

ME 411 / ME 511

# Biological Frameworks for Engineers

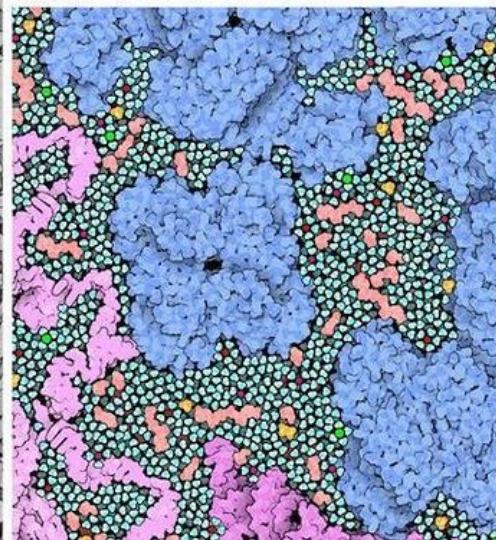
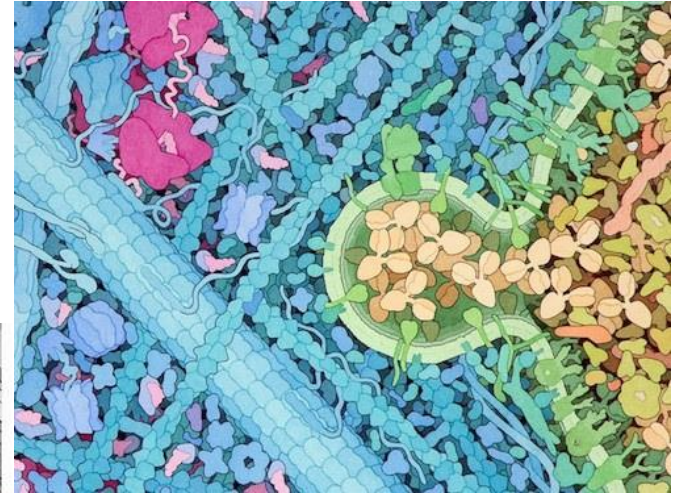
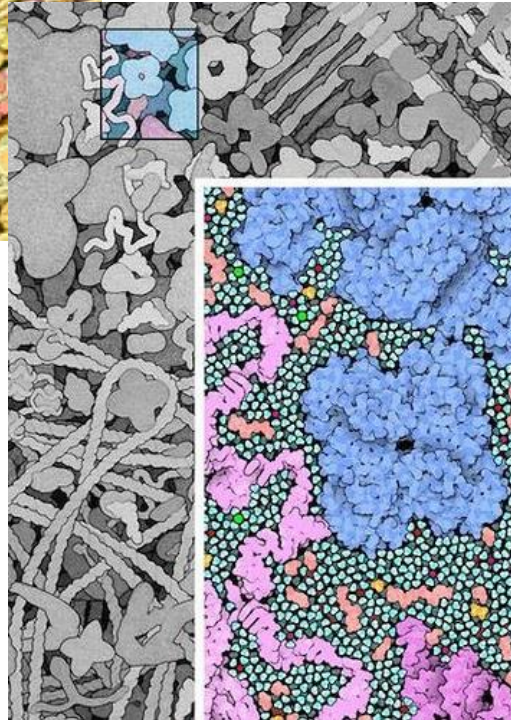
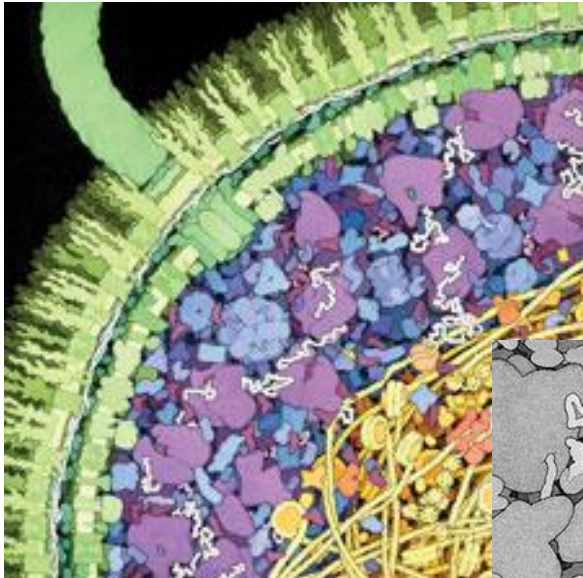
# Class Organization

- Lab 1 worksheet due Wed
- Lab 2 – Lab-on-a-Chip
  - Fri, More 320
  - Sign up for 2:00-3:15, 3:15-4:30 slots
  - Max 20 people per slot

ME 411 / ME 511

# Decoding Proteins and Protein Functions

# A cell is a crowded place...





# Protein Purification

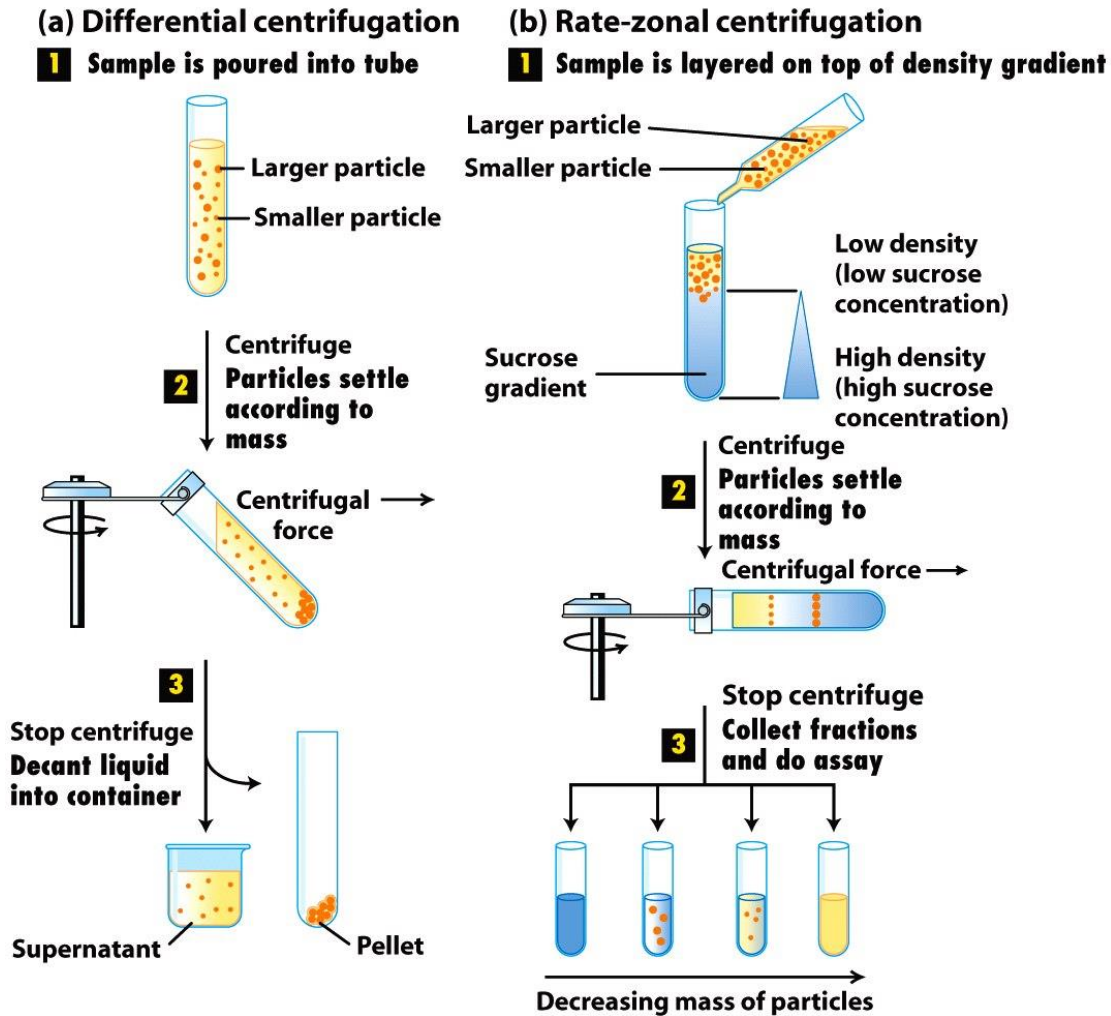


Figure 3-34  
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# Gel Electrophoresis

- Separation by charge-to-mass ratio
- Small proteins migrate faster than large ones
- SDS-PAGE
  - Sodium dodecylsulfate
  - Polyacrylamide Gel Electrophoresis

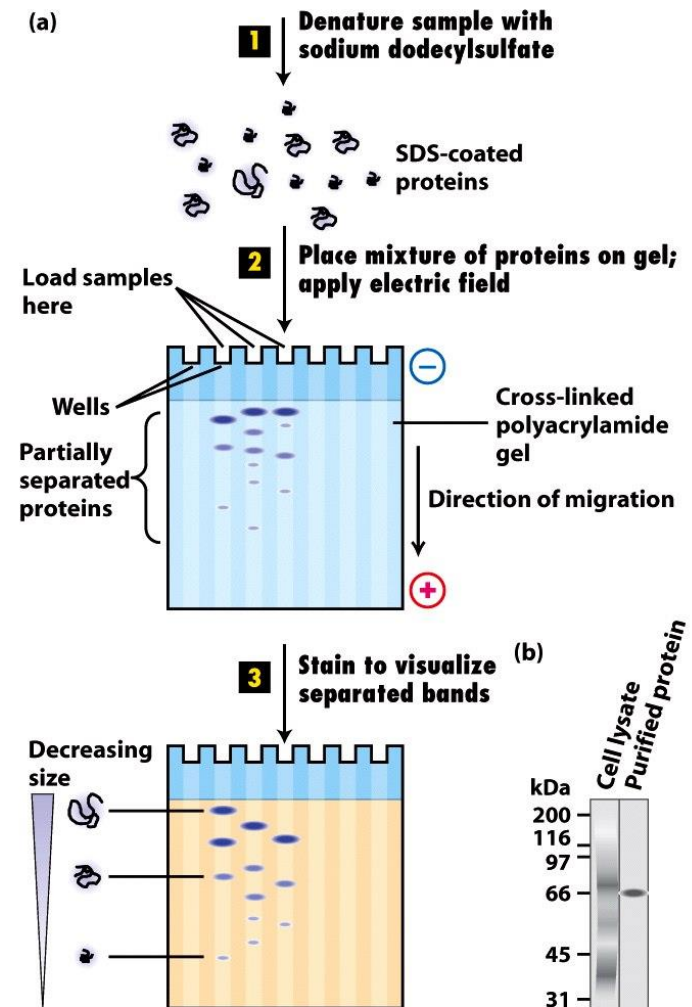
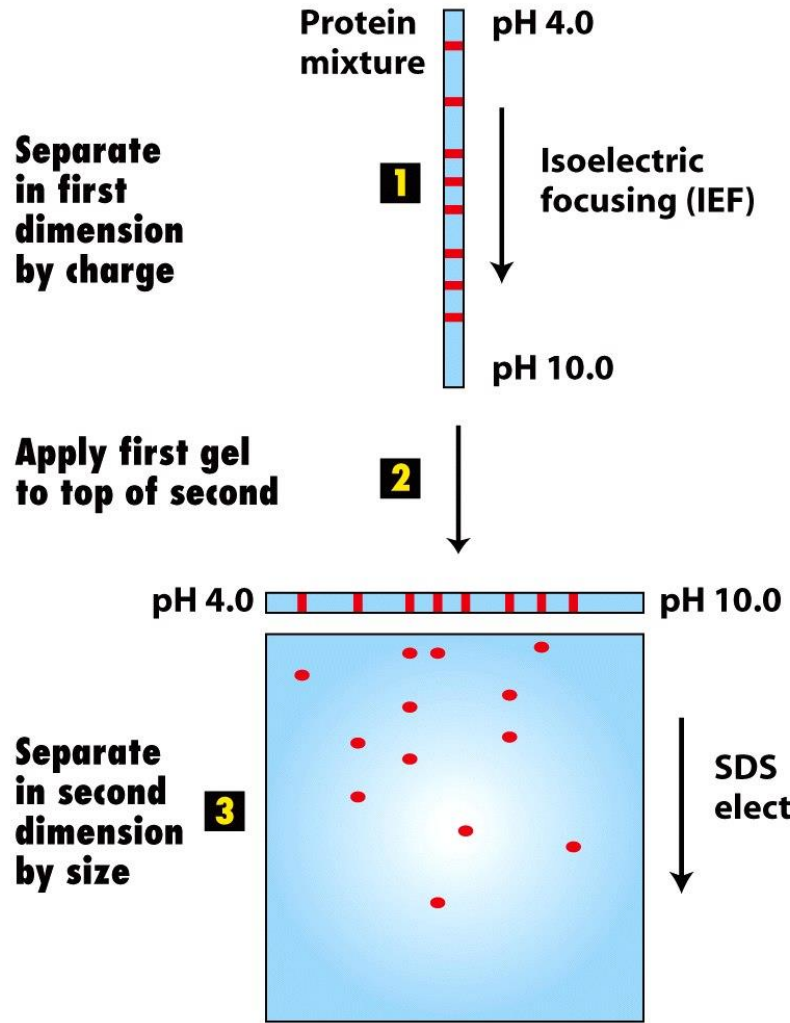


Figure 3-35  
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# 2-D Gel Electrophoresis



## HYDROPHILIC AMINO ACIDS

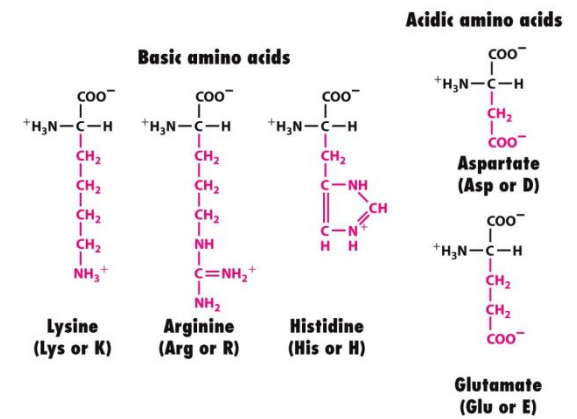


Figure 2-14 part 2  
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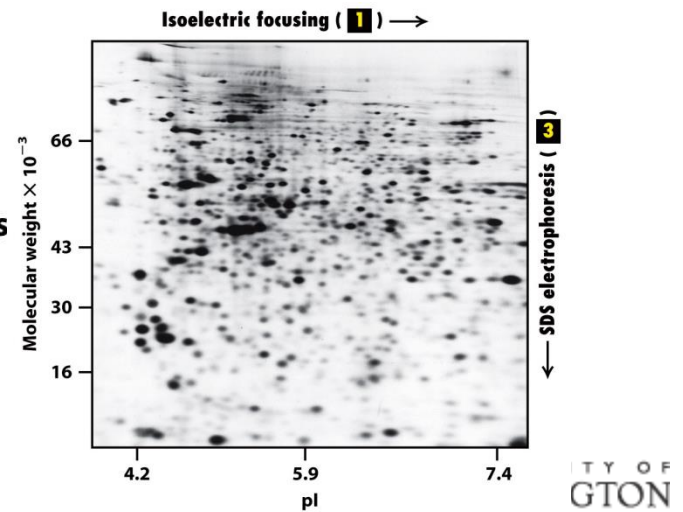


Figure 3-36a  
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Figure 3-36b  
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# Chromatography

## Gel filtration chromatography

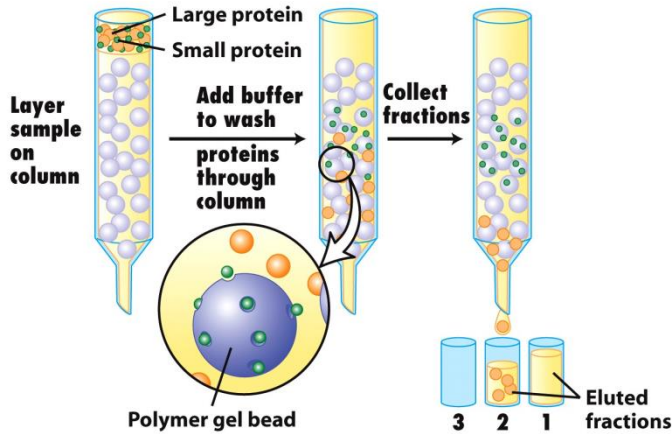
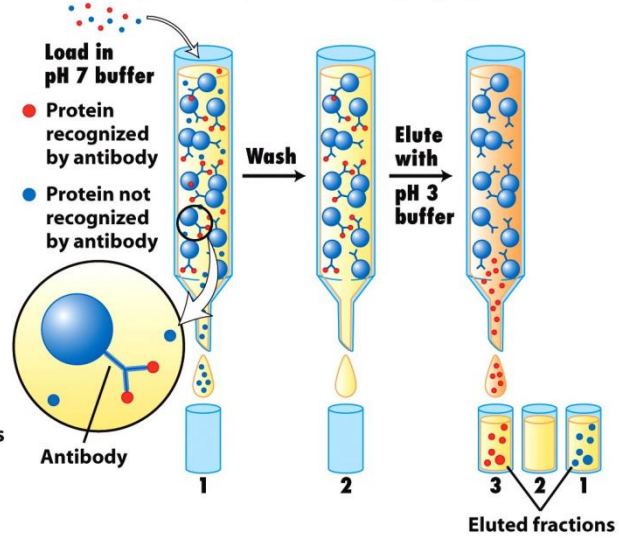


Figure 3-37a  
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## Antibody-affinity chromatography



## Ion-exchange chromatography

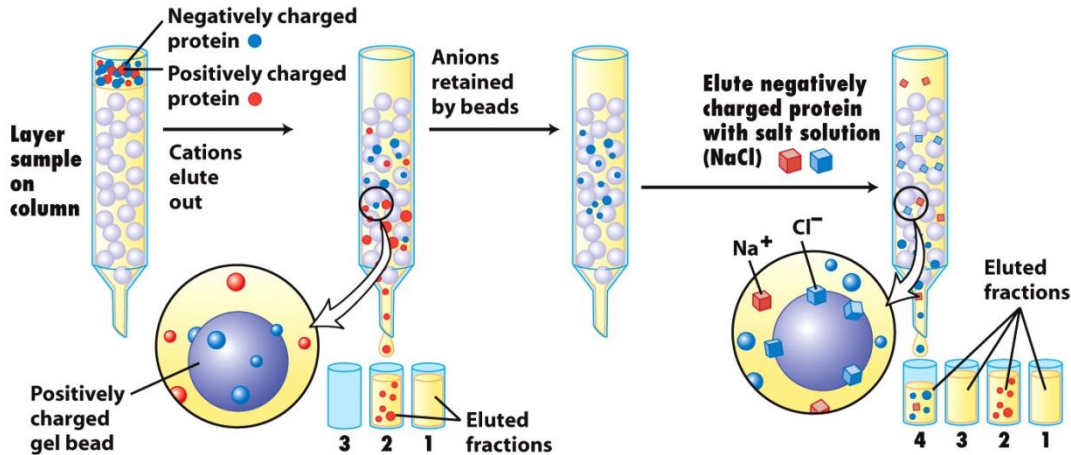


Figure 3-37b  
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# Western Blot

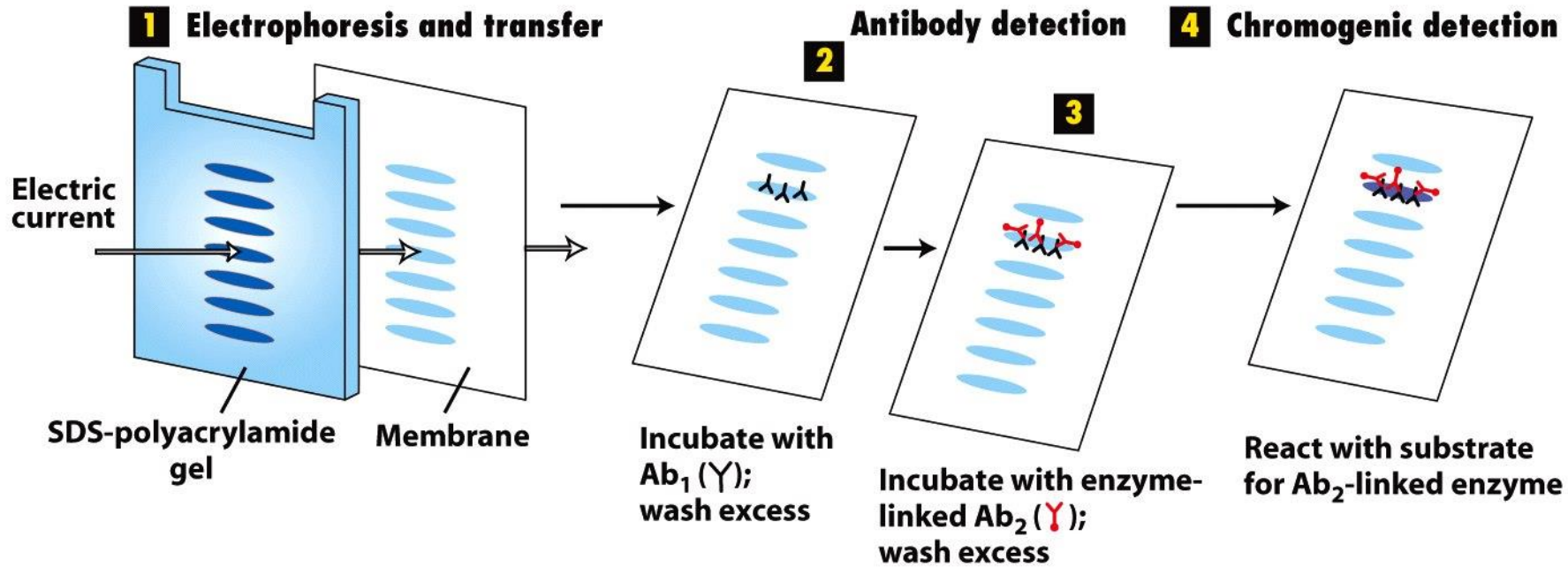


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# Mass Spectrometry

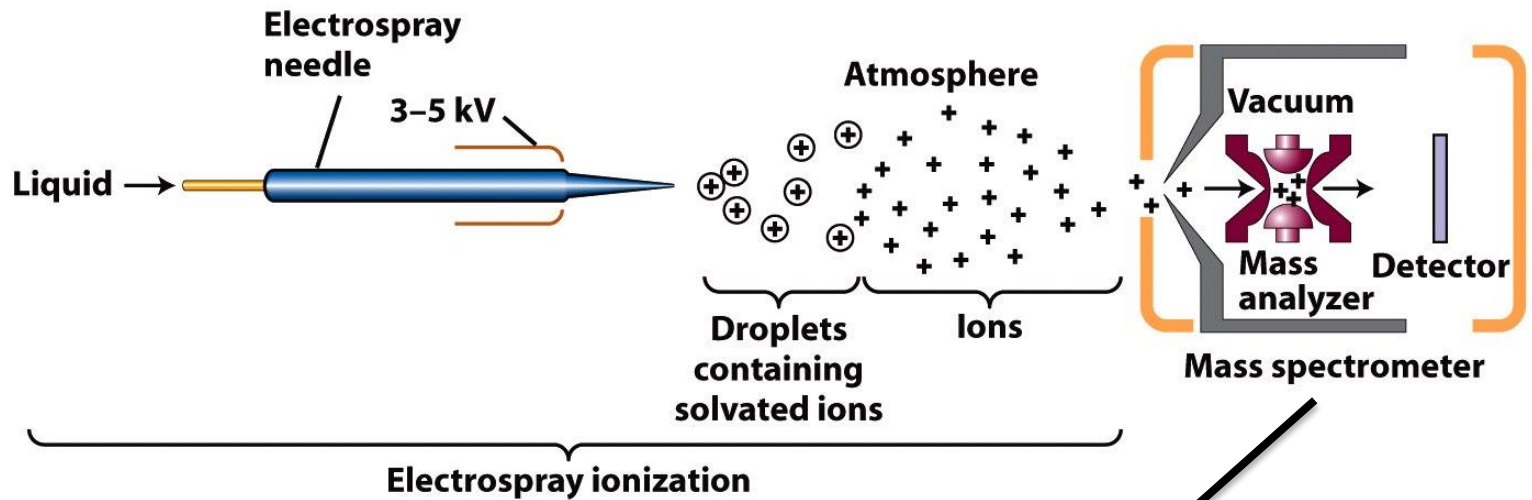


Figure 3-41a  
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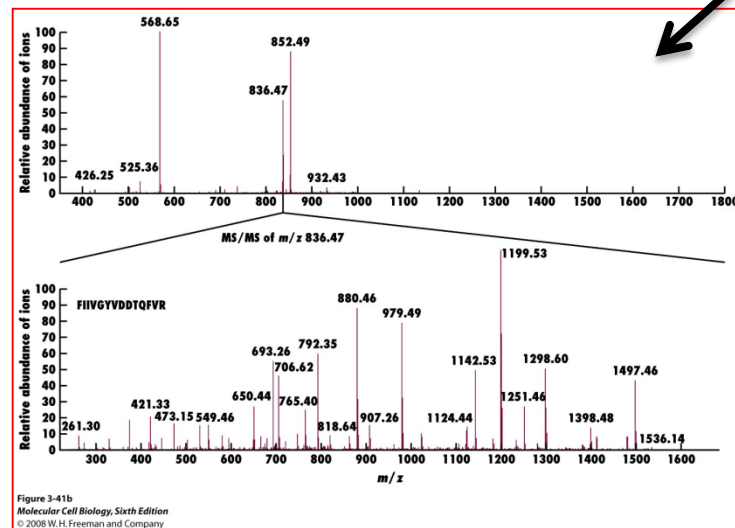


Figure 3-41b  
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# All together now...

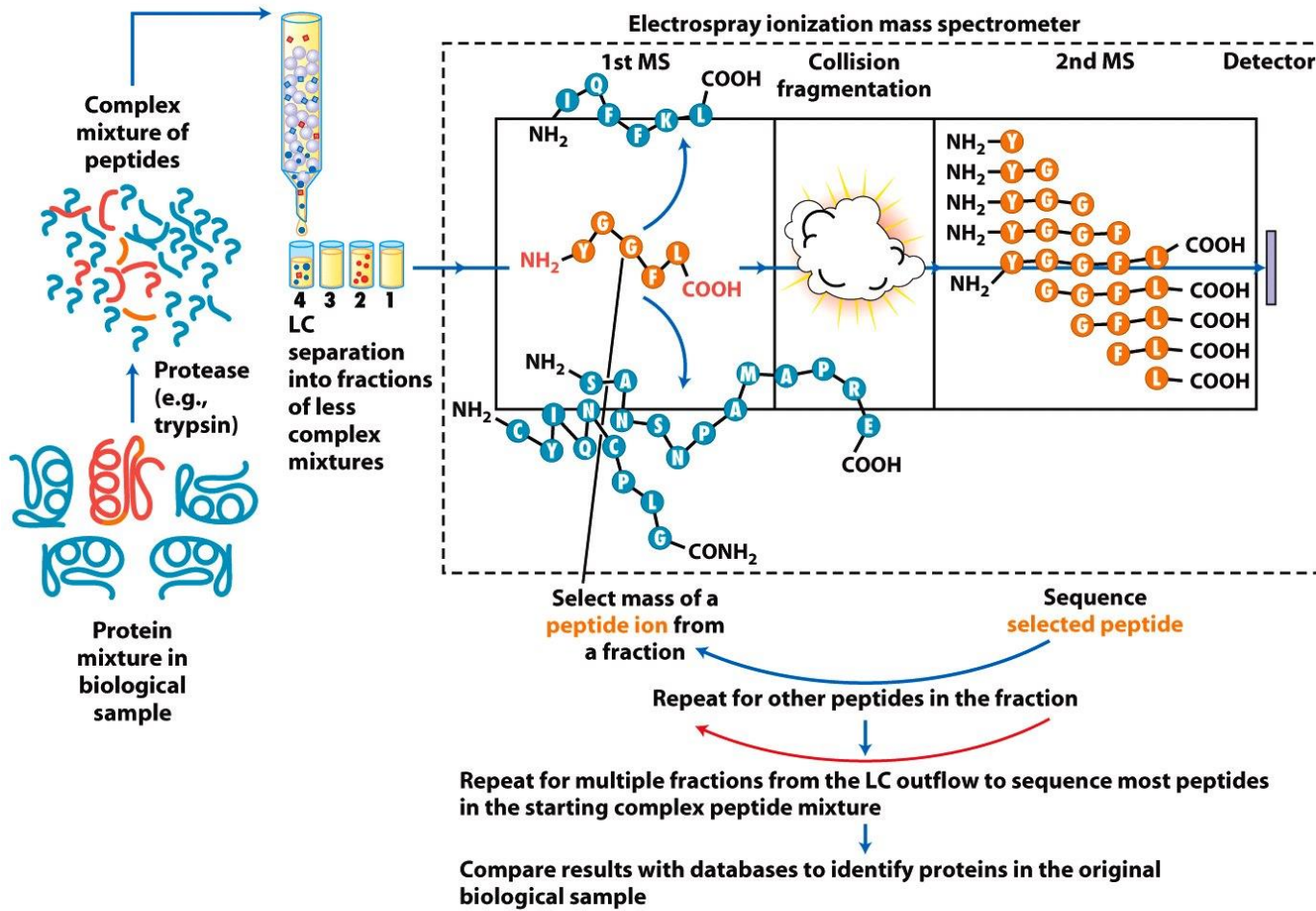


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# X-Ray Crystallography

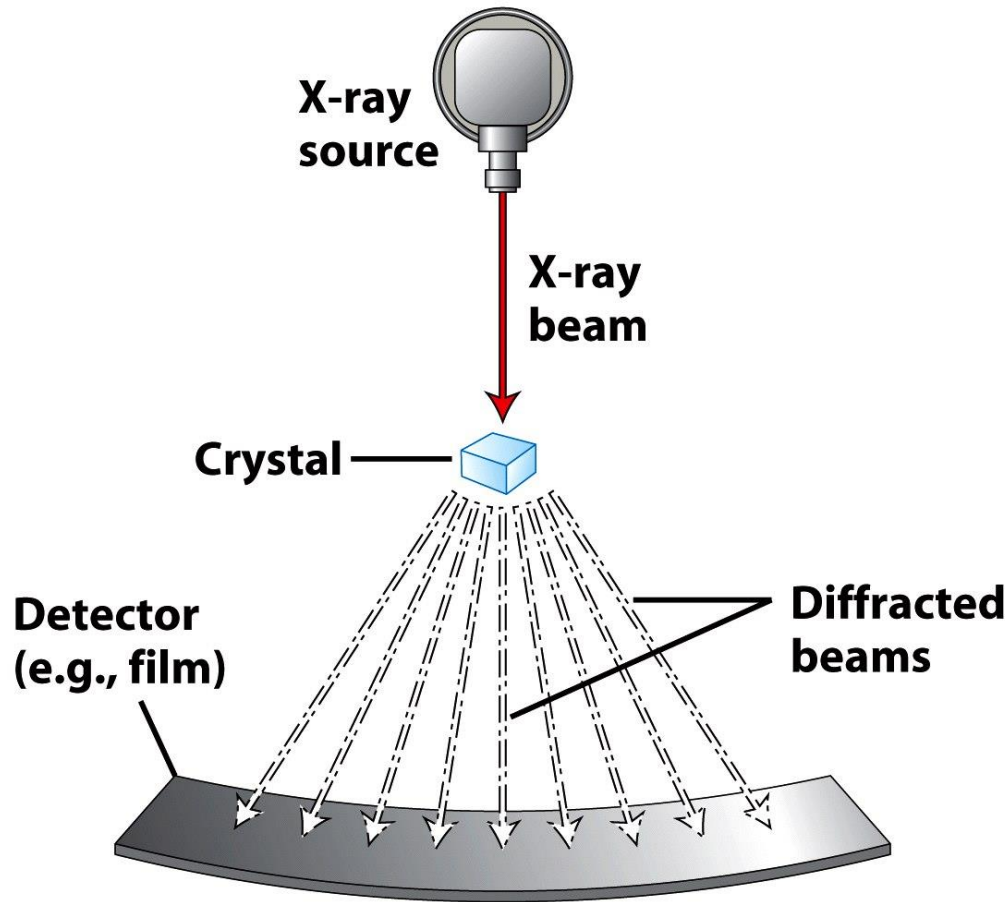


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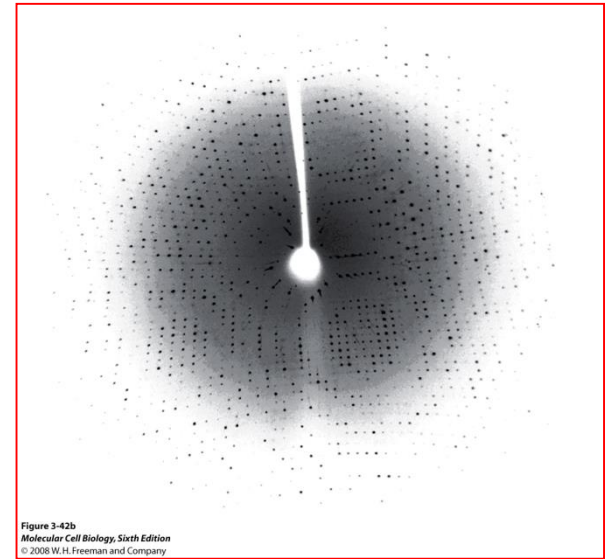
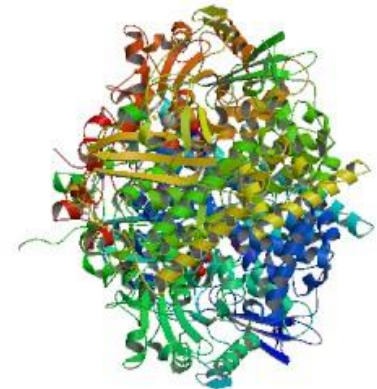


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# Cryo-EM

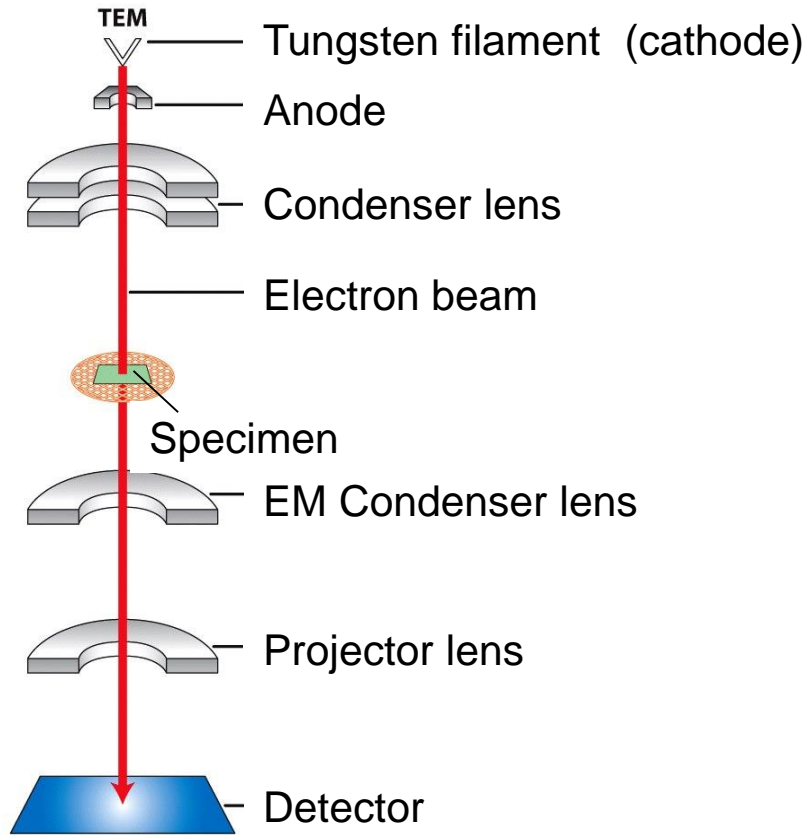


Figure 9-20  
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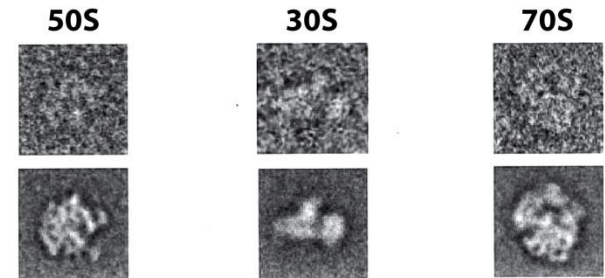


Figure 4-26a  
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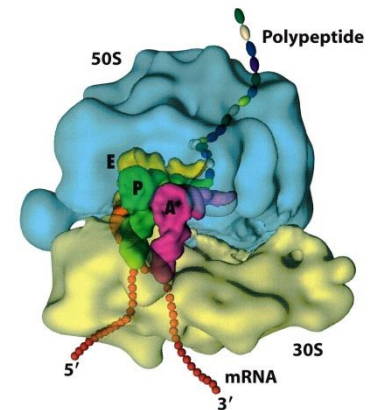
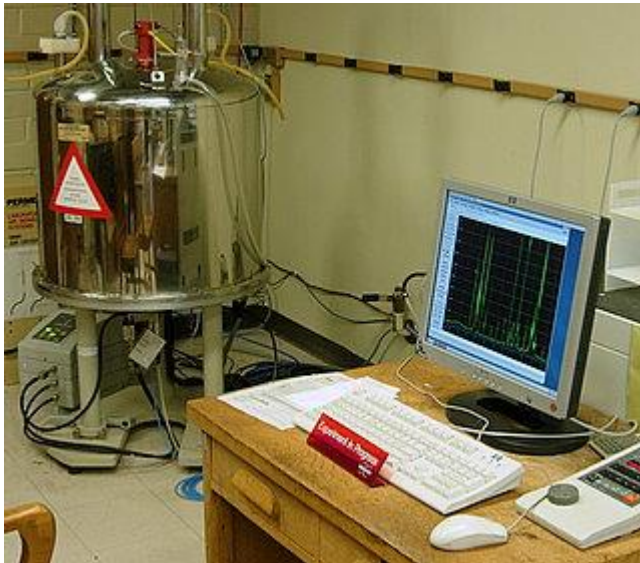


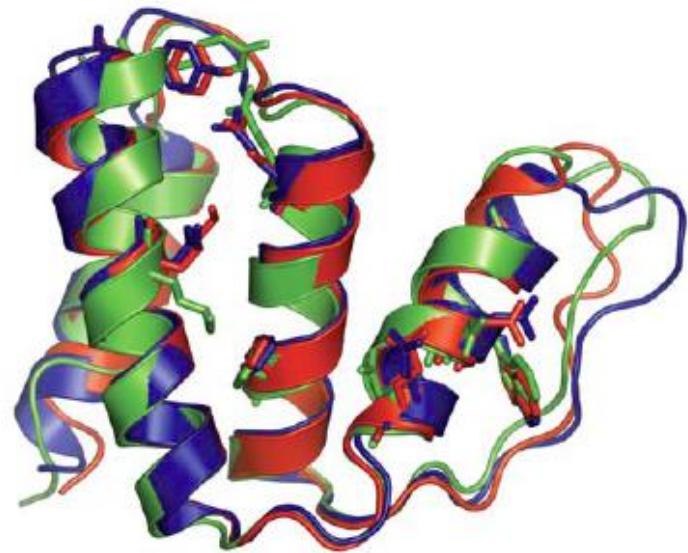
Figure 4-26b  
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*E. coli* Ribosome

# NMR Spectroscopy



**David Baker**, Howard Hughes Institute, University of Washington.

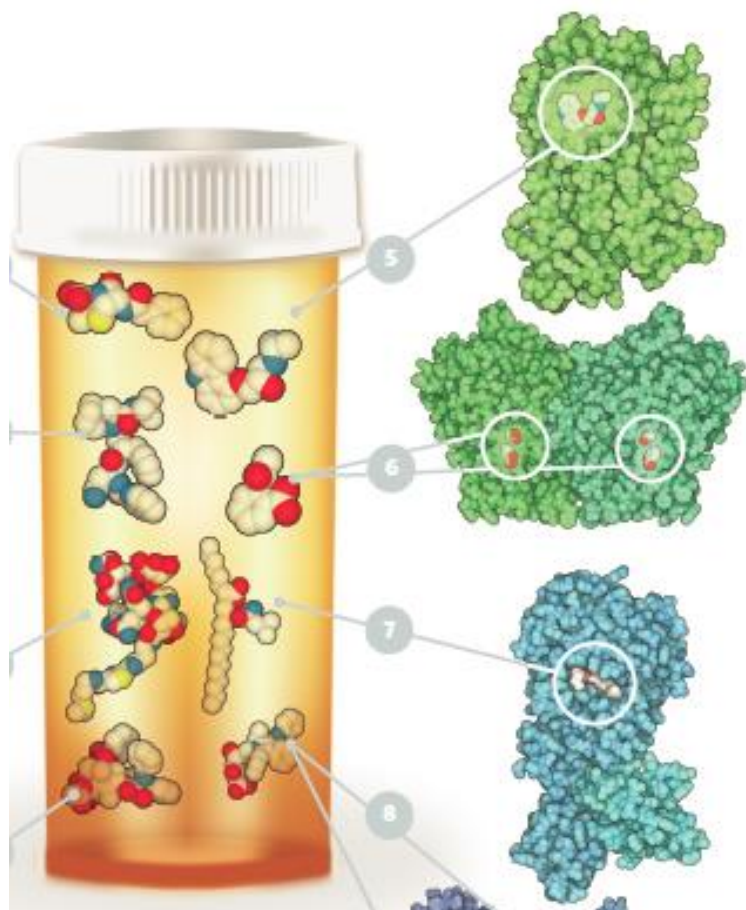


Protein structure prediction by the Rosetta code, showing the unknown structure (blue), the X-ray structure (red, unknown when the prediction was calculated), and a low-resolution NMR structure (green).

Image courtesy of Ross Walker, SDSC, and Srivatsan Raman, University of Washington.

# Protein Function

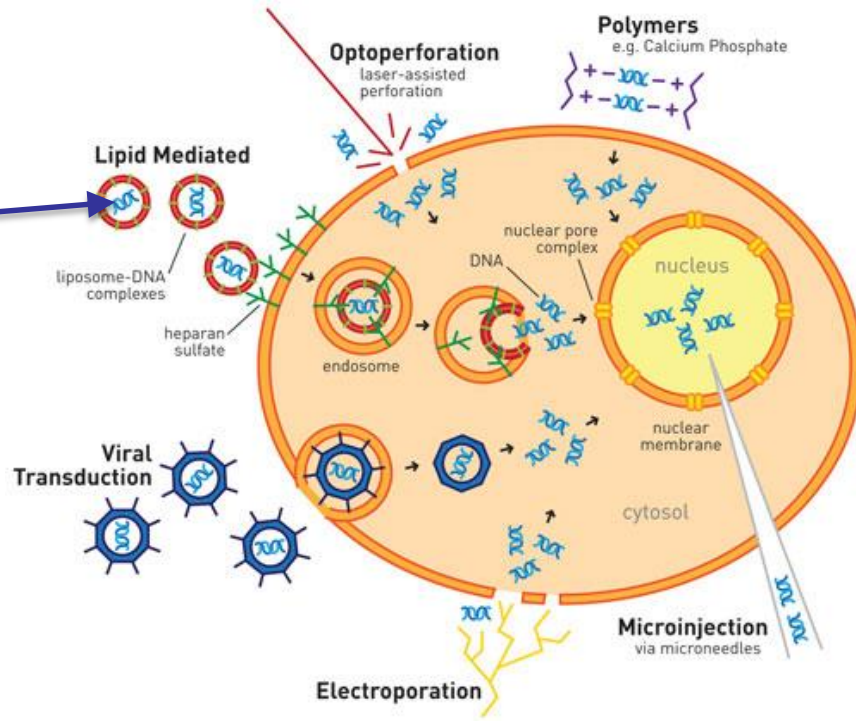
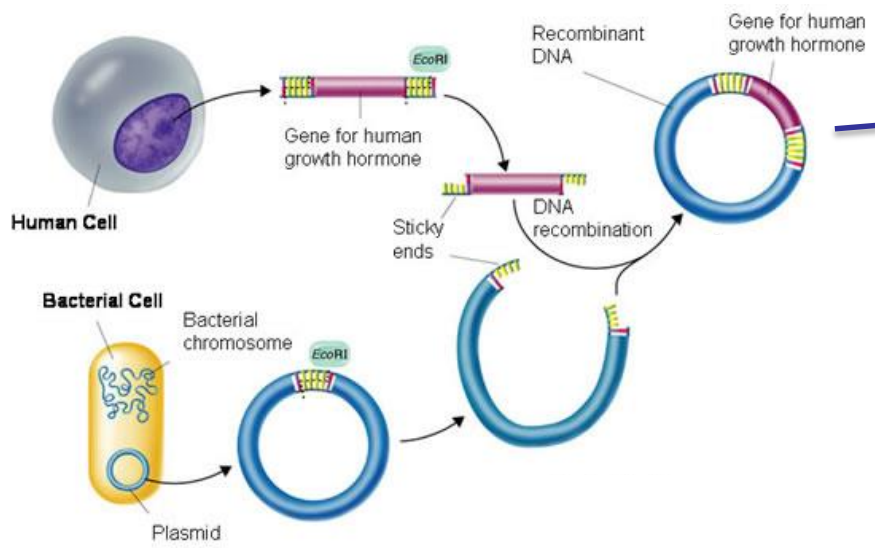
- Pharmacological inhibitors





# Protein Function

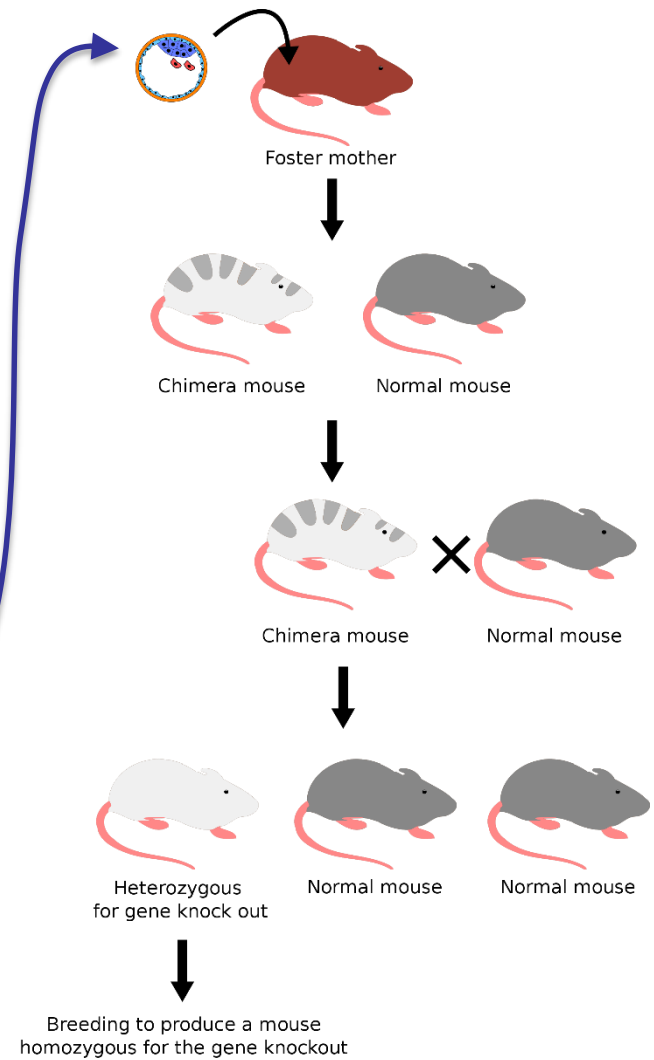
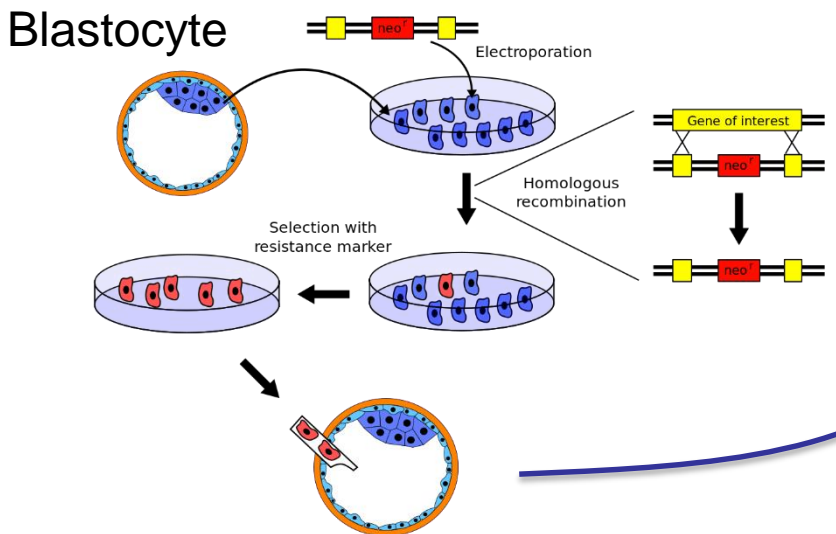
- Recombinant DNA





# Protein Function

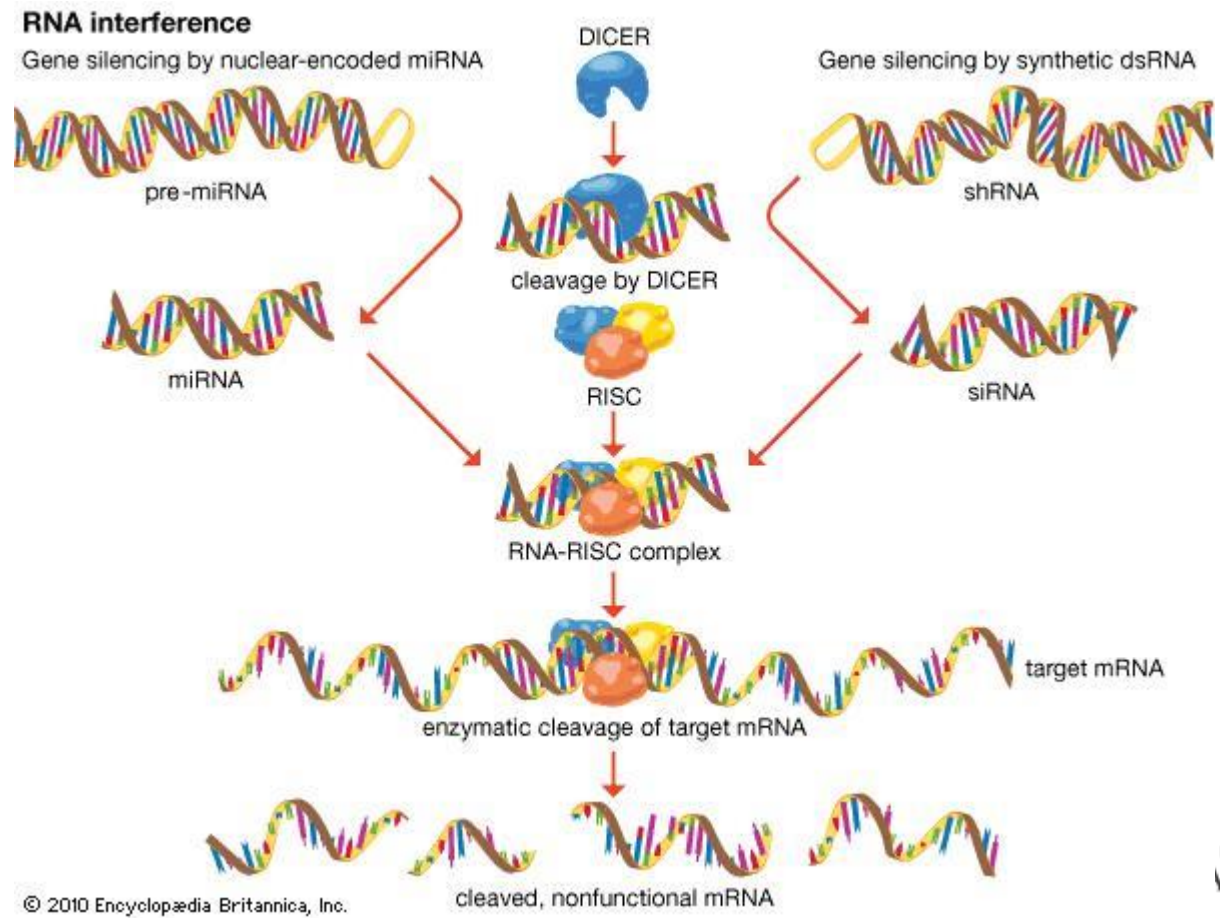
- Knock-out mice



neo' = neomycin

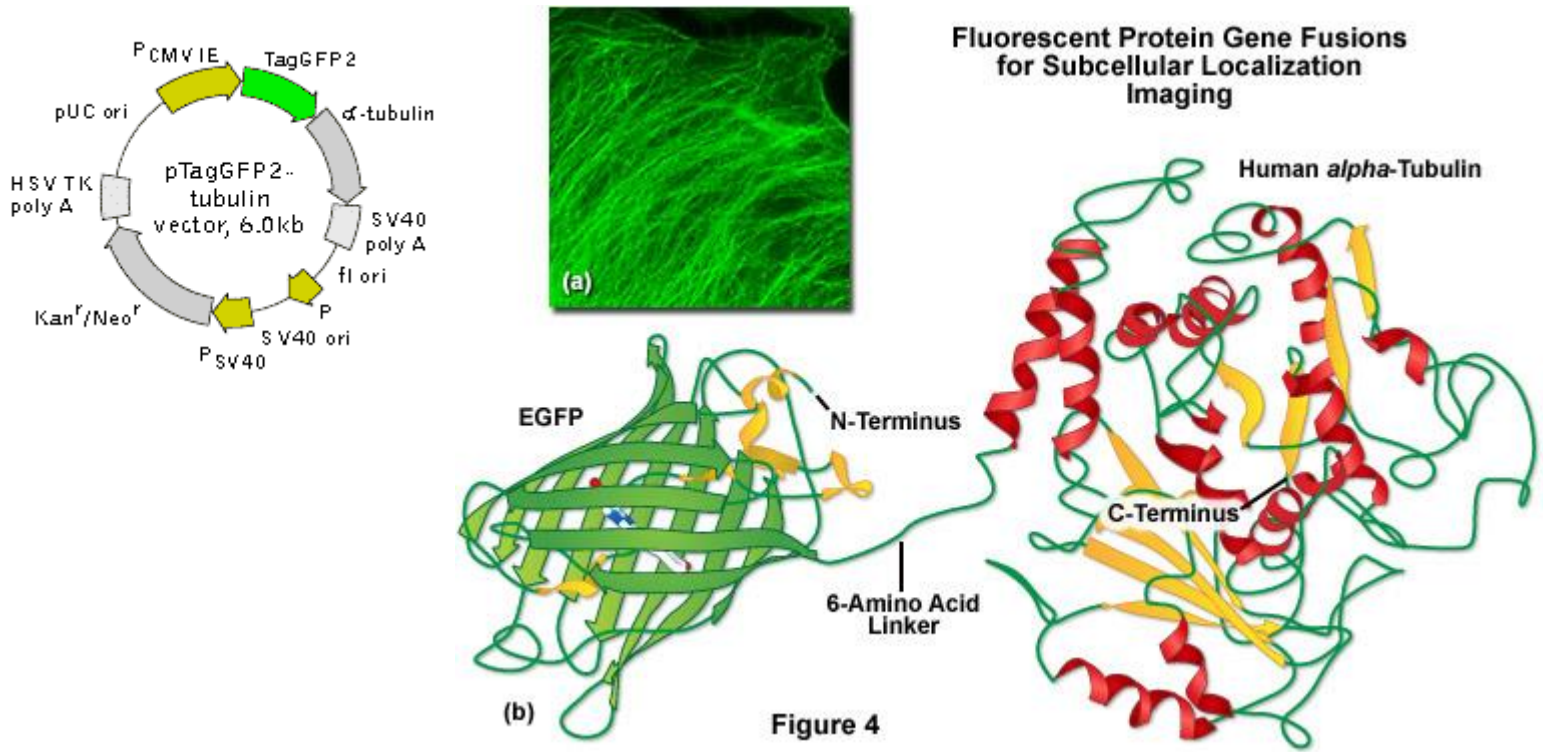
# Protein Function

- RNA Interference



# Protein Function

- Green Fluorescent Protein (GFP)



# Questions ?