

# WOGAN LECTURE

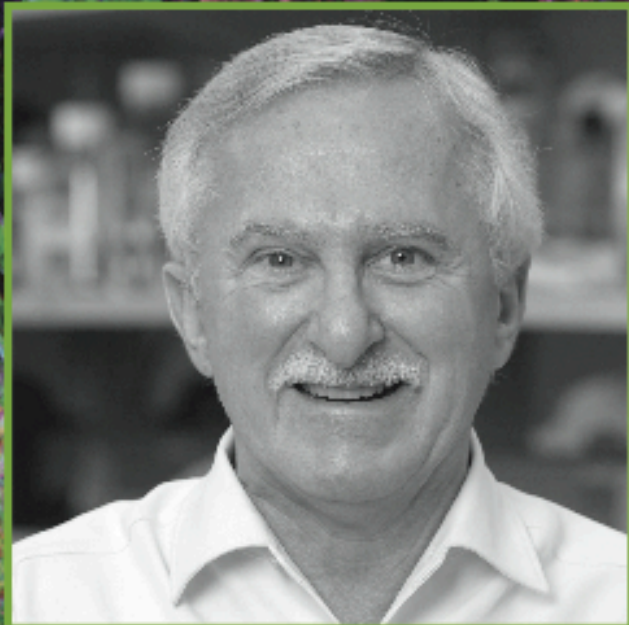
Thursday, November 17, 2016

Schwartz Auditorium Ragon Institute NE46 at 4pm

2015 Nobel Laureate in Chemistry

# Paul Modrich

Duke University



Mechanisms in  
Human DNA  
Mismatch Repair



# BE CAREER EXPO

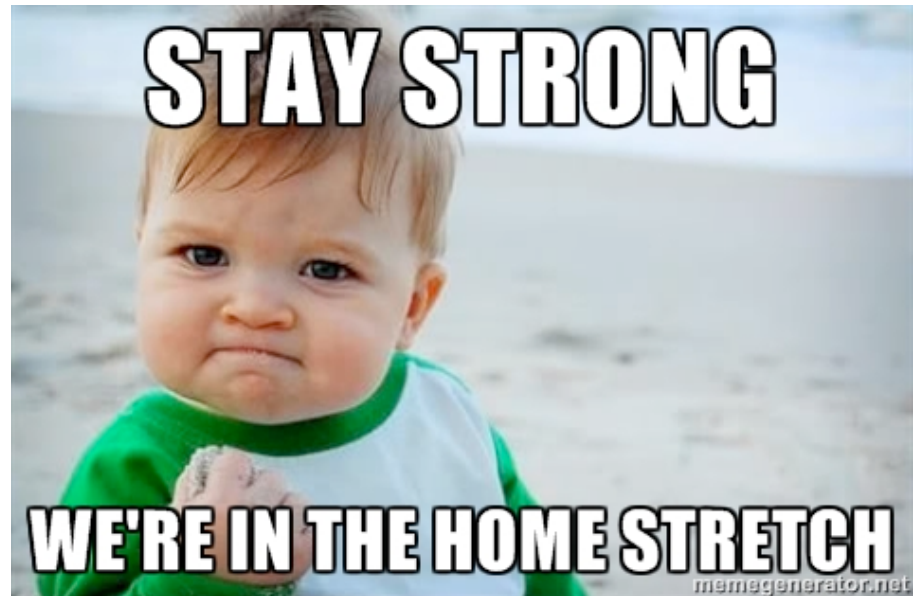
November 18, 2016, 3-5pm  
20 Chimneys (W20-306)



# M3D1: Growth of phage materials

11/15/16

1. Purify M13 phage
2. Add gold nanoparticles (AuNP)
3. Begin Fe(III)-phage-AuNP biomineralization



Thank you, Jifa Qi (Belcher Laboratory) !

# Things to remember...

## Mod 2 nearly complete

- Office hours on Sat, 10 am – 5 pm in 56-302
- Research article due Sun at 5 pm
- Blog post due Mon at 5 pm

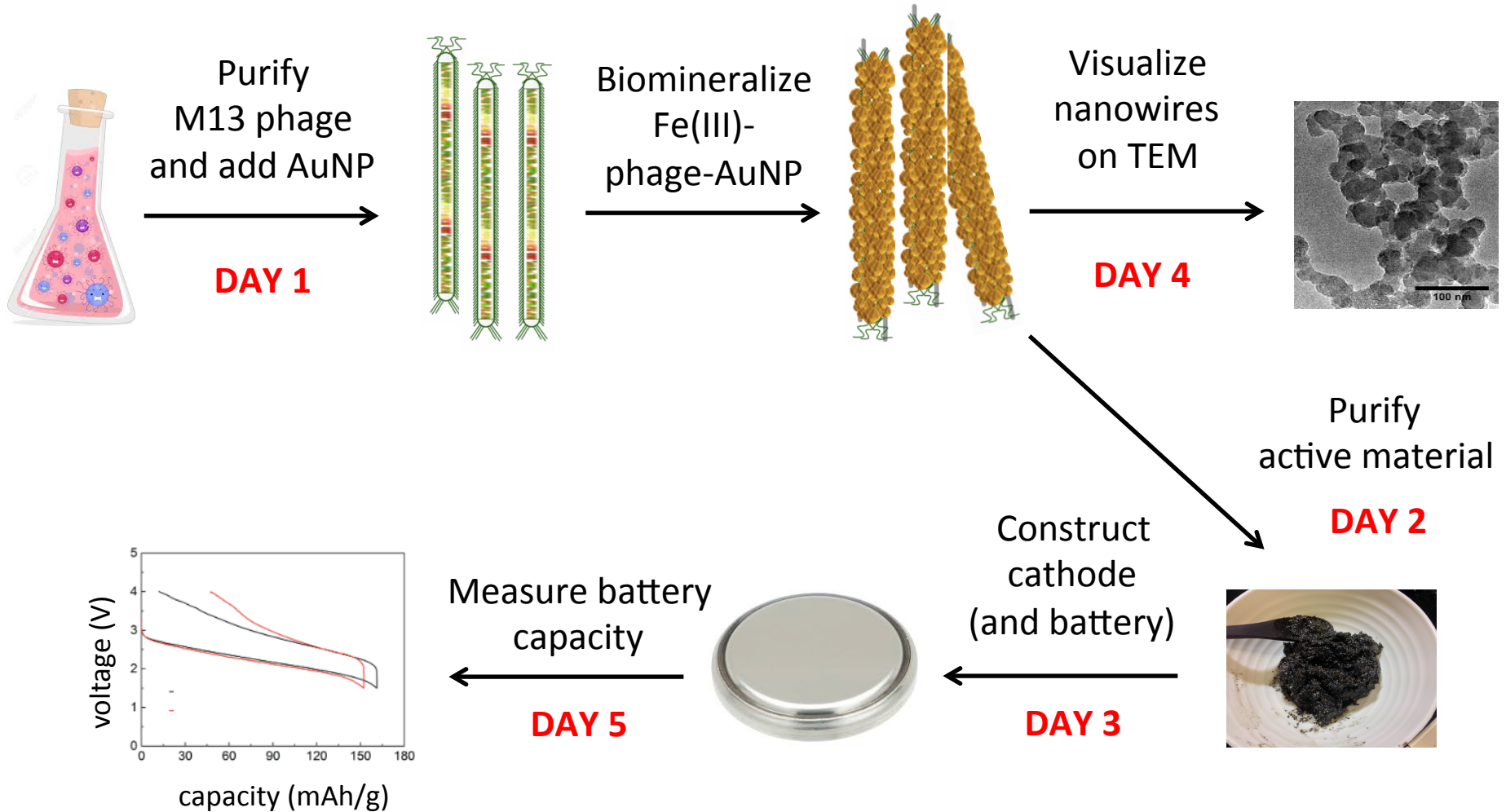
## Mod 3 starts now

- Research proposal presentation
- Mini-report
- Blog posts
  - One required and one for extra credit

# We are in the homestretch!

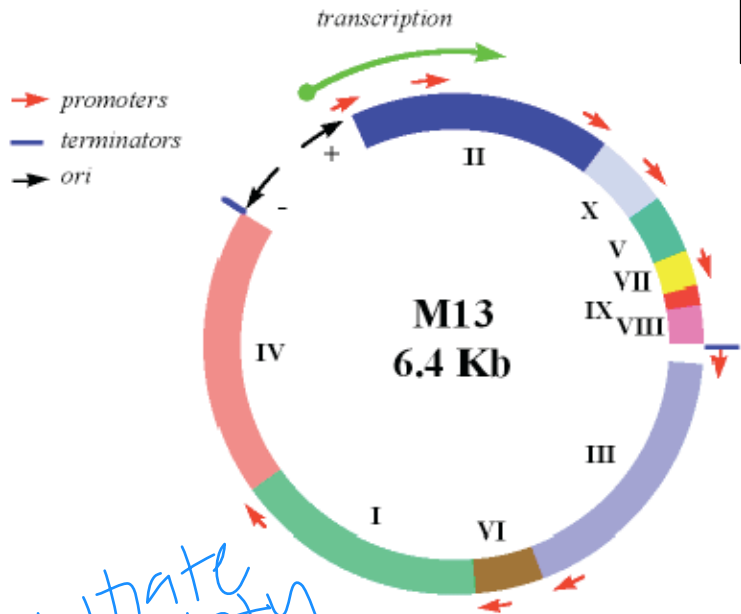
3	1	T/W Nov 15/16	AB	Growth of phage materials	Homework due
3	2	R/F Nov 17/18	AB	Purify active materials	Homework due Research article due Sun, Nov 20 at 5 pm Blog post due  Mon, Nov 21 at 5pm
		T/W Nov 22/23	AB	Lecture, but no laboratory	prep 3 min pitch!
		R/F Nov 24/25		Thanksgiving holiday	
3	3	T/W Nov 29/30	AB	Cathode construction	Lab quiz Homework due
3	4	R/F Dec 1/2	AB	TEM	Homework due
3	5	T/W Dec 6/7	AB	Battery assembly and testing	Lab quiz Homework due Blog post due  Wed, Dec 7 at 10pm
3	6	R/F Dec 8/9		Research proposal presentations	Research proposal presentation slides due Thu/Fri, Dec 8/9 at 1 pm
		T Dec 13		Feedback and celebratory lunch	Biomaterials engineering mini-report due Mon, Dec 12 at 10 pm Blog post due  Wed, Dec 14 at 10pm

# Your research question: How does AuNP size effect battery capacity?



SSDNA phage

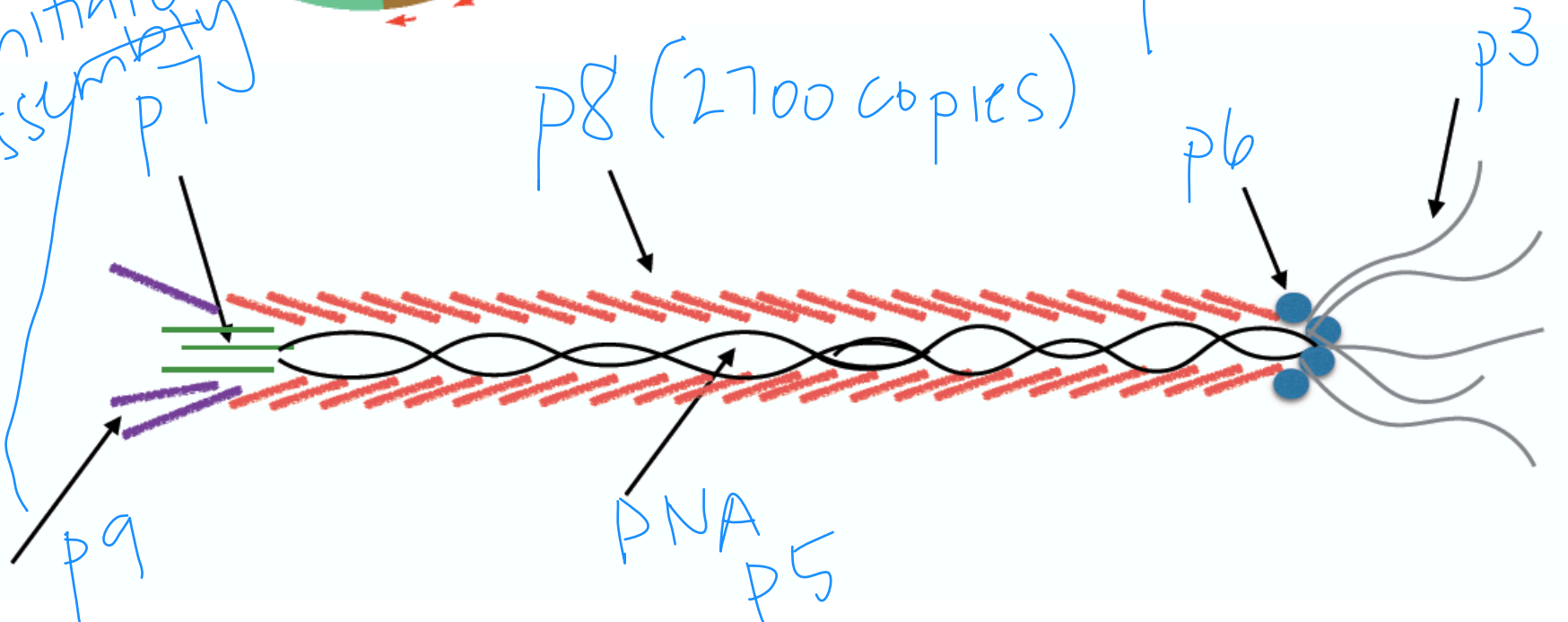
# M13 phage genetics and structure



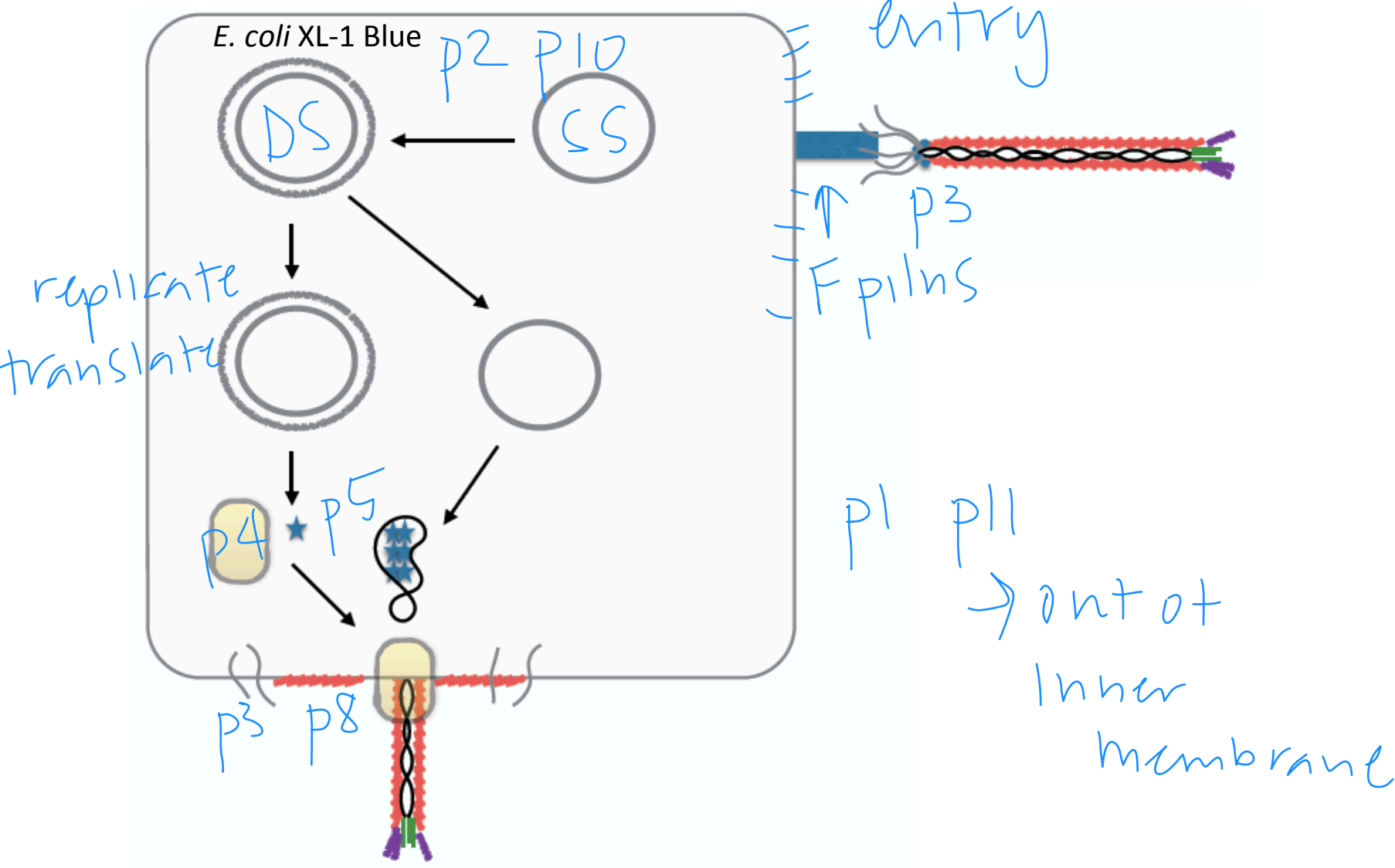
Initiate assembly  
p7  
p9

p8 (2700 copies)

terminate assembly

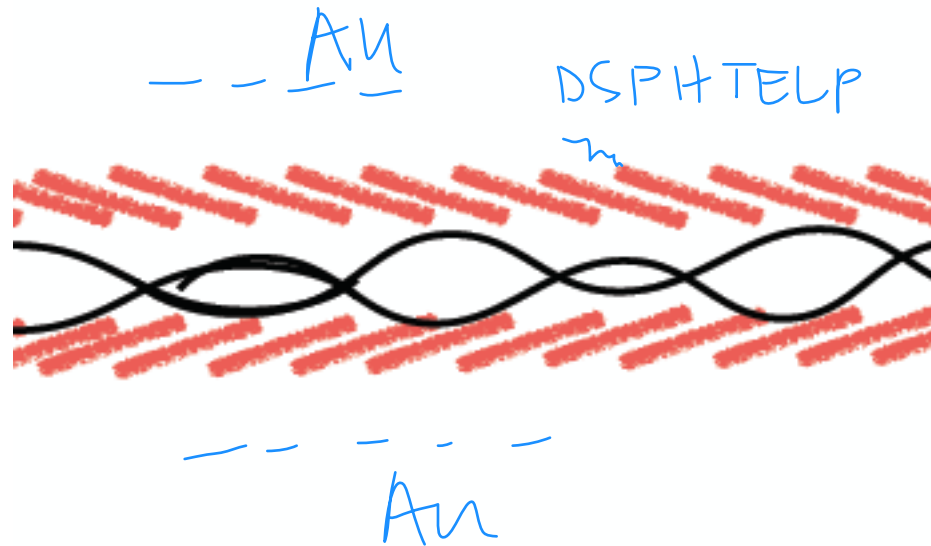


# M13 phage biology



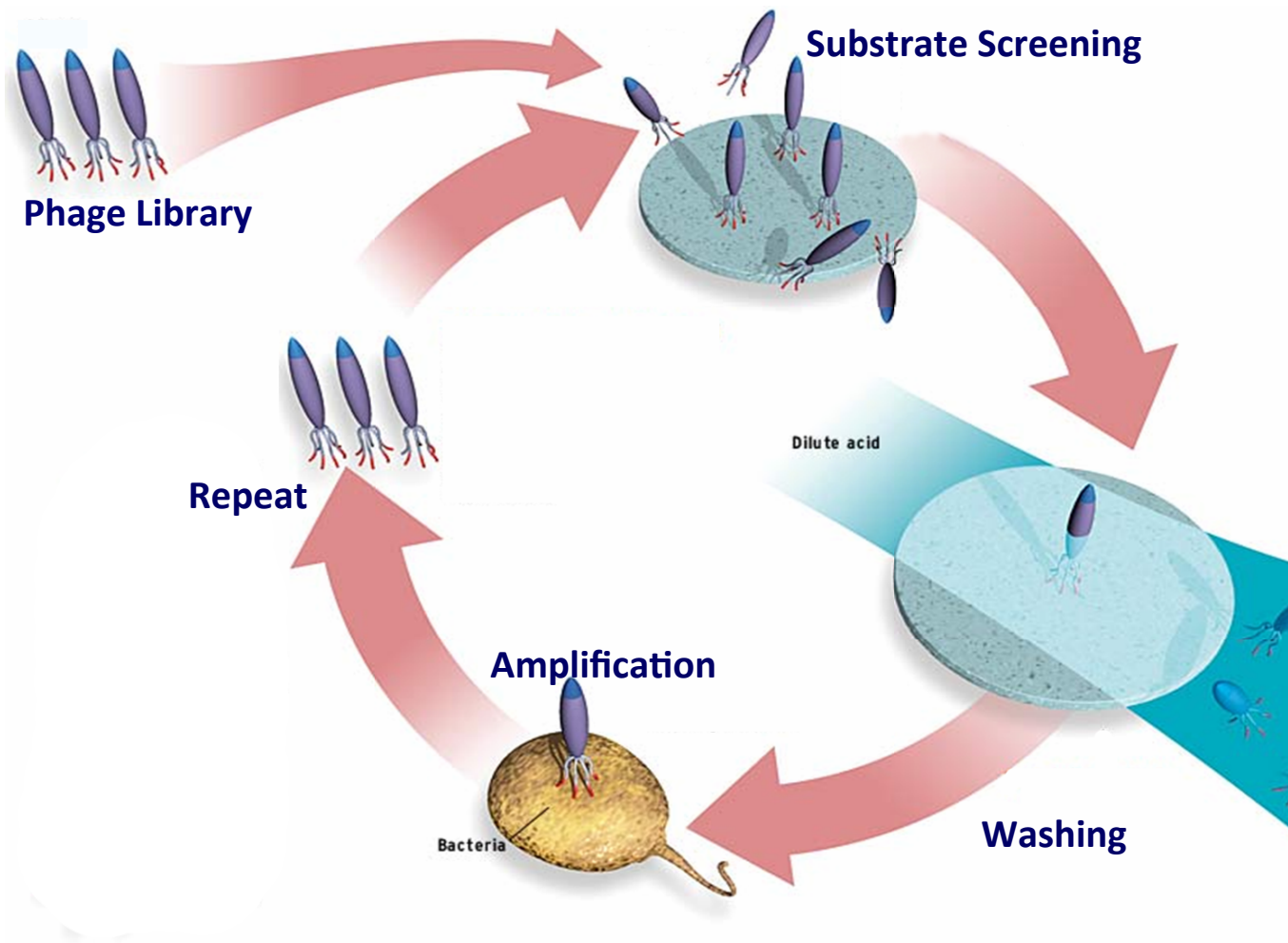


# M13 is a biological nanomaterial

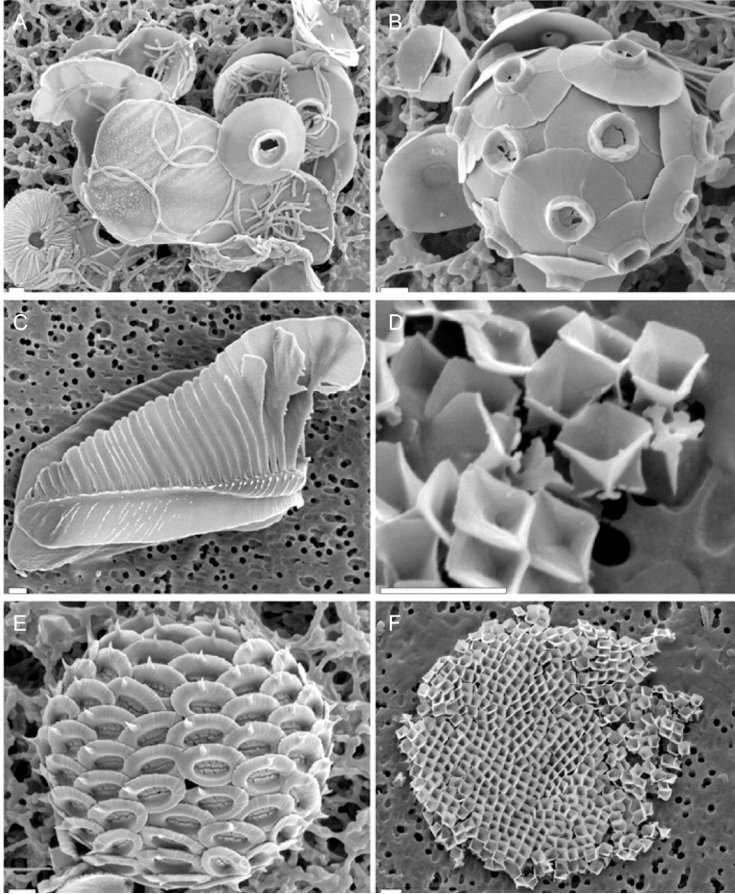


- p8 coat protein mutated to contain sequence DSPHTELP
- **Modified p8 proteins bind gold**, single wall carbon nanotubes (SWCNT), and iron

# Overview of phage display



# M13 phage and biomineralization



- Environmental conditions

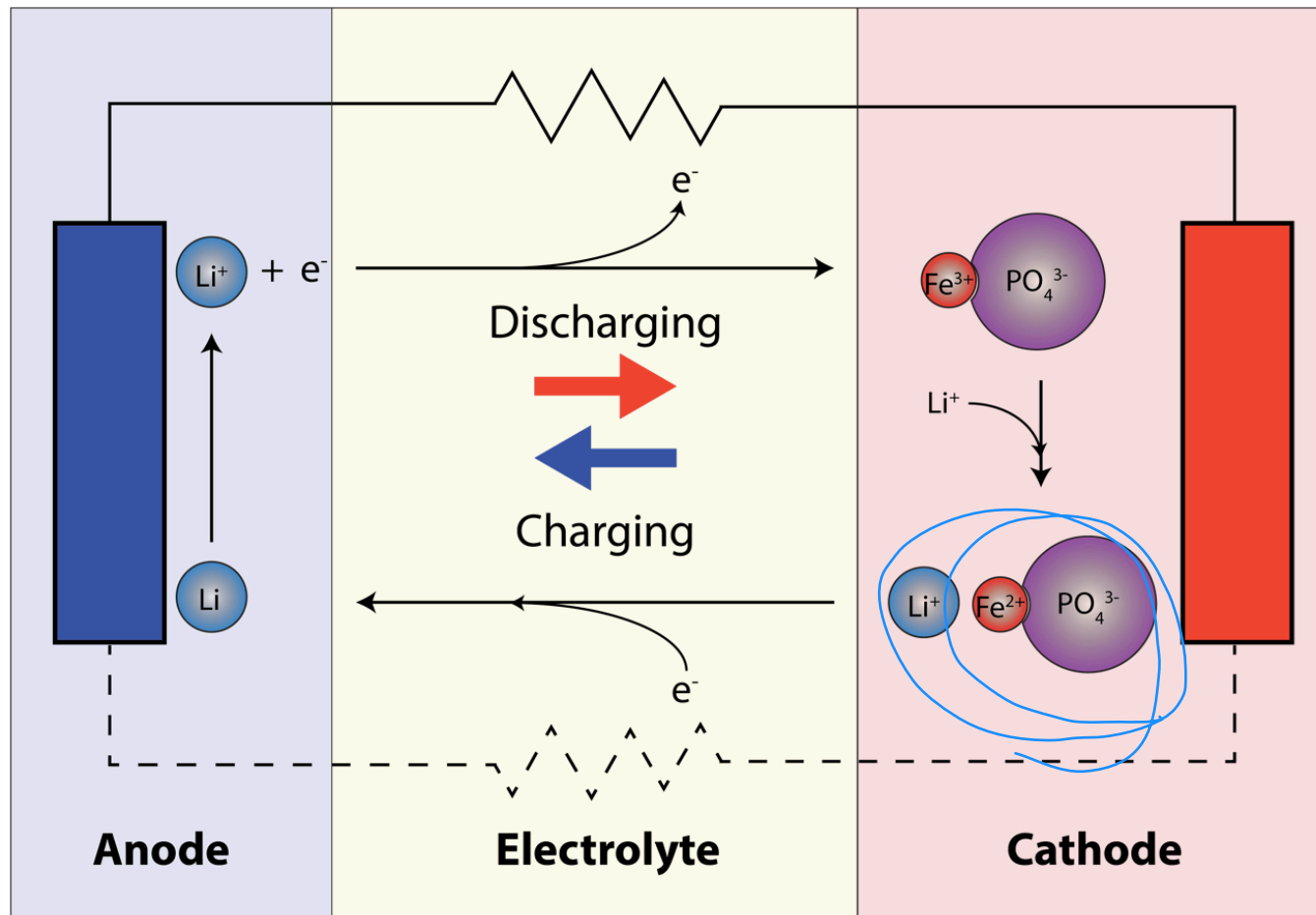
↓ waste  
Safer for environment/  
you

- Structural organization

Save time

M13 provides scaffold for  $\text{Li}(\text{FePO}_4)$  cathode construction

# M13 nanowires as battery cathode



Thank you, George!

# Today...

## 1. Purify M13 phage

- Measure number using spectrophotometry



$$\# \text{ phage / mL} = \frac{(6 \times 10^{16}) (A_{269} - A_{320})}{\# \text{ bases in phage genome}}$$

## 2. Add AuNP



$$\text{mL of AuNP} = \frac{(\# \text{ phage}) (\# \text{ AuNP / phage})}{[\text{AuNP}]}$$

SIZE of AuNP ?

4nm

9nm

40 NP / phage

plasmonics