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Single Quantum Dots Imaged with Resonance Rayleigh Scattering Do Not Blink DAVID W. WARD, WEI MIN, ETHAN S. KARP, XIAOLIANG SUNNEY XIE, Harvard University, Department of Chemistry and Chemical Biology — Semiconductor quantum dots have become a robust fluorescent marker for the life sciences. Two key issues limit the broad use of quantum dots as fluorescent markers: heterogeneous emission and non-radiant dark populations. All bright quantum dots blink stochastically, have considerable heterogeneity in their emission, and have fluctuations in their fluorescence lifetimes, limiting their utility as single particle trackers by introducing potentially large interruptions in particle trajectories. Further, a significant fraction does not fluoresce at all, undermining biophysical studies such as immuno-fluorescence. We present an alternative or complement to fluorescent imaging of quantum dots. We have developed a new technique, resonant Rayleigh scattering (RRS) microscopy, for imaging single quantum dots which does not exhibit blinking. Detection of individual quantum dots, both surface immobilized and freely diffusing in aqueous solution, is demonstrated. Non-fluorescent populations of quantum dots are visible through RRS microscopy. Though other non-fluorescence detection techniques exist they are significantly more complicated than our technique, which requires minimal alteration of a conventional confocal fluorescence microscope.

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