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Room temperature STM imaging in air can damage DNA, even at low tunneling biases and currents[1] JOHN BECHHOEFER, PHILIP GRANT, YUEKAN JIAO[2], Simon Fraser University — STM images of DNA molecules in air or vacuum at room temperature have been plagued by problems of reproducibility. These difficulties have usually been ascribed to substrate artifacts or tip-related effects. However, the recent discovery that low-energy electron beams cause single-strand breaks in DNA suggests that the tunneling electrons used for STM imaging can damage DNA similarly and could be responsible for many imaging problems. Here, we provide experimental support for such a conclusion. Collecting images from an STM that simultaneously detects light-emission from the tip region, we show that the observed DNA structure changes after the first scan. The organic debris from the DNA quenches the light emission from surface plasmons on the gold substrate. Next, we use an atomic force microscope (AFM) whose stiff tip can be used both for tapping-mode AFM and for STM imaging modes. We assess STM-induced damage by re-imaging the same area in tapping-mode AFM. The bias-dependent change in DNA film thickness correlates with the previously observed rate of DNA strand breaks caused by low-energy electron beams of different energies.

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