Optomechanics and Nanomechanics

Optomechanics and Nanomechanics: Physics and Applications

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Optomechanics investigates the interactions between electromagnetic and mechanical degrees of freedom. In about 3 decades of existence, and under the impulse of the development of large-scale projects such as the gravitational wave interferometers LIGO and VIRGO, optomechanics has achieved remarkable progress, extending the paradigm of quantum mechanics to solid-state, macroscopic mechanical devices. Milestones include ground state cooling, the preparation of non-classical mechanical states, and probing Heisenberg's measurements principles in motion detection.
These advance open new perspectives, essentially organized around two scientific questions:

- Is it possible to extend the paradigm of quantum optomechanics to other, more complex systems and conditions?
- Can the unique sensitivity of optomechanical systems be leveraged in others areas of science and technology?

The mini-colloquium 'Optomechanics and Nanomechancis: Physics and Applications' aims at addressing these two questions, and welcomes submissions according to these perspectives, including (and not limited to) ultra-sensitive interferometry, classical and quantum statistical physics, thermodynamics of levitated systems, quantum hybrid systems, near-field interactions, NEMS-MEMS devices, quantum devices for information technology and nanomechanical sensing. It will also represent a unique occasion for early-stage researchers to discover the community and present their own contribution, opening new opportunities in a rapidly evolving field.

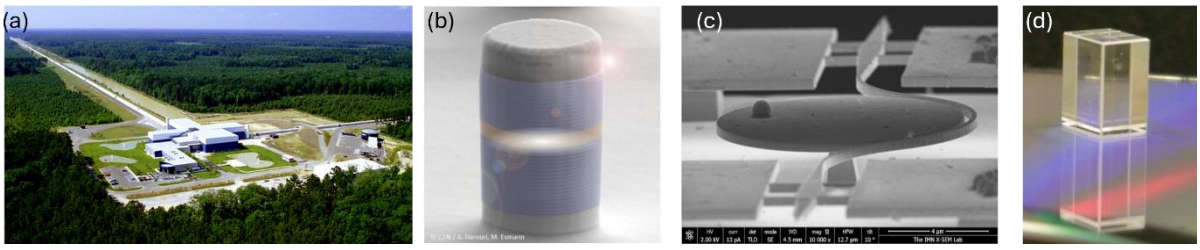

Figure 1 Optomechanical systems for Science and Technology: from the nanometre to the kilometre scale. (a) Full-scale photograph of the Livingstone LIGO gravitational wave interferometer [1]. (b) Scanning electron micrograph of a 4.5 µm diameter ultra-high frequency Brillouin scattering micropillar device [2]. (c) Scanning electron micrograph of a cavity optomechanical bio-sensing device and of a single bacterium deposited on top of it [3]. (d) Rare-earth, cm-scale parallelepipedal quantum hybrid optomechnical crystal [4].

Références

[1] Abbott, Benjamin P., et al. *Physical review letters* **116**, 6 (2016): 061102.
[2] Esmann, Martin, et al. *Optica* **6**,7 (2019): 854-859.
[3] Gil-Santos, Eduardo, et al. *Nature nanotechnology* **15**,6 (2020): 469-474.
[4] Louchet-Chauvet, Anne, et al. *Physical Review Applied* **20**,5 (2023): 054004.