic** (research physicist, nanotechnology): Quantum squeezing and entanglement in non-collinear spin structures
- **TDK topic**: Topological effects in spin-wave propagation

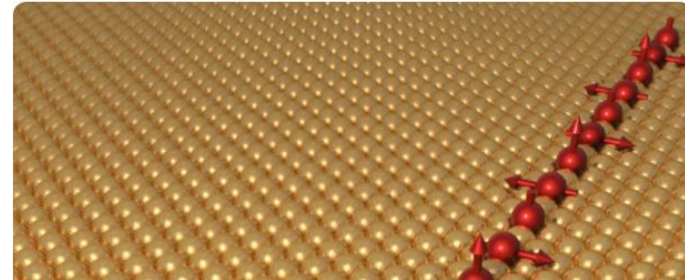


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Thank you for your attention!

Levente Rózsa

rozsa.levente@wigner.hun-ren.hu

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References

- (1) A. Mahmoud *et al.*, J. Appl. Phys. **128**, 161101 (2020).
- (2) M. Romera *et al.*, Nature **563**, 230 (2018).
- (3) H. Y. Yuan *et al.*, Phys. Rep. **965**, 1 (2022).
- (4) L. Rózsa *et al.*, Phys. Rev. B **98**, 224426 (2018).