Carbon mechanical resonators coupled to quantum circuits

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Carbon mechanical resonators have properties that should make them ideal for studying quantum states of motion: they have frequencies in the range of 500 MHz – 1 GHz, they have masses in the range of 10-22 kg, they have unusually large zero point fluctuations in the range of picometers, and they have quality factors exceeding 105. The outstanding challenge, however, for carbon resonators is to detect and manipulate their motion at the single-phonon level. We plan to achieve this by coupling them to superconducting circuits, and to use the quantum toolbox of the superconducting qubit community to "listen" to the quantum sounds of carbon nanodrums and nanostrings. Here, I will describe our results coupling carbon resonators to a superconducting device, and our first ventures into experiments with quantum superconducting circuits.