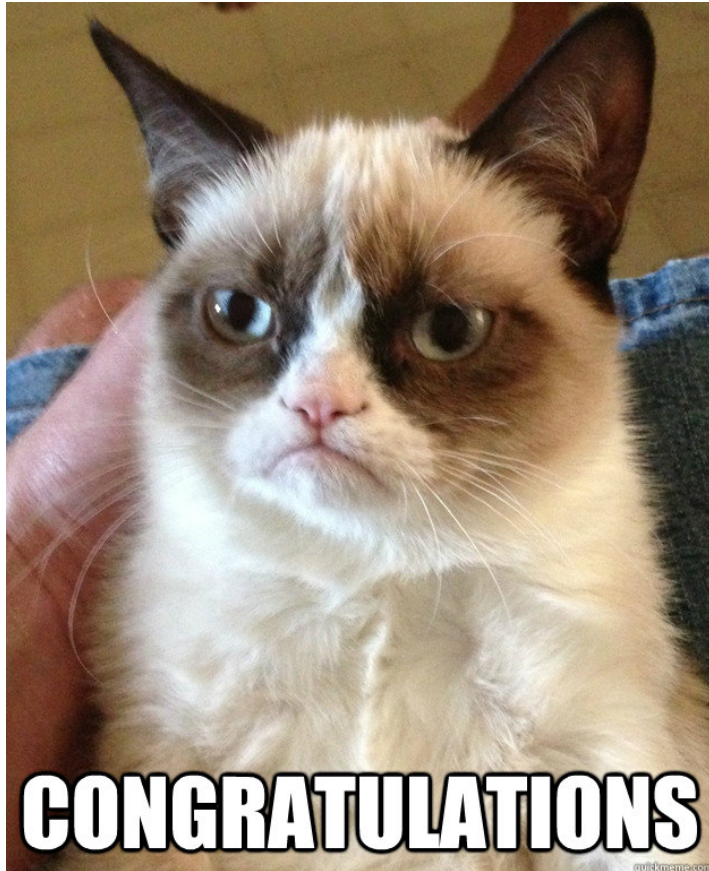


# M3D2:Purify active material

11/16/2016

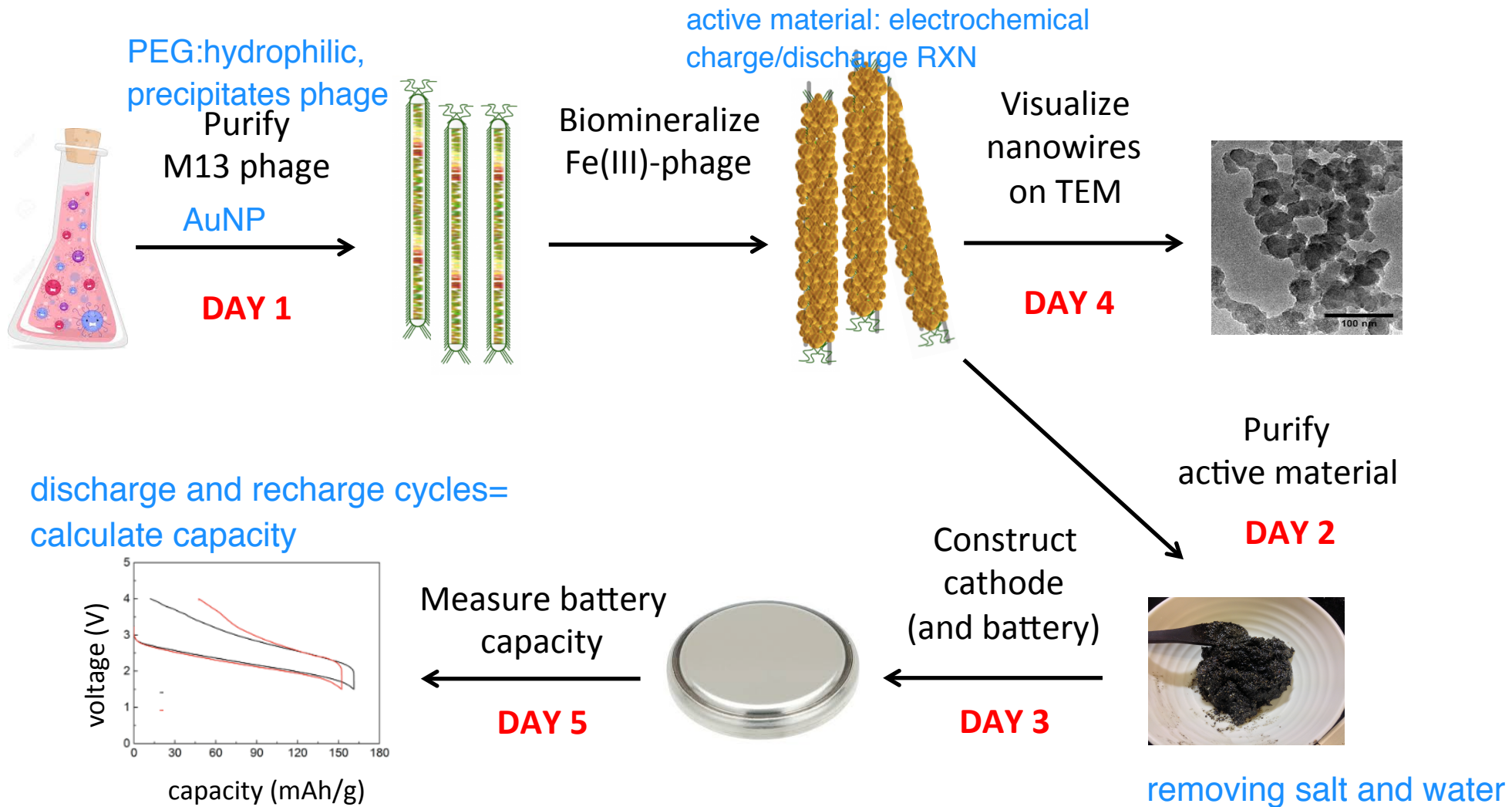
1. BE Communication lab workshop: Research Proposals!
2. Prelab
3. Demo of FePO<sub>4</sub>-phage reaction
4. Collect and wash active material: AuNP-Fe(III)-phage nanowires
5. Prepare TEM samples
6. Prepare active material for 80°C vacuum oven

# Congratulations! You're almost done with Mod2



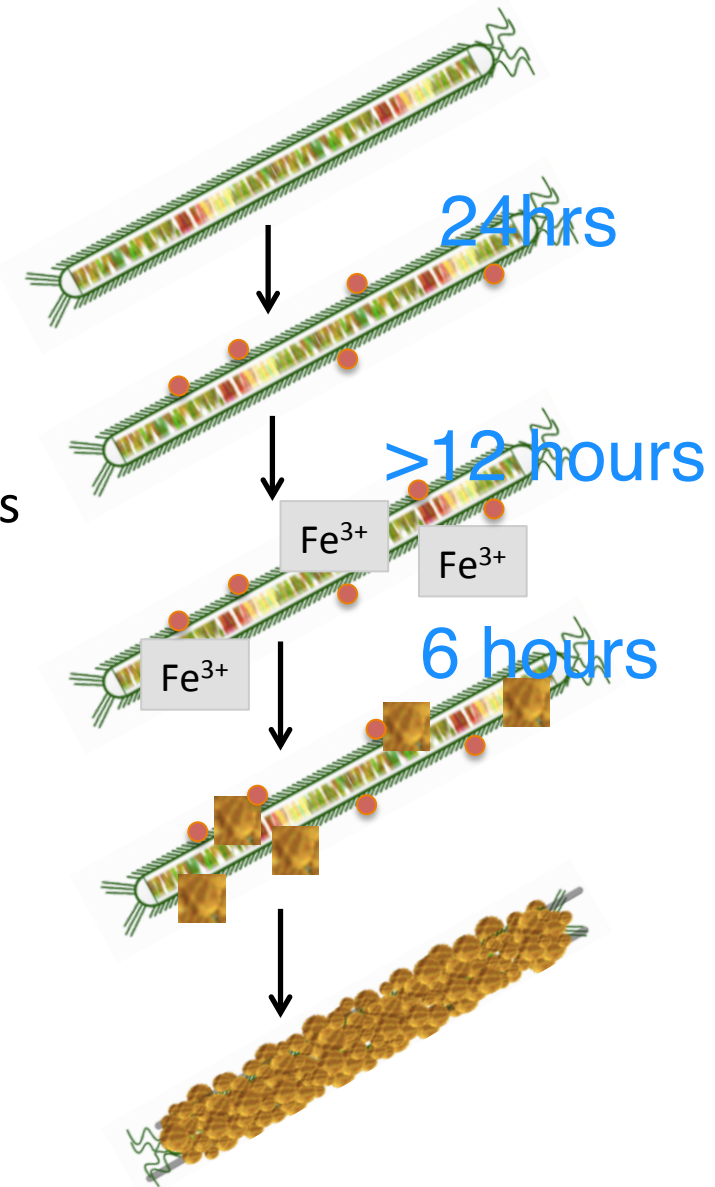
- ✓ Office hours Saturday 11/19 10am-5pm
- ✓ Research report: Due **SUNDAY** 11/20 at 5pm
- ✓ Blog by Monday 11/21 at 5pm
- **M3 research proposal**
  - HW due M3D3 in teams: refine your topic and approach, doesn't have to be your final proposal, **get feedback during downtime(s)**
  - During lecture Tuesday 11/22 team elevator pitches
- Quiz on M3D3

# Module 3: biomaterials engineering



# Phage Biomining

- P8 coat protein modified to include DSPHTELP, neg charged peptide
- Gold nanoparticles (AuNP ●) incubated with phage for 24 hours after M3D1.
- Next phage/AuNP incubated in  $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2$  as a source of  $\text{Fe}^{3+}$ 
  - 90% efficiency!
  - $\text{Fe}^{3+}$  back into solution if wait > 12 h
- $\text{PO}_4^{3-}$  from  $\text{NaPO}_4$  precipitates Fe(III)
- nucleation / accumulation / mineralization ensues
  - amorphous ( $\alpha\text{-FePO}_4$ ), not crystal
  - promising cathode material



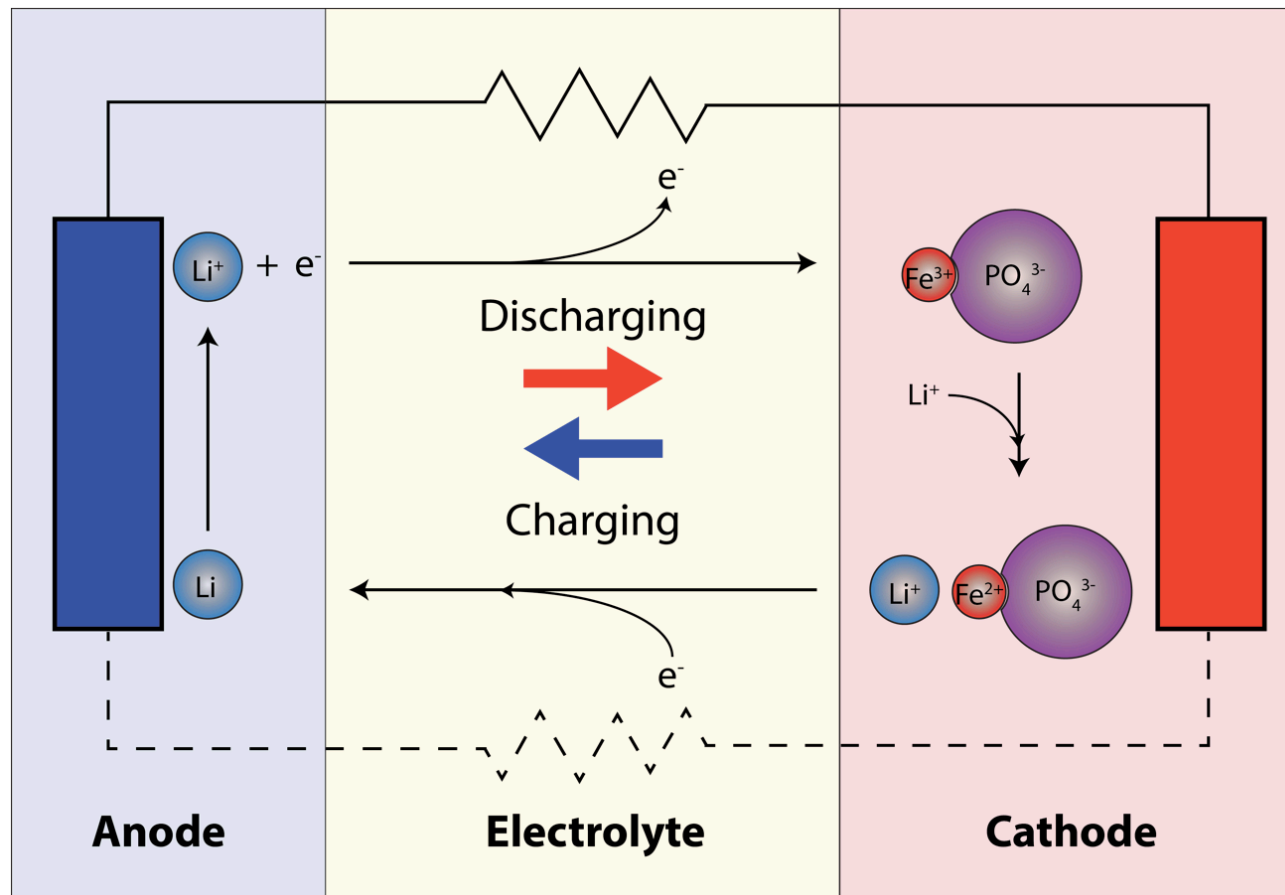


# Diagram of Mod3 battery

M13 phage: scaffold

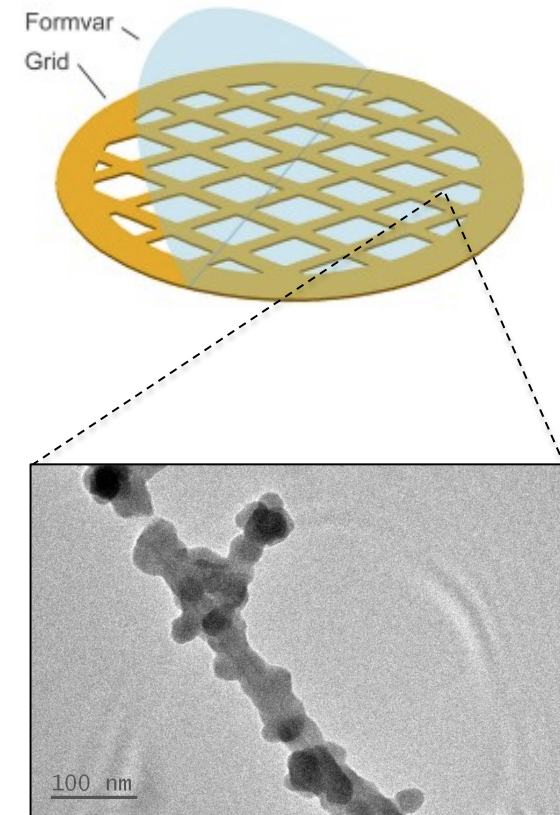
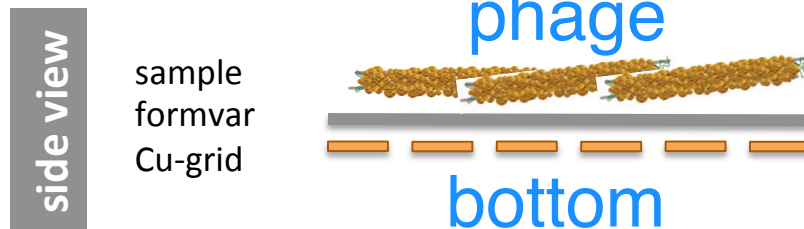
AuNP: electrical conductor

Fe(III) PO<sub>4</sub>: ion storage



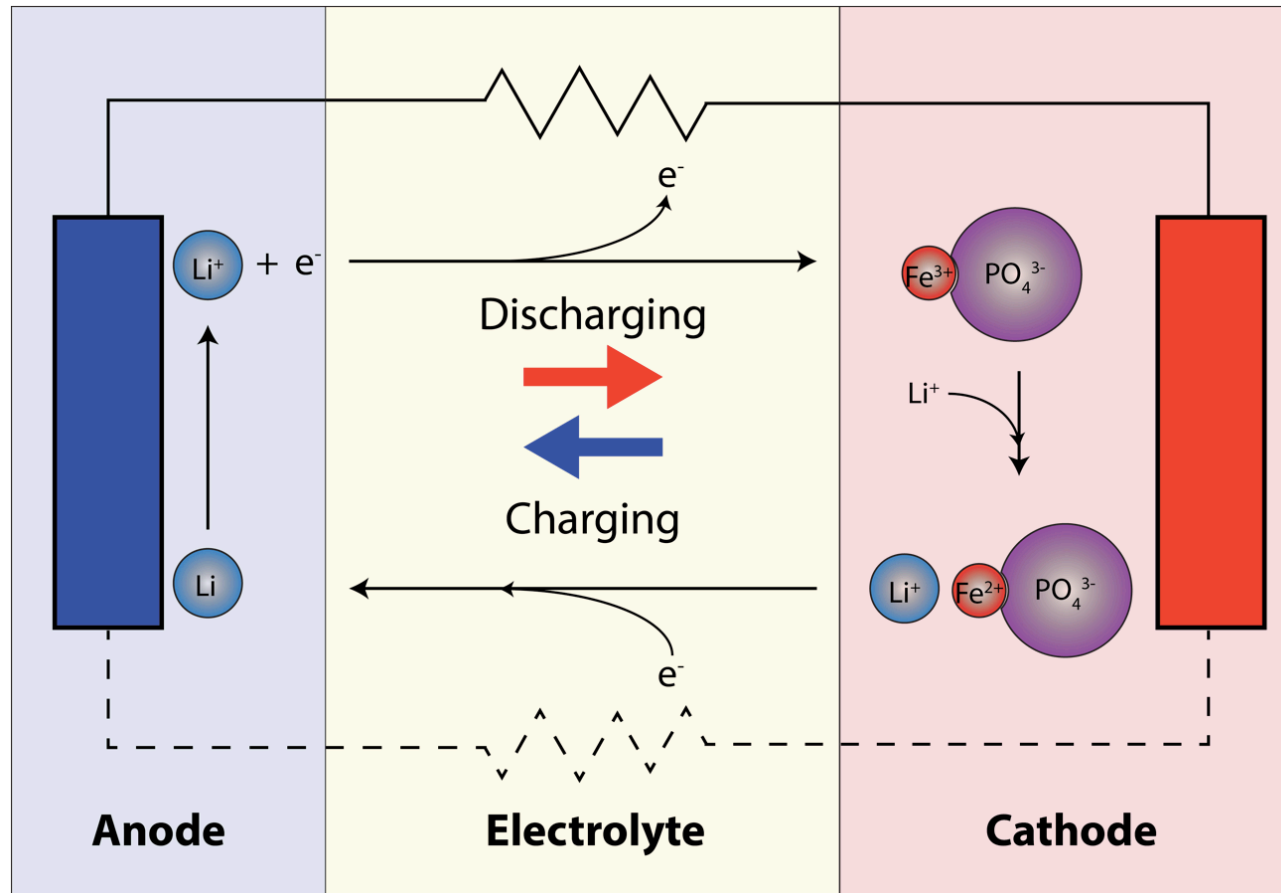
# Set aside Fe(III)-phage-AuNP for TEM inspection

- The Fe(III)-phage-AuNP active material is in its purest form
  - no impurities, binder, etc.
- Formvar coated Cu-grid
  - copper-orange side
  - ✓ silver/black side where droplet deposited
- Practice handling it with tweezers



2 samples: undiluted and 1:10 dilution

# What is your experimental question/ hypothesis?



## In lab today...

1. Demo of FePO<sub>4</sub>-phage reaction **write observations!**
  2. Collect and wash active material (lots of long spins!)
  3. Practice then prepare TEM samples
  4. Prepare active material for 80°C vacuum oven
- During the downtime you should discuss and choose a topic for M3D3 homework (and potentially beyond!) submitted as a pair/team
  - Remember class time 11/22 Prof. Belcher would like to hear elevator pitches from as many of you as possible.