

# How to 3D Print Molecules

Printing molecules is a fun and exciting way to see all of the structural complexity in the molecules that make up the world we live in!

## How can I make a 3D print of a molecule?

Making a 3D print of a molecule is easier than you think! What will you print?

## How do I get started?

### FIND YOUR MOLECULE

#### The Pubchem Project

- Great for small molecules of few atoms
- <https://pubchem.ncbi.nlm.nih.gov/>

#### Protein DataBank

- Best for large biologically related molecules.
- <http://www.rcsb.org/pdb/home/home.do>

### PICK YOUR FAVORITE FORMAT!

You can choose what you want your molecules to look like! The different formats you see in your textbook can be 3D printed.

- Show atoms, bonds, or general shape
- Check out the back to decide which format would work for you!

### OR: FIND FILES THAT ARE ALREADY READY TO PRINT

#### Thingiverse

- 3D printable files of anything and everything
- [www.thingiverse.com](http://www.thingiverse.com)

#### NIH 3D Print Exchange

- 3D printable files of models related to biomedical sciences
- <https://3dprint.nih.gov/>

### THE LIBRARY CAN HELP

At the D. H. Hill Makerspace, you can print your molecules yourself. You can also consult with Makerspace staff to include more advanced features or troubleshoot your design.

### HUNT LIBRARY MAKERSPACE

4th Floor of Hunt Library

#### Hours:

Sunday–Friday: 2 – 7 p.m.

### D. H. HILL LIBRARY MAKERSPACE

1st Floor of D. H. Hill Library

#### Hours:

Sunday–Thursday: 10 a.m. – 10 p.m.  
Friday: 1 p.m. – 8 p.m.

[go.ncsu.edu/make](http://go.ncsu.edu/make)

### QUESTIONS?

If you'd like to learn more about 3D Printing at NCSU Libraries, contact us at [library\\_makerspace@ncsu.edu](mailto:library_makerspace@ncsu.edu)



# Creating a 3D Printable File using Chimera

## STEP 1: GET ACCESS TO CHIMERA SOFTWARE

Chimera software is preloaded onto computers in the Makerspace

Download to your personal computer at <https://www.cgl.ucsf.edu/chimera/>

## STEP 2: LOAD YOUR MOLECULE INTO CHIMERA

In Chimera follow the sequence:  
File -> Fetch by ID -> Select PubChem or PDB -> Enter ID code for molecule

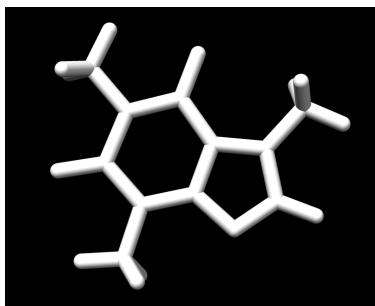
## STEP 3: CHOOSE YOUR FORMAT

Actions -> Atoms and Bonds: Here you can choose stick, ball and stick, or sphere format

Actions -> Surface -> Show: This will show the surface format

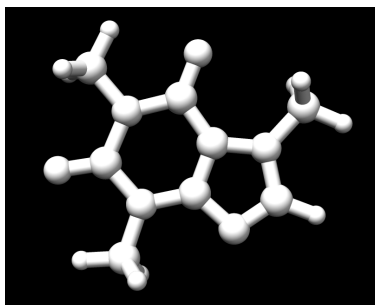
You can make your surface look nice, ask about how!

## FORMATS



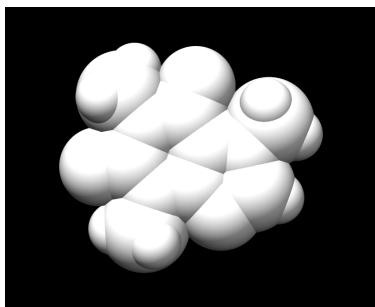
### Stick Format

- Bonds represented as sticks, atoms implied
- Can clearly see bonding
- Fragile
- Difficult to print small
  - Make sure your molecule is large enough
  - Adjust thickness of sticks in Chimera
- Can require a large amount of support if molecule isn't flat



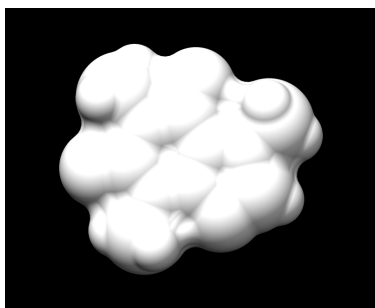
### Ball and Stick Format

- Bonds represented as sticks, atoms as spheres
- Can clearly see bonding and atoms
- Fragile, but slightly stronger than stick format
- Difficult to print small
  - Make sure your molecule is large enough
  - Adjust thickness of sticks in Chimera
- Can require a large amount of support if molecule isn't flat



### Sphere Format

- Atoms represented as large sphere, bonds implied
- Can clearly see atoms
- Somewhat similar to the actual shape
- Very sturdy
- Can print small or large
- Will require support material



### Surface Format

- Surface of the molecule based on modelling
- Can see atoms, not quite as clear as sphere format
- Most accurate representation of the actual shape
- Very sturdy
- Can print small or large
- Will require support material

## GO FURTHER

**Print your own lab equipment!**

**Design your own molecule!**

**Go beyond molecules!**

**Science!**

## Chimera Citation

Molecular graphics images were produced using the UCSF Chimera package from the Computer Graphics Laboratory, University of California, San Francisco (supported by NIH P41 RR-01081).

Relevant Journal Citation: Pettersen, E.F., Goddard, T.D., Huang, C.C., Couch, G.S., Greenblatt, D.M., Meng, E.C., and Ferrin, T.E. "UCSF Chimera - A Visualization System for Exploratory Research and Analysis." J. Comput. Chem. 25:1605-1612 (2004).

**Want Hands-on Access?**  
Take an orientation at the D. H. Hill Makerspace.