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Quantum technology to measure the fine structure constant and illuminate biology

Tuesday, January 29, 2019 12:30 PM (25 minutes)

Quantum technology enables new measurements and thus new insights in fundamental physics, applied physics, chemistry, and biology. We will discuss two examples:

Using interference of matter waves, we have recorded the most precise measurement of the fine structure constant, at 0.20-part-per-billion accuracy. Comparison with Penning trap measurements of the electron gyro-magnetic anomaly is a broad and deep test of the Standard Model of particle physics, and sets bounds on dark-sector candidates that are competitive with accelerator tests.

In transmission electron microscopy, using lasers to manipulate the electron wave function can be used to extract all information that is physically present in the electron stream. We have developed Zernike phase contrast in electron microscopy. We will discuss implications for structural biology and future plans to attain Heisenberg-limited imaging with electrons.

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