Mod 3 Day 2: Phage Nanowires

11/14/2013

- **Phage Display/Panning**
- **TEM!**
- **Today: Nanocomposite Synthesis and TEM prep**

Announcement:

- ONE day extension if you visit any writing lab!
  - Also applies if the visit was for your draft
  - For non-BE writing labs: document visit

Mod 3 Assignments

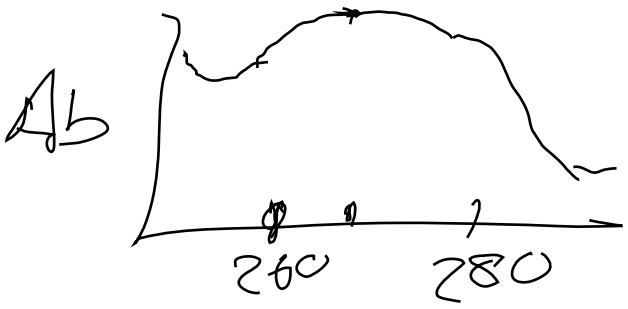
- Research Proposal – **Dec 10th**
  - Identify a topic of interest, gather relevant background information, understand what you read
  - NEW research question! [not your UROP work]
  - 12 minute talk describing background, research problem and goals, proposed methods, expected results, resources needed, and societal impact.
- Mini-Report – **Due Dec 5th (5pm)**
  - Not as bad as Mod 2!
  - Background & Specific Approach, Results/Data Interpretation, Future Work
    - Schematic, appropriate data figures from each step

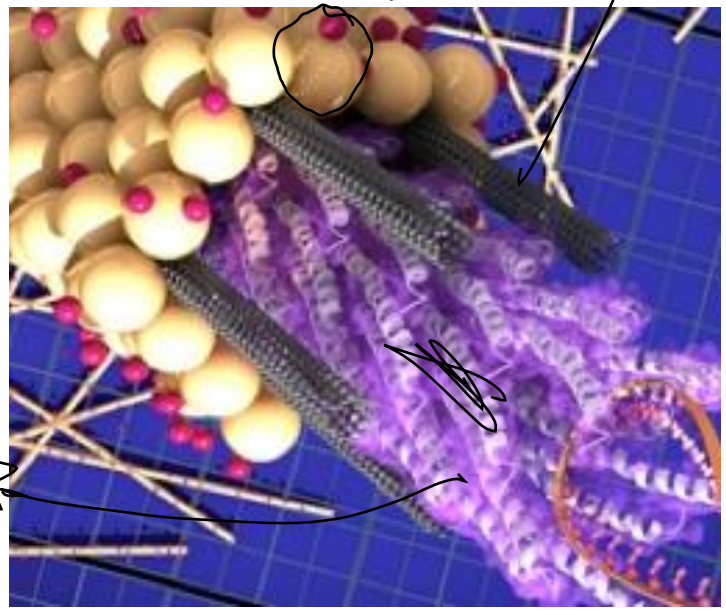
Additions and Clarifications

- Spectroscopic quantification:

$$\#\ \text{phage particles per mL} = \frac{(6\text{x}10^{16})(\text{A269} - \text{A320})}{\#\ \text{DNA Bases in the phage genome}}$$

- Broad plateau (260-280)
  - Very high phage protein content





Engineering Design – Phage Display

- Fuse gene fragments encoding specific polypeptides to M13 coat genes – p8 or p3

Phage will display protein add

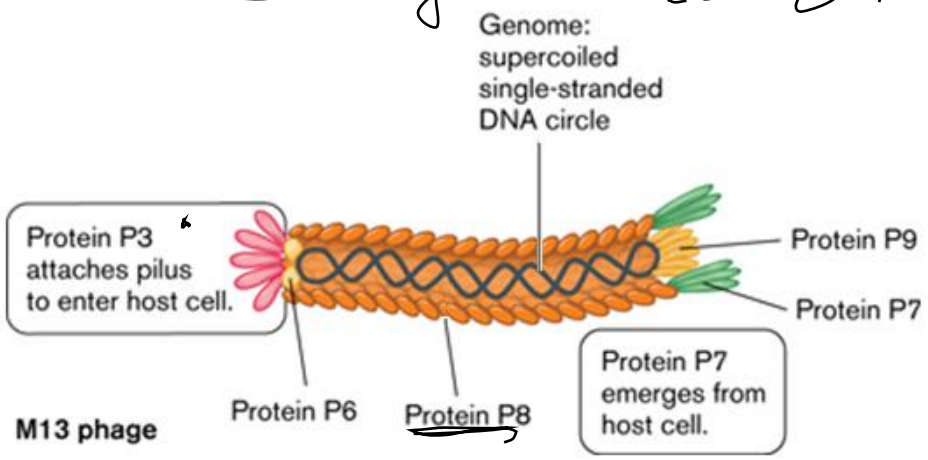
"Rational" design → have specified end goal in mind

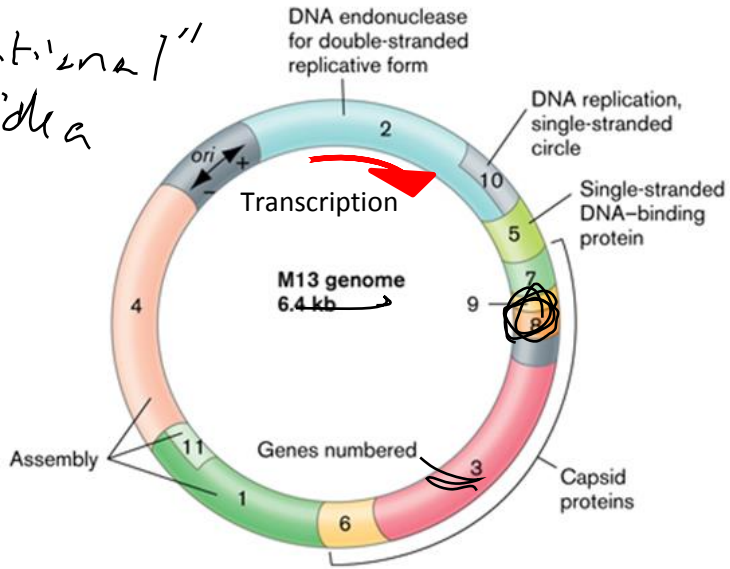
Reminder:

SWNT → e^- path

Au → light collection

"Semi-Rational" has gen. idea

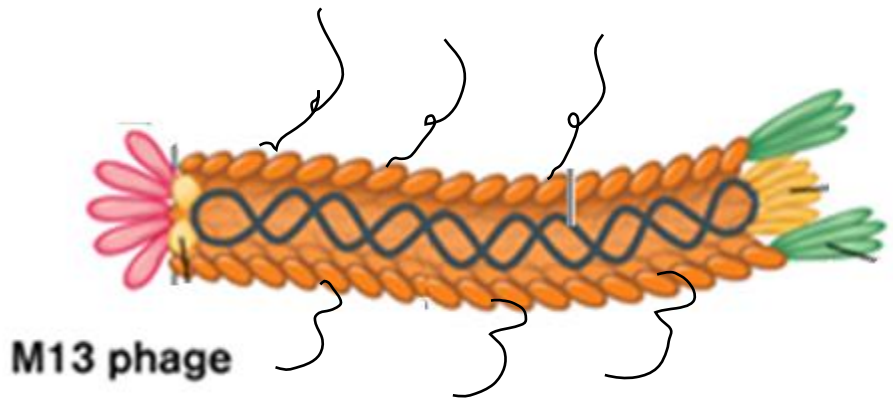




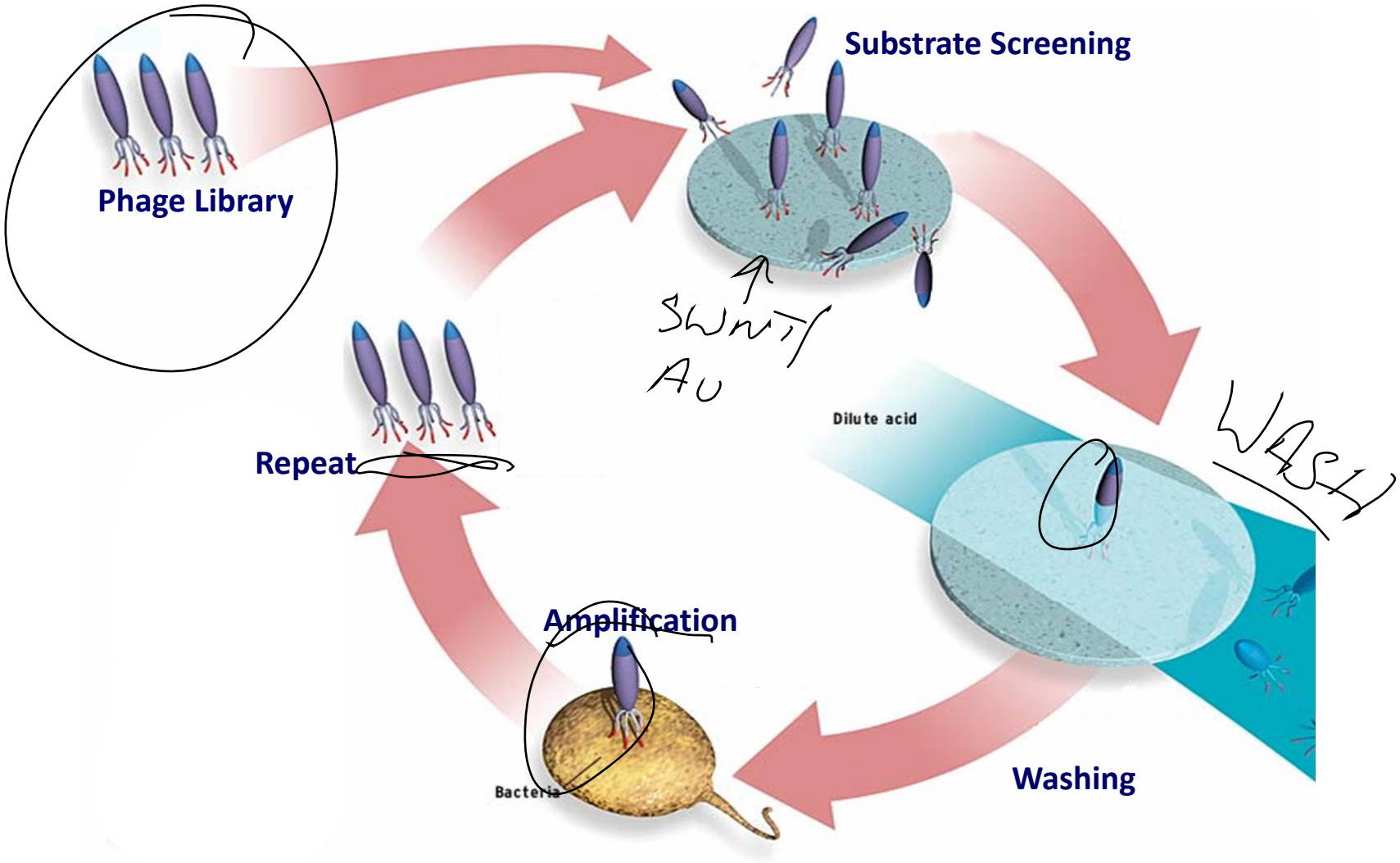
Source: Slonczewski J, Foster JW. Microbiology: an evolving science. New York: W.W. Norton, 2011. Web.

Phage display

- Identify functional peptide sequences fused to phage coat
- Library of peptides can be cloned, creating a phage pool
- Panning



Phage Display



Engineering Design: p3 vs p8

Our modif.

p3 → Initial contact

Pros → long! More freedom to add longer AA ~20-30

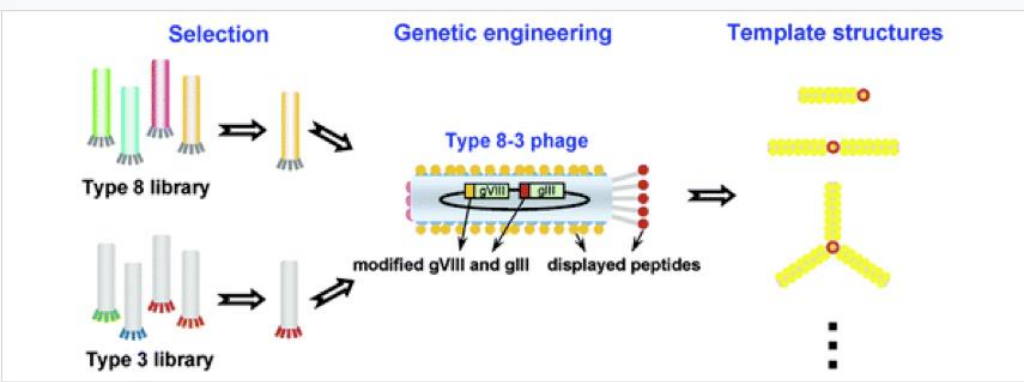
Cons → 5. Copy# is low.

p8 →

Pros → Copy# 2700

Cons → Short b-Sac

C



TEM Fundamentals

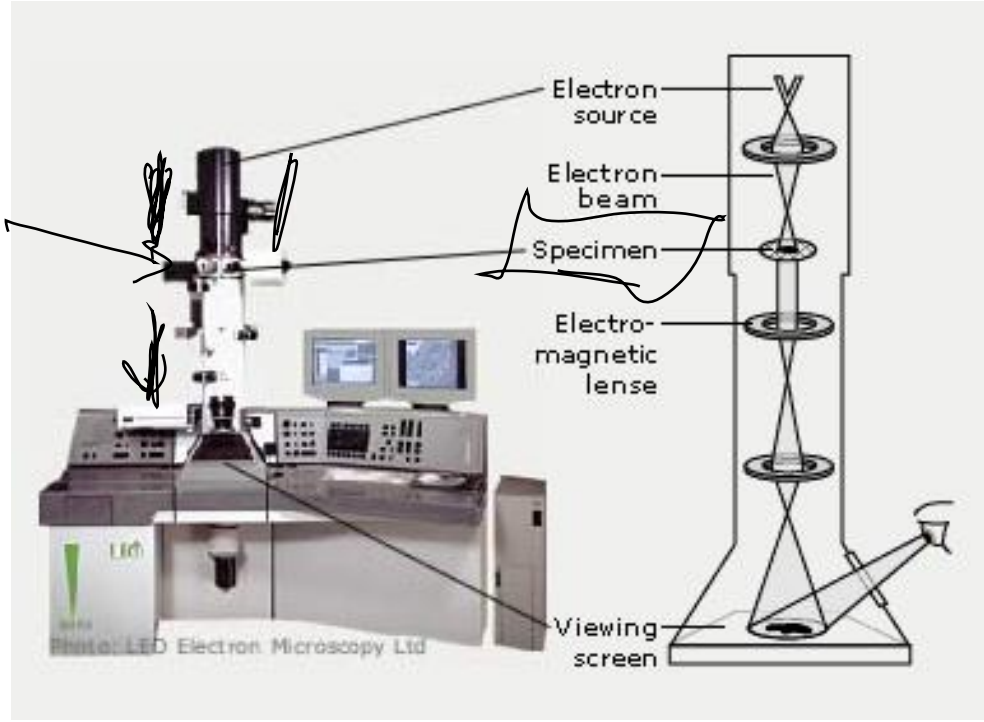
1932

- Transmission Electron Microscopy
- High resolution!

Shorter λ

Scattered or more SP through

Very thin



Source: Nobelprize.org

Today: Nanocomposite Synthesis

- SWNT groups: transfer to 15mL falcon tube
- ALL: React with Titanium Isopropoxide Ti(i-PrO)4
- Chill complexes, calculate for TiO_2 complexes:
  - Vol 100%EtOH to make 95% w/phage
  - Goal – 15:1 TiO_2:phage ***by mass***
  - Erlenmyer flask – ONLY EtOH volume
- Supercooled Bath
  - 100 mL Ethelene Glycol:EtOH (1:1)
  - Dry ice (-40C)
- Add Ti(i-PrO)4, then phage
- Allow to reach RT

Today: TEM prep

- Goal: determine morphology & density with possible elemental analysis
- Vortex samples to disperse wires
- Grids prepared individually, use tweezers!
- 5uL nanocomposite
- Wash 100% EtOH
- Wash H_20
- Store