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NND07 : Nanomechanics, Optomechanics, Electromechanics: fundamental physics and advanced engineering

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Invited Speakers: to be confirmed

Sponsors: GDR Symphonique

Nanomechanics, optomechanics and electromechanics explore mechanical motion and its coupling to electromagnetic, thermal, and hybrid environments across a broad range of platforms [1]. Over the past decades, major breakthroughs, such as ground-state cooling of mechanical oscillators and the preparation of non-classical states, have demonstrated the ability to access and manipulate mechanical systems in the quantum regime [2-3]. Initially driven by questions in quantum measurement and the extension of quantum physics to macroscopic systems, the field has expanded to address a wide range of challenges in various domains, among which ultra-sensitive mechanical sensors [5], quantum and classical transduction [6], hybrid systems [7], nanophononics, thermal transport, levitated particles and wave-controlled motion [9], multimode optomechanics, thermodynamics and fluctuation physics [4], or nonlinear phenomena in nanomechanical and optical systems. Simultaneously, these fields rely on and stimulate progress in engineering areas such as micro- and nano-fabrication, scanning microscopy, photonics, microwave hybrid quantum circuits, and high-Q mechanical resonators for metrology, signal processing and reservoir computing [8-9].

The mini-colloquium "Nanomechanics, Optomechanics, Electromechanics: fundamental physics and advanced engineering" will showcase the broad interdisciplinarity of the field, spanning nanomechanics, optomechanics and electromechanics from fluctuations, thermodynamics and nonlinear dynamics [4] to resonator-based sensing [5], computing [9] transduction [6], high-Q devices [8], levitated systems [10], and hybrid platforms. It will provide a stimulating platform for early-career researchers to connect with the community, present their results, and foster new collaborations at the interface of condensed-matter physics, photonics, microwave engineering, statistical physics and nanofabrication.

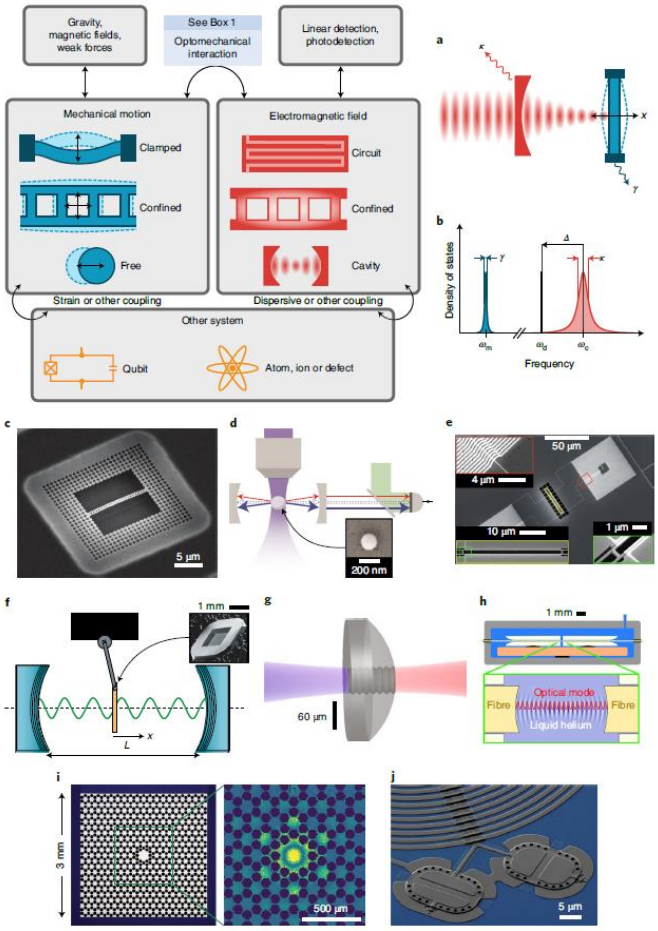

Figure 1, Various platforms that have been used to demonstrate or exploit optomechanical physics [11]

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[2] Teufel et al., Nature 475, 359-363 (2011).
[3] Mercier de Lepinay et al., Science 372, 625-629 (2021).
[4] Bellon, et al., Phys. Rev. B 110, 224305 (2024).
[5] Fogliano et al., Nat. Commun. 12, 4124 (2021).
[6] Forsch et al., Nat. Phys. 16, 69-74 (2020).
[7] Gerashchenko, el al., ArXiv:2505.21481
[8] Engelsen, et al., Nat. Nanotechnol. 19, 725-737 (2024).
[9] Farah, et al., ArXiv:2601.02617v3
[10] Hupfl, et al., Phys. Rev. Lett. 130, 083203 (2023).
[11 Barzanjeh, et al. Nature Physics 18.1 (2022): 15-24