- Announcements
- Pre-lab Lecture
  - Mod3 Concepts
  - Intro to M13 Virus
  - Intro to Solar Cells Materials
  - Today in Lab (M3D1)

Announcements

- Introducing… Tim, TA for Module 3
- Module 3 assessment: team oral presentation
  - novel research proposal
  - define a specific question and an approach to address it
  - downtime in lab during M3 to work on it
- FNT: summarize 5 recent research findings
  - give full citation
  - no need to define *new* Q yet, just field of interest

Module 3 Foundations

- Biology can interface with nano- and microscale materials

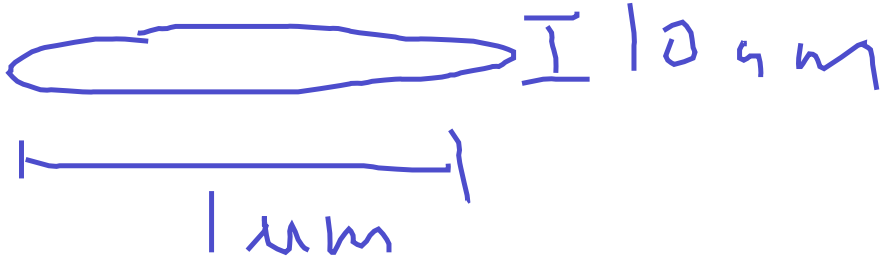
cells 1-10 μm
*viruses 0.01-1 μm
protein 1-100 nm

- Nanoscale materials may have improved or even emergent properties

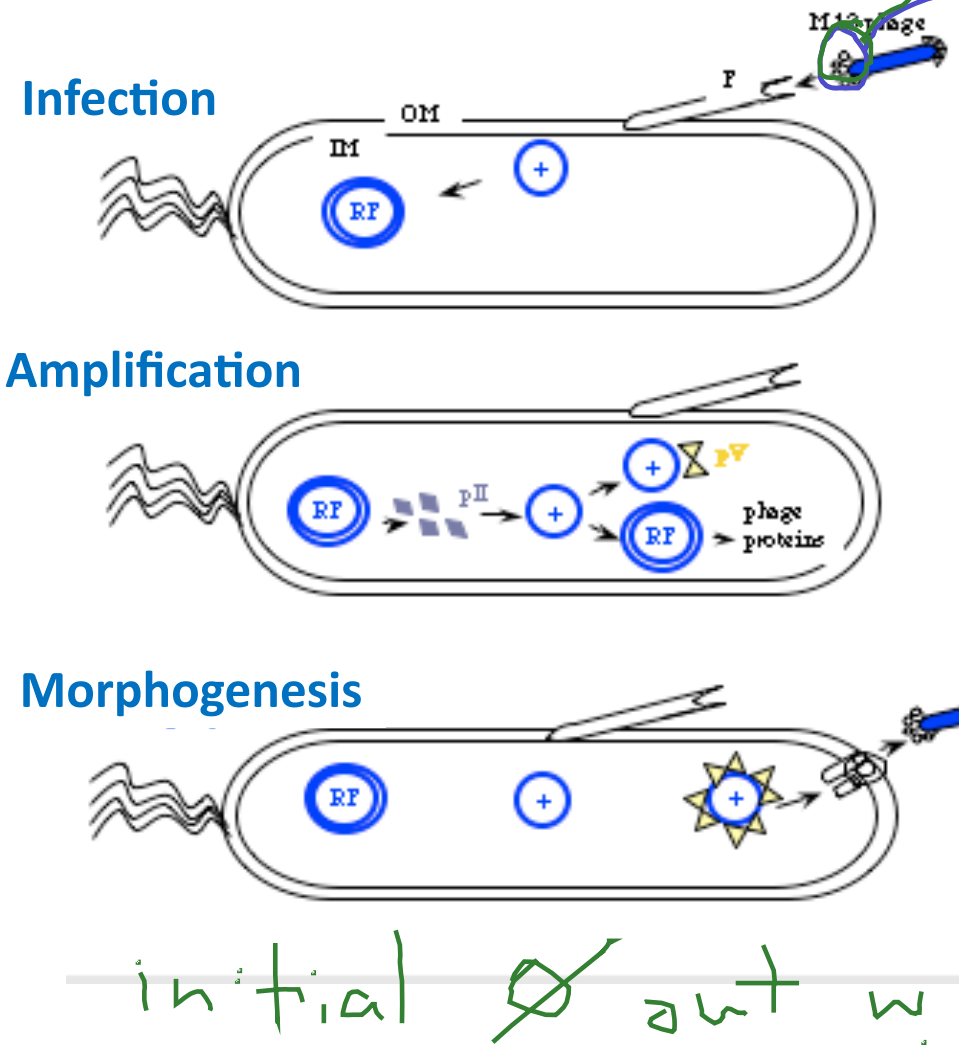
high surface area : volume

- elec, magnetic, optical, catalytic
benefits
+ risks

- Our nanomaterial is a phage!



M13 phage life cycle



p3/p6 entry at TolA@F pilus of E coli

p2, 5, 10 – replicates in ds. form, packaged s.s. form – coated w/ p8

p7/p9 exit

p4, 11, 1 make pore

initial ∅ out w/ in 10^1

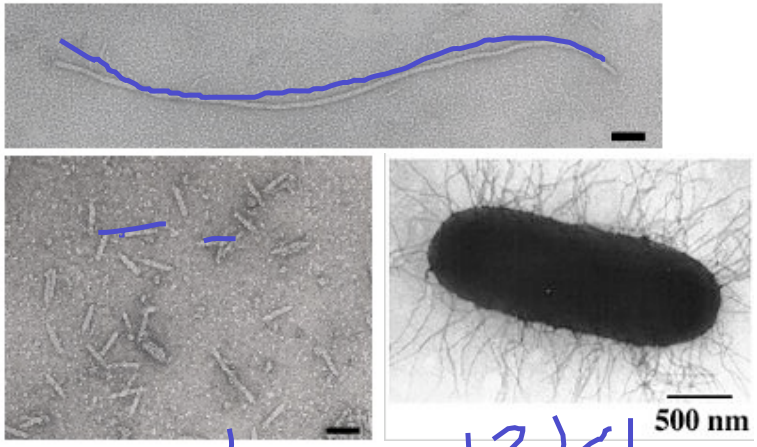
Image from Fall 2007 wiki. RF = replicating form

M13 as engineering substrate

Length of DNA (to be packaged) dictates size of phage… w/in limits

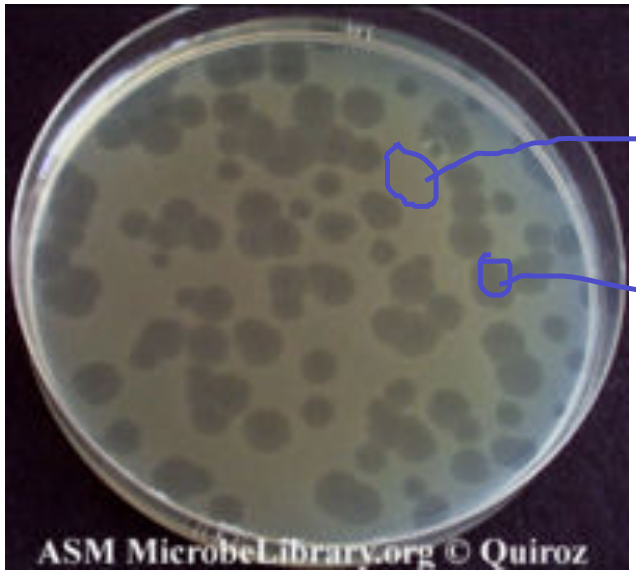
Surface proteins can be used for peptide display

Library design and screen via binding assay



Images from 20.109 wiki

Phage titer: plaque assay or spec.



By plating:

Phage slow *E. coli* growth upon infection

"lawn" - opaque = bacteria

"plaque" clear = less dense

infected by ∅

PFU (cf. CFU)

By spectroscopy:

- Nucleic acids (peak 260) and proteins (peak 280) can be ~quantified at 269 nm absorbance
- Subtract background at A320

SWNT/TiO2 nanocrystal approach

- Begin today: react phage w/SWNTs

	SWNTs (ug)	phage (# of particles)*
1:1	40	4x10^13
2.5:1	100	4x10^13
5:1	200	4x10^13

Red + Yellow
Orange + Blue
Green + Pinkle

- Next time react w/Ti(OCH(CH3)2)4
- Why bother?
  - isolated SWNT paths
  - proximity to TiO_2
- Eventually…
  - TEM observation
  - Solar cell assembly

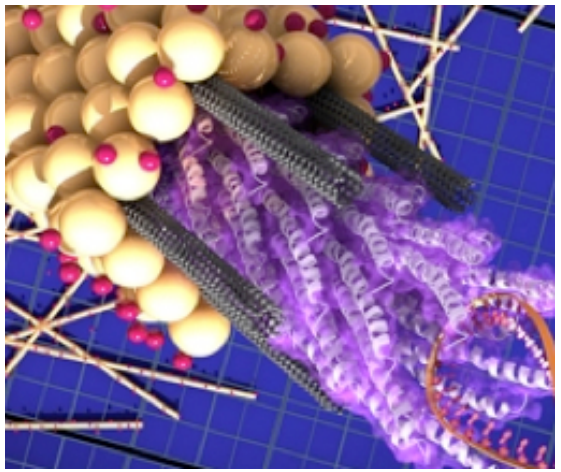
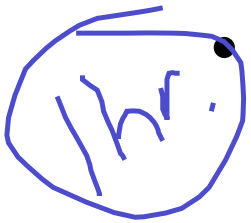


Image: Matt Klug

Today in Lab (M3D1)



- Prepare phage by precipitation with PEG/NaCl
  - Phage are in the supernatant!!
  - Pellet is bacteria
- Obtain viral titer
  - take care with quartz cuvettes!
- React phage w/SWNTs
  - in TBS pH 7.6
- Dialyze phage in prep for next step
  - in NaCl pH 5.3, then 10

centrifuge @ 11k's lab

★ Know where your pellet is ★

may need to scale to 10^{12}

↑ T: 0z nucleation,

low e-static repulsion

stabilize complex