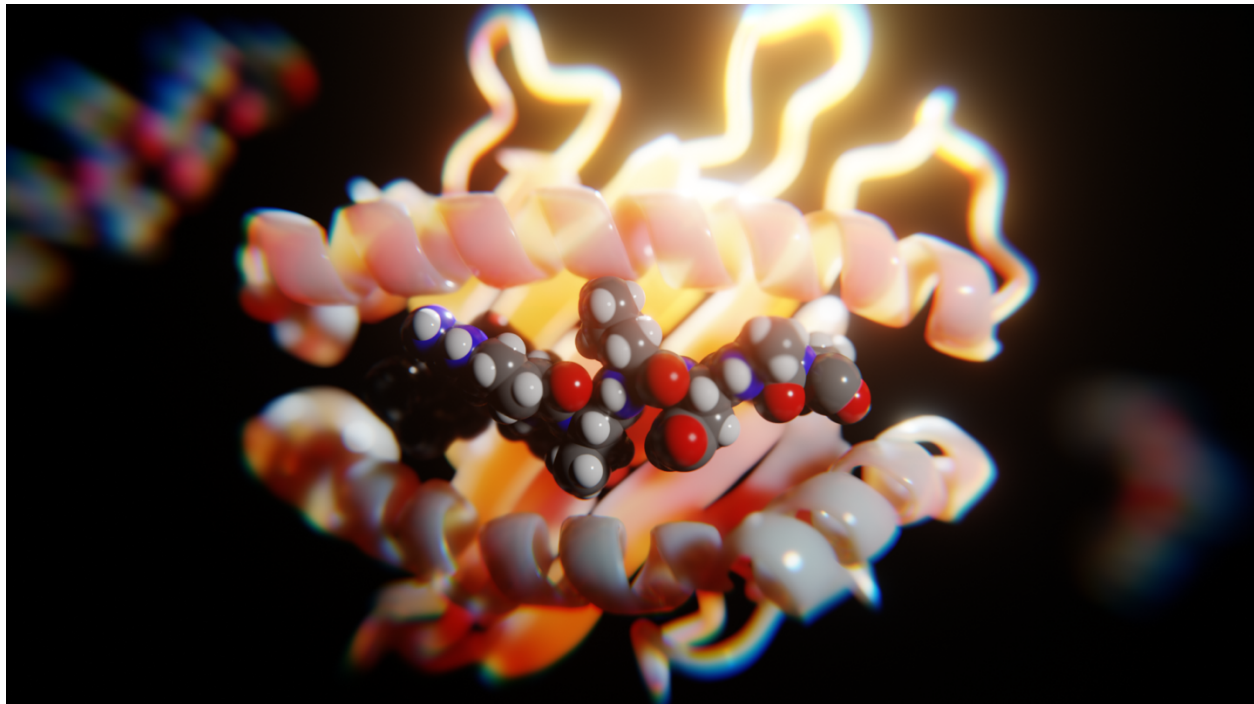# Lesson 1: The 3D Viewport and Lighting

Day: Jan 18, 2023
Time: 10:30 – 11:30AM
Room: 56-154

Lesson Summary

For many of you, this will be your first introduction to the world of 3D modeling. At first it would feel foreign, and you will likely find yourself wondering, how can I possibly remember all this? Don't worry! Everyone feels this way when they first start.

Class Schedule

1.	Course Intro	5 min
2.	Converting a structure to a 3D model	10 min
3.	Manipulating a structure in Blender	10 min
4.	Experimenting with Blender materials	10 min
5.	Experimenting with lighting	5 min
6.	Adding scenery	3 min
7.	Final render settings	5 min
8.	Post processing with the compositor	5 min
9.	Render your image	2 min
	Total Time	50 min

# 1. Converting a structure to a 3D model (10 min)

Before we jump into Blender, we will need a structure. In this lesson, we will be rendering the MHC structure from assignment 2 of 20.420. Some of you may remember it. As this is the first class, many of you won't have the software downloaded yet so I have provided the file. So, you can sit back and relax for this section as I demo it.

- Download ChimeraX: https://www.rbvi.ucsf.edu/chimerax/
- Download the PDB file: https://files.rcsb.org/download/2BVP.pdb
- Open the PDB in ChimeraX
  - Delete waters → `delete :HOH`
  - Delete everything but the MHC → `delete /B /A:181-274`
  - Hide interacting amino acids → `hide /A atoms`
  - Increase cartoon width → `cartoon style width 3.5`
  - Increase cartoon thickness → `cartoon style thickness 1`
  - Update colors → `color byelement`
  - Add in hydrogens → `addh /C`
  - Depict peptide as spheres → `style /C sphere`
  - Save as a model → `save structure.glb format gltf instancing true`

2. Manipulating a structure in Blender (15 min)

Now that you have a model of your structure, we can open it in Blender and begin practicing with the interface.

- Download Blender: https://www.blender.org/download/
- Open Blender
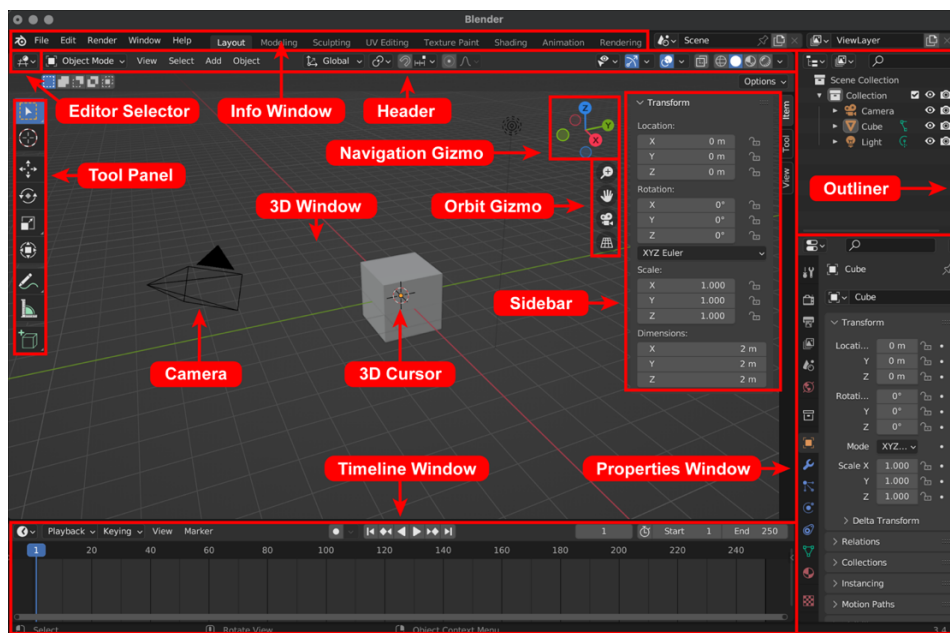
Figure 1. Getting to know the 3D viewport. While it is definitely not necessary to memorize these names, I will use these terms in the tutorial.

- Delete default cube → `X` → `d`
- Import the structure → `File` → `Import` → `glTF (.glb/.gltf)`
- Clean up the structure
  - Create new collection called `Complex` → `C`
    - Create new collection called `MHC` → `C`
    - Create new collection called `Peptide` → `C`
  - Right-click and delete `2bvp.pdb`
  - Move `ribbons` to `MHC`
  - Right-click and delete `Atoms`
  - Move all `atoms` into `Peptide`
- Right click `MHC` and `Select Objects`
  - Set the origin to your object → `Object` → `Set Origin` → `Origin to Geometry`
- Center the object at World Origin
  - Click on an `orthographic viewpoint` in the `Navigation Gizmo`
  - Move the object with `Move` in the `Tool Panel`
  - Repeat with the other `orthographic viewpoints` in the `Navigation Gizmo`
- Scale `Complex` by selecting `Scale` in the `Tool Panel`
- Fit to camera view
  - `View (Sidebar)` → `Camera to View`
  - `Scale` and `Rotate` and `Move` in the `Tool Panel`

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3. Experimenting with Blender materials (10 min)

- Switch to render view by selecting Viewport Shading in the Header bar
  - You will notice that the colors are dull and uninteresting
- Adjust the colors of the MHC by selecting it and going to the Material Properties tab in the Properties Window
  - Press New
  - Subsurface = 2.0
  - Roughness = 0.2
  - Check Screen Space Refraction
  - Check Subsurface Translucency
- Adjust the colors of each atom (you only of to changed one of each type)
  - Metallic = 0.0
  - Roughness = 0.2
  - Base Color to full saturation

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4. Experimenting with Lighting (10 min)

- Change the background to black in World Properties of the Properties Window
  - Color → Hex → 000000
- Select Light
- Change the light type in the Object Data Properties Tab in the Properties Window

- o Area
- o Adjust the light to your liking
- Add back light
    - o Duplicate Light with Shift+D
    - o Move it behind the protein
    - o Change the Power to 750

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5. Adding scenery (2 min)

- The scene would look better if there were more substrates floating in the background
- In the Outliner, Right-click Peptide and Duplicate Collection
- Select the new peptide Right-click → Select Objects
    - o Maneuver it to the back of the scene
- Repeat this as many times as you'd like

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6. Final render settings (5 min)

- Adjust the camera settings
    - o Select Camera in the Outliner panel
    - o Select the Object Data Properties Tab in the Properties Window
    - o Check Depth of Field
    - o Expand the Depth of Field option
        - ▪ Expand Aperature
            - F-Stop = 0.05
    - o The image now looks blurry
    - o Expand Viewport Display
        - ▪ Select Limits
        - ▪ A green crosshair just appeared in the 3D Window
            - Maneuver it to wherever you would like to be in focus
- Go to Render Properties tab in the Properties Window and check:
    - o Ambient Occlusion
    - o Bloom
    - o Screen Space Reflections
    - o Color Management → Look → High Contrast

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7. Post processing adjustments in the compositor (10 min)

- Go to the Compositing tab in Info Window
- Check Use Nodes
- Shift+A → Search → Lens Distortion
    - o Drag and drop it between Render Layers and Composite
    - o Dispersion = 0.175
- Shift+A → Search → Glare
    - o Drag and drop it between Render Layers and Lens Distortion

- o   Streaks → Fog Glow
- o   Medium → High

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8. Render your image (2 min)

- Render the image
    - o   Select Render from the Info Window
    - o   Render Image
    - o   We are using Eevee, which is lower quality but very fast. It should finish in less than a minute.