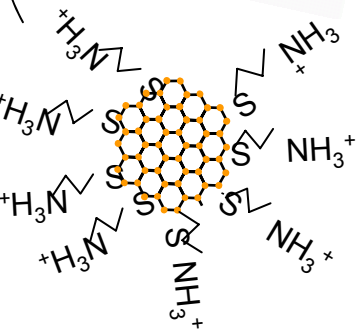


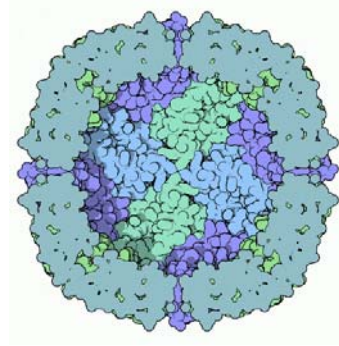
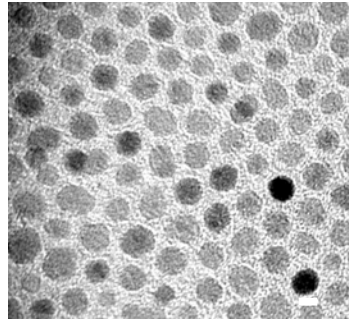
Kimberly Hamad-Schifferli

Biological and Mechanical Engineering, MIT

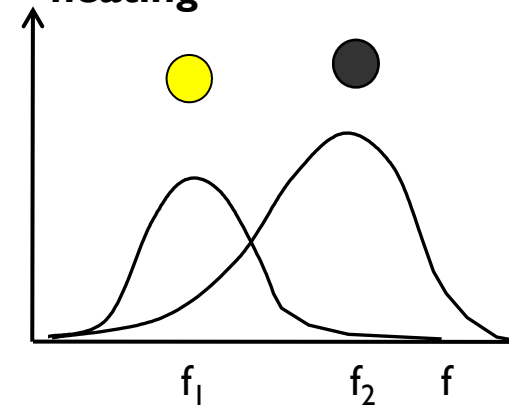
**Nanoscale interfaces
with proteins and
DNA**



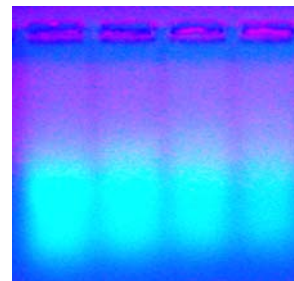
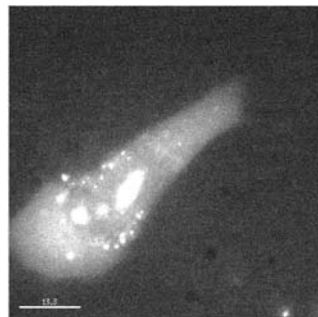
**Synthesis of nanoparticles with
unique properties**



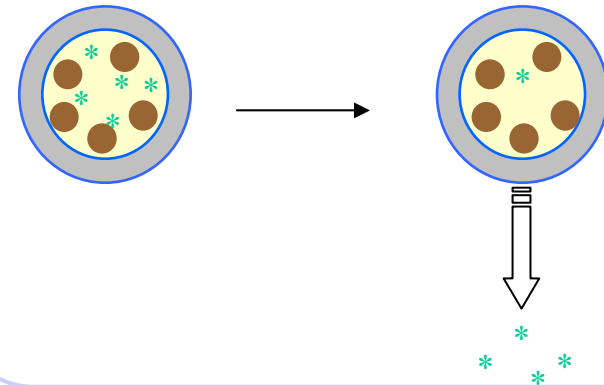
**Understanding and
manipulation of particle
heating**

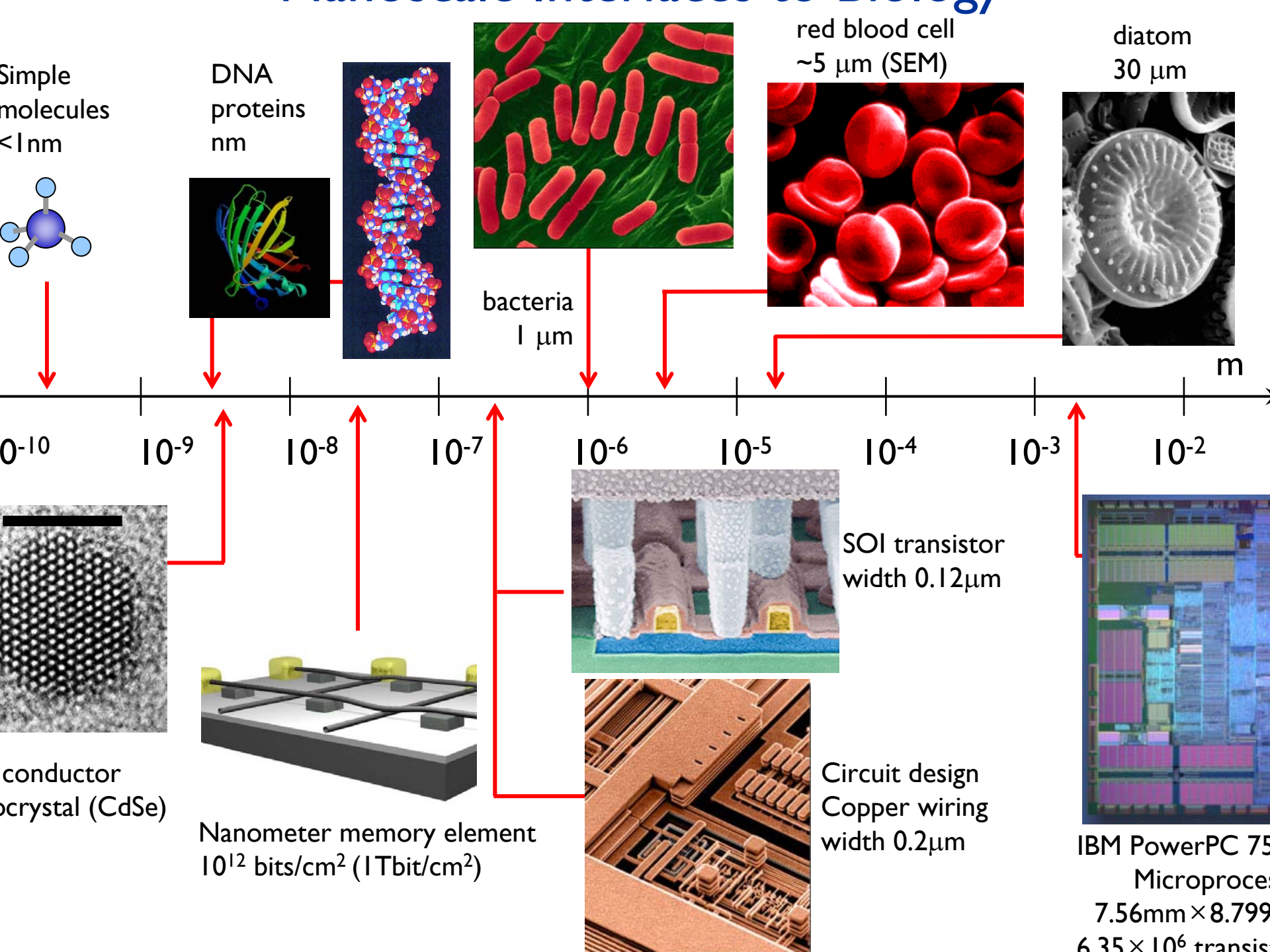


Multifunctional particles



Triggering drug release



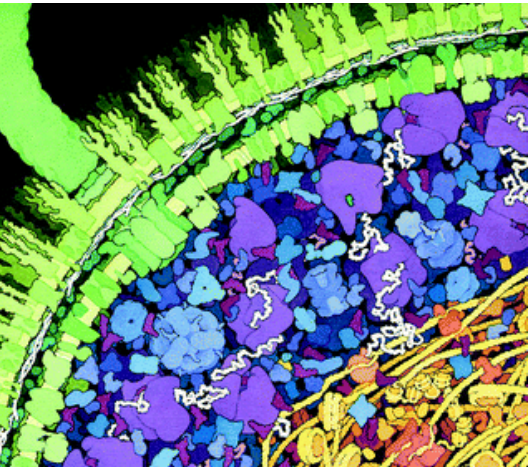


Controlling Biology with Nanoparticles

Making an interface that preserves biological function (quantify)

Exploit physical properties of inorganic nanoparticles

- Heating by fields
- Fluorescence + Magnetic

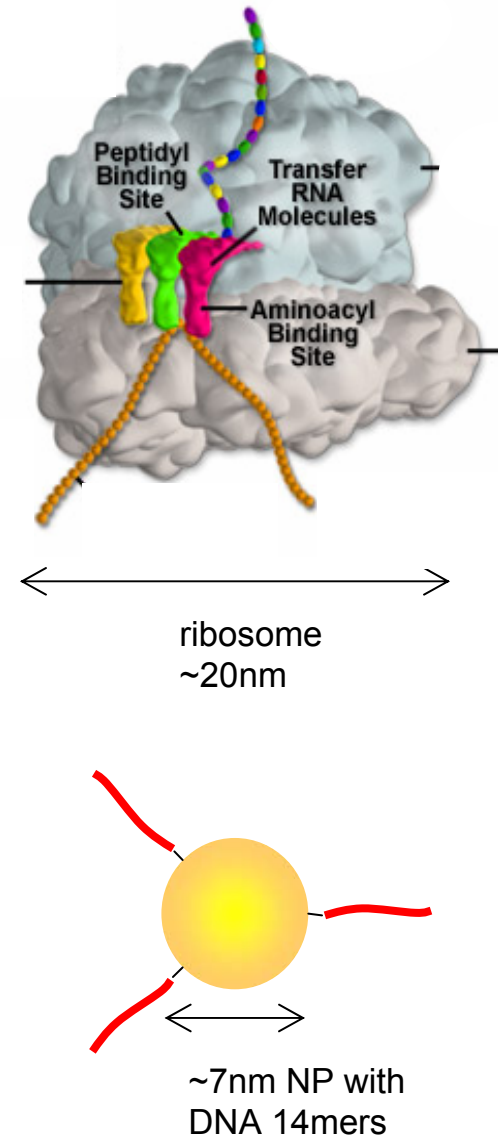
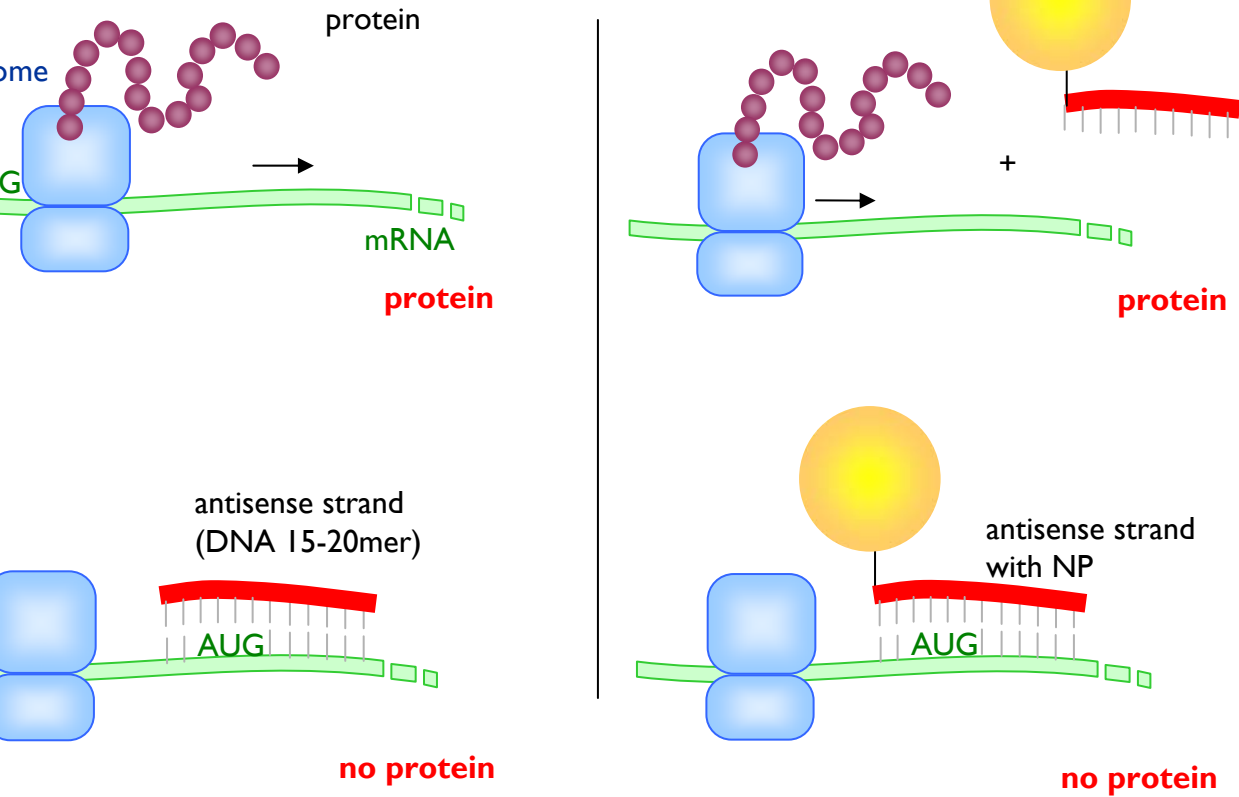


Target function of biological molecules and processes

- Multifunctional particles
- Drug Delivery
- Imaging
- Gene expression

Enhancing Antisense Gene Regulation with NPs

- Use NPs to enhance antisense by steric blockage
- Study conformation of DNA on NP



Characterizing NP-protein Interfaces

NP ligand

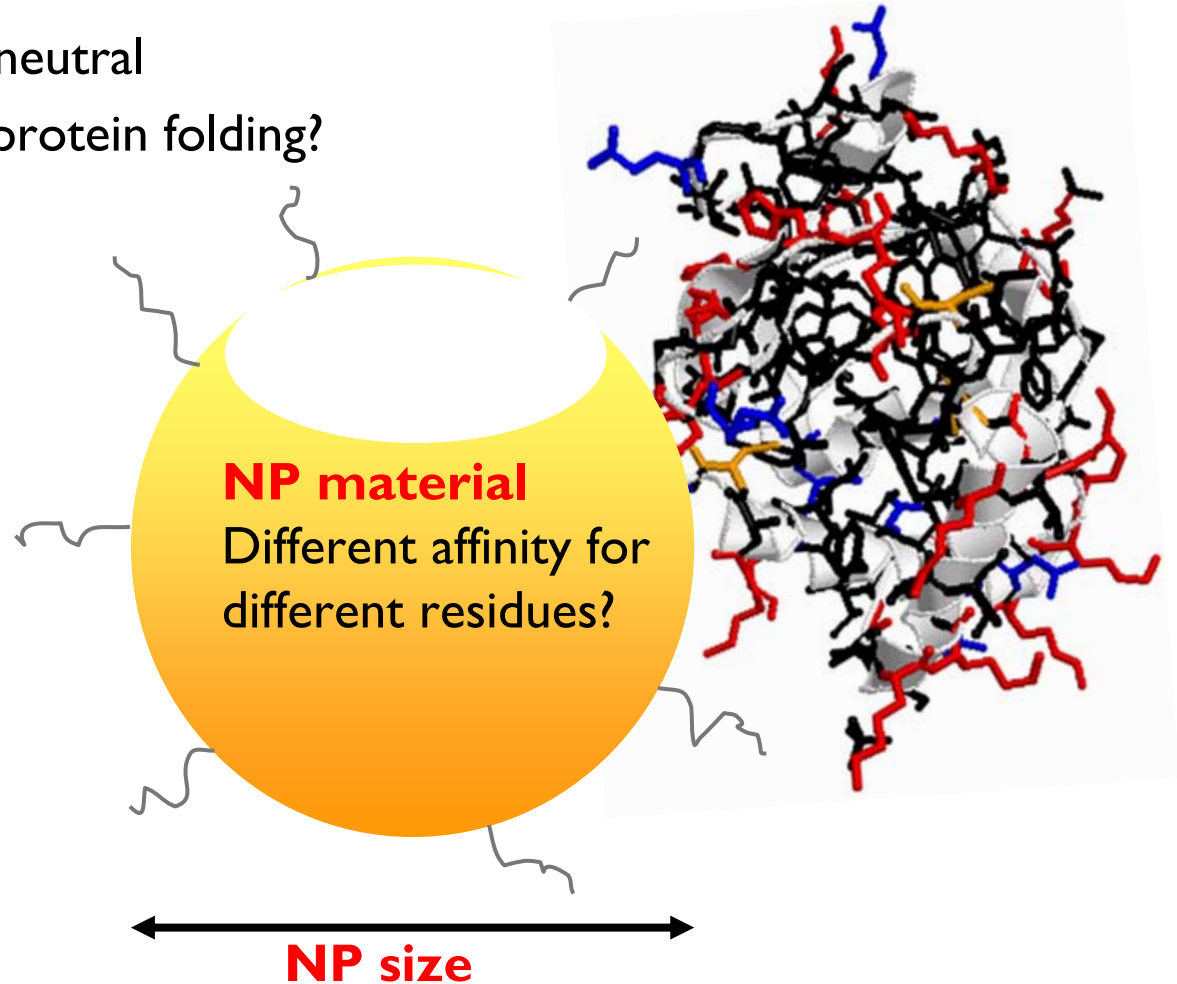
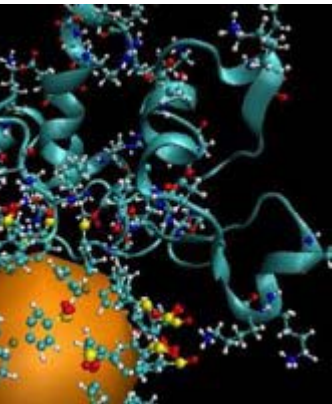
positive/negative/neutral
improve/worsen protein folding?

Labeling site

Sites sensitive to protein stability

simulations

onmuk Hwang, TAMU)
molecular interactions



effect of curvature on protein folding?

E. Aubin, D. G. Morales, K. Hamad-Schifferli., *Nano Lett.*, 2005

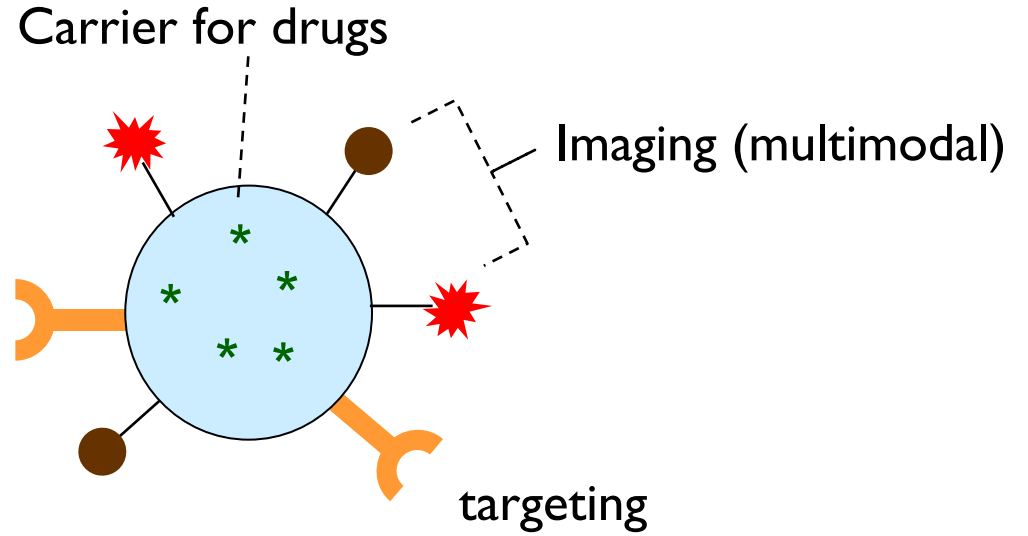
E. Aubin-Tam and K. Hamad-Schifferli., *Langmuir*, 2005

E. Aubin-Tam, H. Zhou, K. Hamad-Schifferli., *Soft Matter*, 2008

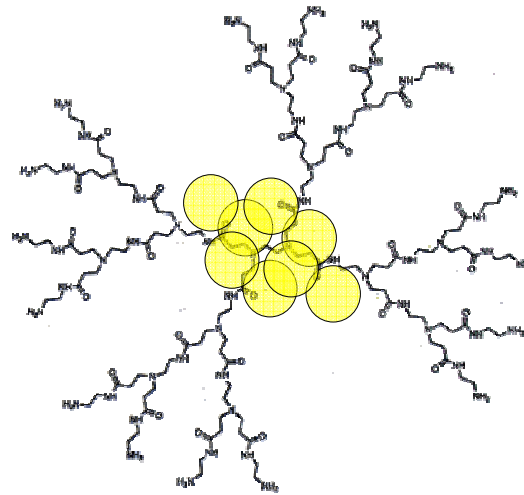
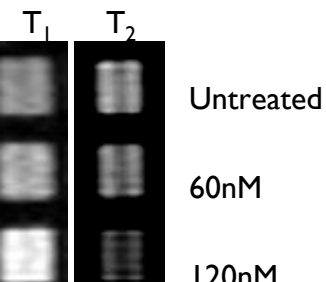
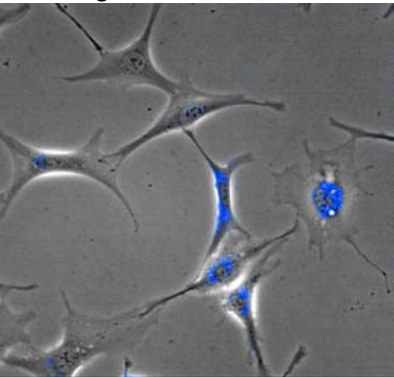
E. Aubin-Tam and K. Hamad-Schifferli. *Biomad Mater*, 2008

Nanoparticles as multifunctional therapeutic agents

- Inefficient conjugation
- Large
- Stability and biocompatibility



Au₈-PAMAM particles:



Polyamidoamine dendrimer

- Delivery
- Functionalizable

Au₈:

- Fluorescence
- MRI

~3nm