

- Announcements
- Lab Quiz
- Pre-lab Lecture
  - ❖ Review M13 engineering
  - ❖ Nanocomposite synthesis
  - ❖ Intro to TEM
  - ❖ Today in Lab (M3D2)

# Announcements

- No lecture or lab all next week
- Return for TEM → prepare samples today
- FNT: start defining research proposal on a wiki page
  - Use 20.109(F11):*restofyourpagenamewhere* prefix
  - Define topic and idea
  - Summarize at least 2 relevant references
  - It's okay to change your topic later!

\* 2 super-groups, not 3

M2 returned → w 11/23  
→ 1 week to revise

# Engineering M13 overview

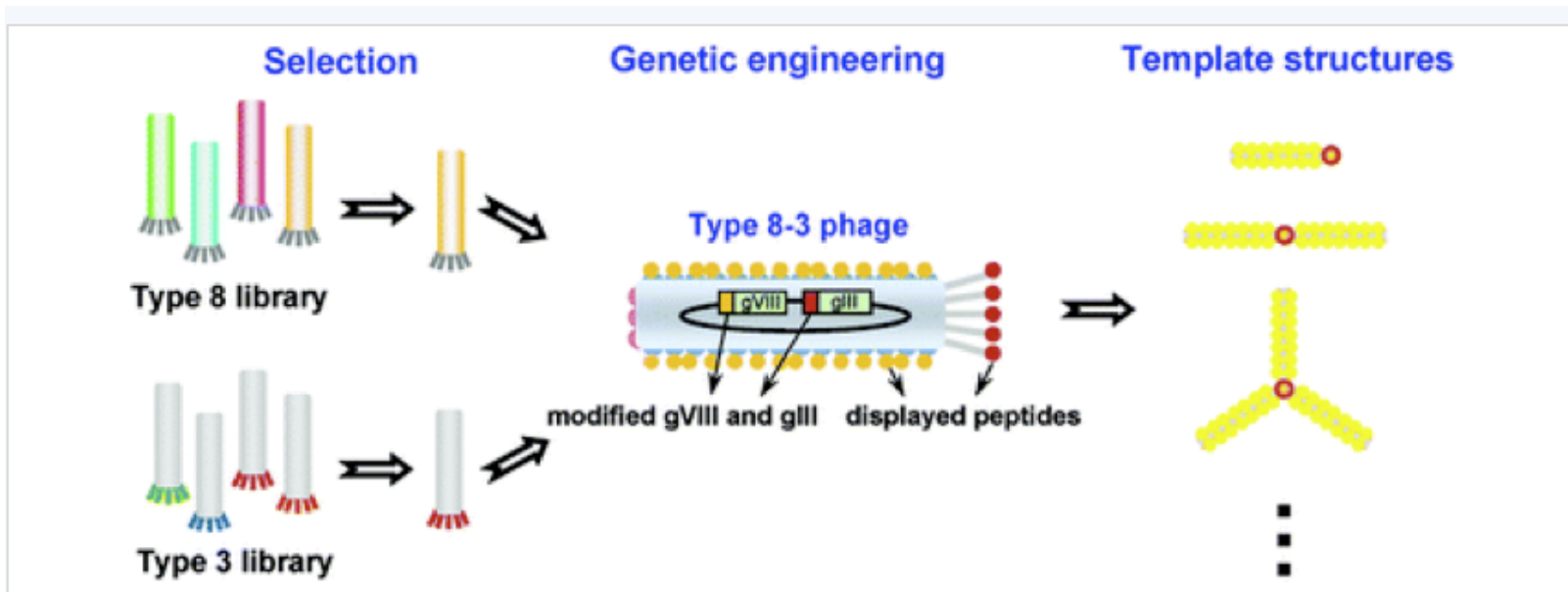
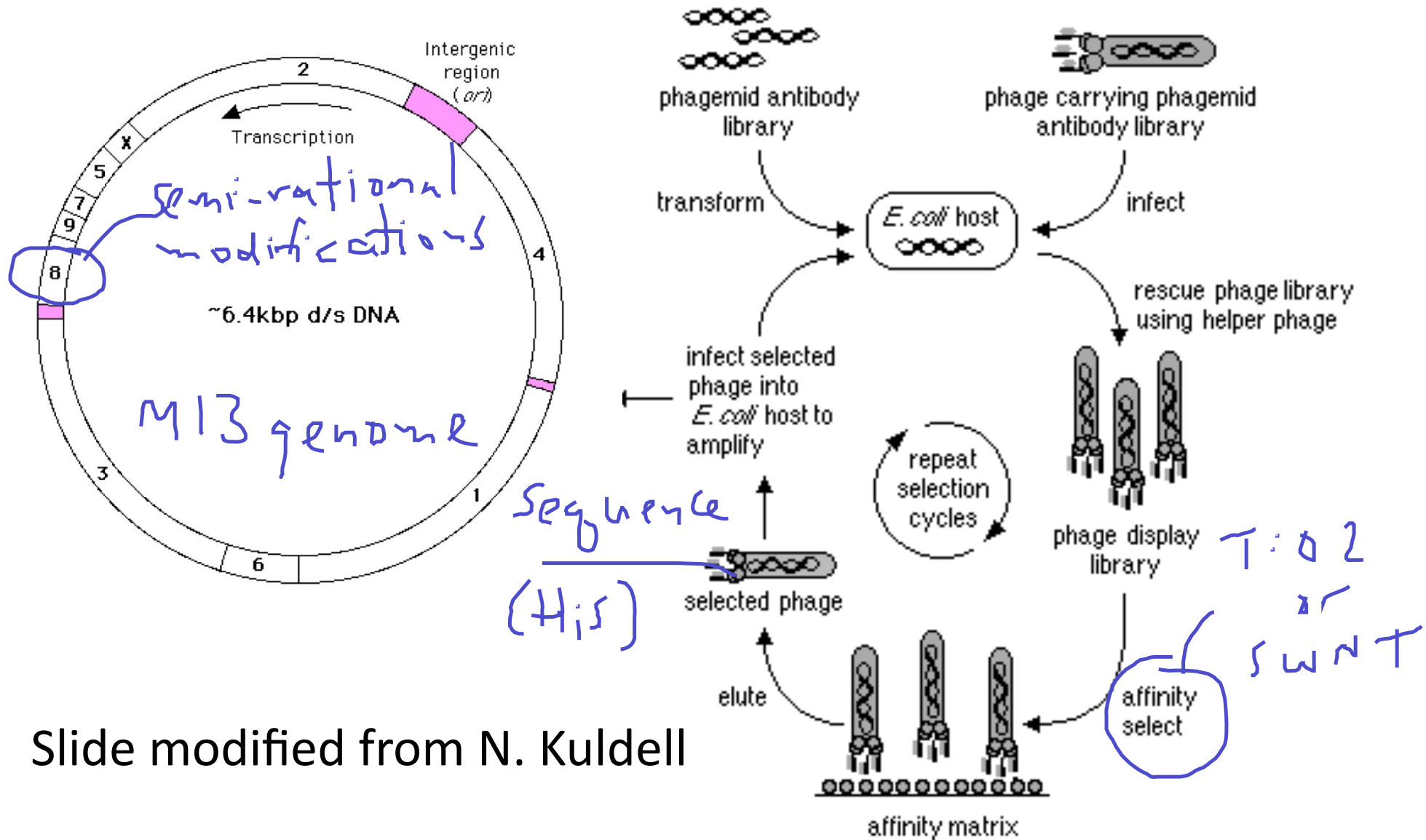


Image from Y. Huang et al., *Nano letters* 5(7):1429 (2005).

Phage don't normally bind SWNTs and TiO<sub>2</sub>.  
 How did Angie's lab find such phage?



Slide modified from N. Kuldell

# Nanocomposite synthesis: overview

- Goal: compare system made w/varying SWNT: $\phi$
- All reacted with same [Ti(I-pro)4]

Prepare supercooled NaCl/ice bath

Pre-chill EtOH

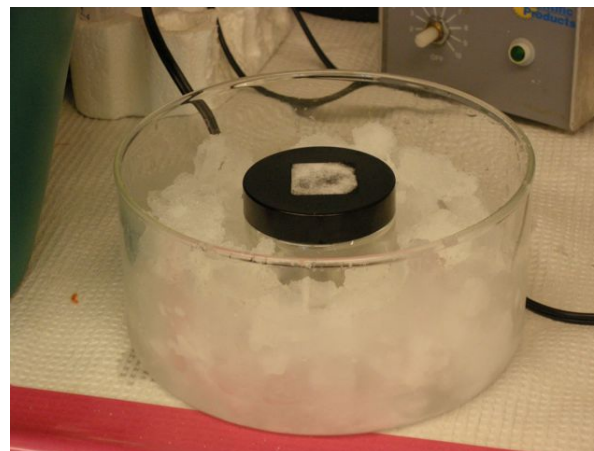
Add Ti(I-pro)4

Add SWNT/ $\phi$  mixture

Stir 10-15 min

Prepare aliquot for TEM

Centrifuge, wash rest of mixture



*conts/gloves/goggles*

Hazard statement(s)

H226

H316

H319

H331

Flammable liquid and vapour.  
Causes mild skin irritation.  
Causes serious eye irritation.  
Toxic if inhaled.

# TEM: foundations

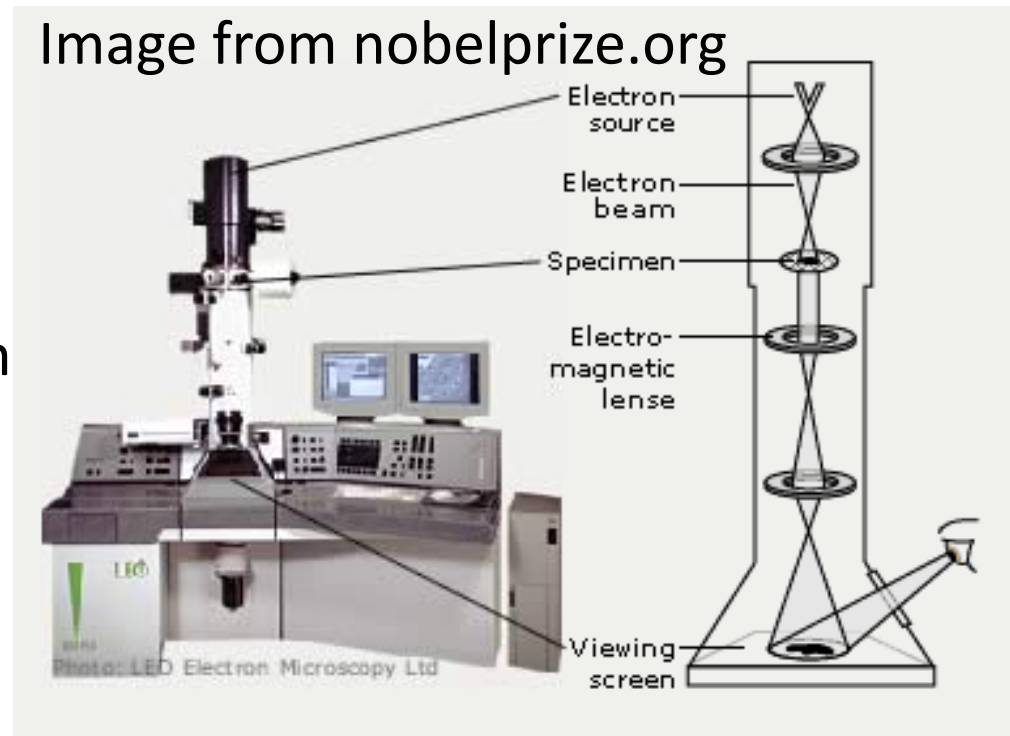
- Very high resolution – why?

low  $\lambda$  of  $e^-$  compared to light  
(scattered, absorbed)

- EM lens to focus
- Sample preparation
  - very thin, under vacuum
  - can't image *in situ* bio.

cryo-EM –

- Many imaging modes

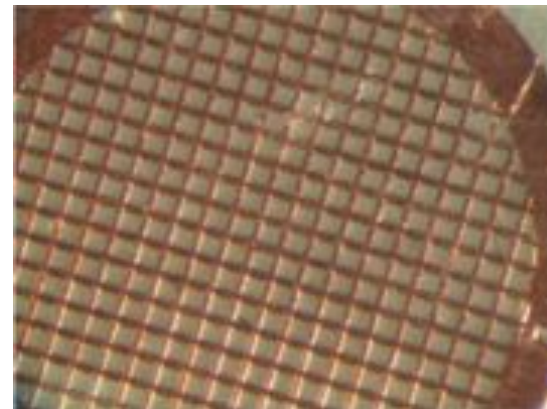


# TEM: your experiment

- Morphology, density, *maybe* elemental analysis
- Protocol:
  - Each group (not super-group) should prepare a grid
  - Disperse wires: vortex
  - Load onto Cu/carbon grid
  - Incubate, wash grid

*disperse energy*

*Grid is extremely delicate!*



# Today in Lab (M3D2)

- React SWNT:φ with [Ti(I-pro)4]
  - Prepare aliquot for TEM
  - Wash and pellet remaining mixture for solar cell assembly
- Discuss research proposal ideas with your partner
- Should be a nice short day – enjoy it!