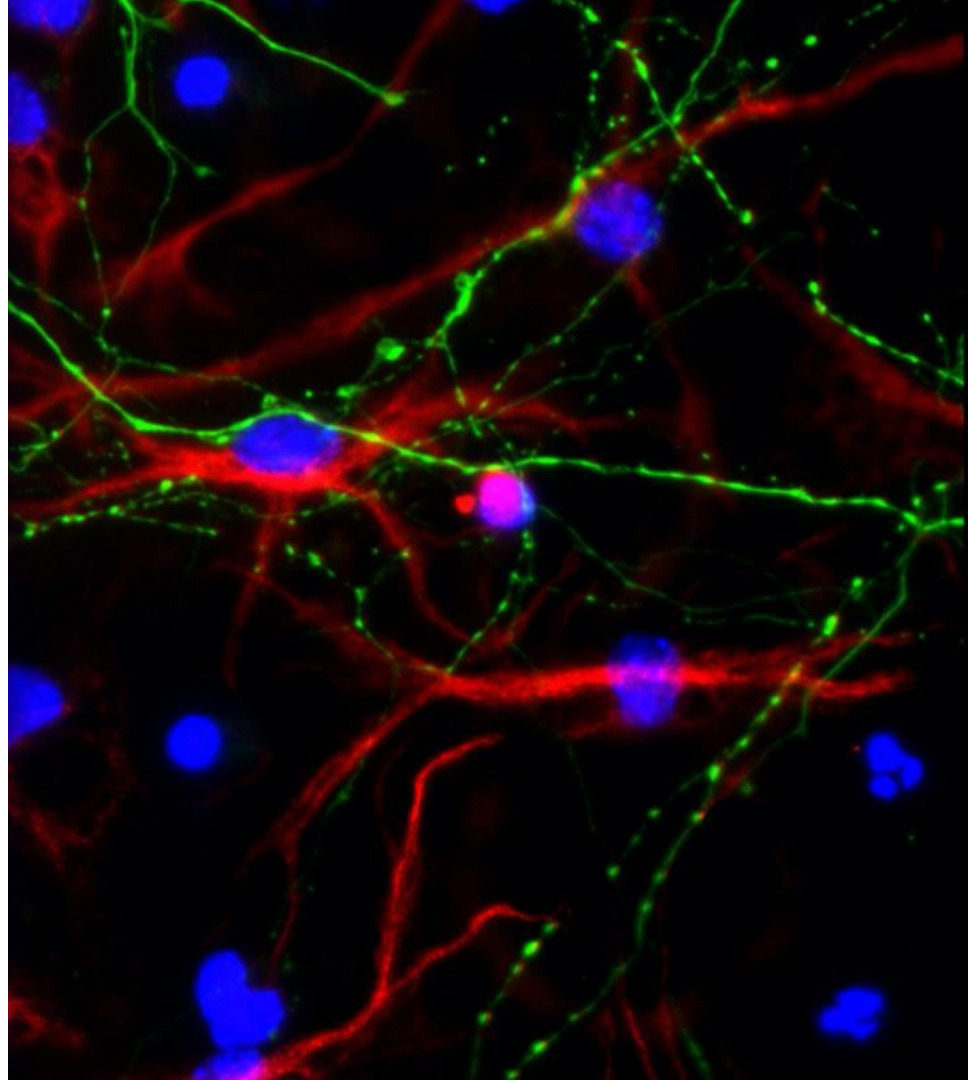


Quantum Dots

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CHEM 3320
April 8, 2022

Outline

- Quantum Dot
 - What they are
 - Fluorescent properties
- Medicinal Applications
 - Fluorescent Imaging





A.

Artificial Atoms

Synthetic nanoscale crystals
that glow when stimulated
by an excitation light
source^{1,2}

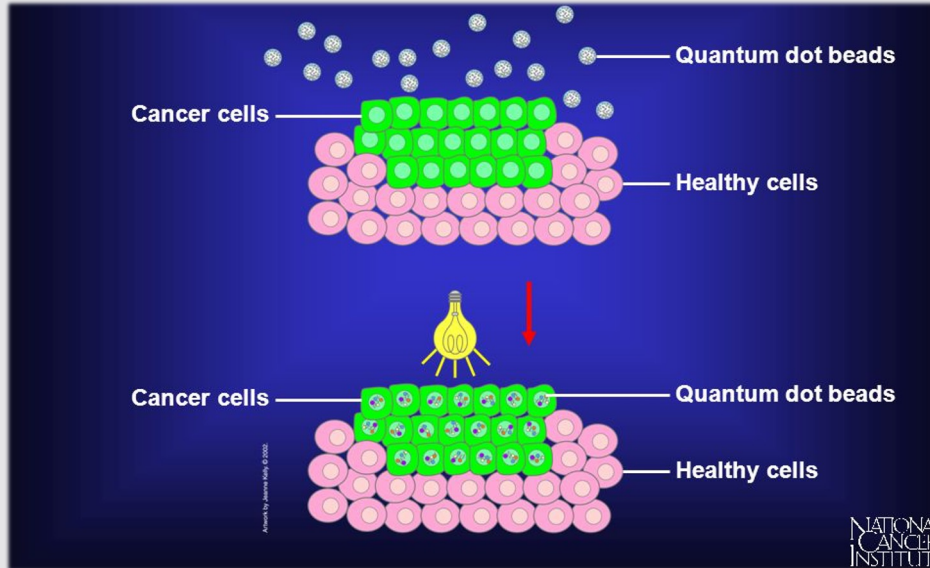
Quantum dots are fluorescent when excited due to:¹

- High Quantum Yield
- High Molar Extinction Coefficient Values



D.

Fluorescence Imaging

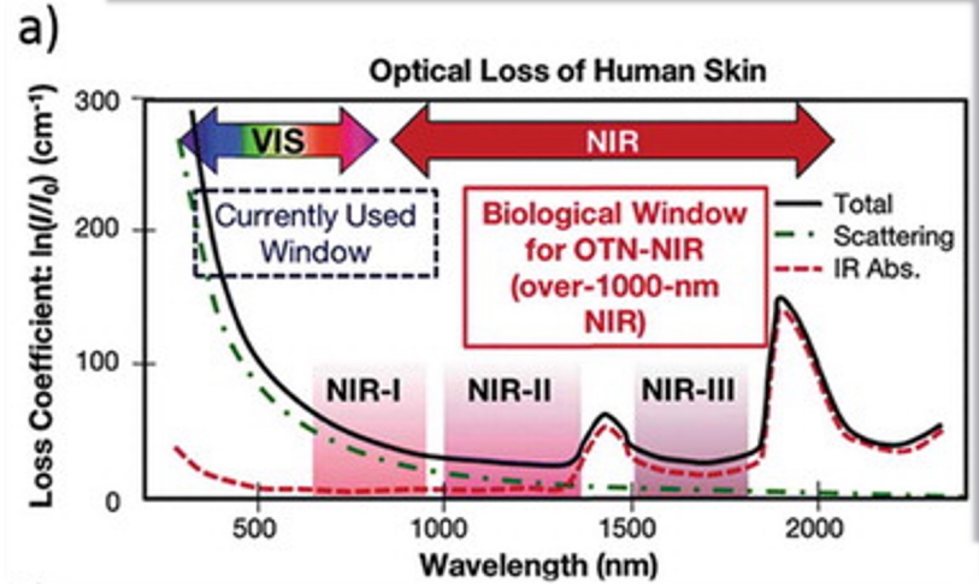


E.

- Use of **fluorescent** dyes or proteins as **labels** to **illuminate** biological processes³
- Non-invasive tumor detection method
 - Provides surgery guidance

Recent Advances on fluorescent biomarkers of near-infrared quantum dots for in vitro and in vivo imaging⁴

Chinnathambi, S. & Shirahata, N.



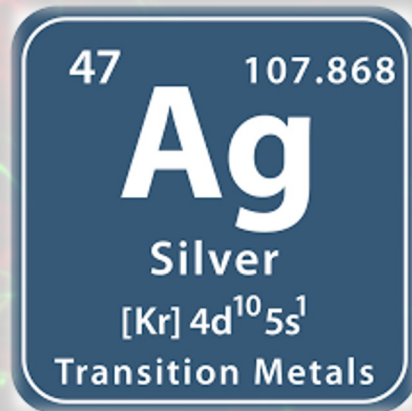
- NIR region is between UV-vis and IR regions
 - Minimizes scattering and absorption of light by tissues

Ag₂Te Quantum Dots

- Bright NIR II emission
- High chemical stability
- Low toxicity

In Vivo Study Difficulties

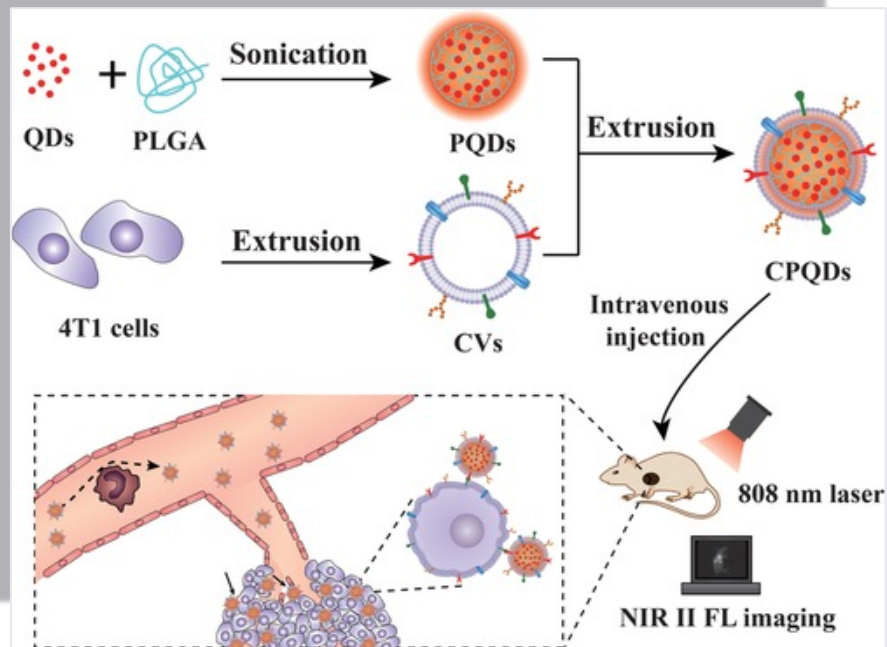
- Low fluorescence efficiency
- Inefficient enrichment at tumor sites



F.

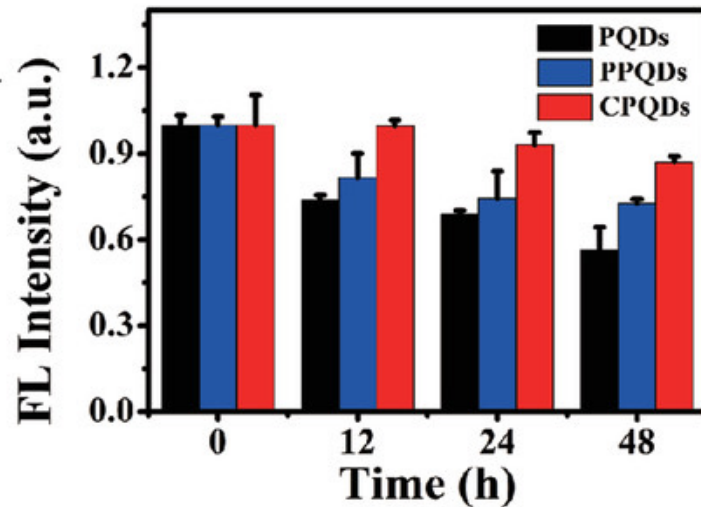
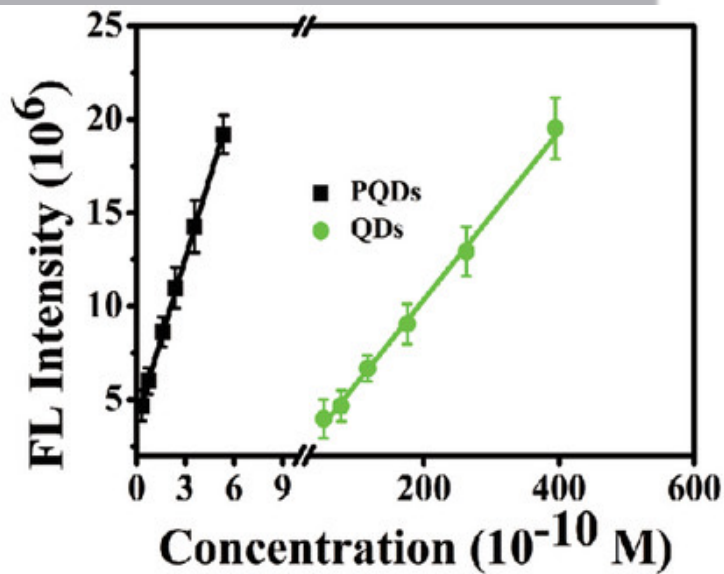


G.



Cell Membrane-Camouflaged NIR II
Fluorescent Ag_2Te Quantum Dots-
Based Nanobioprobes for Enhanced
In Vivo Homotypic Tumor Imaging⁵

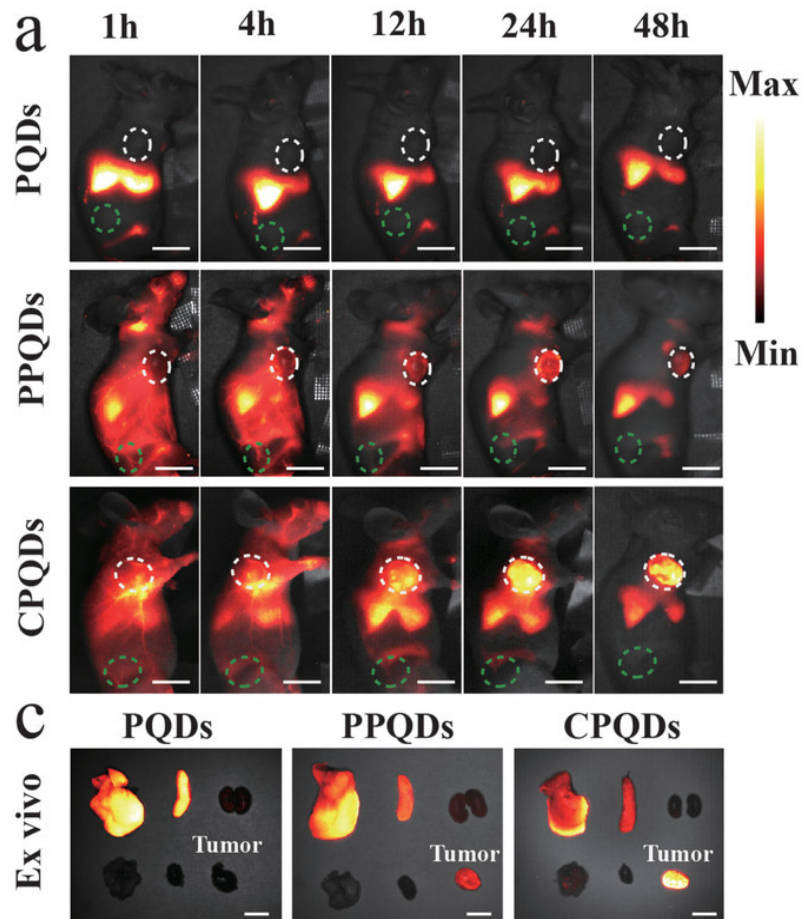
Zhang, J et al.



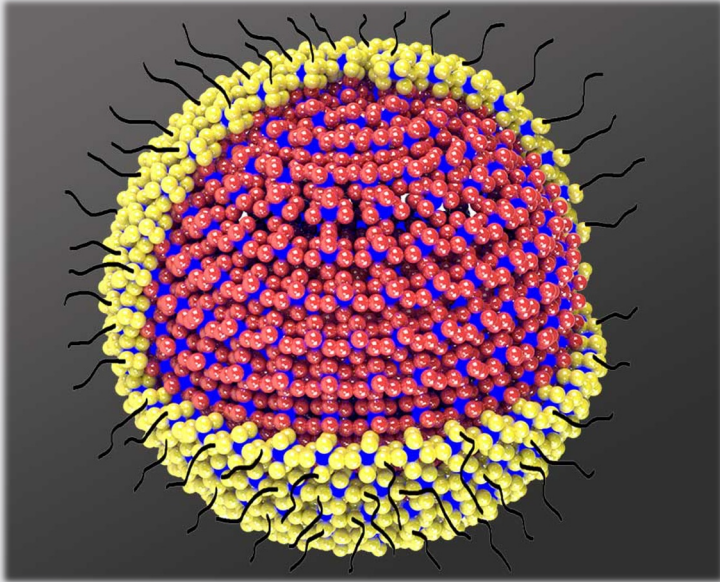
PQD's were **60** times brighter
PQD's were highly stable – **97% conserved** after 1 hour

Improved accumulation at tumor sites

Fluorescence intensities
reached a maximum at 24 h



Overview

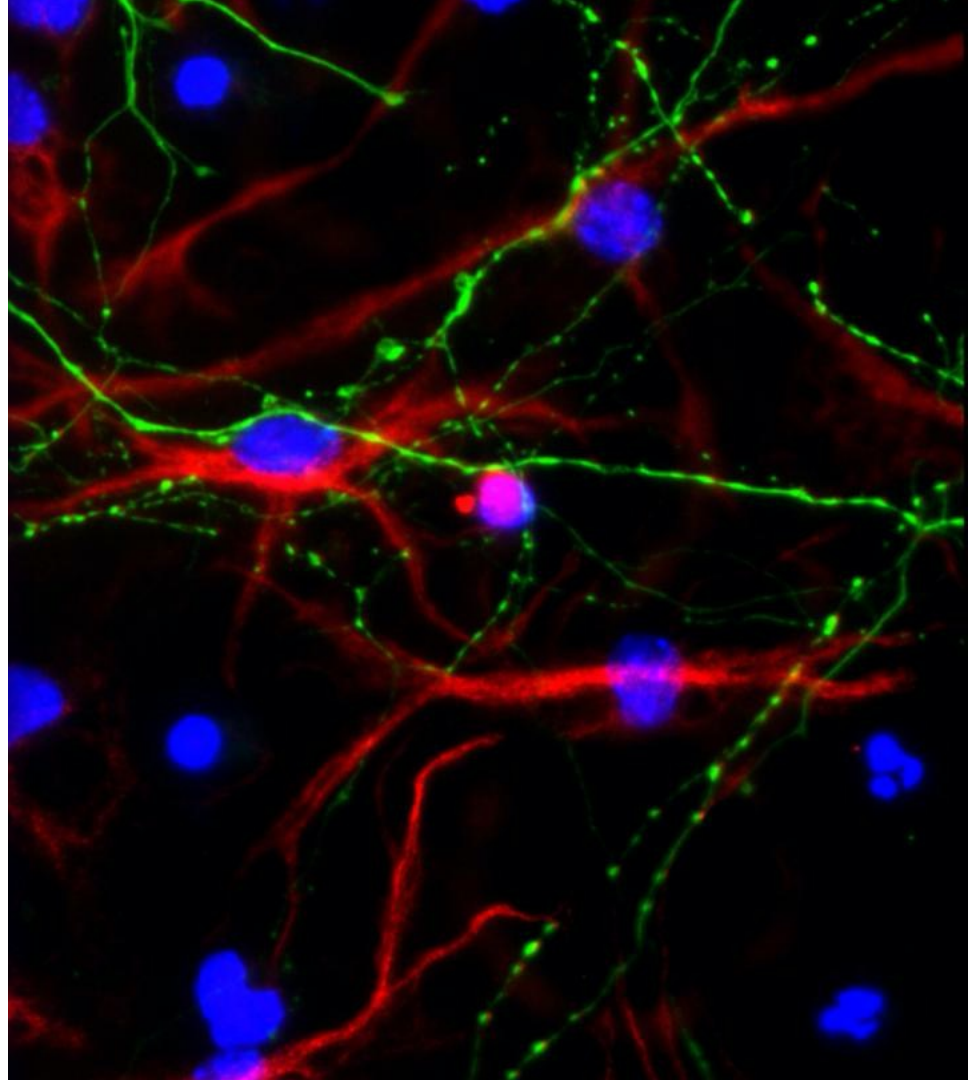


H.

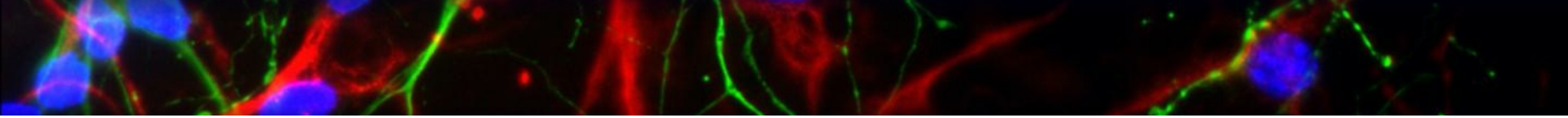
- Quantum dots are synthetic nanoscale crystals
 - Electronic states
- Fluorescent Imaging
 - Camouflaged Ag_2Te quantum dots with cancer cell membranes

Thank you for listening!

Questions?

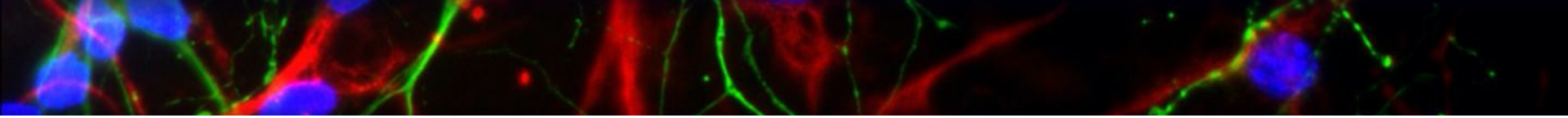


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5. Zhang, J., Lin, Y., Zhou, H., He, H., Ma, J., Luo, M., Zhang, Z., Pang, D. *Adv. Healthcare Mater.* **2019**, *8*, 1.

Image References



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