# Plasmonic enhancement of one-photon- and two-photon-excited single-molecule fluorescence by single gold nanorods

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# Stellingen

behorende bij het proefschrift

## Plasmonic Enhancement of One-Photon- and Two-Photon-Excited Single-Molecule Fluorescence by Single Gold Nanorods

1. When conducting plasmon-enhanced single-molecule studies, there exists no perfect positioning strategy for placing single molecules with respect to plasmonic nanoantennas.
   *Chapters 2, 3, 4 and 5 of this thesis*.

2. Because of its low quantum yield and complicated photochemistry, methylene blue may not be the best molecular probe for measuring the local redox potential in a cell.
   *Chapter 3 of this thesis*.

3. Because of the size distribution of quantum dots, the enhancement factor by a nanoantenna can only be accurately determined by measuring with and without the nanoantenna for *the same* quantum dot.
   *Chapter 5 of this thesis*.

4. Gold nanorods' shape instability upon femtosecond laser irradiation is the major hurdle for their application in single-molecule two-photon-excited fluorescence enhancement.
   *Chapter 6 of this thesis*.

5. In addition to what is reported by the Halas and Maier groups, the gold-thiol bond can also be cleaved by a focused continuous-wave laser.
   *Goodman et al., ACS Nano **11**, 171-179 (2017) and Simoncelli et al., ACS Nano **12**, 2184-2192 (2018).*

6. The axial super-resolution method proposed by Isbaner *et al*. based on metal-induced energy transfer requires prior knowledge of the fluorescent molecules and is not able to super-resolve two different molecules along the optical axis.
   *Isbaner et al., Nano Lett. **18**, 2616-2622 (2018).*

7. Although the reported enhancement factors remain lower than for the metal counterparts, all-dielectric nanoantennas are promising alternatives because of their lower sensitivity to laser heating.
   *Regmi et al., Nano Lett. **16**, 5143–5151 (2016).*

8. For achieving brighter fluorescent molecular probes for two-photon microscopy, it is easier to enhance the brightness of the existing two-photon absorption fluorophores physically than, as is often proposed, to seek for new molecules with larger two-photon absorption cross-sections.
   *Albota et al., Science **281**, 1653-1656 (1998).*

9. "Problem solved" is not equivalent to "problem understood" in experimental physics.

10. In undesired effects of some research lies the opportunity for future research.

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Leiden, June 27, 2018