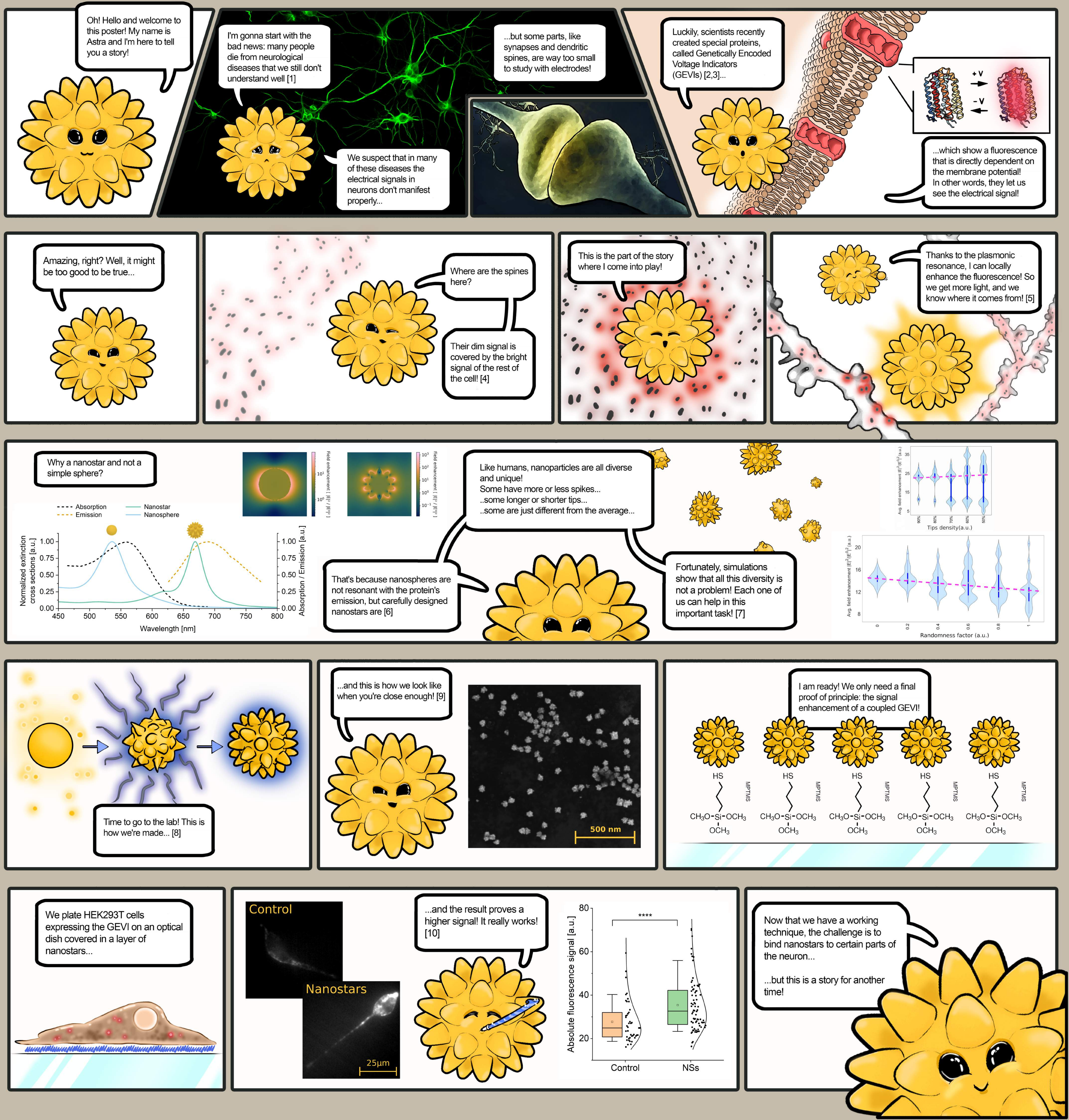
Astra and the Nanoparticles

M. Locarno, X. Meng, M. Post, C. Glessi, T. Schmidt, N. Brandsma, S. Blokhuizen, Q. Dong, S. Ganapathy, D. Brinks

Brinks Lab - Department of Imaging Physics - TNW - TU Delft

Illustrations by Noemi Rosano



Notes:

[1] Feigin, V. L. et al. "Global, regional, and national burden of neurological disorders, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016". The Lancet Neurology 2019, 18.
[2] Kralj, J. M. et al. "Electrical spiking in Escherichia coli probed with a fluorescent voltage-indicating protein". Science 2011, 333.
[3] Yang, H. H. et al. "Genetically encoded voltage indicators: Opportunities and challenges". Journal of Neuroscience 2016, 36.
[4] Hochbaum, D. R. et al. "All-optical electrophysiology in mammalian neurons using engineered microbial rhodopsins". Nature Methods 2014, 11.
[5] Kühn, S. et al. "Enhancement of single-molecule fluorescence using a gold nanoparticle as an optical nanoantenna". Physical Review Letters 2006, 97.
[6] FDTD simulations confirm that colloidal gold nanostars are resonant with the emission of Arch(D95N). Nanospheres, on the contrary, could enhance the absorption of Arch(D95N), but the nanoscopic localization due to the tips of the nanostar would be lost.
[7] A series of FDTD simulations highlighted how the average field enhancement at the resonance wavelength (680nm) does not change drastically when some tips are missing, or when the tips have different lengths from the ideal case. This result motivates our approach based on colloidal synthesis of nanostars, which generates a population of different shapes and sizes.
[8] Barbosa, S. et al. "Tuning size and sensing properties in colloidal gold nanostars". Langmuir 2010, 26.
[9] SEM Micrograph of colloidal gold nanostars deposited on silicon substrate, coated with MPTMS.
[10] The automated screening approach shows a clear 31% enhancement of QuasAr6a fluorescence. The null hypothesis of the one-sided Mann-Whitney test is that the median absolute brightness of the control is greater or equal to the median of the nanostars sample. At the 0.0001 level, the median of the nanostars is significantly higher than the control. Patch clamp analysis (not depicted) shows that the voltage sensitivity is unaffected by the plasmonic effect.