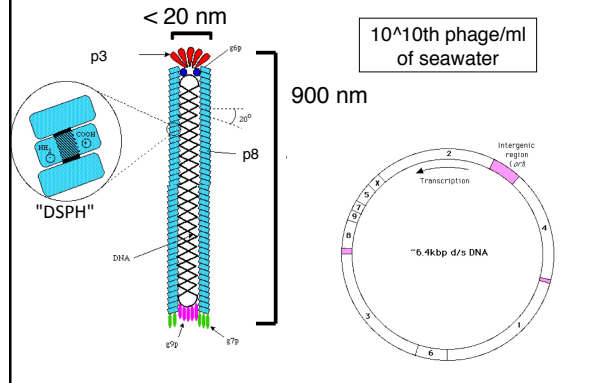


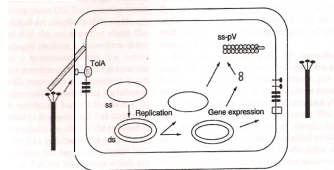
# Biomaterials Engineering

M3D1  
11.15.11

## BioMaterials: Starting with "Bio"

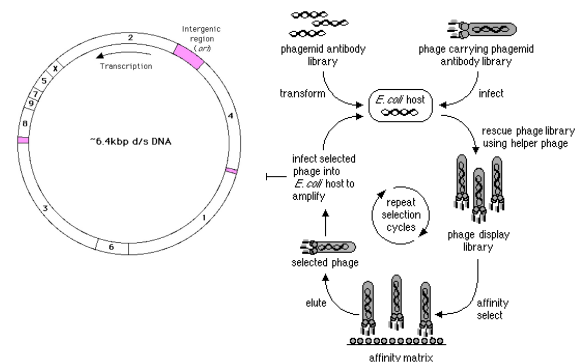


## Phage life cycle



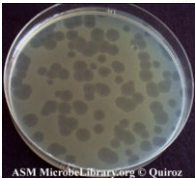
1. Infection
2. Amplification
3. Morphogenesis + release of progeny phage
  - new M13 phage particles within 10' post-infection
  - 1000 phage/cell within the first hour

## Phage don't normally bind carbon nanotubes. How did Angie's lab find these specialized phage?

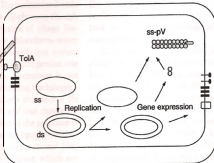


### Counting Phage Particles

PFU =



ASM MicroLibrary.org © Quiroz



Phage/ml =

$$(6 \times 10^{16}) (\text{Abs}_{269} * \text{Abs}_{320}) \div \text{\#bases in phage}$$

Abs<sub>269</sub> = abs from protein +DNA  
 Abs<sub>320</sub> = baseline  
 Phage is 6400 bases

### Parts 1 + 2 of your experiment today

Phage purification

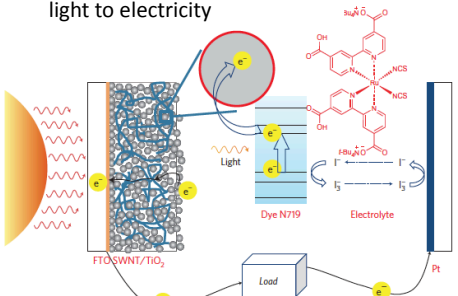
- Harvest phage infected cells. Phage in SUPERNATANT!
- Concentrate by precipitation (+PEG/salt)
- Pellet may not be visible...have faith.
- Pool phage with "super-group"

Measurement of phage concentration

- Use quartz cuvettes
- Dilute 1:10 in TBS and measure Absorbance
- Calculate volume needed for  $4 \times 10^{13}$  phage  
(want this volume btw 0.5 ml and 5 ml)

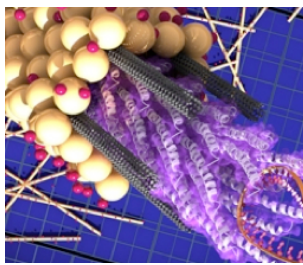
### BioMaterials: now for "materials"

Photovoltaic device: converts light to electricity



From Nature Nanotech 24 APRIL 2011

### Phage provide architecture for SWNTs



SWNTs have different amounts of metallic and semiconducting materials on them which can short circuit electron paths

To optimize electron collection: vary ratio of SWNTs:phage

- Solvent exposed surface for TiO<sub>2</sub>
- Unbundle SWNTs

Image from MIT news

## Part 3: reacting phage with SWNTs

Ratio SWNTs:phage	Super-Team
1:1 (40 ug: $4 \times 10^{13}$ )	Red, Green, Purple
2.5:1 (100 ug: $4 \times 10^{13}$ )	Orange, Blue
5:1 (200 ug: $4 \times 10^{13}$ )	Yellow, Pink

1. Calculate volume of SWNTs needed (stock=20 ug/ml)
2. Mix in dialysis tubes (label clips of your tubes)
3. Dialyze against NaCl pH 5.3 then 10

Low pH = minimize electrostatic repulsion (phage/SWNT)

High pH = stabilize complex, ready for TiO<sub>2</sub>

## Guidelines for your 20.109 research proposal

Writing a research proposal requires that you identify an interesting topic, spend lots of time learning about it, and then design some clever experiments to advance the field. It also requires that you articulate your ideas so any reader is convinced of your expertise, your creativity and the significance of your findings, should you have the opportunity to carry out the experiments you've proposed.

## FNT:

- 5 recent findings
- 3-5 sentence description of each
- reference