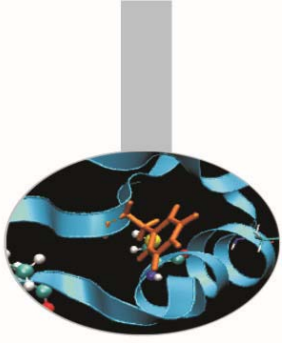
CINECA SCAI
SuperComputing Applications and Innovation



Blender

Francesca Delli Ponti – f.delliponti@cineca.it
SuperComputing Applications and Innovation Department

PRACE

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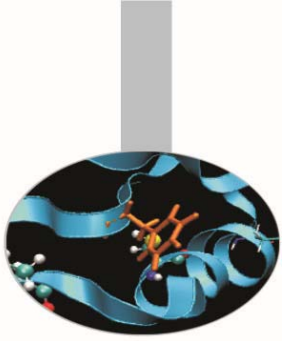
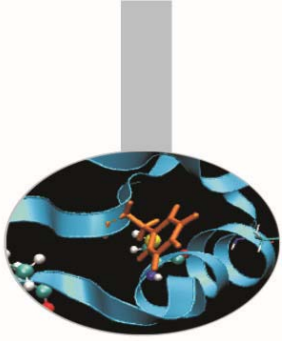


BLENDER HISTORY

“Blender is a professional free and open-source 3D computer graphics software product used for creating animated films, visual effects, art, 3D printed models, interactive 3D applications and video games. Blender's features include 3D modeling, UV unwrapping, texturing, raster graphics editing, rigging and skinning, fluid and smoke simulation, particle simulation, soft body simulation, sculpting, animating, match moving, camera tracking, rendering, video editing and compositing. It further features an integrated game engine.”

http://en.wikipedia.org/wiki/Blender_(software)



BLENDER HISTORY

"The Dutch animation studio Neo Geo and Not a Number Technologies (NaN) developed Blender as an in-house application. The primary author was Ton Roosendaal, who previously wrote a ray tracer called Traces for Amiga in 1989. The name Blender was inspired by a song by Yello, from the album Baby.
Roosendaal founded NaN in June 1998 to further develop and distribute the program.
... The Blender Foundation initially reserved the right to use dual licensing, so that, in addition to GNU GPL, Blender would have been available also under the Blender License that did not require disclosing source code but required payments to the Blender Foundation. However, they never exercised this option and suspended it indefinitely in 2005.[5] Currently, Blender is solely available under GNU GPL.

Suzanne

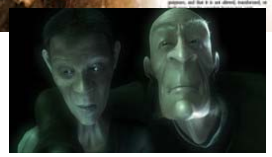
... As a sort-of easter egg, a last personal tag, the artists and developers decided to add a 3D model of a chimpanzee. It was created by Willem-Paul van Overbruggen (SLiD3), who named it Suzanne after the orangutan in the Kevin Smith film Jay and Silent Bob Strike Back.
Suzanne is Blender's alternative to more common test models such as the Utah Teapot and the Stanford Bunny. A low-polygon model with only 500 faces, Suzanne is often used as a quick and easy way to test material, animation, rigs, texture, and lighting setups, and is also frequently used in joke images[citation needed]. Suzanne is still included in Blender. The largest Blender contest gives out an award called the Suzanne Awards."

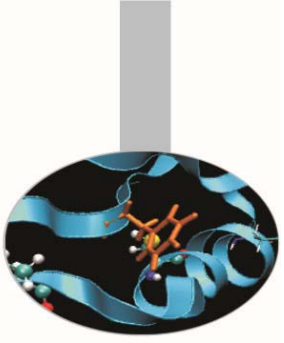
http://en.wikipedia.org/wiki/Blender_(software)

BLENDER FOUNDATION

BLENDER
http://www.blender.org
https://www.blender.org/features/
http://www.blender.org/features/projects/

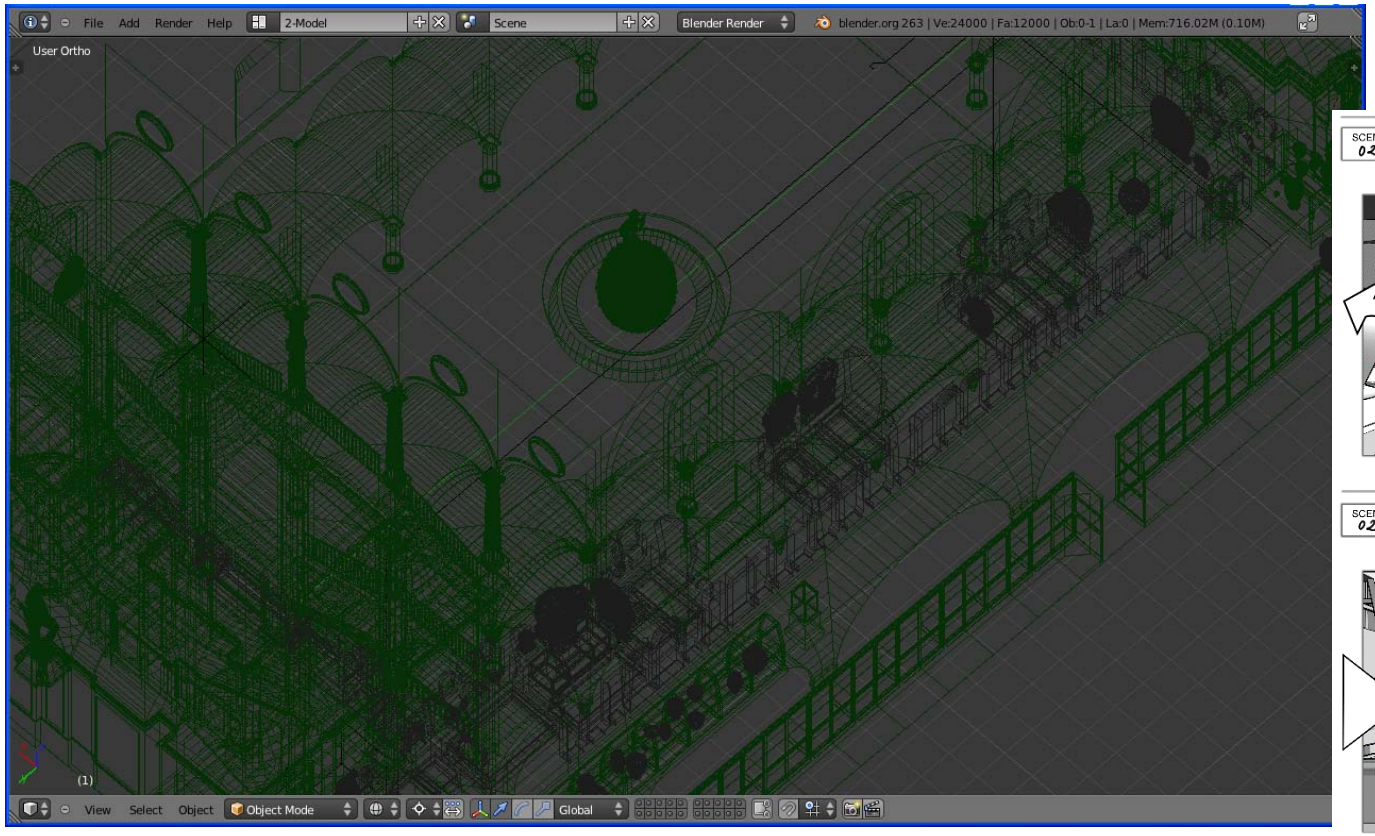
http://gooseberry.blender.org/





BLENDER – CINECA APPLICATIONS

- SCENE:



Apa the Etruscan and 2700 years of Bolognese History
(in ACM SIGGRAPH ASIA 2011, Posters and Sketches Proceedings, Hong Kong, 2011)

PRACE

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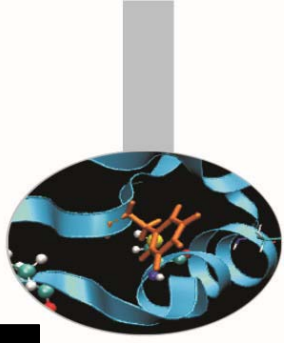
BLENDER – CINECA APPLICATIONS

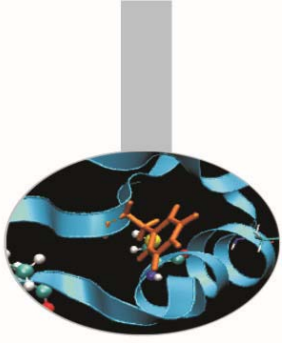
- RENDER:

Apa the Etruscan and 2700 years of Bolognese History
(in ACM SIGGRAPH ASIA 2011, Posters and Sketches Proceedings, Hong Kong, 2011)

http://www.cineca.it/it/video/apa-alla-scoperta-di-bologna-i-primi-minuti-del-cartoon-3d



Blender 2.78

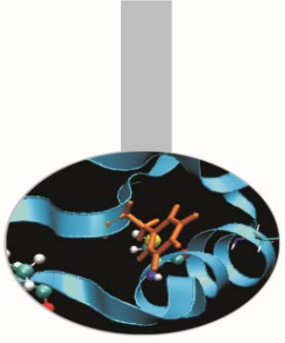


WHY BLENDER?

Integrate features of scientific software that not have visualization as main purpose

Moreover:

- open source software (no cost to use it)
- many features (now it could be consider a complete software)
- if something is missing, a large community continuously solves problems and add features and specific modules



ALTERNATIVE

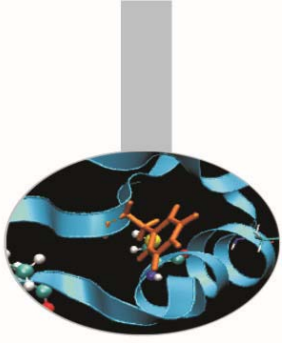
Many external renderers exist, for scientific purpose is wide used

POV-RAY
http://www.povray.org/

“It is a ray tracing program which generates images from a text-based scene description” and it “does not include a modeling feature; it is essentially a pure renderer with a sophisticated model description language.”

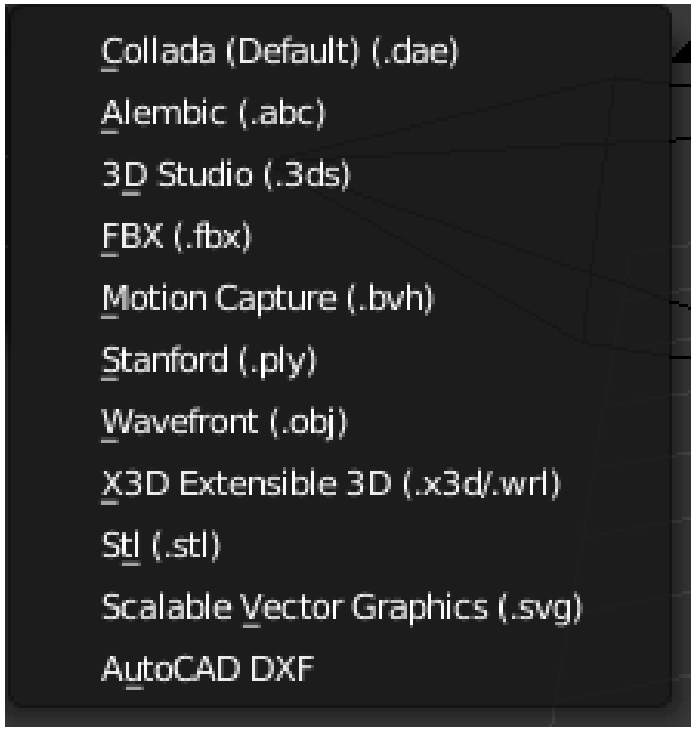
https://en.wikipedia.org/wiki/POV-Ray

Blender has much more possibility than a simply renderer!



HOW TO ECHANGE FILES

Blender has many format files that could be imported:



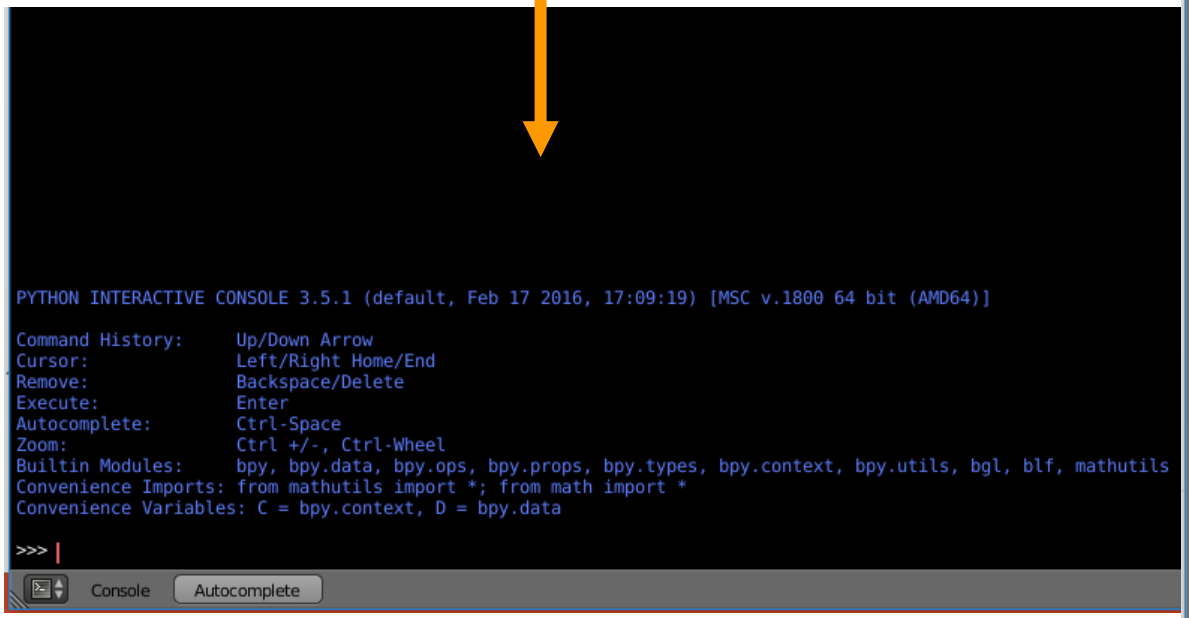
just some examples, but the format files that give best result are:

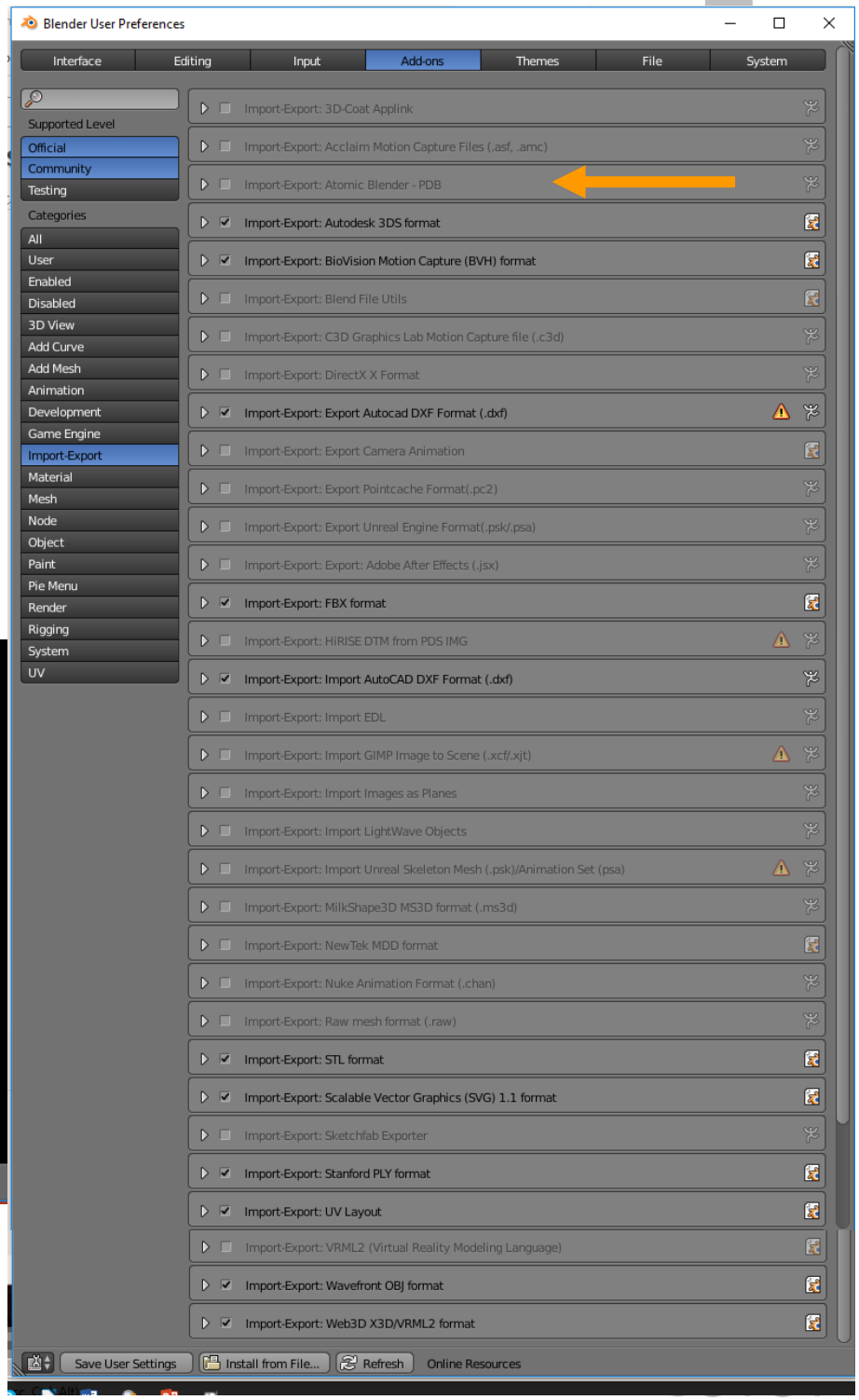
- Obj
- X3d
- Stl (only for geometry)

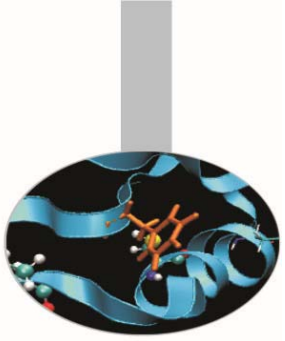
HOW TO ECHANGE FILES

Others modules for different format files could be activated

Or
programmed using the Blender python console







PROBLEMS

Every software has its specific format file to export models and simulations, so tests are fundamental!!!!

Furthermore not always the object created in a specific software could be exported correctly or at all.

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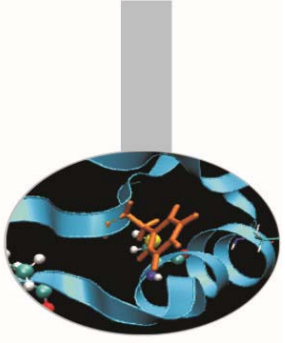

Basis of Modeling

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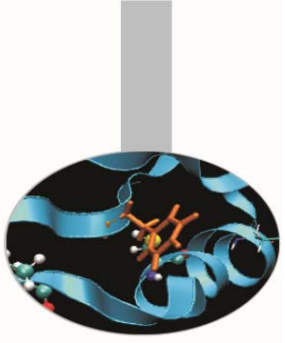
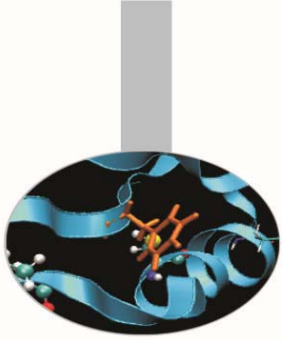


SCENE

The scene includes points, lines and polygons, they all exist inside a three dimensions space defined by X, Y, Z axis.

In order to compose a scene is necessary:

- define 3D object geometry – OBJECT MODELING
- define texture and material of all objects – SHADING AND TEXTURING
- define scene light for realistic final render - LIGHTING
- realize frame (RENDERING) or export created models in format file for real time navigation



OBJECT MODELING

- **3D models created with Blender**
- **3D models created with others software and imported in Blender**
- 3D models from laser scanner

software to manage point clouds

http://meshlab.sourceforge.net/

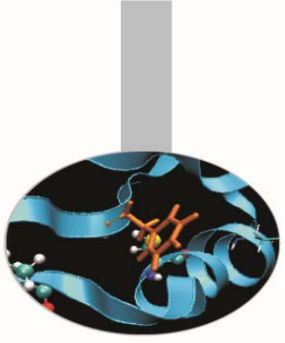
- 3D models from photographs

software to create models from photographs

http://www.photomodeler.com

http://www.arc3d.be/

http://www.agisoft.com/



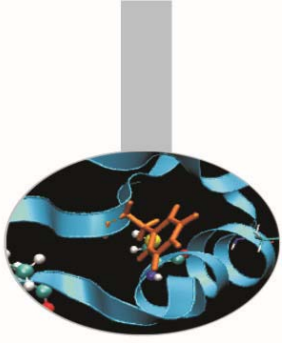
EXAMPLES OF IMPORTED MODELS

Terrain:

-terrain created with osgdem
http://openscenegraph.sourceforge.net/documentation/OpenSceneGraph/doc/osgdem.html

-building with the software City Engine
http://www.esri.com/software/cityengine

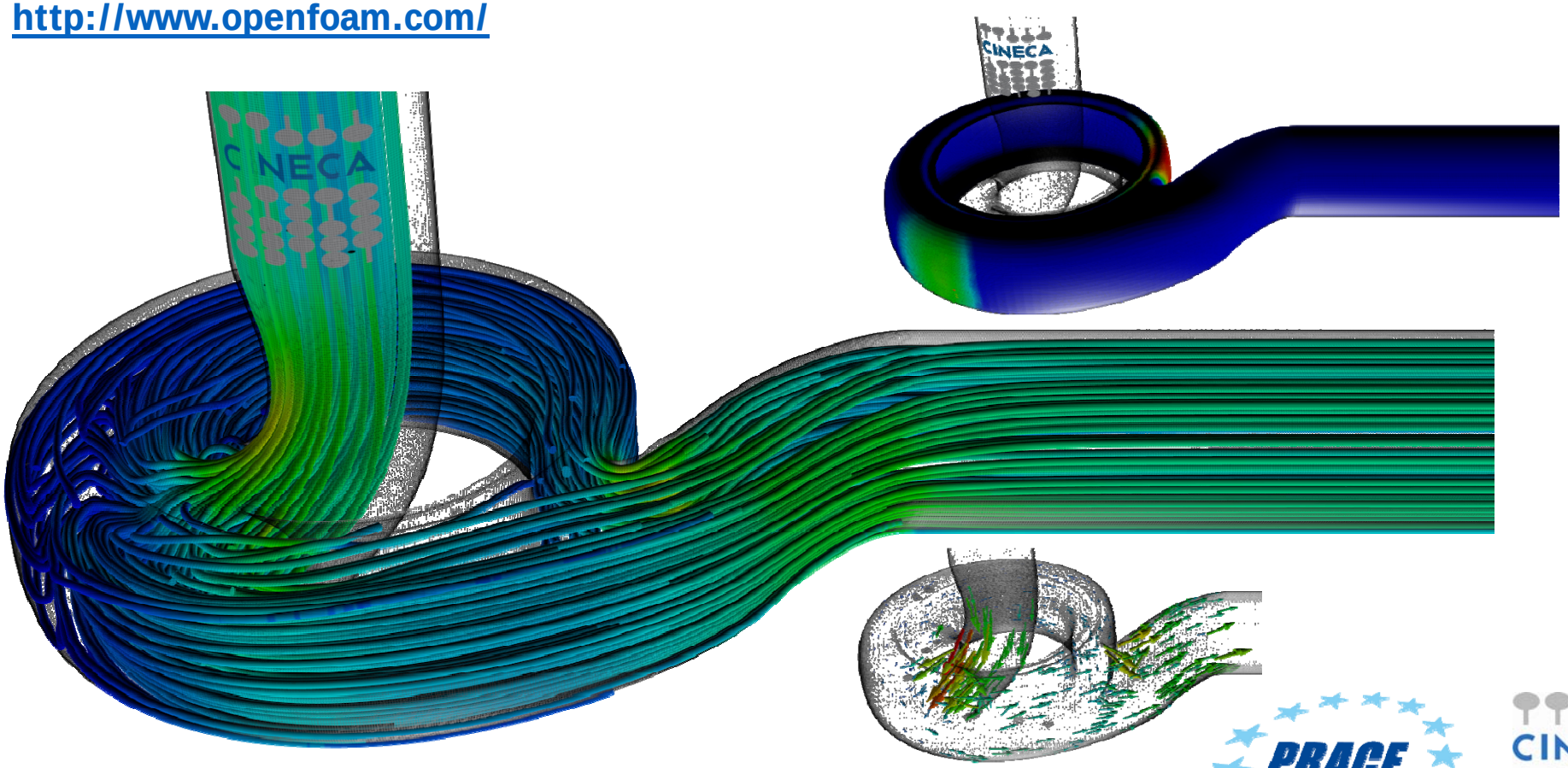
exchange format file: obj



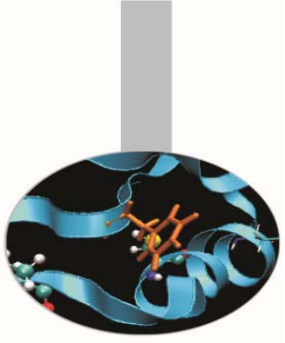
EXAMPLES OF IMPORTED MODELS

Fluid Dynamics simulation:

-Pump and its flow inside, the model and the simulation were made in OpenFOAM
http://www.openfoam.com/



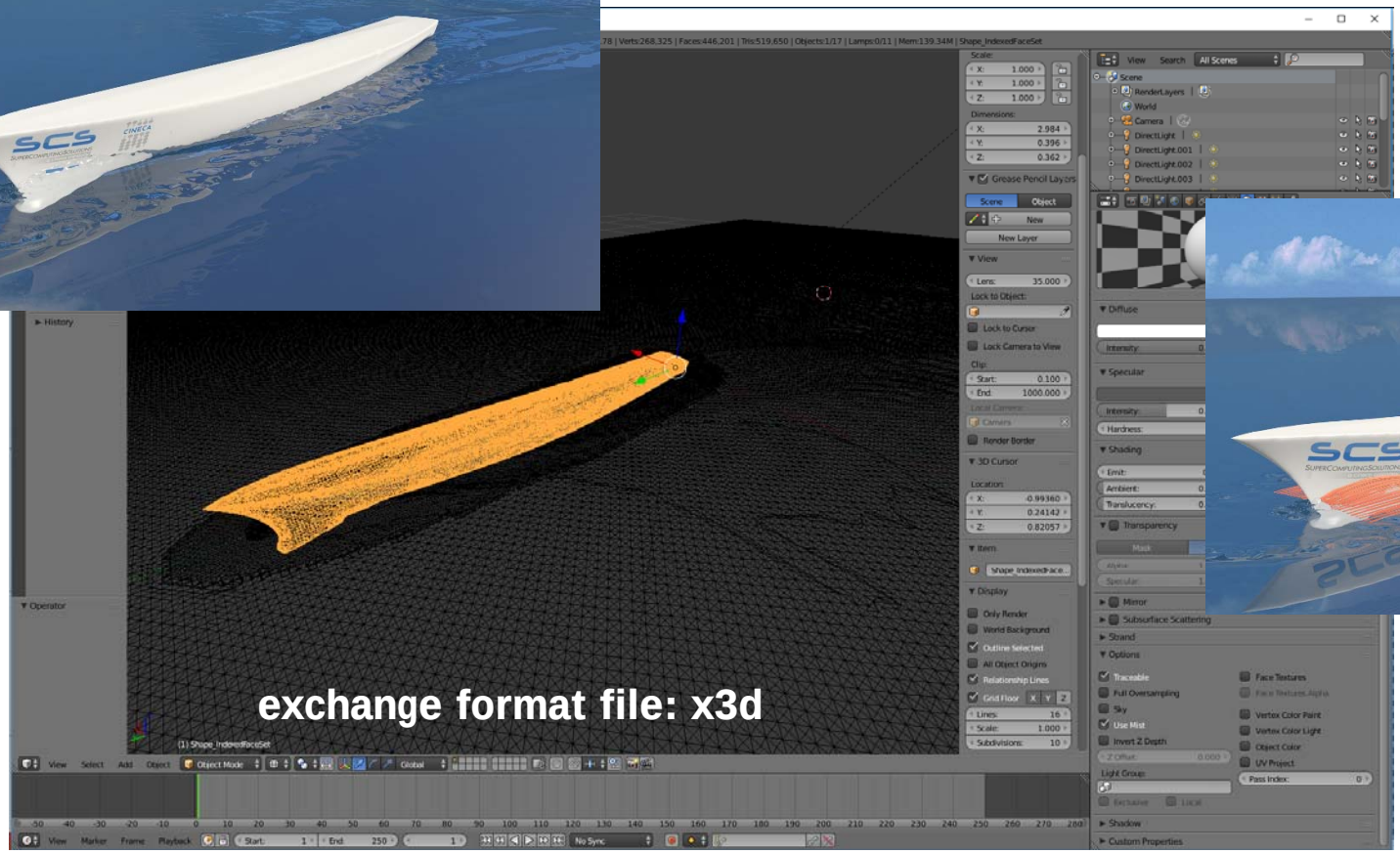
exchange format file: x3d

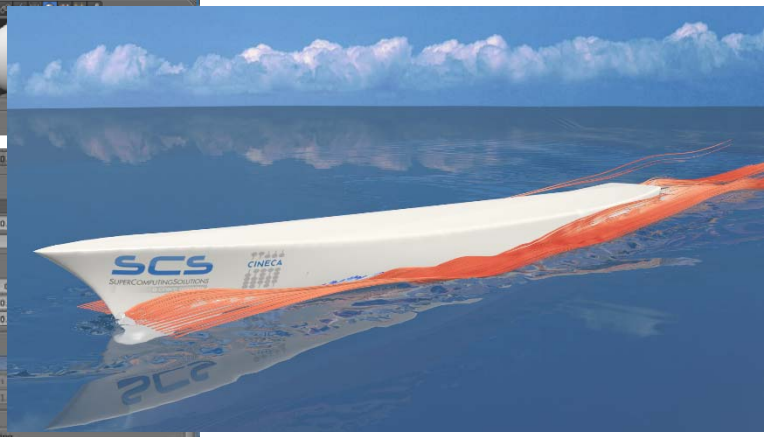


EXAMPLES OF IMPORTED MODELS

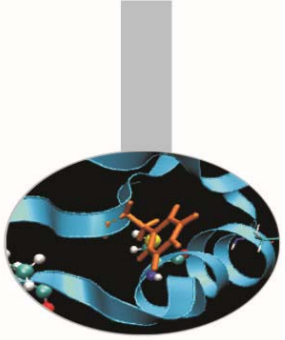
Fluid Dynamics simulation:

-Simulation of hull movement during navigation, made in OpenFOAM
http://www.openfoam.com/





exchange format file: x3d



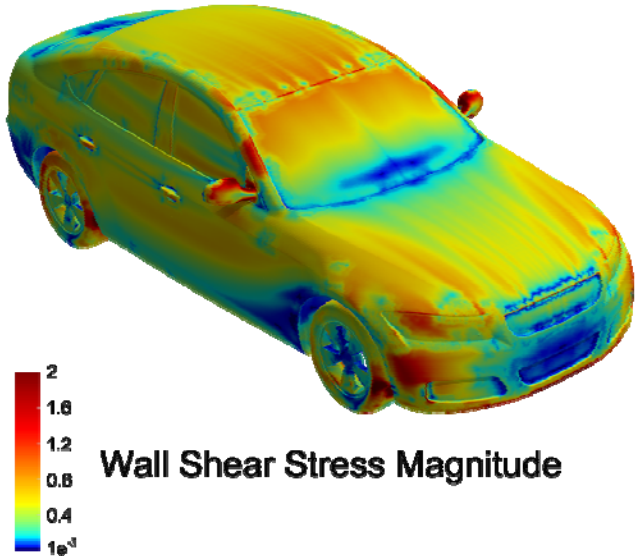
EXAMPLES OF IMPORTED MODELS

Cars model simulation:

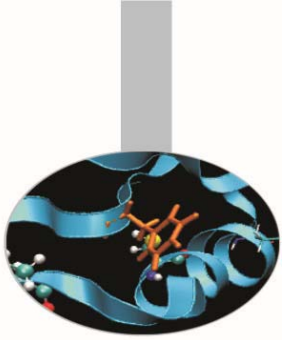
The reconstructed wall shear stress through Reduced Order Modelling on DrivAer model (ezRB), courtesy of Angela Scardigli and Haysam Telib - Optimad engineering srl, Filippo Salmoiraghi and Gianluigi Rozza - SISSA mathLab

- Model and simulation were made by OpenFOAM
http://www.openfoam.com/

The exported file from OpenFOAM was in VTK (http://www.vtk.org/), this couldn't be imported directly inside Blender, we passed through Paraview
http://www.paraview.org/
in order to have a model readable in Blender.



exchange format file: VTK → elaboration in Paraview → x3d Blender input file

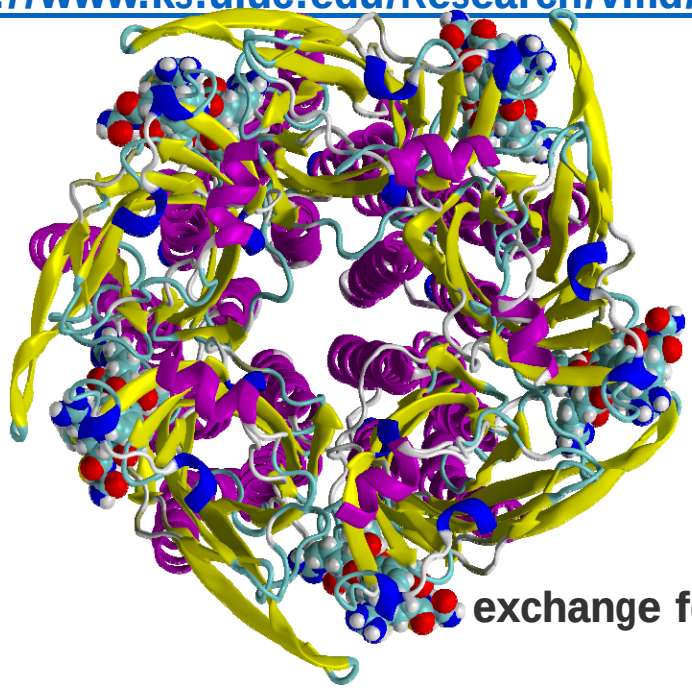


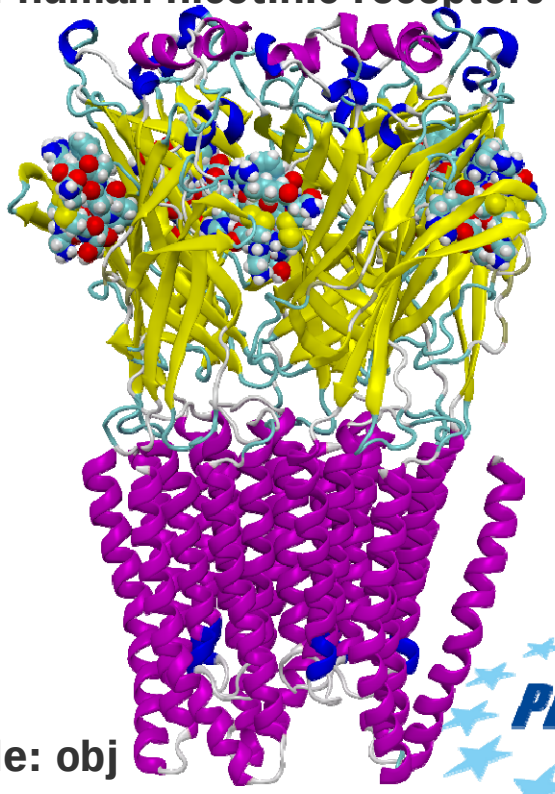
EXAMPLES OF IMPORTED MODELS

Molecule:

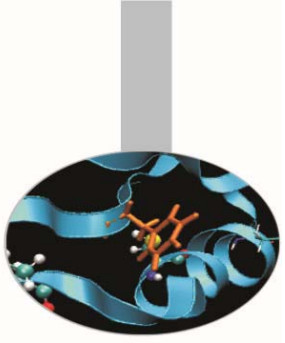
New homology model of human alpha7 nicotinic receptor generated by using the open TMD of the glutamate receptor (PDB entry: 3RIF) and the conotoxin-bound AChBP (PDB entry:2BYP) to model the LBD. Conotoxin in vdw representation. Thanks to: Letizia Chiodo, Therese Malliavin, Luca Maragliano, Grazia Cottone, Giovanni Ciccotti ISCRA Project HP10BEFJB6 :"Large scale motions in models of human nicotinic receptors"

- The model was made in VMD
http://www.ks.uiuc.edu/Research/vmd/





exchange format file: obj



OBJECT MODELING
3D MODELS

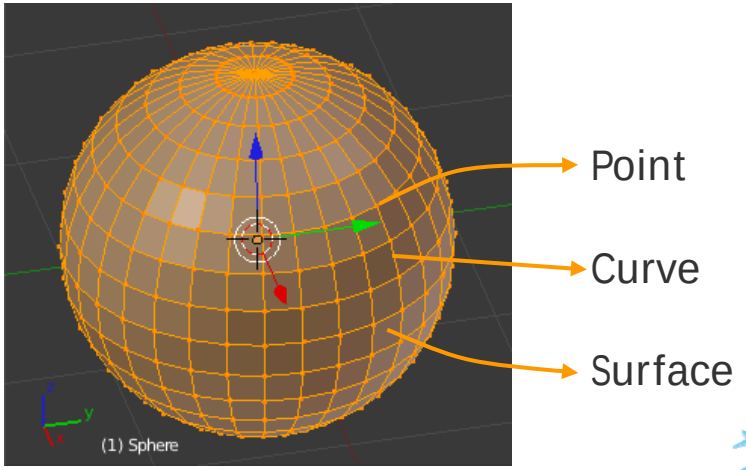
3D MODELS

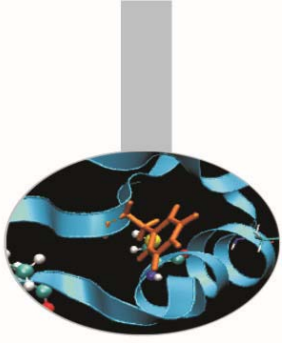
a representation of 3D OBJECTS by using points connected each others by curves that define surfaces like triangles, quadrilaterals or other type.

A number of polygons linked together is called polymesh (mesh) and so can define a 3D object.

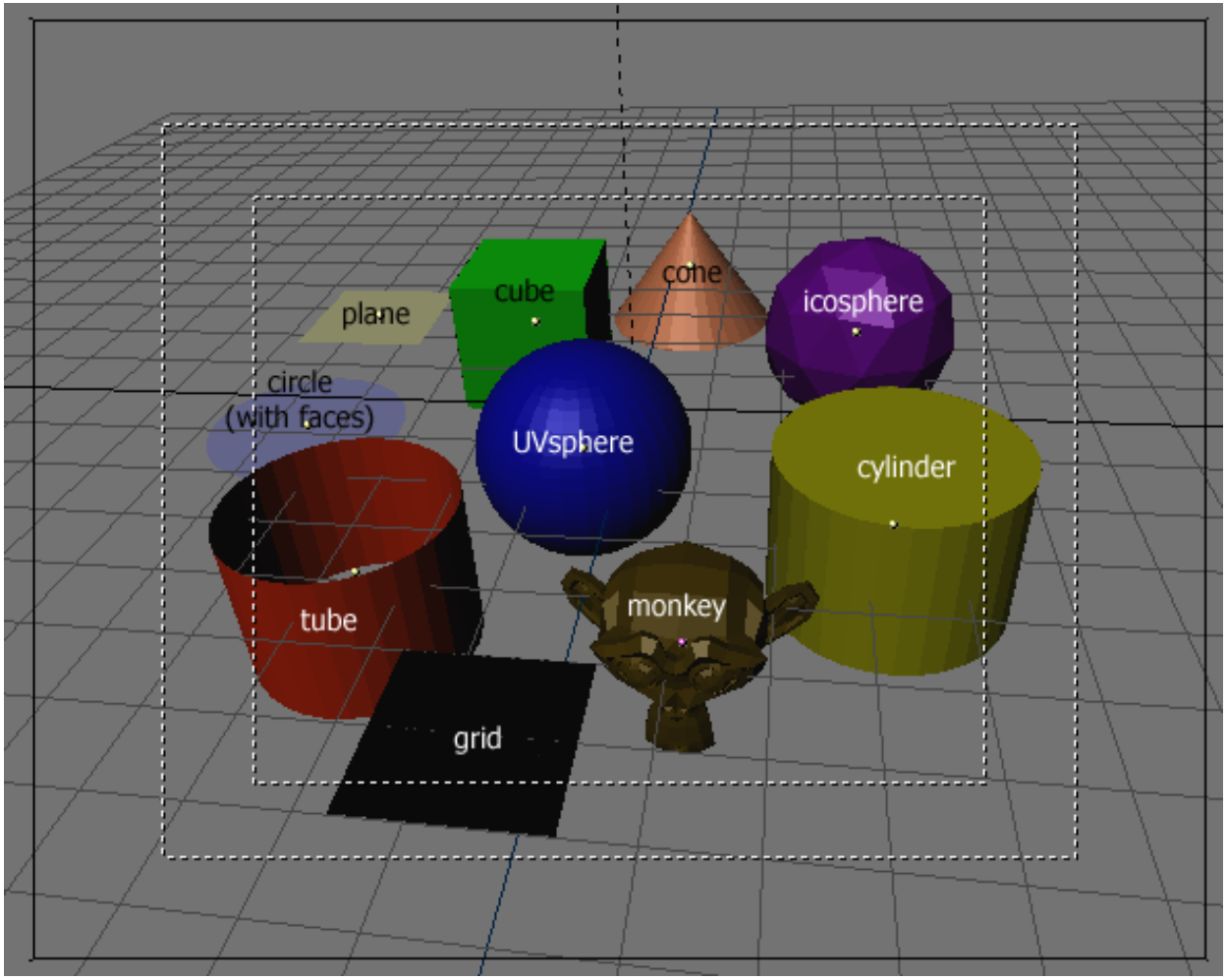
The coordinates are the geometric information, while the way in which the faces are made from the vertices are the topological information.

→ The set of faces is called Mesh.

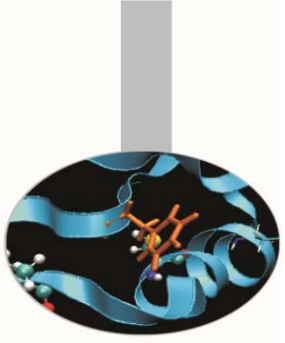




BLENDER MESH PRIMITIVES



OBJECT MODELING



- **Box modeling**

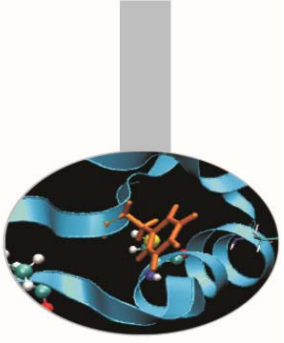
Suited for simple and organic shapes

Starting from simple Mesh type objects (i.e. cube, sphere, …) by changing vertices, edges and/or polygons 3D complex object can be created

- **Spline modeling**

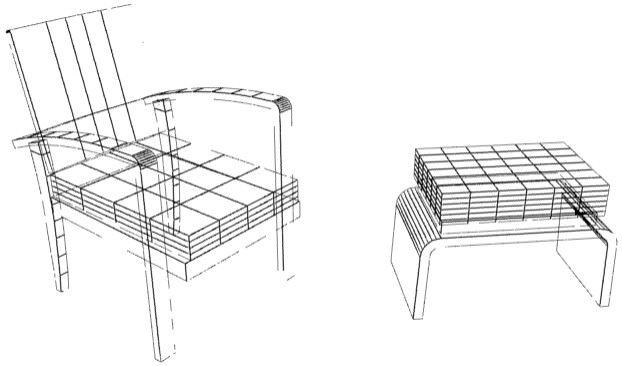
Suited for the design and mechanical models

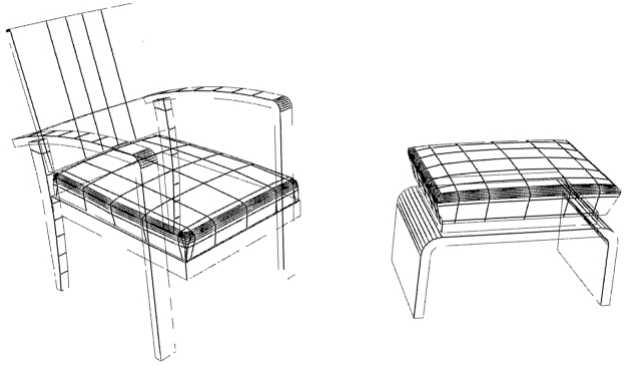
Starting from a 2D Spline, like a building's plant, with specific operations like extrusion it is possible to obtain 3D object

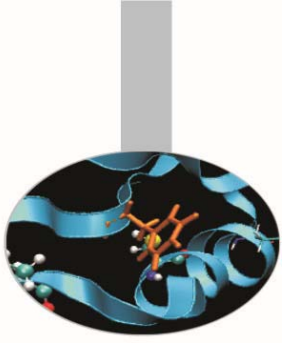


OBJECT MODELING

Example of BOX MODELING from “MUVI”, house of the Thirties



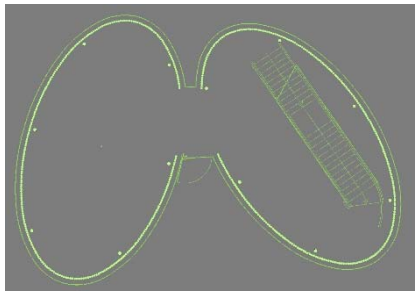


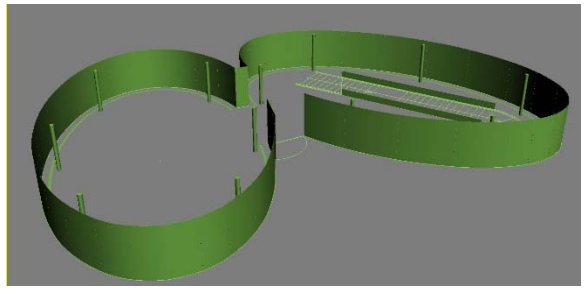


OBJECT MODELING

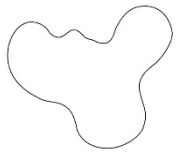
Example of SPLINE MODELING, extruded surface:

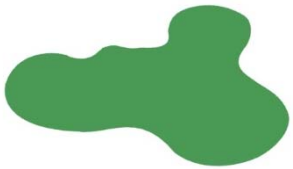
surface created by extending a curve along a direction.

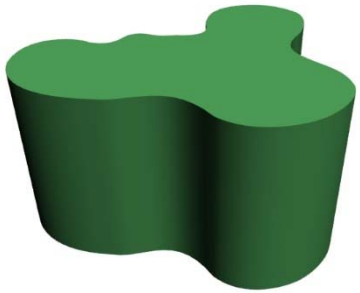


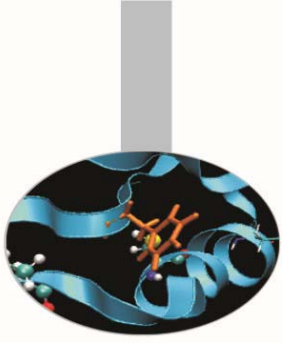


Example of extruded surface from “MUVI”, house of the Thirties:





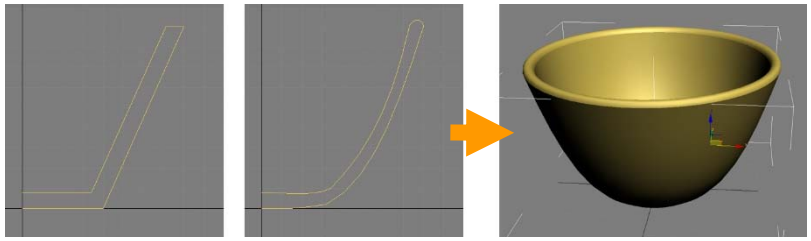




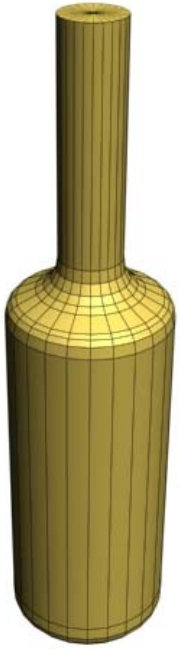
OBJECT MODELING

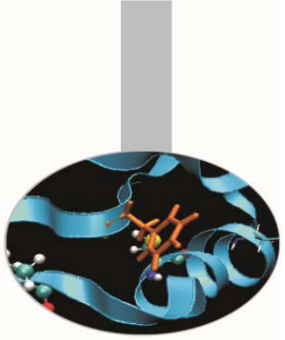
Example of SPLINE MODELING, revolved surface:

surface created using a simple curve, which is rotated about an axis to define a shape.



Example of revolved surface from "MUVI", house of the Thirties:





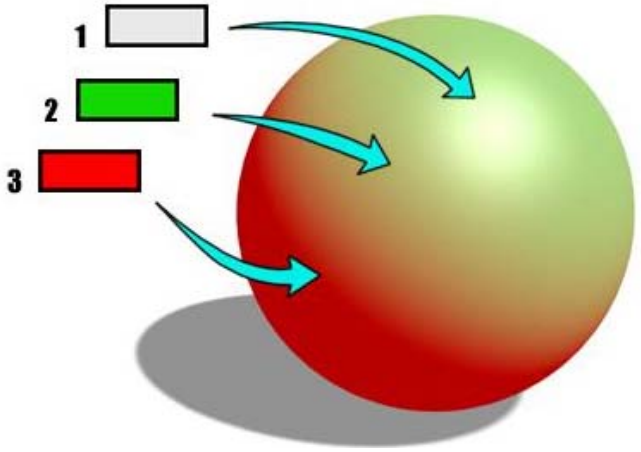
SHADING

Each object must be better identified with its own material.
In particular, the material must be defined with different attribute and properties, which identify the material behavior to light.
The shadow and the light parts make an object appear three-dimensional, other information, such as transparency, refraction, roughness or smoothness, give more information of objects.

The following are lighting components:

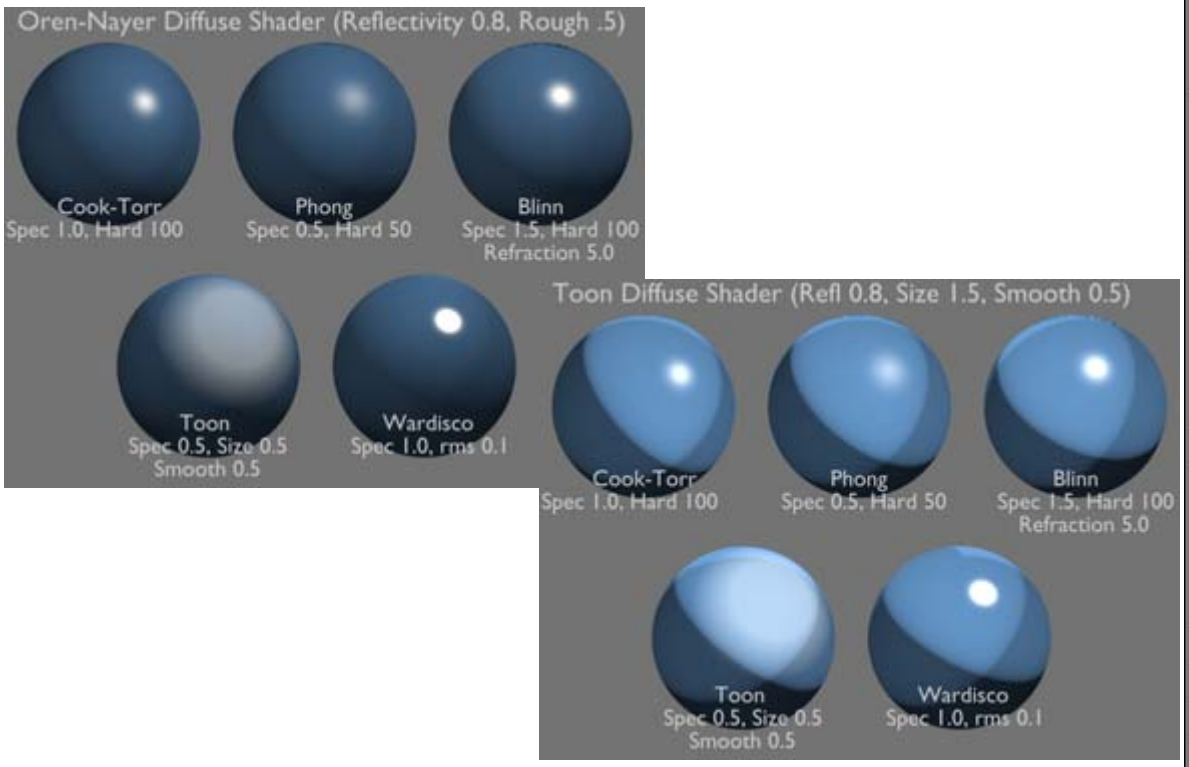
- Ambient (3), color of the shaded part of the material that is still affected by the indirect light;
- Diffuse (2), color of the part directly affected by the light;
- Specular (1), color of the part of a glossy object.

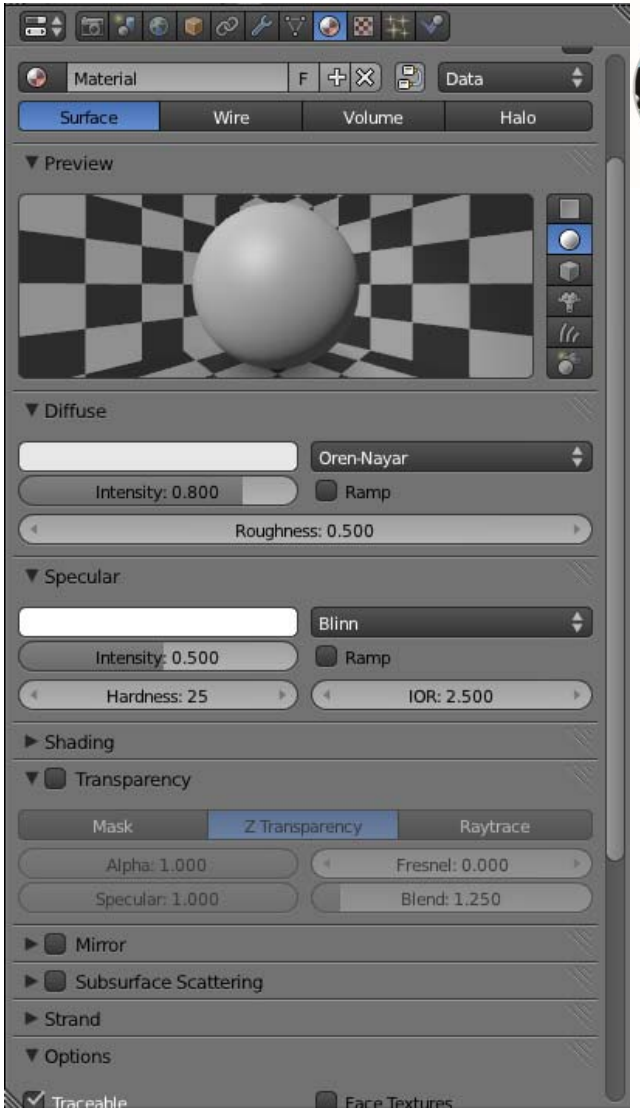
In reality,
Ambient and Diffuse
are the same color!

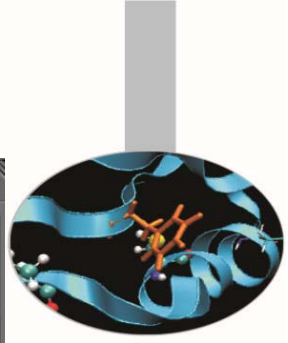


SHADING

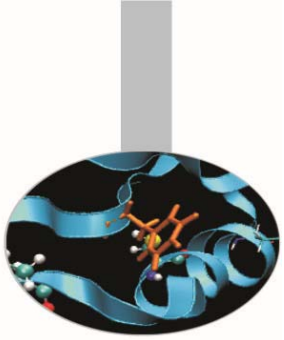
Examples of Blender shading:







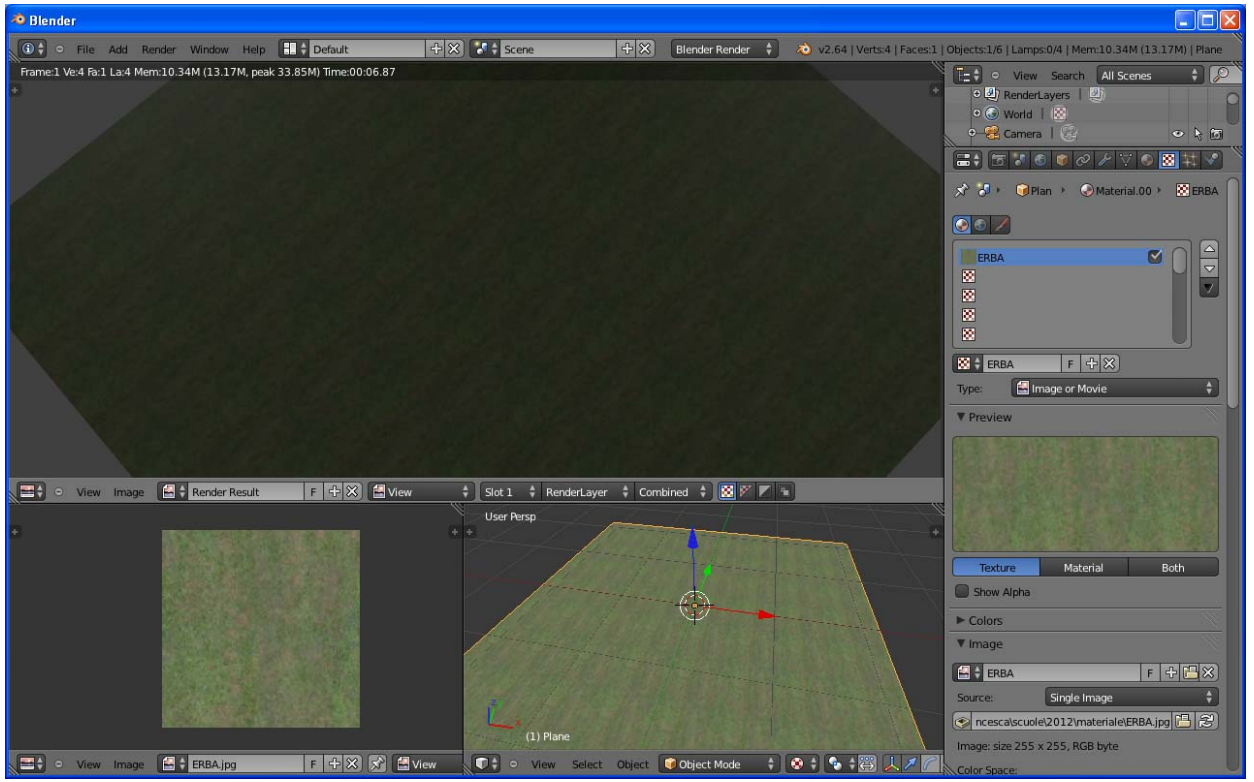
http://wiki.blender.org/index.php/Doc:2.4/Manual/Materials/Properties/Diffuse_Shaders

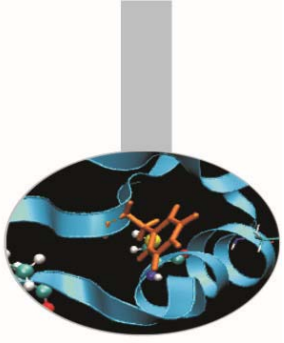


TEXTURING

Example of texture bitmap

The texture must be elaborated in order to have continuity up-down and left-right to be able to be repeated it over the entire object without discontinuity.

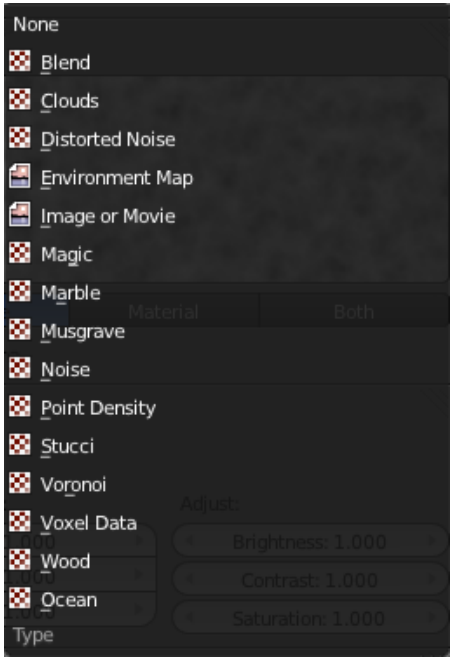


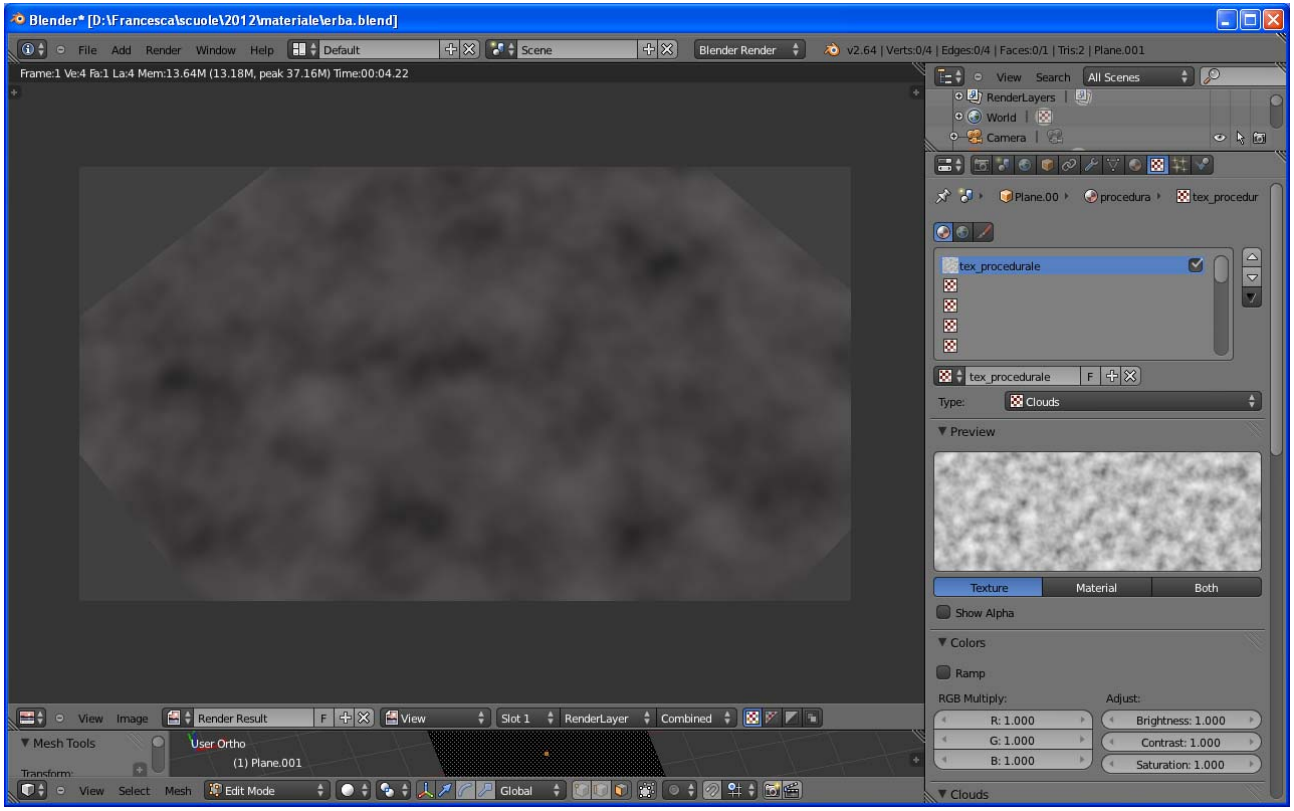


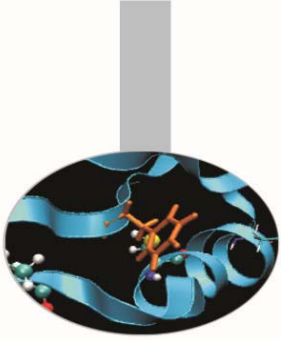
TEXTURING

Procedural texture
a computer-generated image created using an algorithm in order to create a realistic representation of natural elements.

Blender procedural texture:



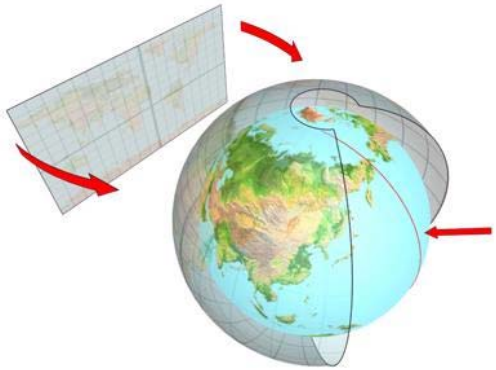




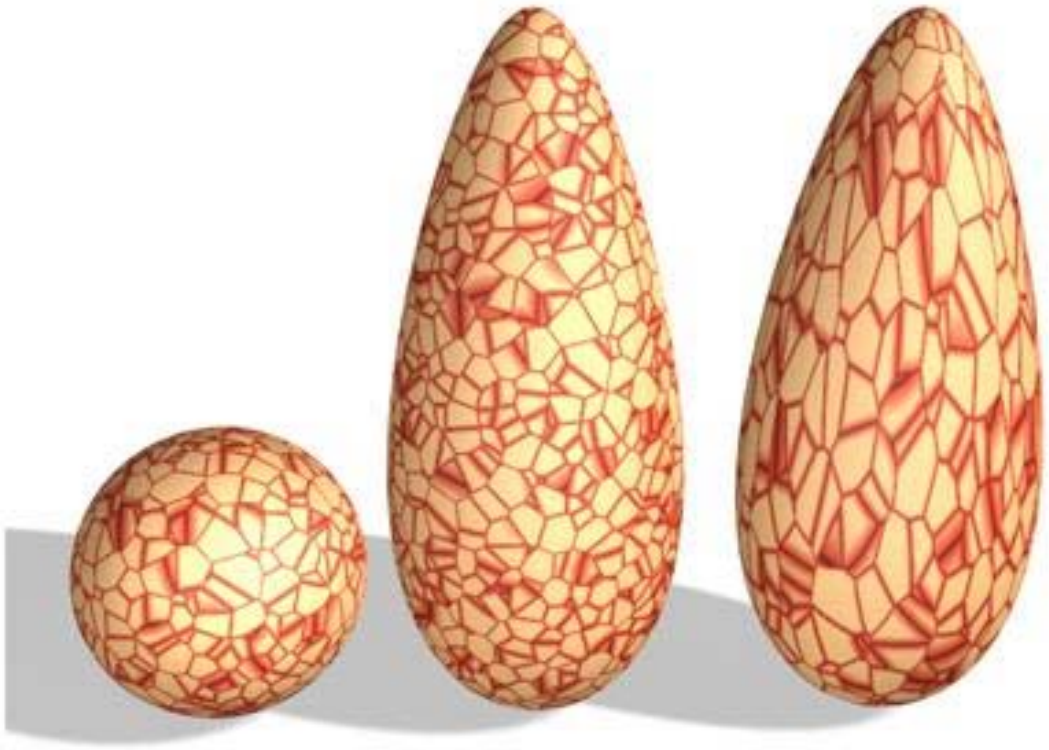
TEXTURING

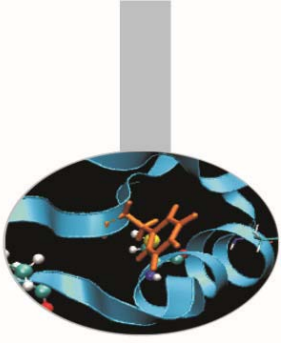
In order to correctly apply a texture must be set up texture coordinates, that define how is visualize on a object:

- **projection method,**
- **orientation,**
- **ripetition.**



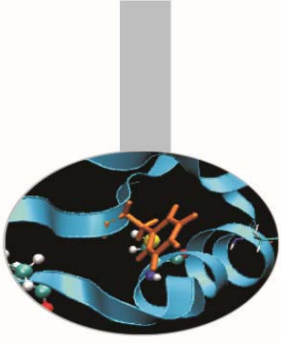
Example of a spheric projection





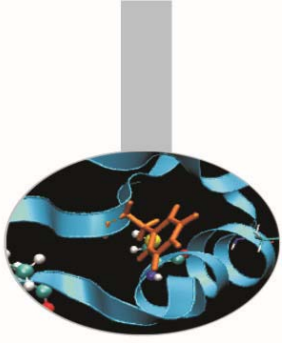
SHADING/TEXTURING

Example from “MUVI”, house of the Thirties



SHADING/TEXTURING

Example from “MUVI”, house of the Eighties



LIGHTING

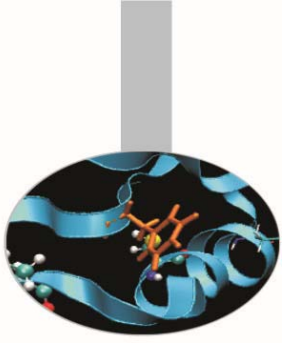
Lighting is a necessary step and is recommended even before the definition of the materials, in this way (with neutral material for all objects in the scene) can be better valuated the effect of the lights.
Below three general types of light that can be used:

- **Omni** (points of light that emit in all directions);
- **Spot** (cones of light used for simulate lamps or projectors);
- **Direct** (cylinders of light, usually used to simulate sunlight).

Each light can be customized by location and illumination intensity parameters, like decay, color, …

For real-time navigation is useful to develop the textures so that they contain lighting and rendering information through a procedure called Render to Texture:

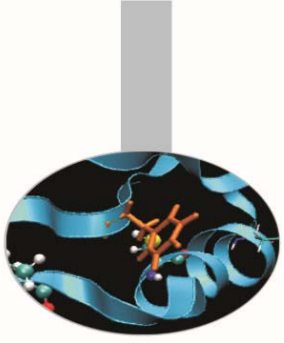
shadows and multi-texture are compacted into a single texture.



RENDERING

The set of operations required to transform a three-dimensional model (all 3D objects in the scene and their properties) in a two-dimensional visual representation (bitmap), depending on the view parameters and the type of the chosen mode of visual presentation .
By using algorithms that allow to make the effects of **Global Illumination** it is possible to achieve realistic effects of the scene.

GLOBAL ILLUMINATION definition:
It is a method (algorithm) of computation for light calculation in the scene which, takes in to account the light bounces from the neighboring surfaces, along with the normal illumination of direct lights. In Other words GI calculates the Indirect light also, thus it makes the renders more photo-realistic.

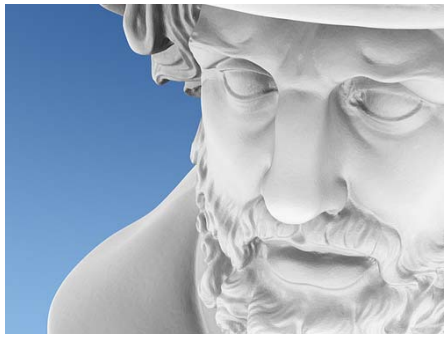


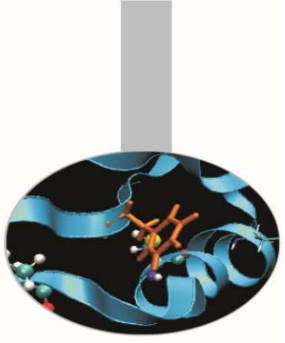
RENDERING

YafaRay
http://www.yafaray.org/

LuxRender
http://www.luxrender.net/

Aqsis Renderer
http://www.aqsis.org/





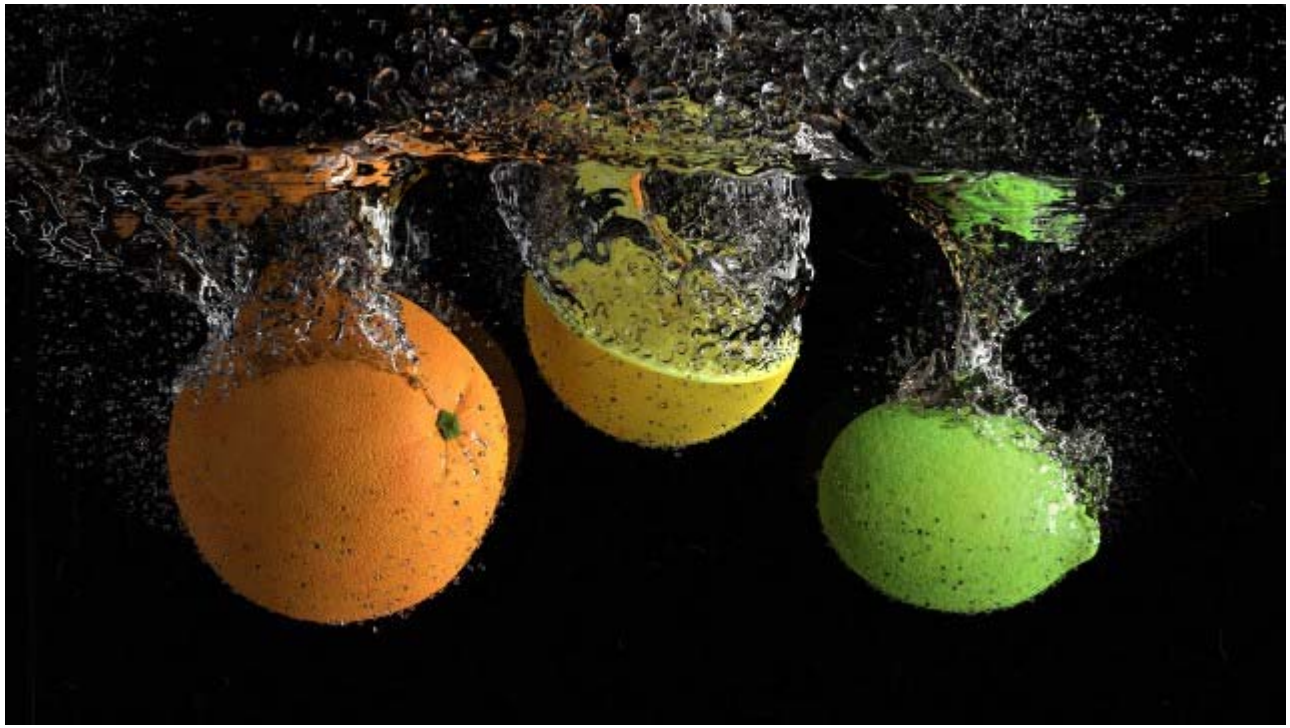
RENDERING

Blender has two type of render:

- Blender Render
- Cycles Render

Photorealistic Rendering

Blender now features a powerful new unbiased rendering engine called Cycles that offers stunning ultra-realistic rendering. The built-in Cycles rendering engine offers:

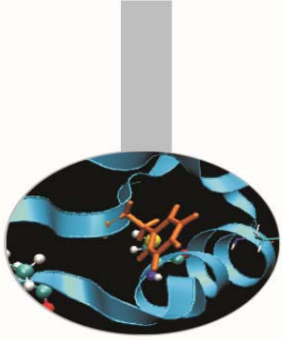


GPU & CPU rendering

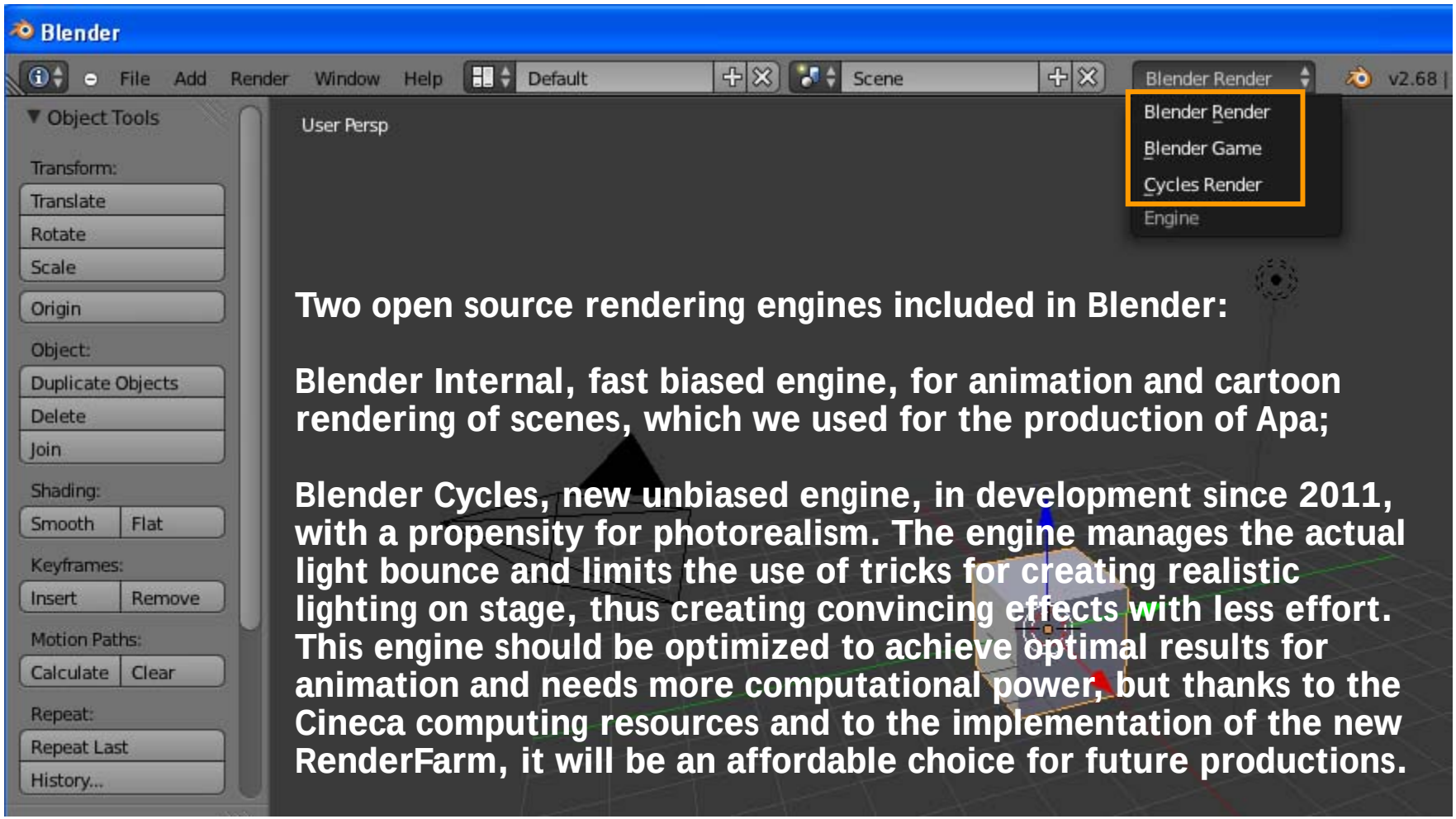
Realtime viewport preview

HDR lighting support

Permissive License for linking with external software



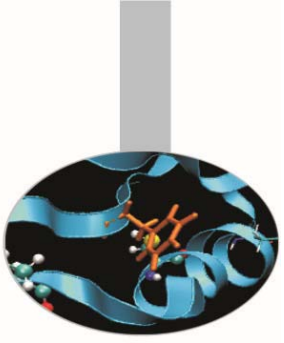
RENDERING



Two open source rendering engines included in Blender:

Blender Internal, fast biased engine, for animation and cartoon rendering of scenes, which we used for the production of Apa;

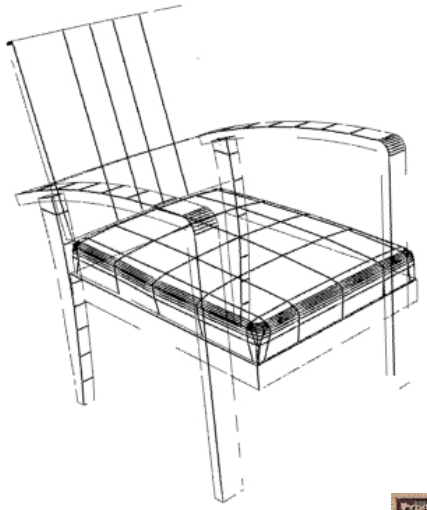
Blender Cycles, new unbiased engine, in development since 2011, with a propensity for photorealism. The engine manages the actual light bounce and limits the use of tricks for creating realistic lighting on stage, thus creating convincing effects with less effort. This engine should be optimized to achieve optimal results for animation and needs more computational power, but thanks to the Cineca computing resources and to the implementation of the new RenderFarm, it will be an affordable choice for future productions.



REAL TIME - RENDER TO TEXTURE

Render to Texture

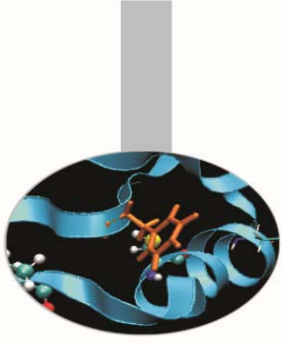
This operation allows to precompute light and shadow information on the individual objects, necessary for real-time navigation.



WEB

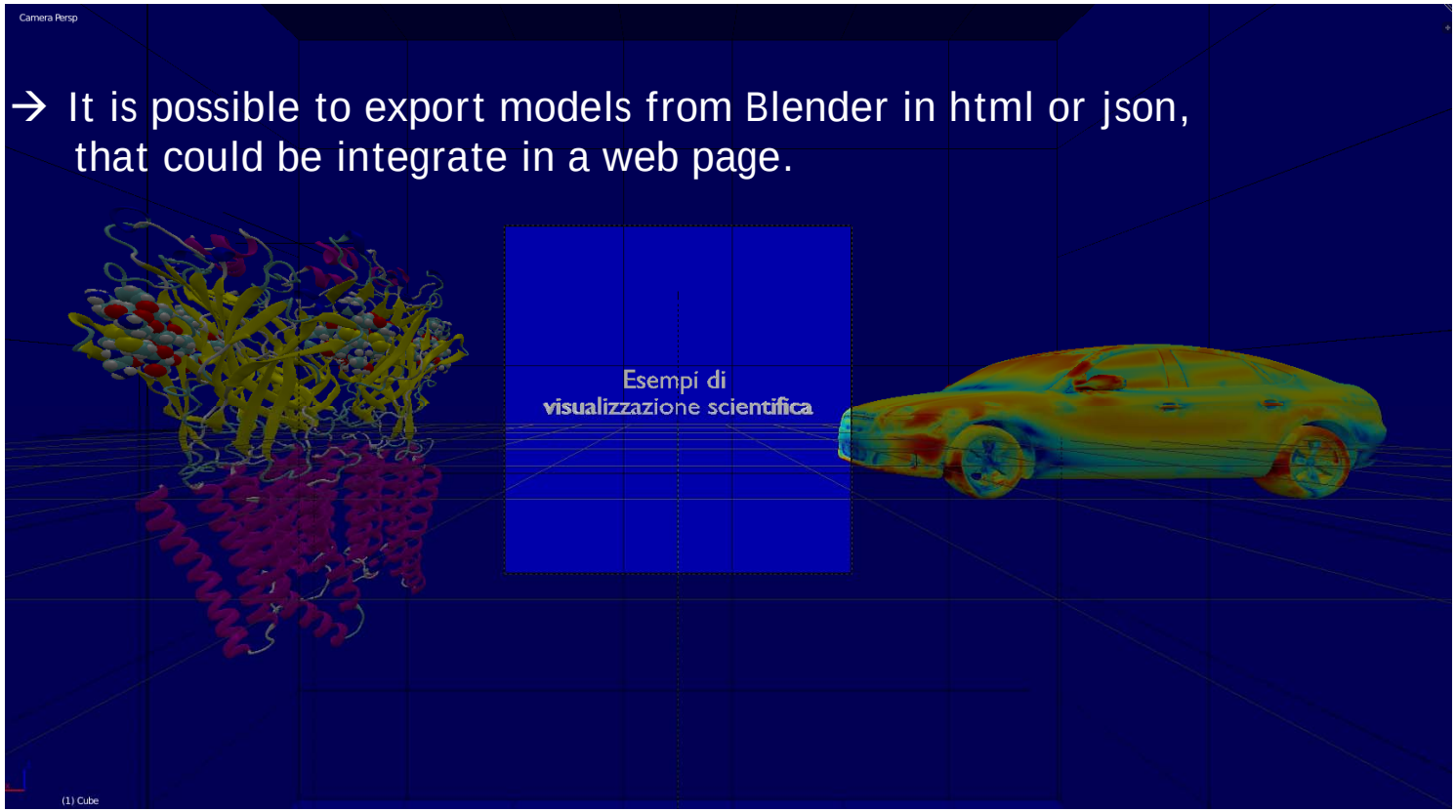
By exporting models in format x3d it is possible to put the model in a html page and navigate it freely (http://www.x3dom.org/).

https://hpc-forge.cineca.it/files/visit_3Dmodels/public/ChiostroIII_X3D/ChiostroIII.html

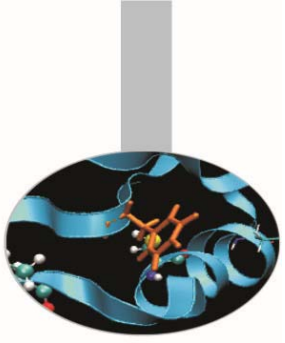


WEB

New instrument is **Blend4web**
https://www.blend4web.com/en/



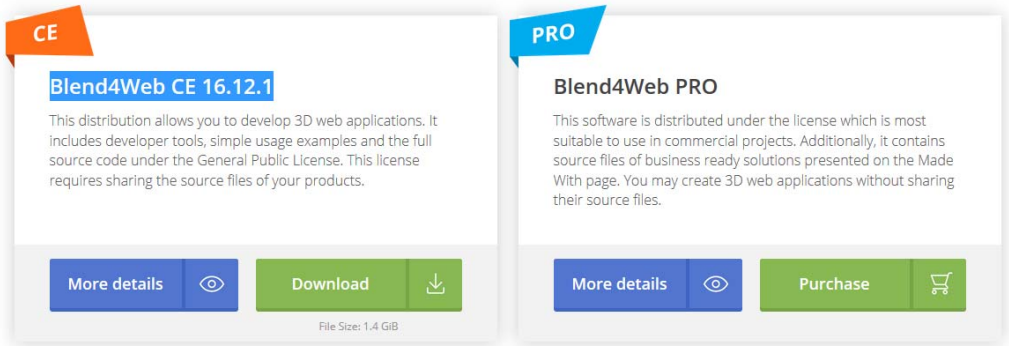
http://www.hpc.cineca.it/content/virtual-reality



BLEND4WEB – HOW TO INSTALL

Blender with Blend4web could be installed in two way, got to page
https://www.blend4web.com/en/downloads/

- Download all the packages with blender
https://www.blend4web.com/en/



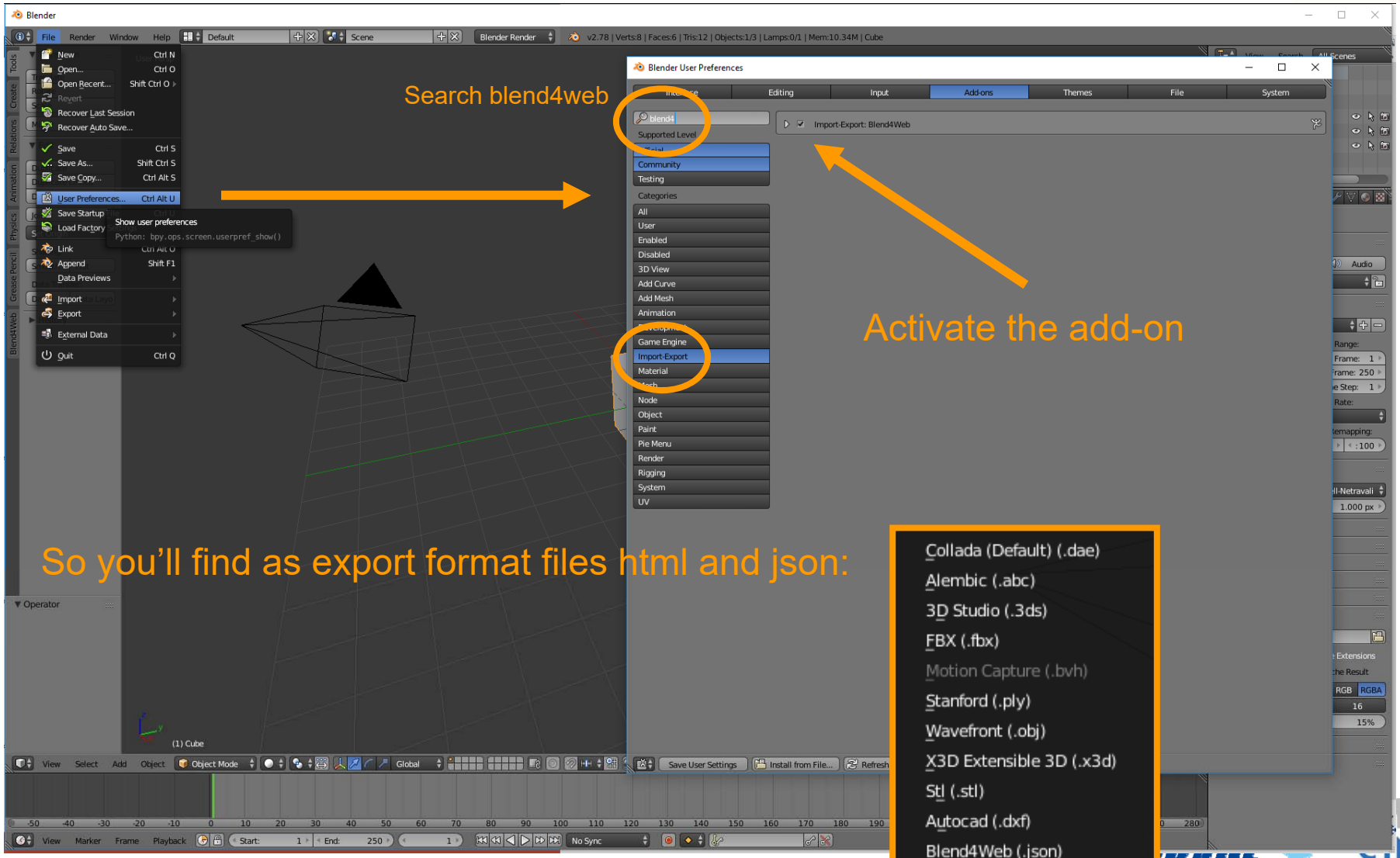
- Install Blender and the Blend4web add-on separately

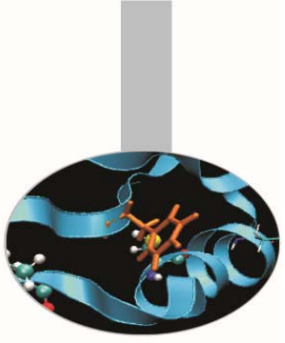
Blender Add-on

Although the Blender add-on is included in the Blend4Web SDK distributions, it can be installed and used separately as well. This option suits users who need only HTML export or tools such as the normal editor. Please note that some SDK features (Scene Viewer, Project Manager, Fast Preview) along with source files of the examples and tutorials are not available. The add-on is licensed under the GPL.

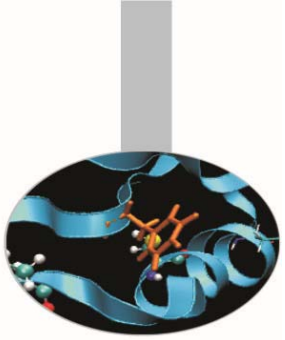
Download (version 16.12.1, 4 MiB)

BLEND4WEB - ACTIVATE THE ADD-ON

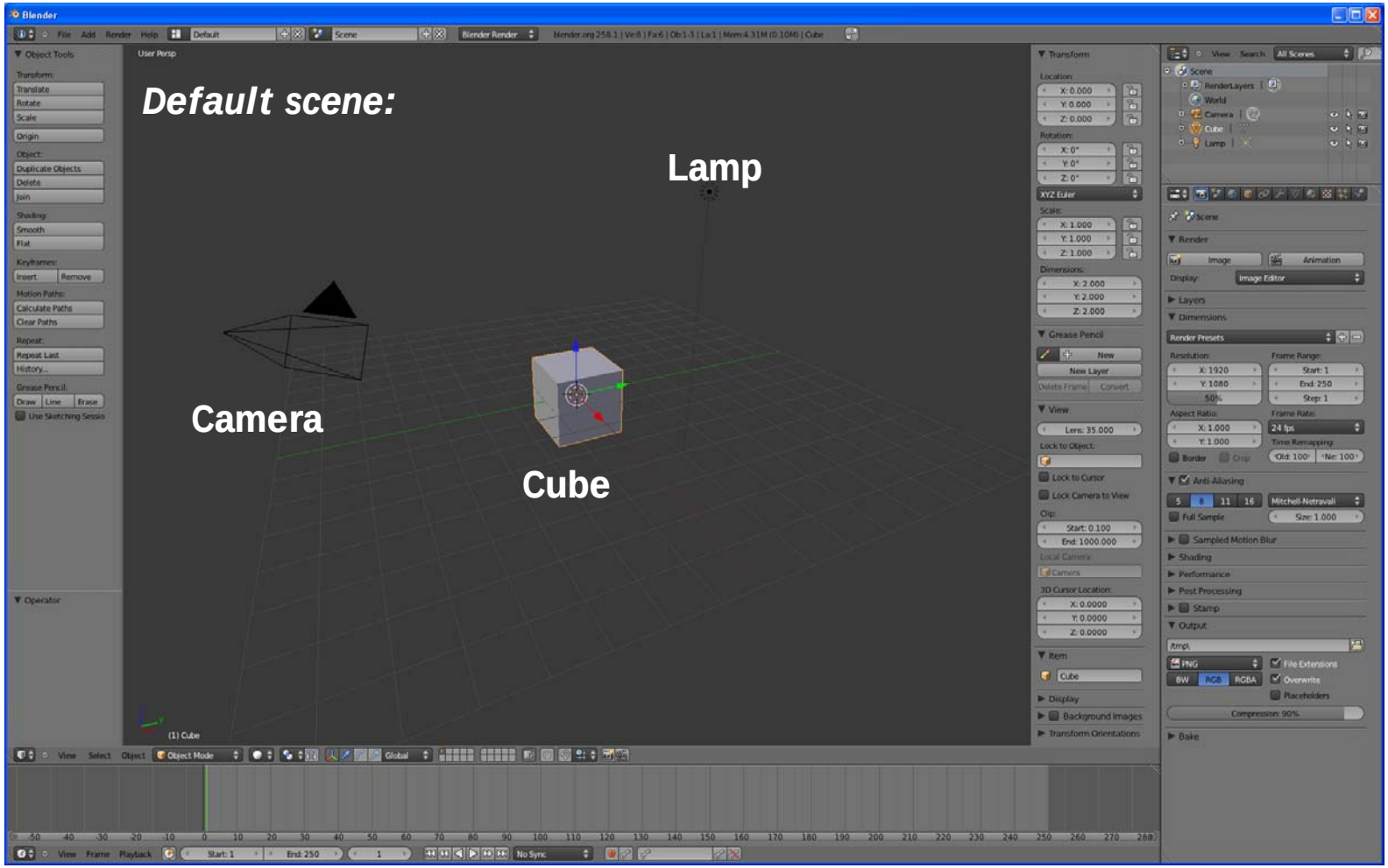


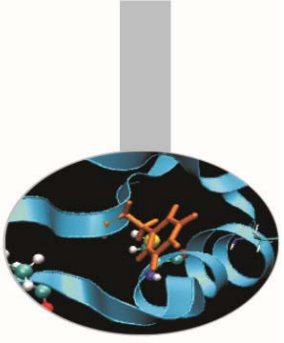


Blender interface

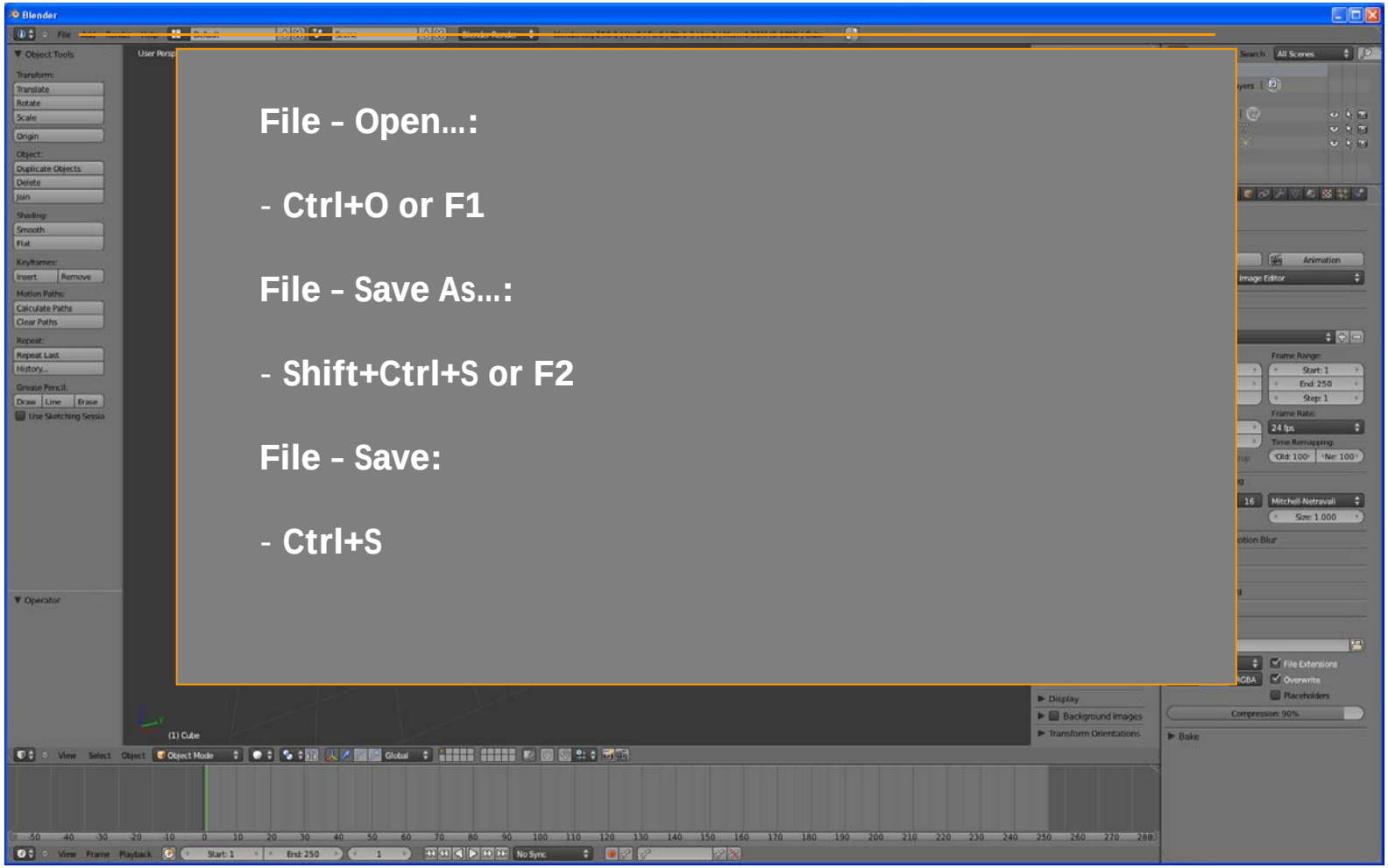


INTERFACE

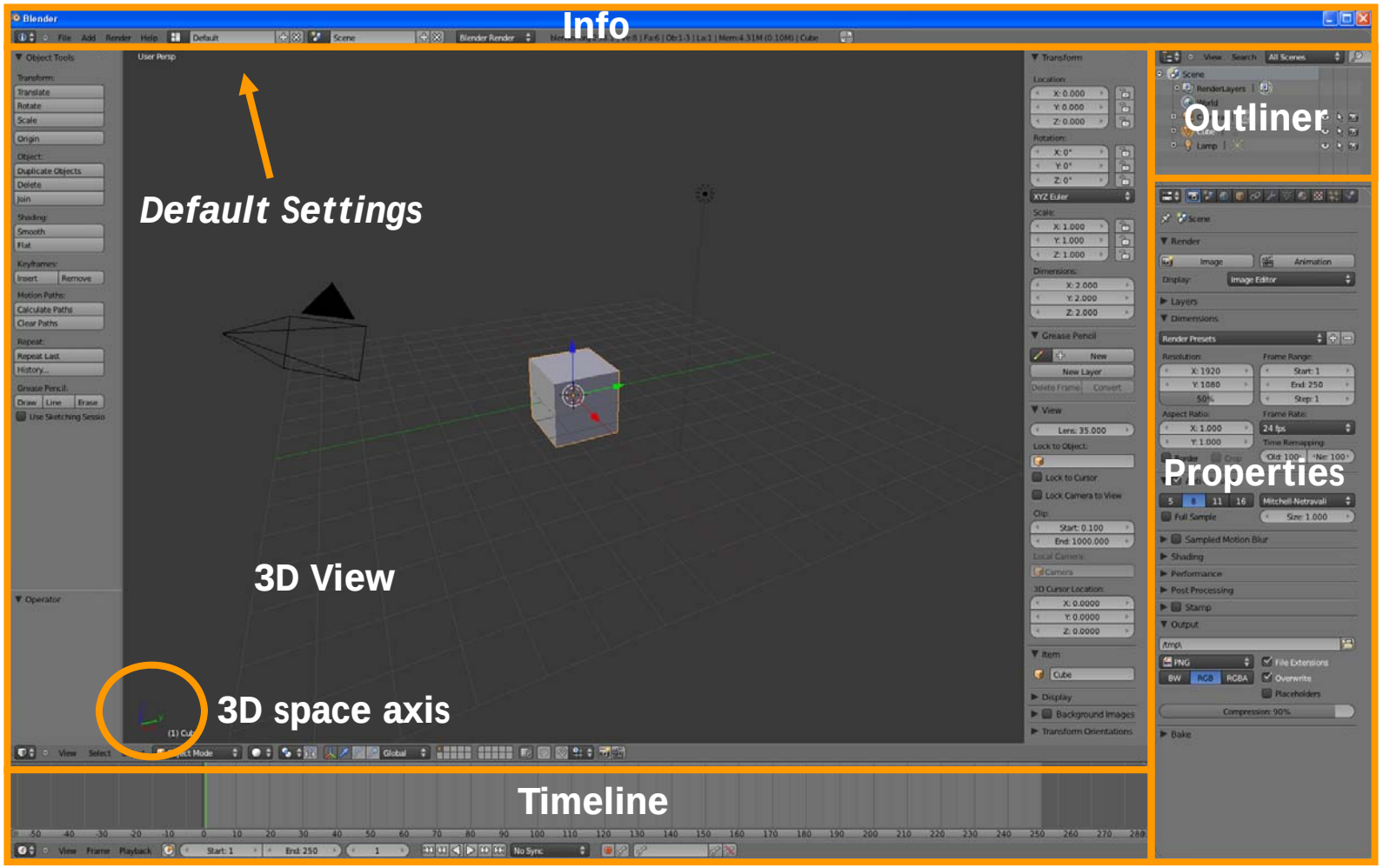


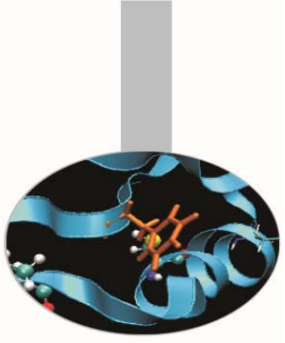


INTERFACE

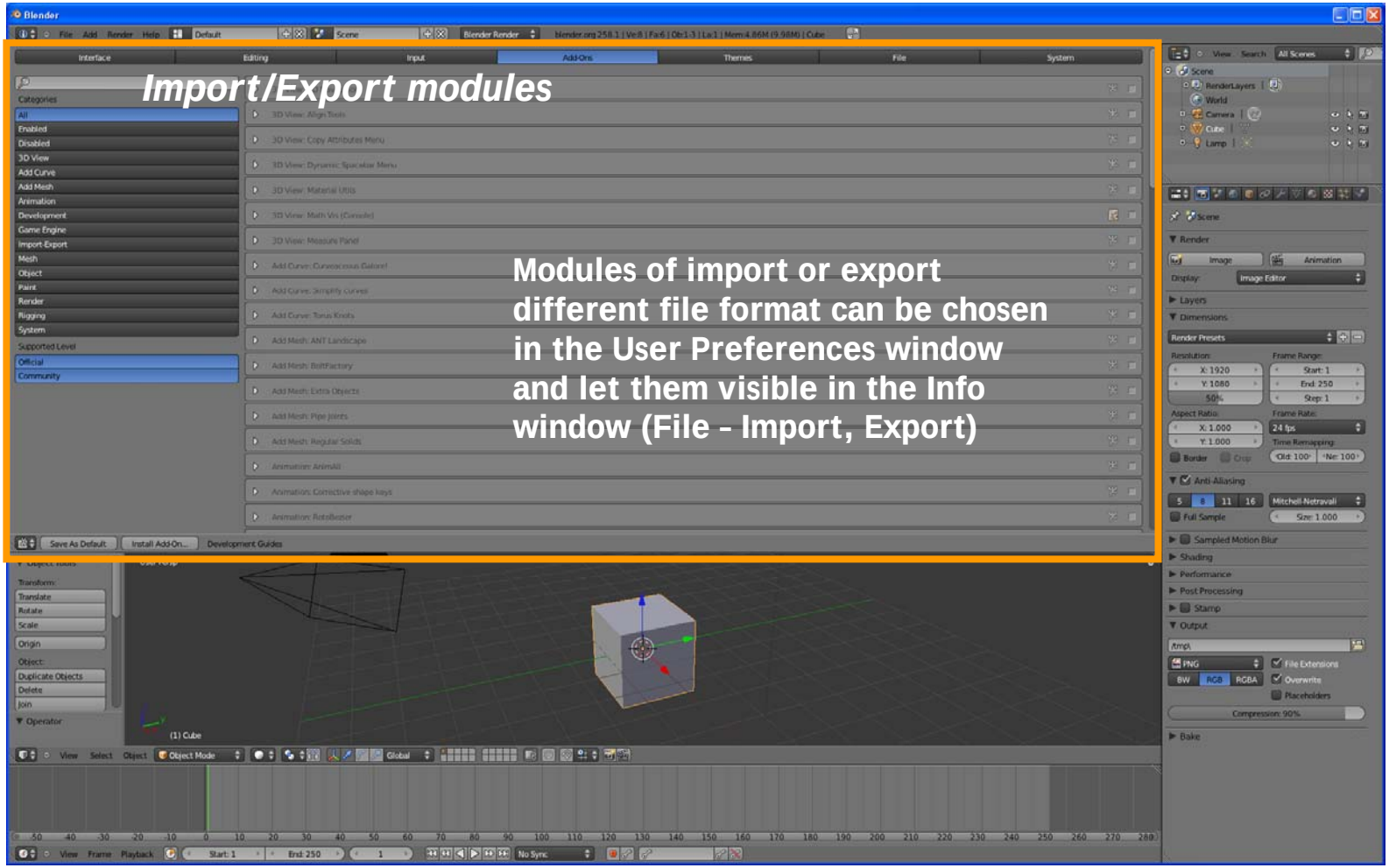

File - Open...:
- Ctrl+O or F1
File - Save As...:
- Shift+Ctrl+S or F2
File - Save:
- Ctrl+S

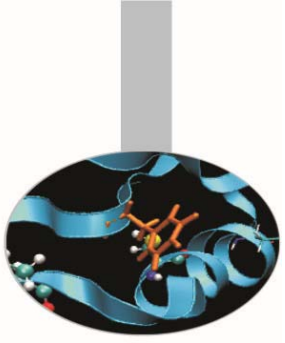
INTERFACE


Info
Default Settings
Outliner
Properties
3D View
3D space axis
Timeline



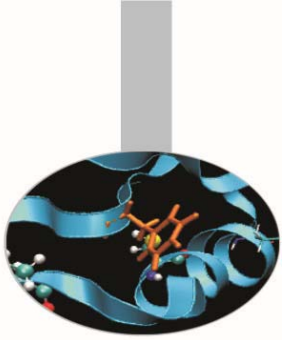
INTERFACE - USER PREFERENCES



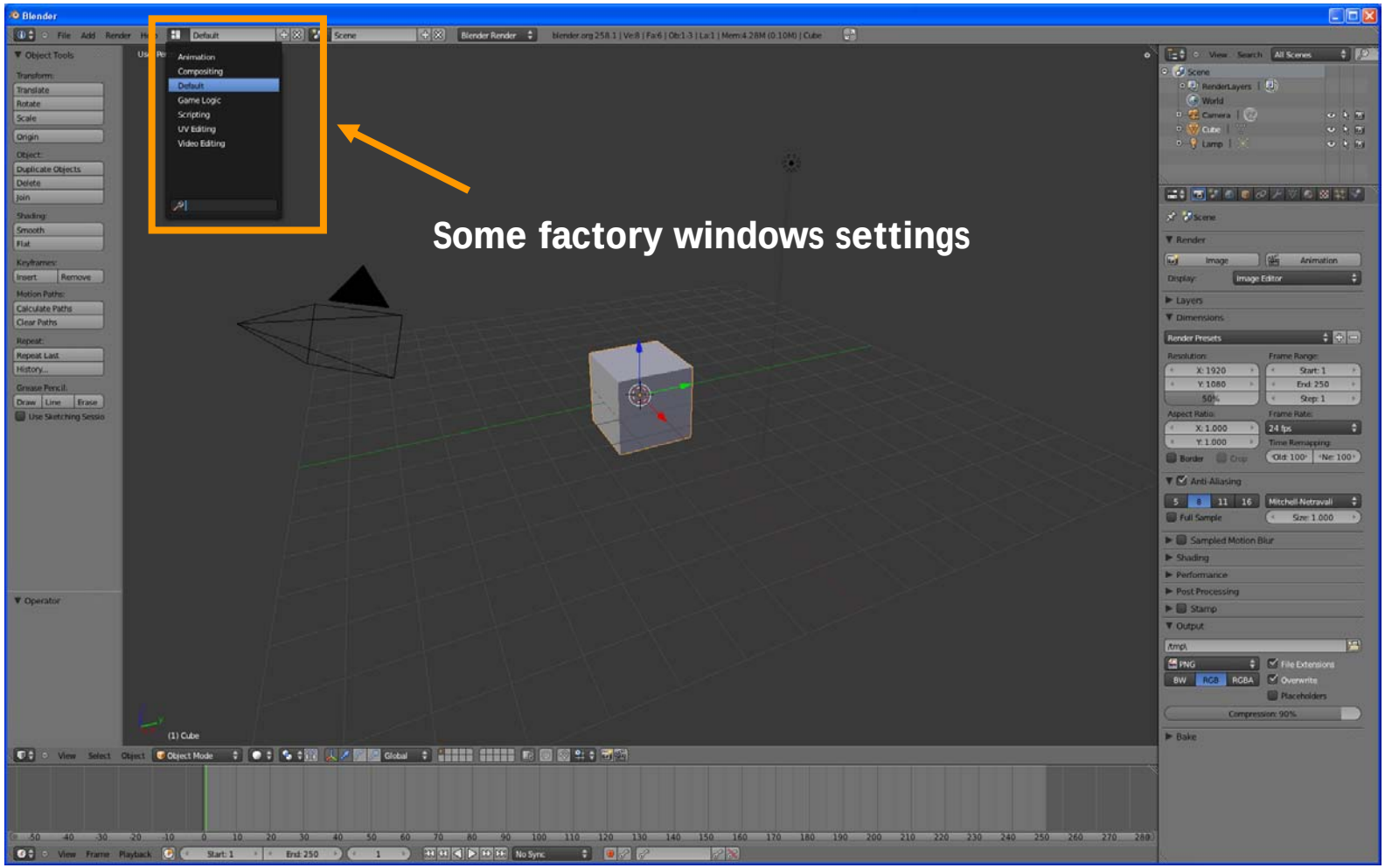


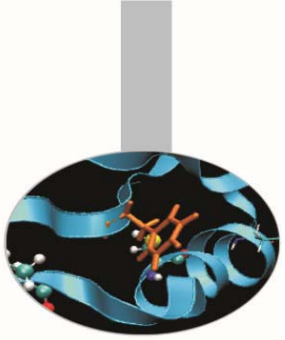
SHORTCUT

Combinations of keys that are used for a lot of commands (keyboard and/or mouse) instead of using tool bar, faster in the modeling stage.

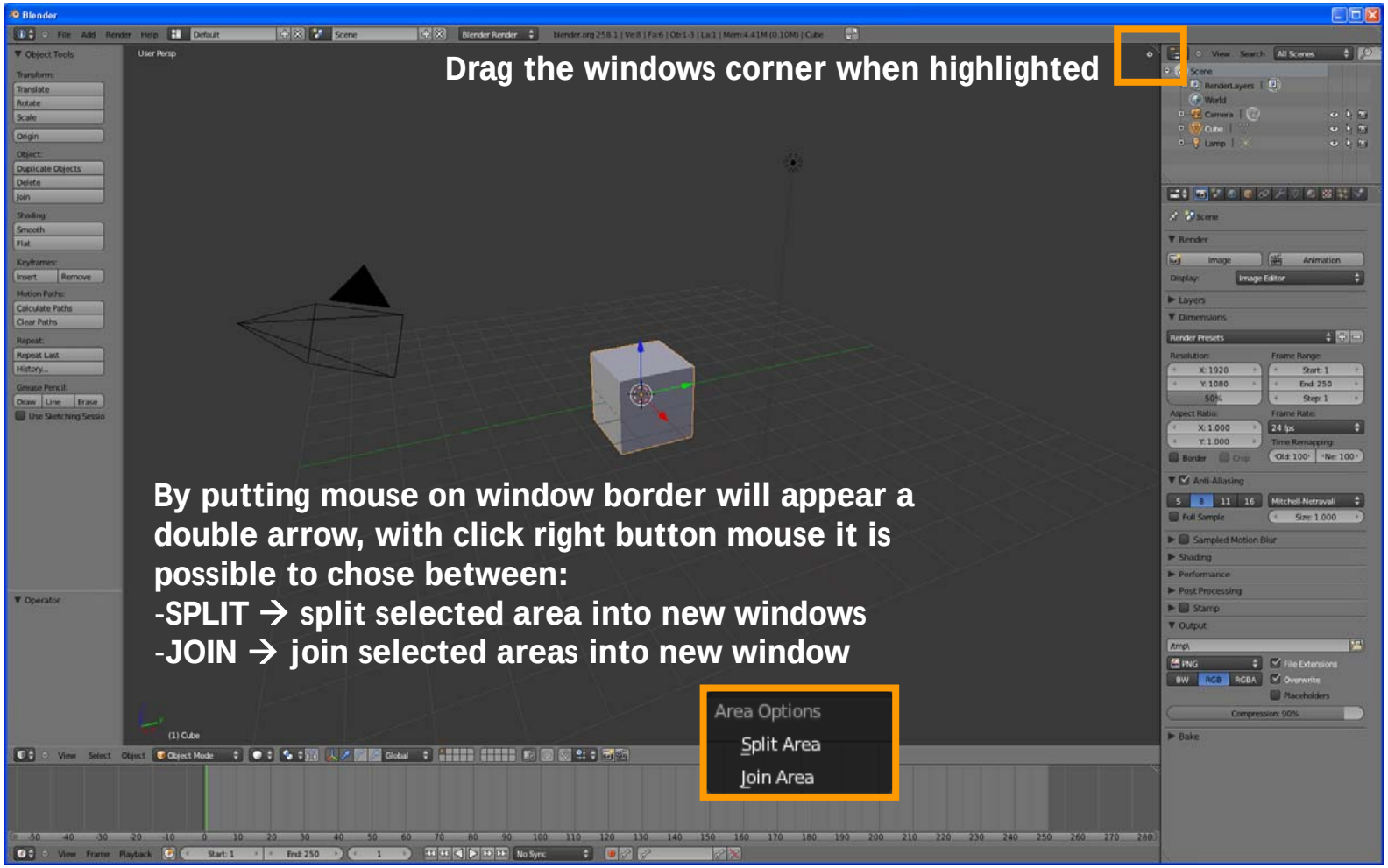


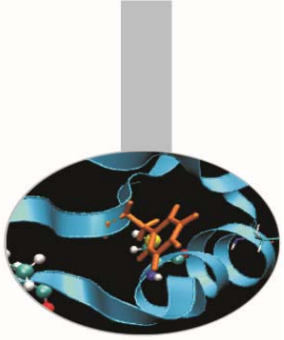
INTERFACE


Some factory windows settings
Default
Animation
Compositing
Default
Game Logic
Scripting
UV Editing
Video Editing

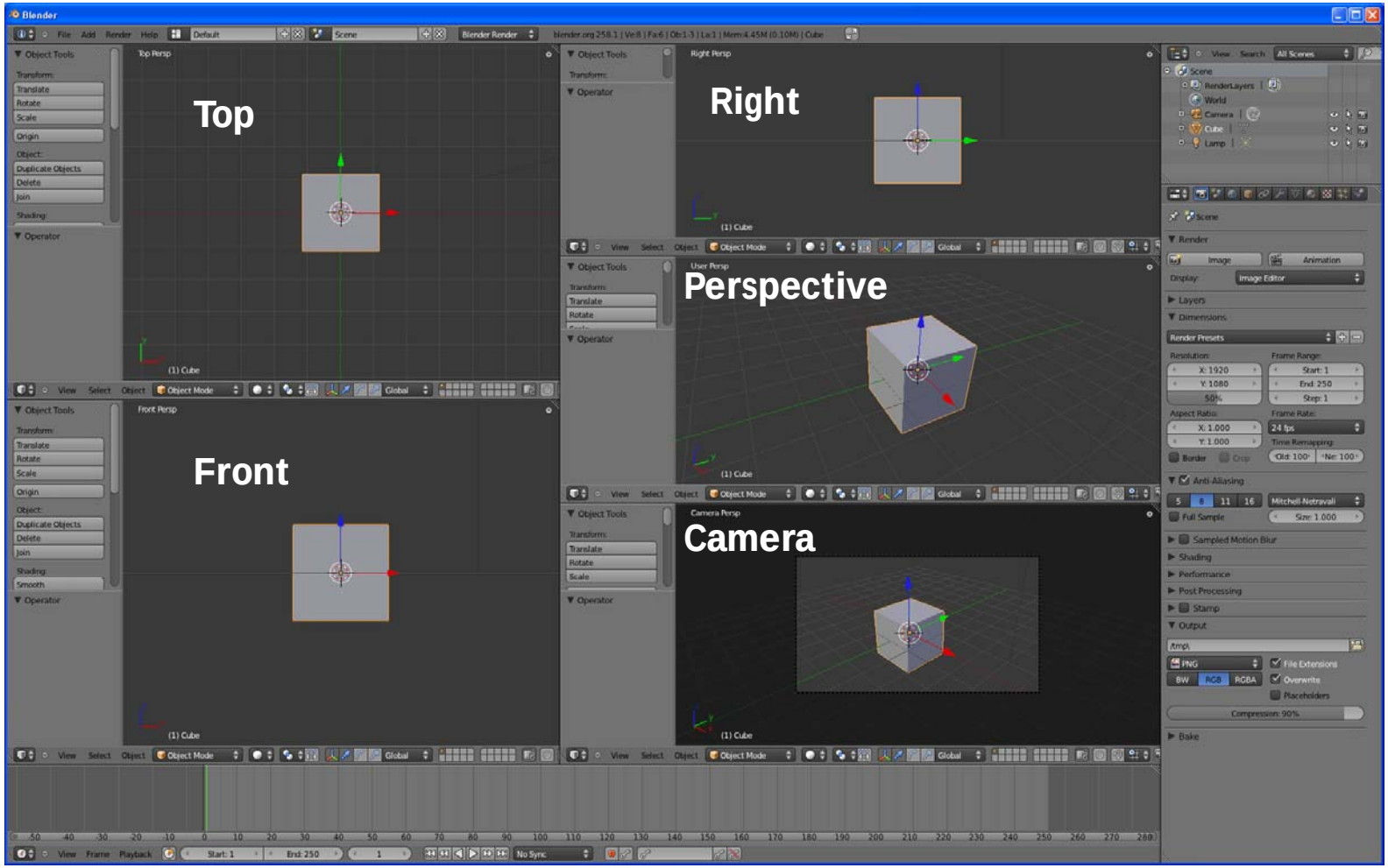


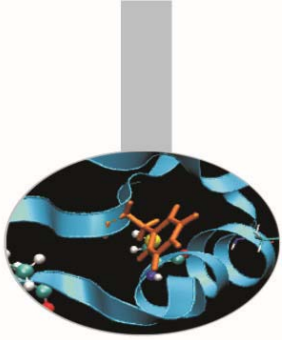
INTERFACE


Drag the windows corner when highlighted
By putting mouse on window border will appear a double arrow, with click right button mouse it is possible to chose between:
-SPLIT → split selected area into new windows
-JOIN → join selected areas into new window
Area Options
Split Area
Join Area

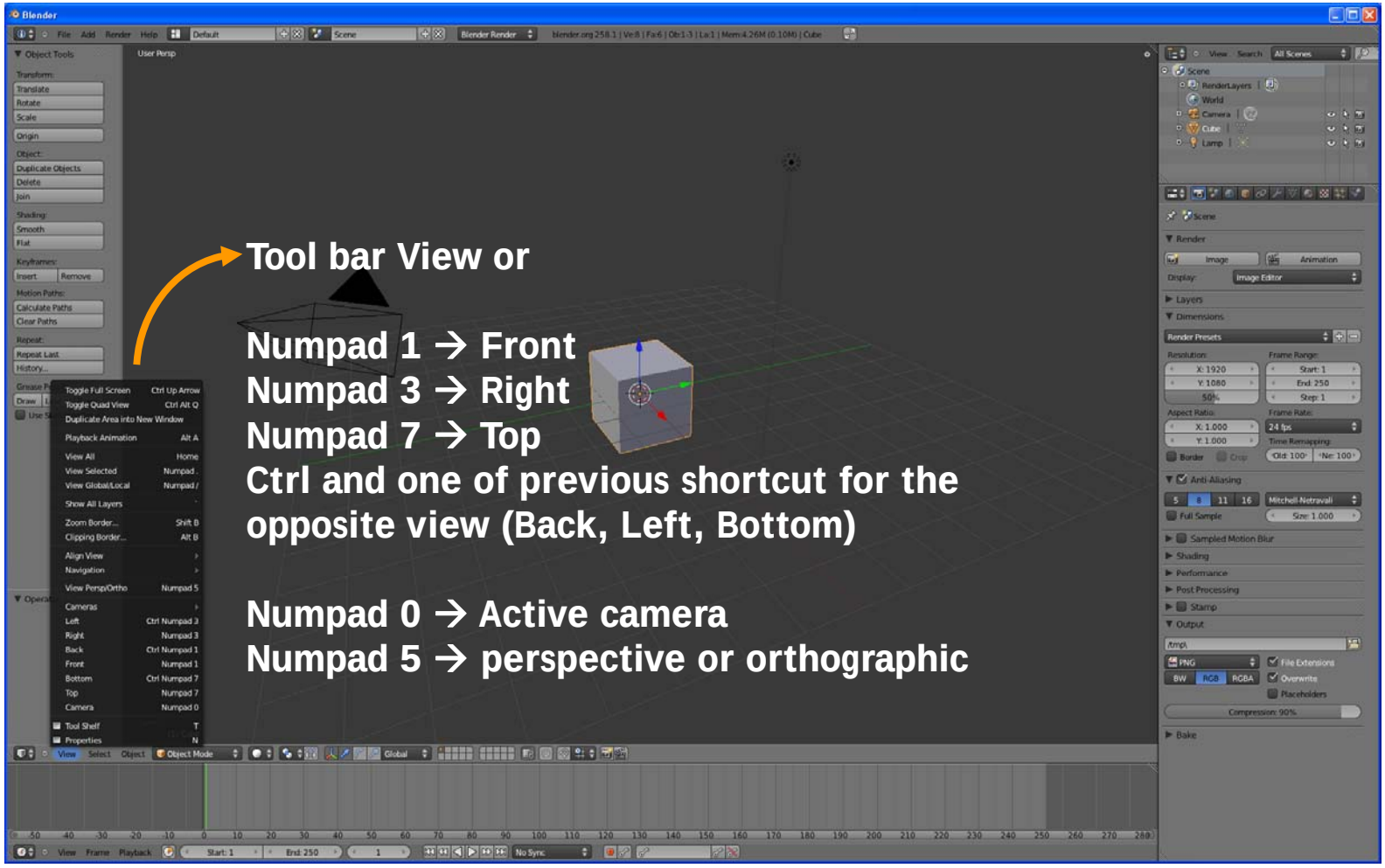


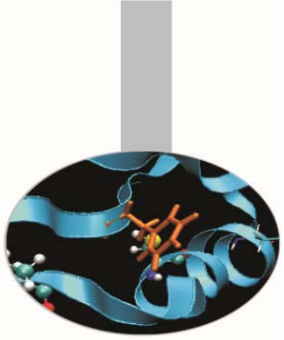
INTERFACE



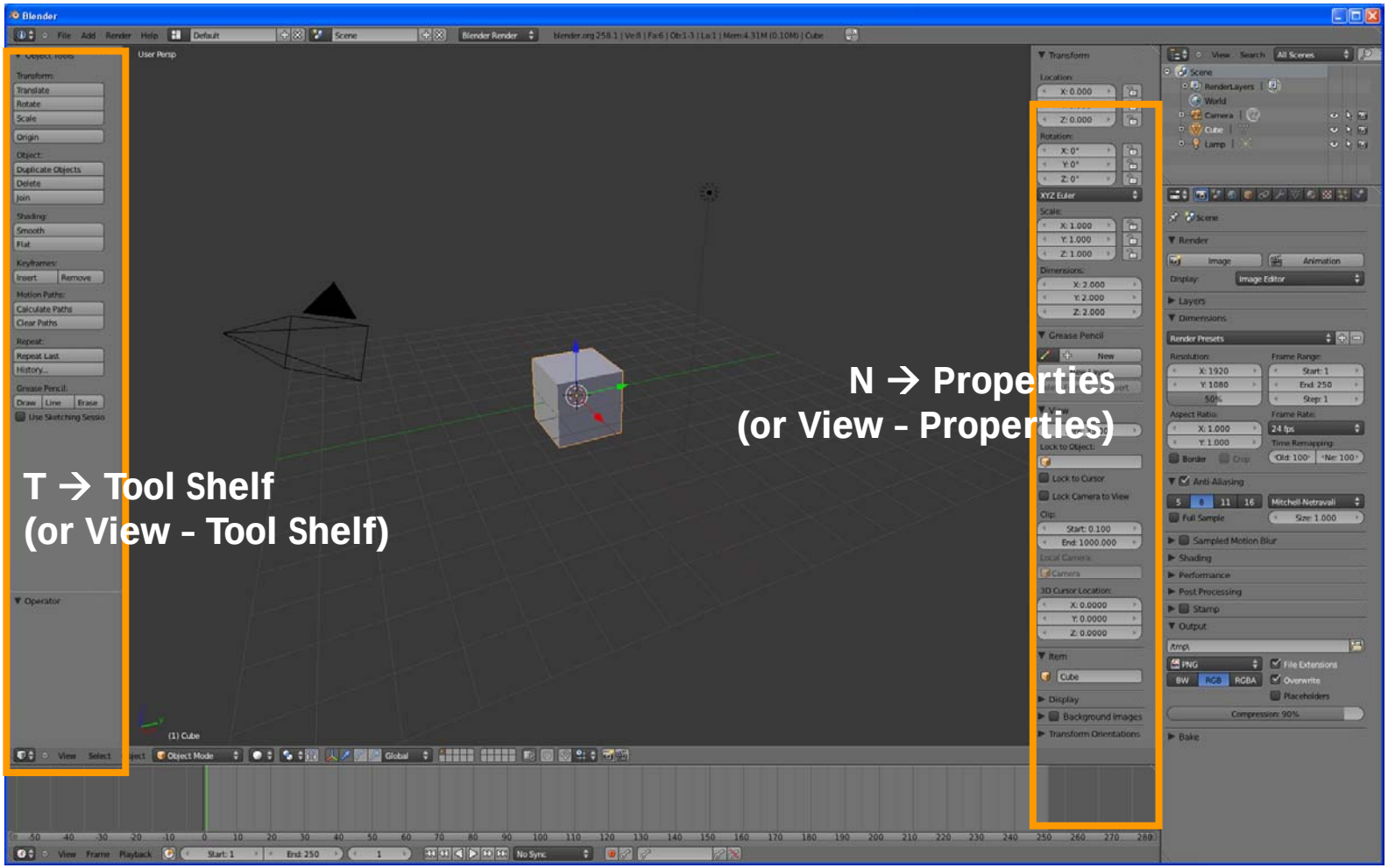


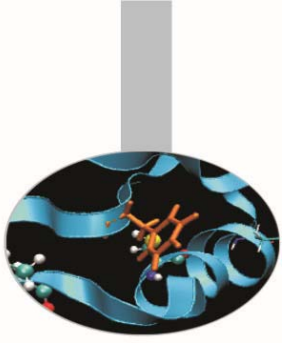
INTERFACE


Tool bar View or
Numpad 1 → Front
Numpad 3 → Right
Numpad 7 → Top
Ctrl and one of previous shortcut for the opposite view (Back, Left, Bottom)
Numpad 0 → Active camera
Numpad 5 → perspective or orthographic

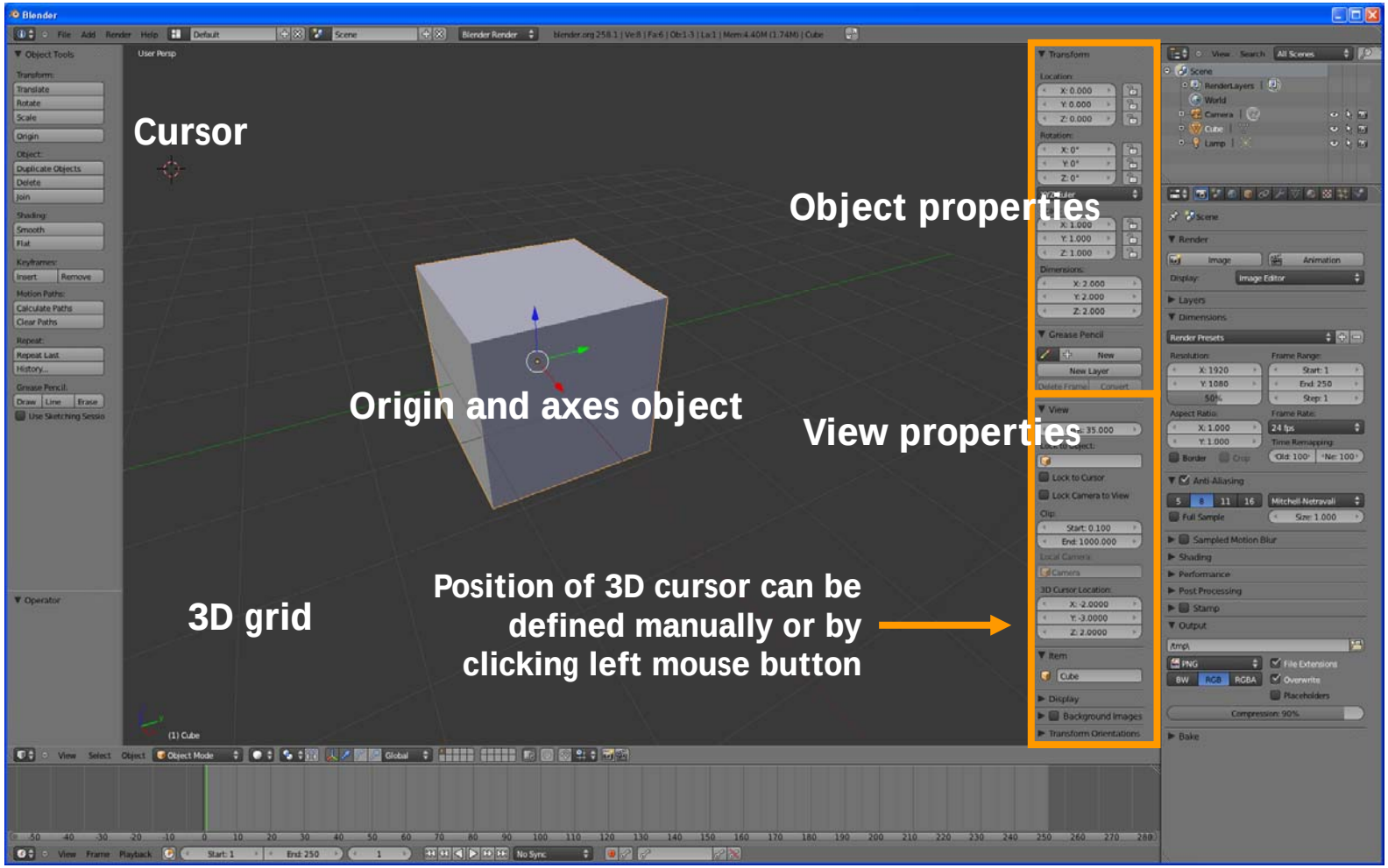


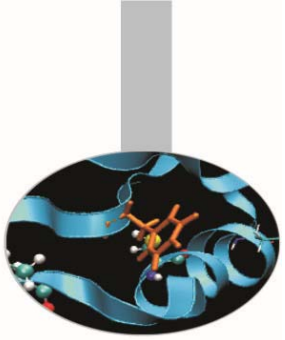
INTERFACE


T → Tool Shelf
(or View - Tool Shelf)
N → Properties
(or View - Properties)

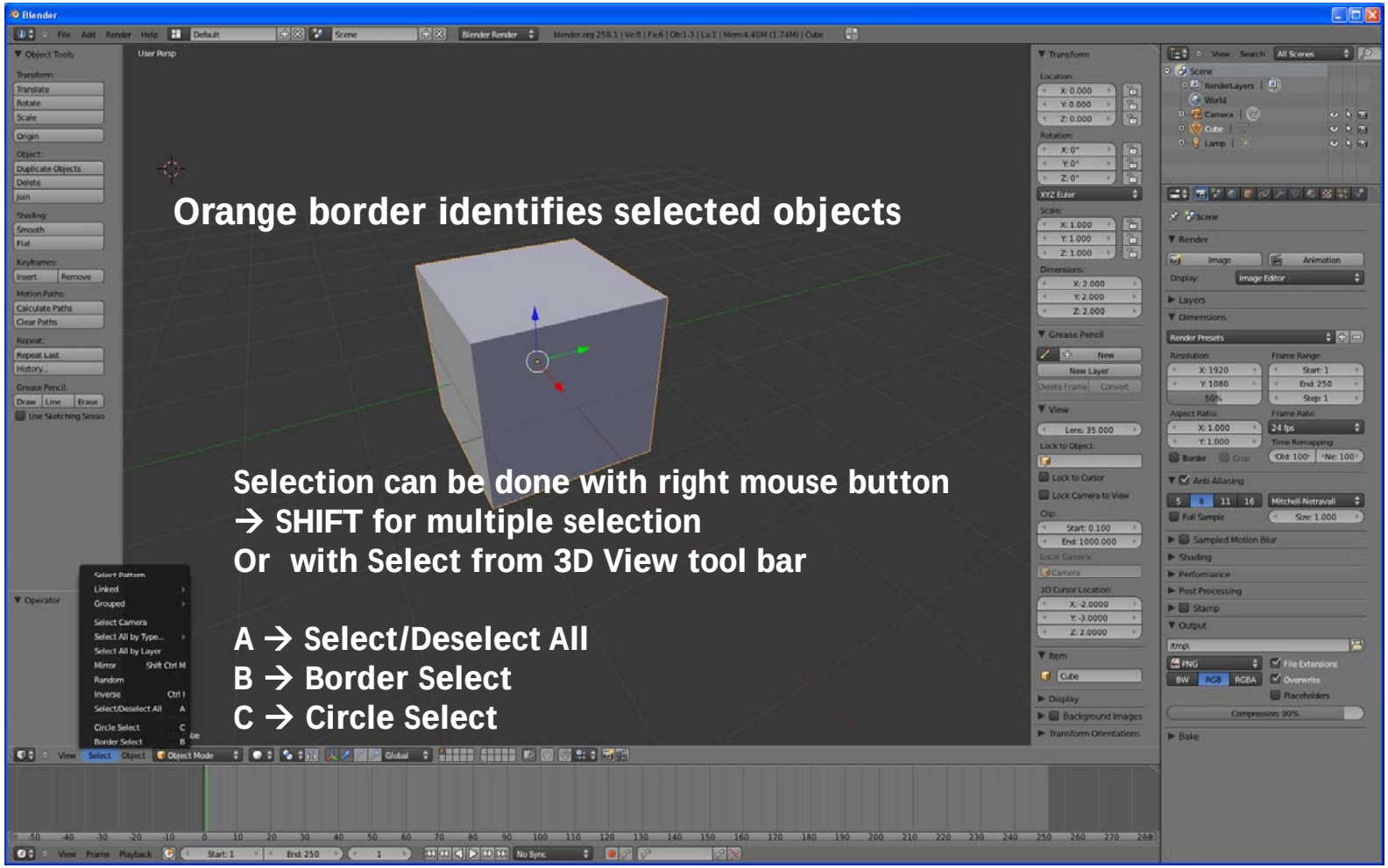


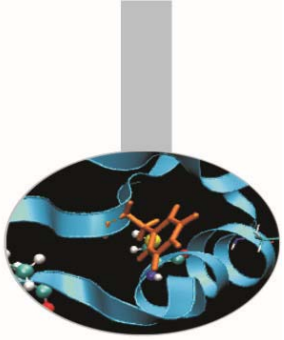
INTERFACE


Cursor
Object properties
Origin and axes object
View properties
3D grid
Position of 3D cursor can be defined manually or by clicking left mouse button

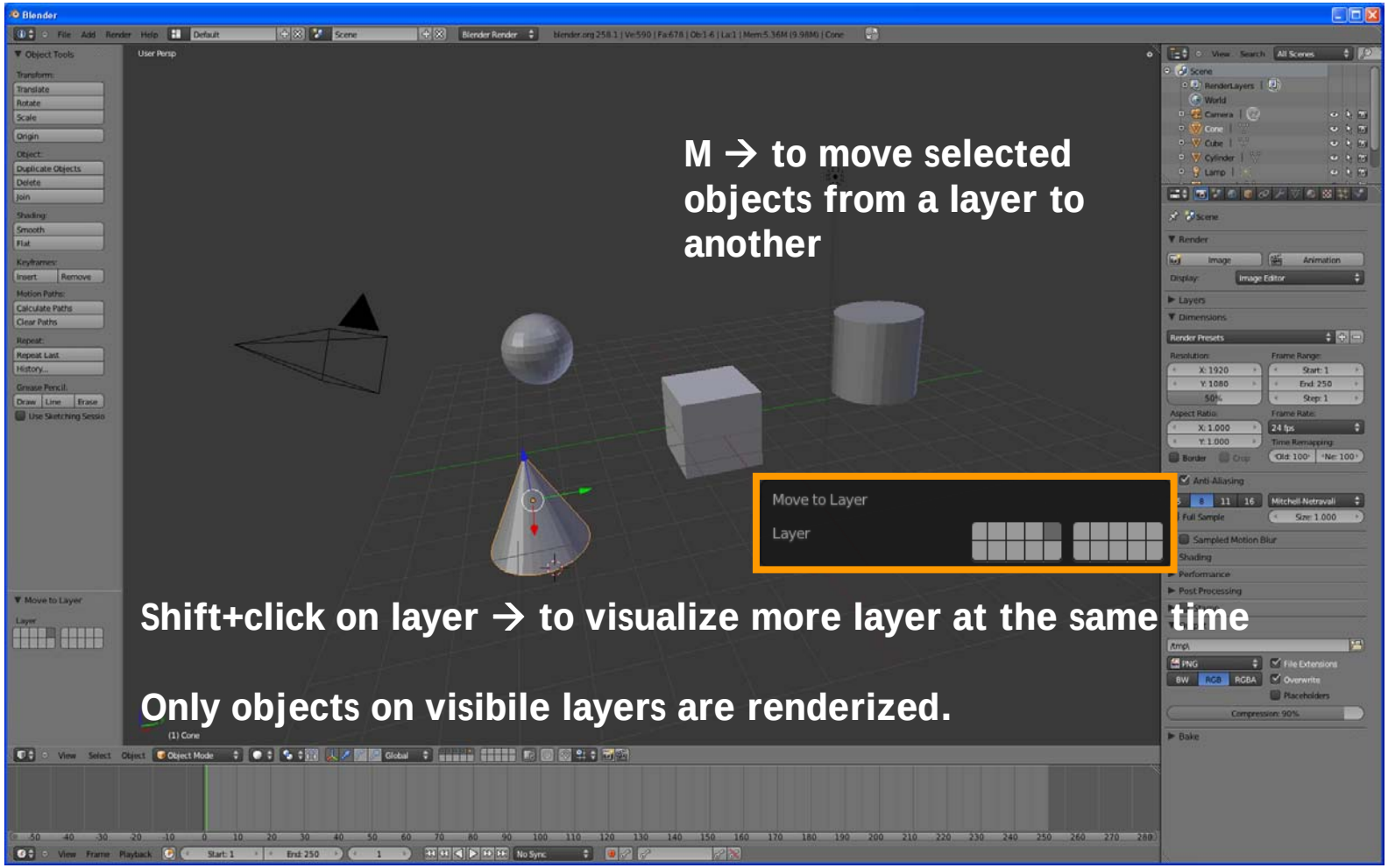


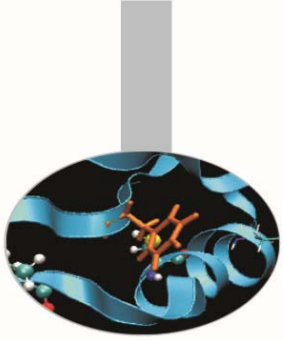
INTERFACE


Orange border identifies selected objects
Selection can be done with right mouse button
→ SHIFT for multiple selection
Or with Select from 3D View tool bar
A → Select/Deselect All
B → Border Select
C → Circle Select

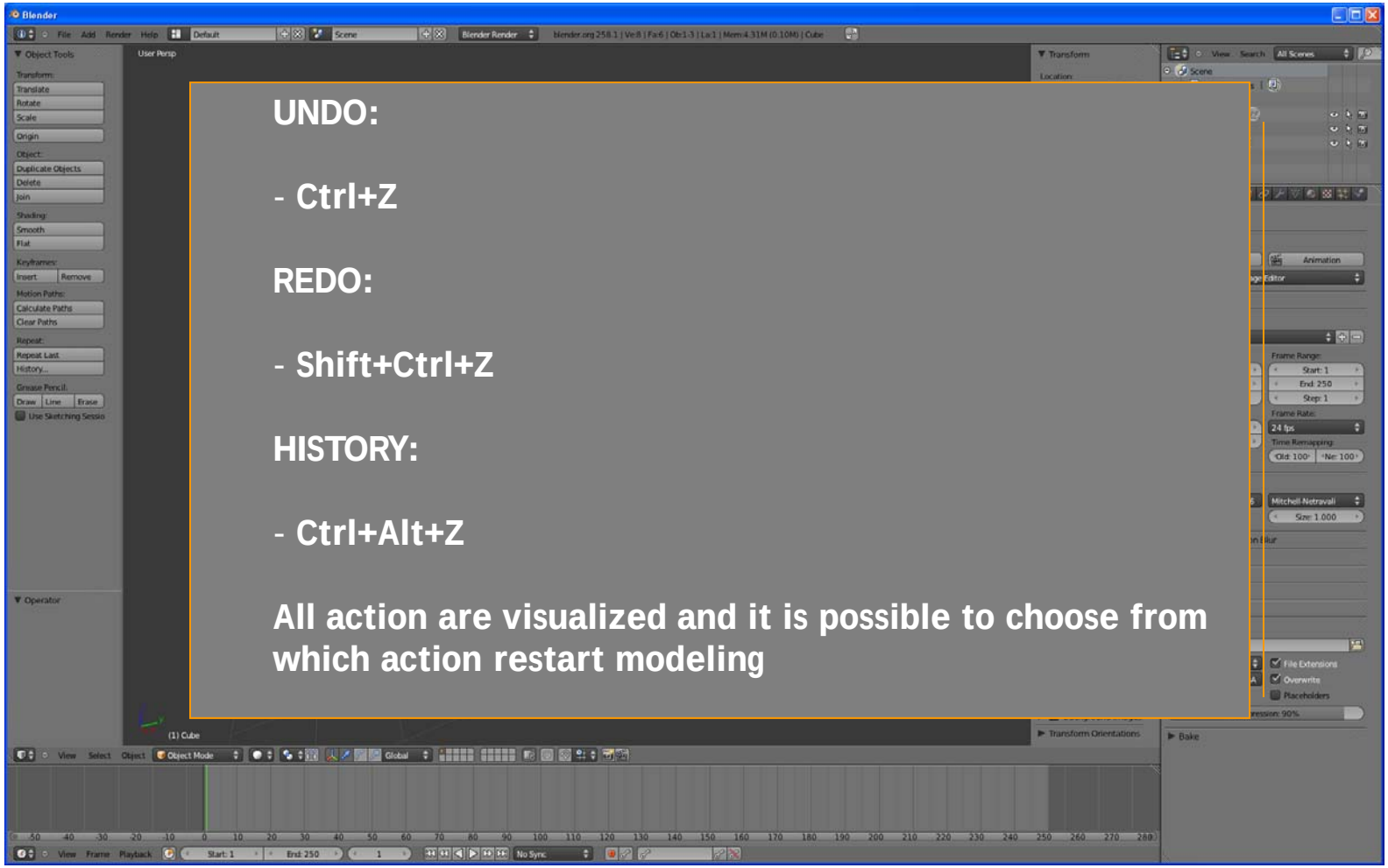


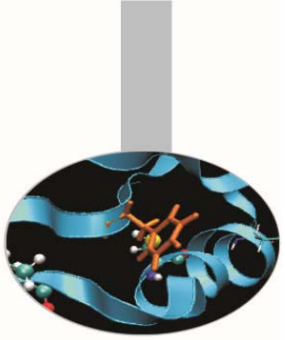
LAYER


M → to move selected objects from a layer to another
Move to Layer
Layer
Shift+click on layer → to visualize more layer at the same time
Only objects on visibile layers are renderized.

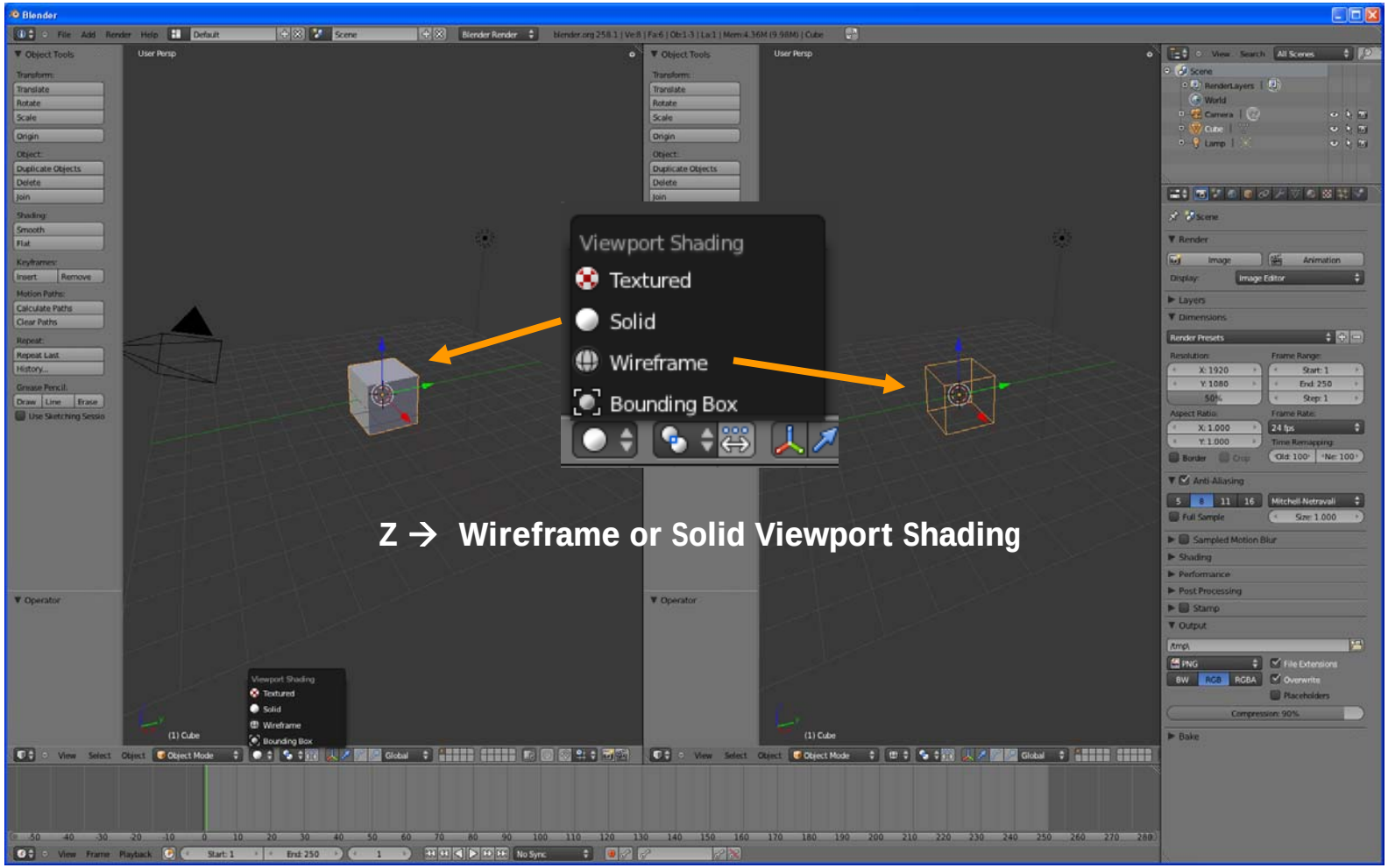


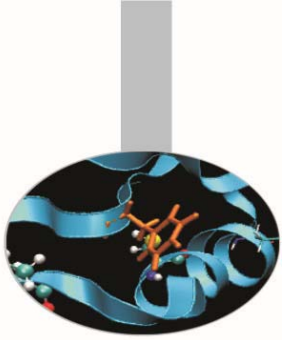
INTERFACE


UNDO:
- Ctrl+Z
REDO:
- Shift+Ctrl+Z
HISTORY:
- Ctrl+Alt+Z
All action are visualized and it is possible to choose from which action restart modeling

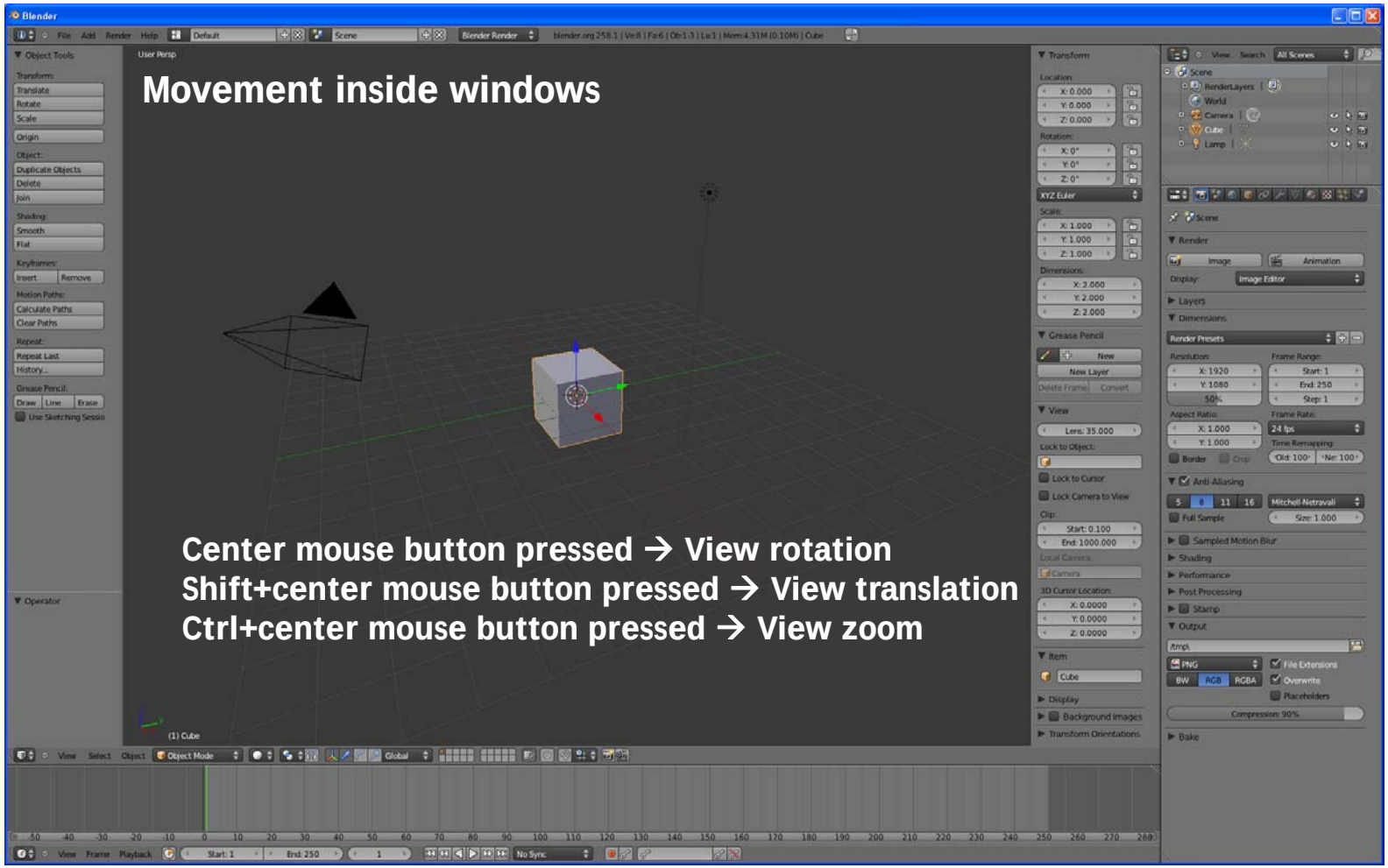


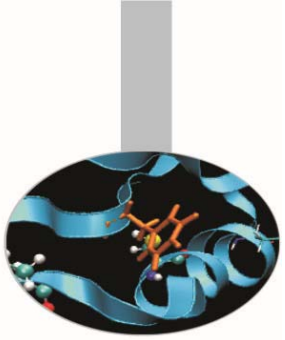
INTERFACE


Viewport Shading
Textured
Solid
Wireframe
Bounding Box
Z → Wireframe or Solid Viewport Shading

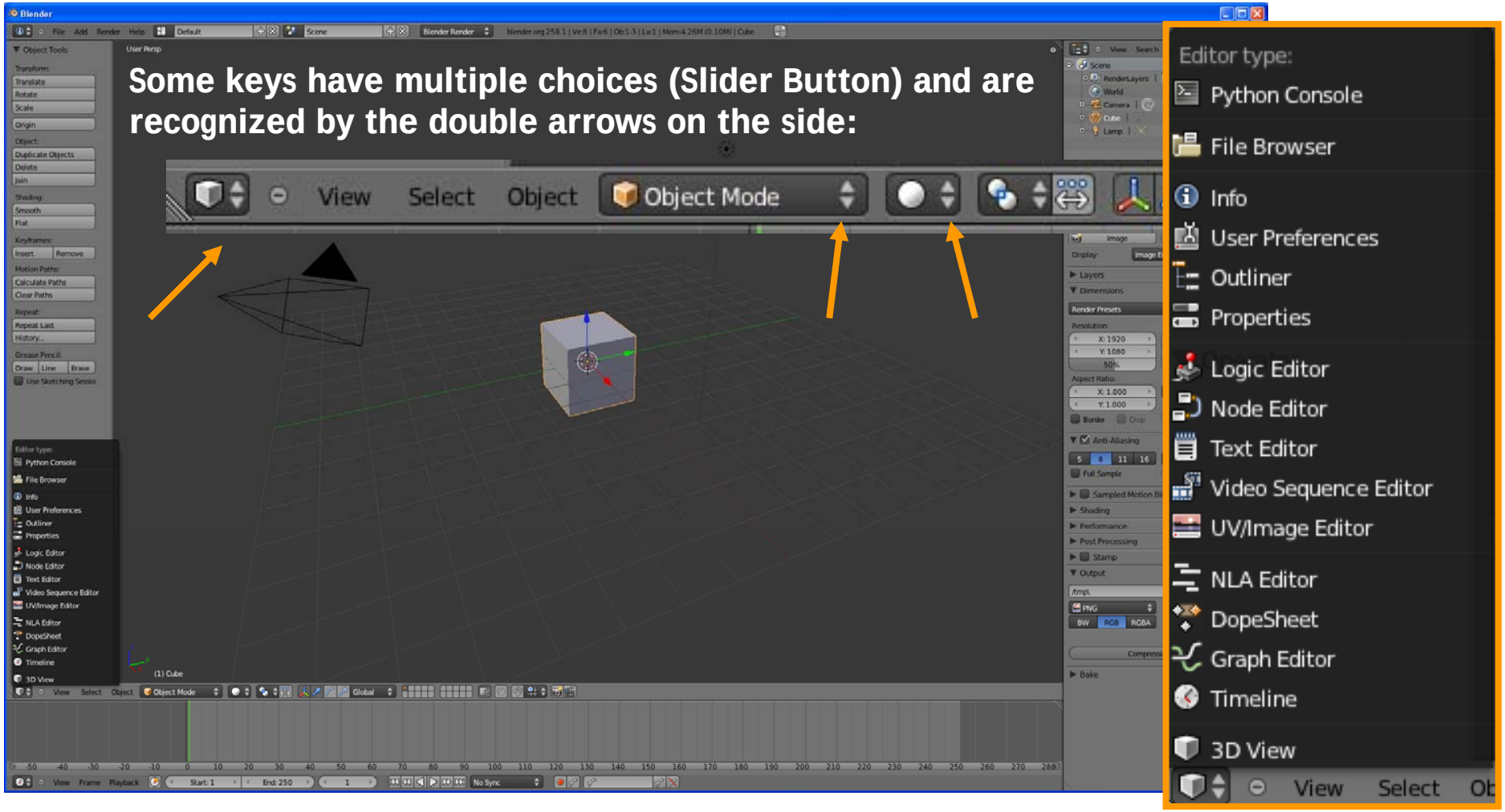


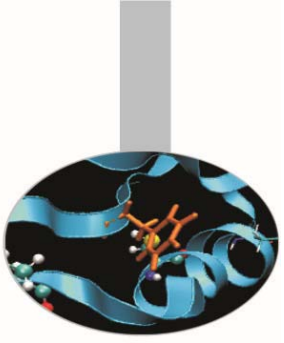
INTERFACE


Movement inside windows
Center mouse button pressed → View rotation
Shift+center mouse button pressed → View translation
Ctrl+center mouse button pressed → View zoom

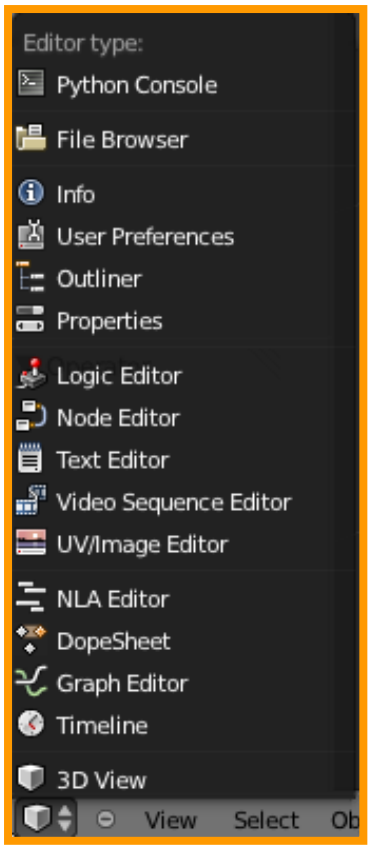


INTERFACE

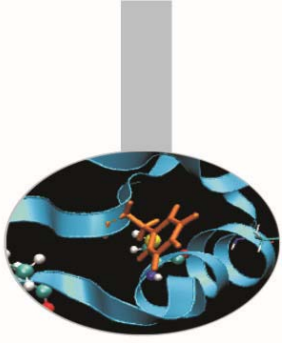

Some keys have multiple choices (Slider Button) and are recognized by the double arrows on the side:
View
Select
Object
Object Mode
Editor type:
Python Console
File Browser
Info
User Preferences
Outliner
Properties
Logic Editor
Node Editor
Text Editor
Video Sequence Editor
UV/Image Editor
NLA Editor
DopeSheet
Graph Editor
Timeline
3D View



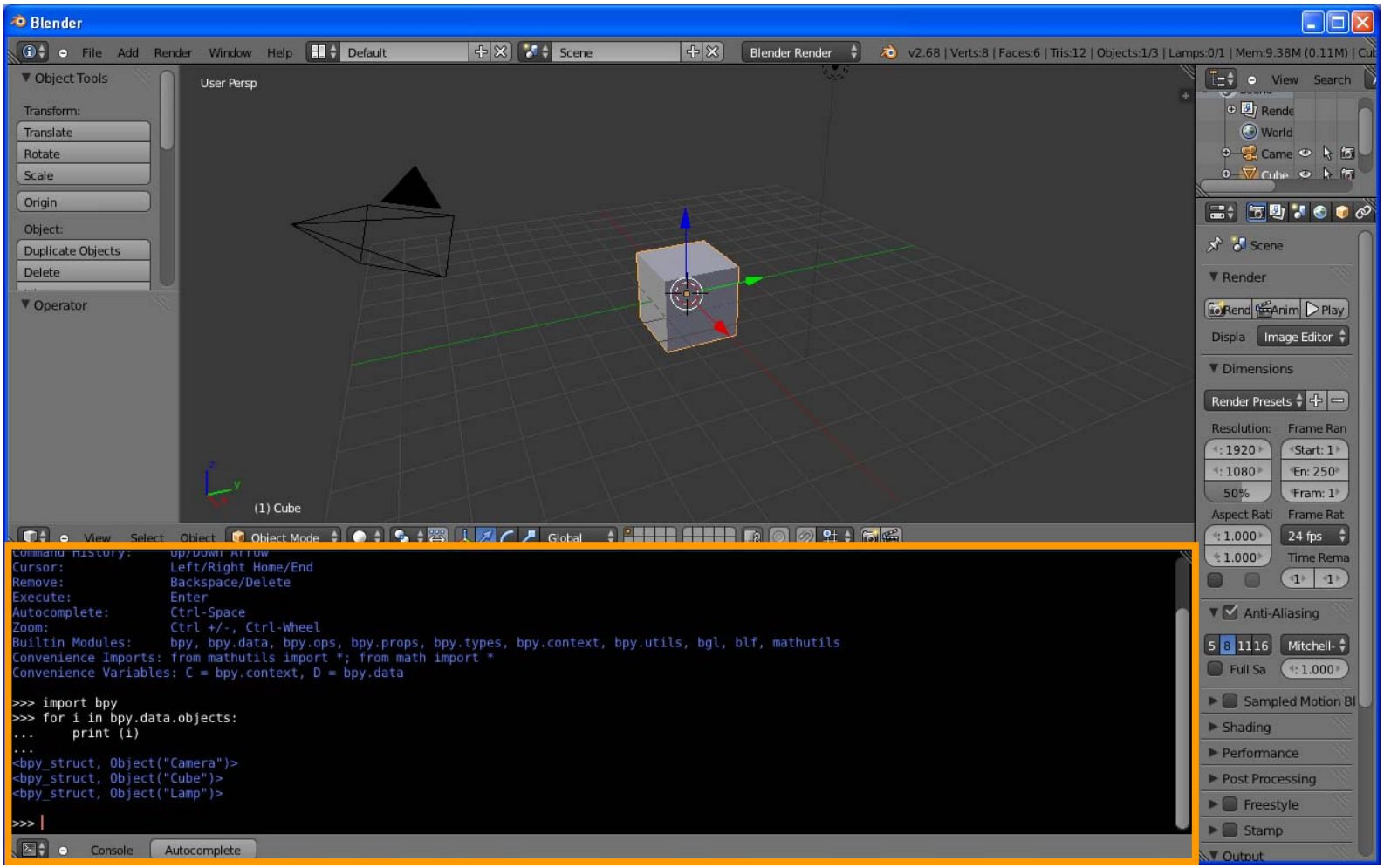
INTERFACE



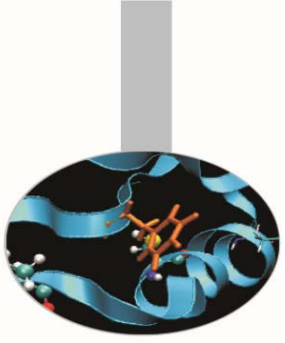
PYTHON CONSOLE - to directly use python in Blender
FILE BROWSER - used to organize, load and save files
INFO - provides information and options for managing files, windows and engines
USER PREFERENCES - customize Blender to your work style and computer
OUTLINER - helps you find and organize your objects
PROPERTIES - shows the several attributes of the currently selected object
LOGIC EDITOR - a game logic editing window
NODE EDITOR - allows you to use nodes for texturing, materials and compositing
TEXT EDITOR - keep notes and documentation about your project, and write Python scripts
VIDEO SEQUENCE EDITOR - assemble video sequences into a film strip
UV/IMAGE EDITOR - an image editor with advanced UV management tools
NLA EDITOR - manage non-linear animation action sequences
DOPE SHEET - combine individual actions into action sequences
GRAPH EDITOR - manage animation keys (and drivers) and inter/extrapolation of these
TIMELINE - controls for animation playback
3D VIEW - a graphical view of your scene



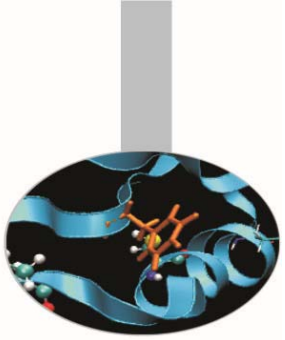
PYTHON CONSOLE



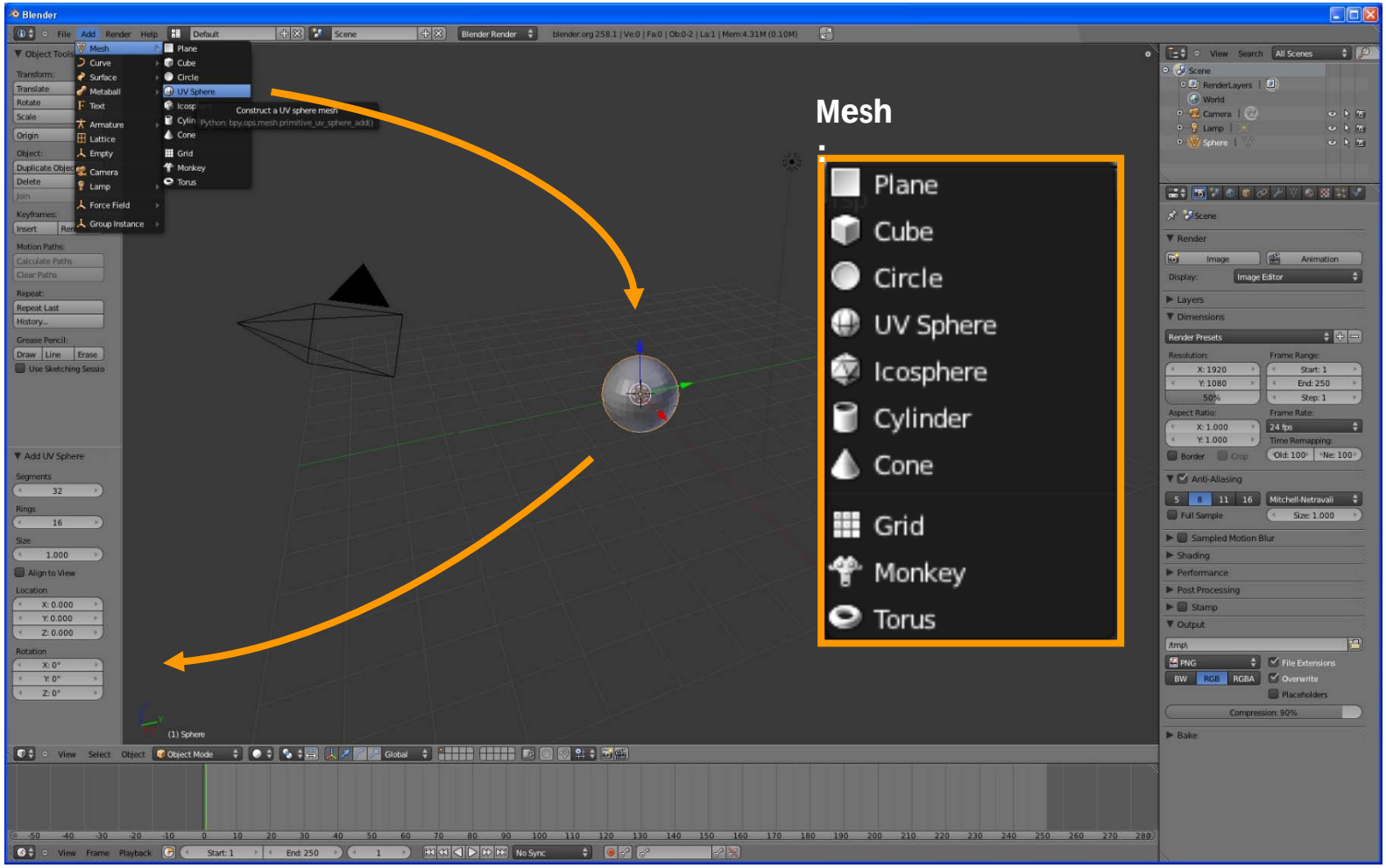
https://www.blender.org/api/

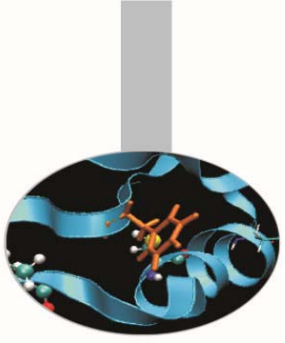


Create and modify object

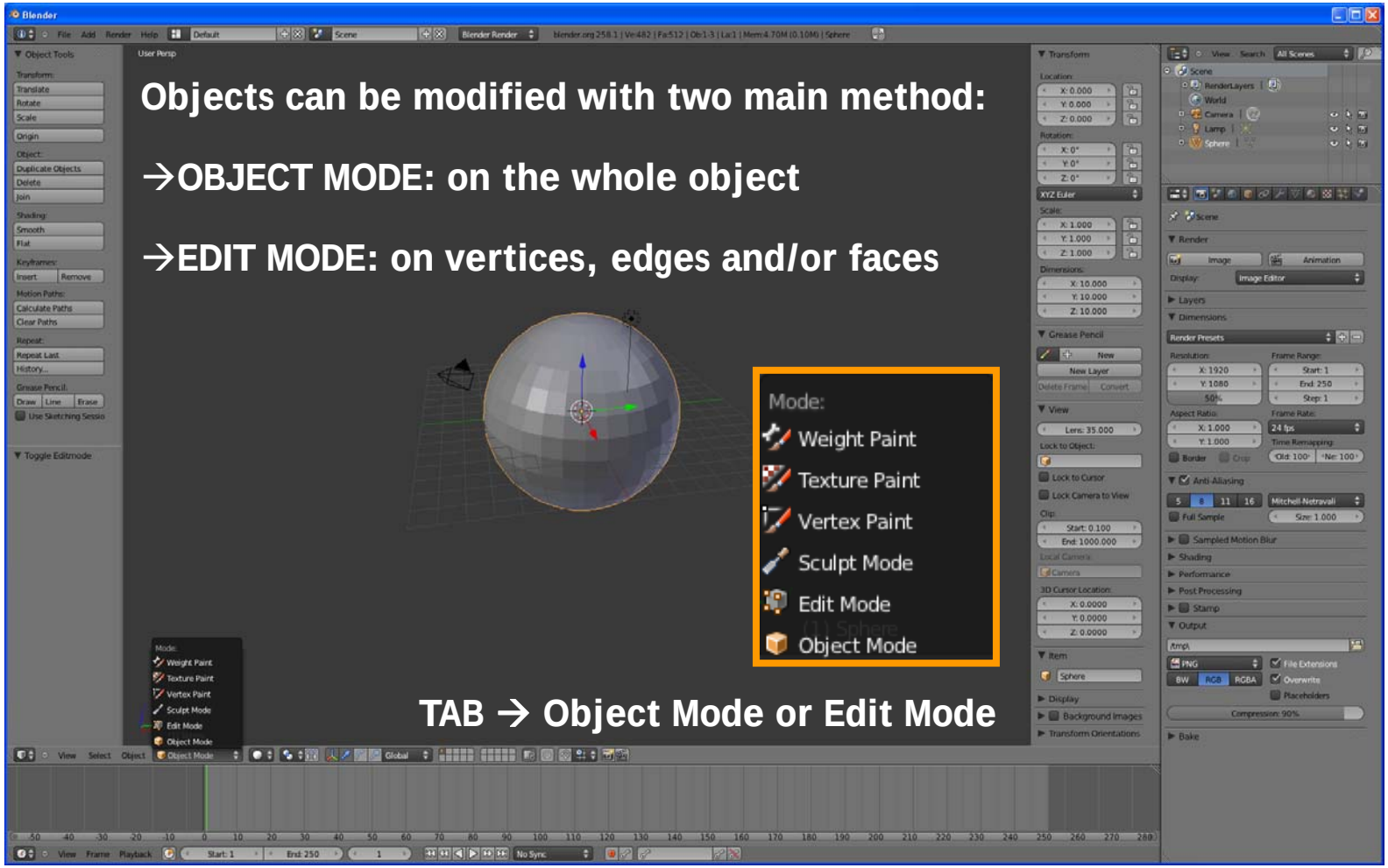


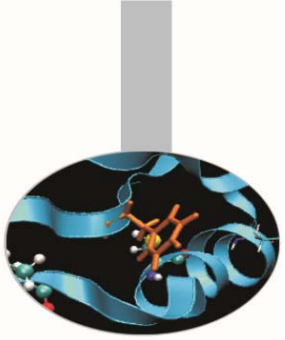
ADD MESH


Mesh
Plane
Cube
Circle
UV Sphere
Icosphere
Cylinder
Cone
Grid
Monkey
Torus

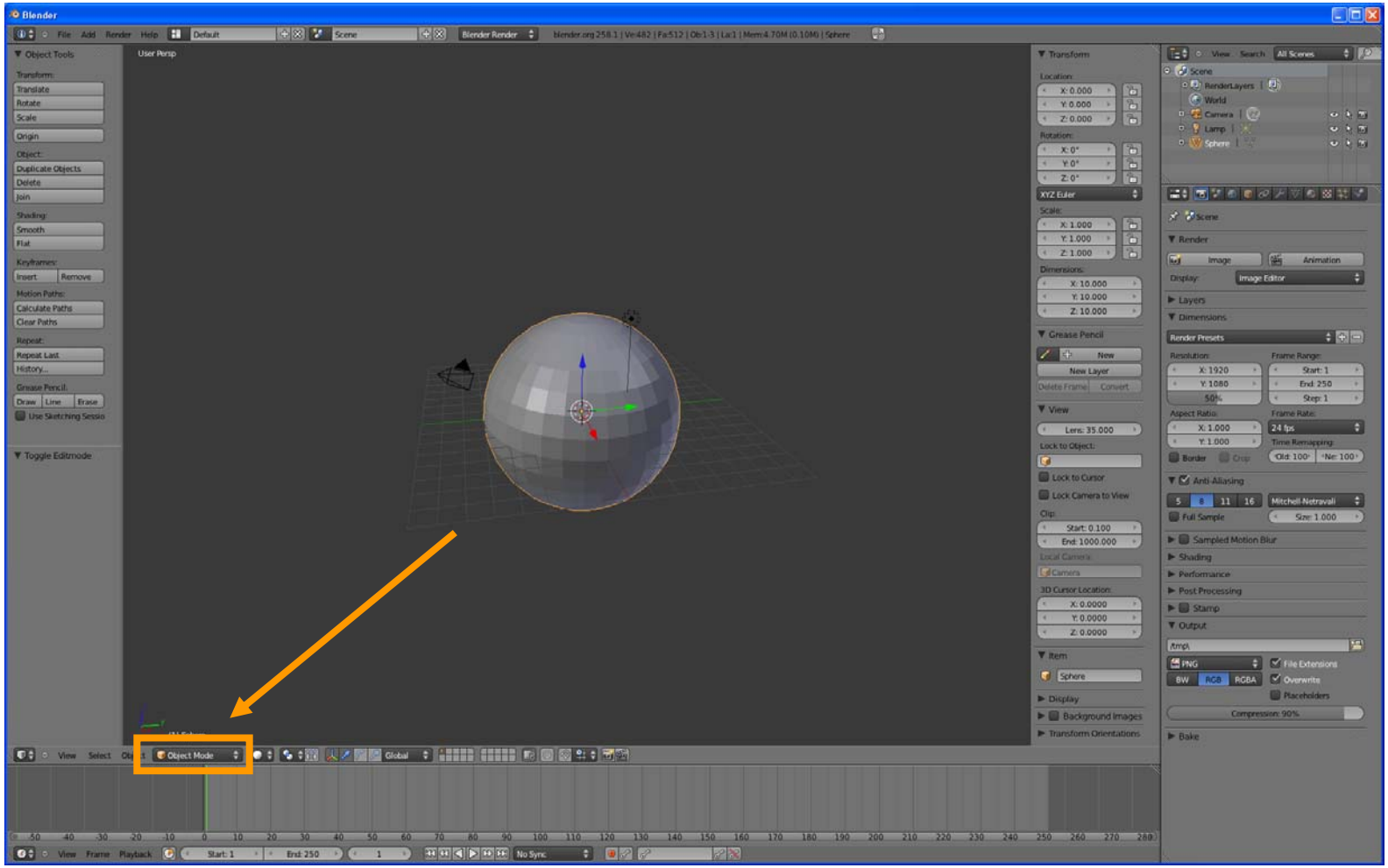


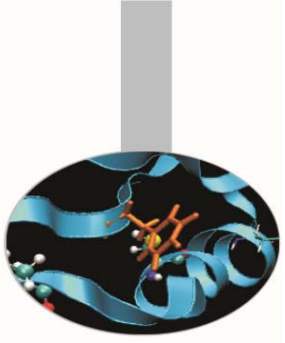
MODIFY OBJECTS



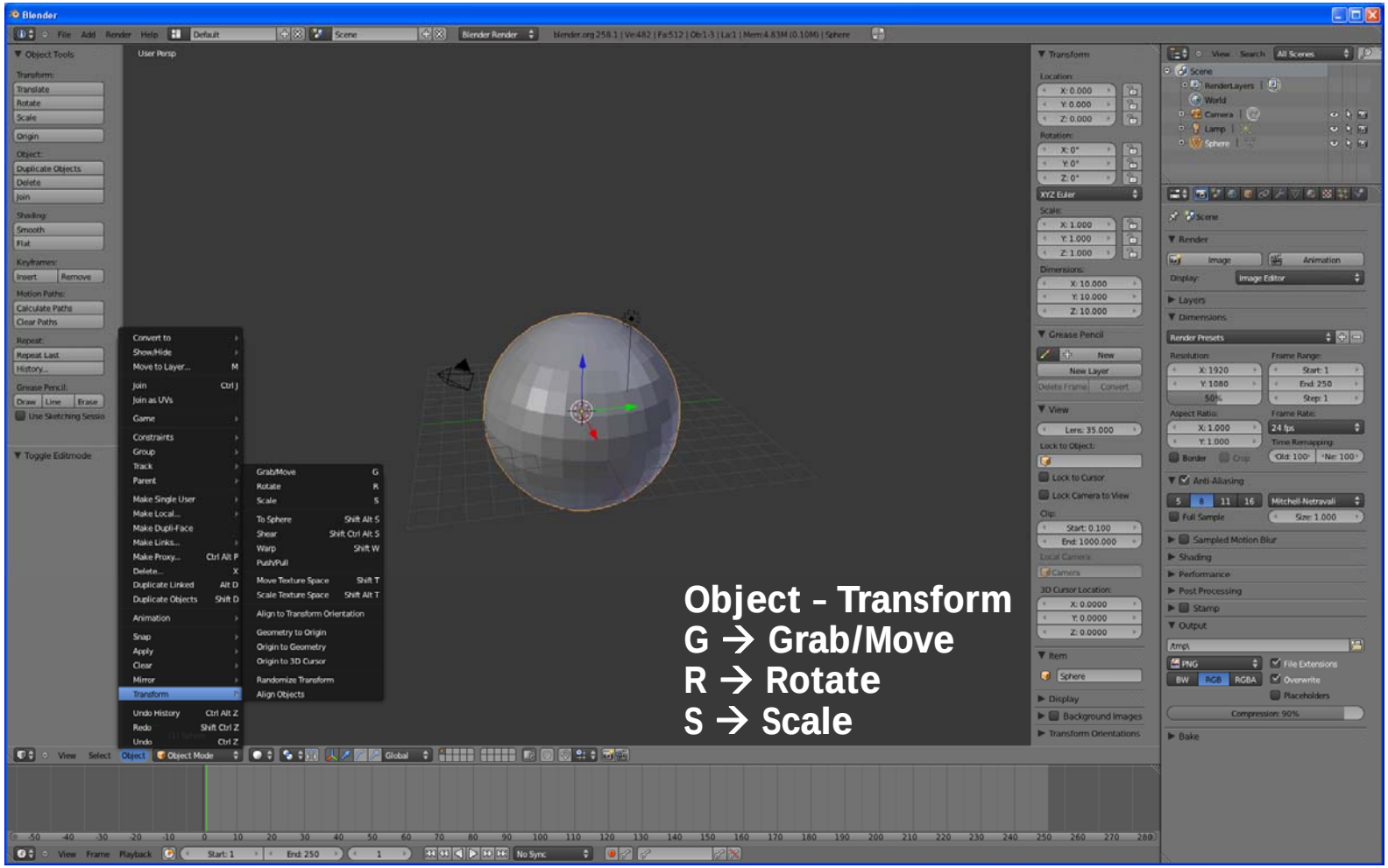


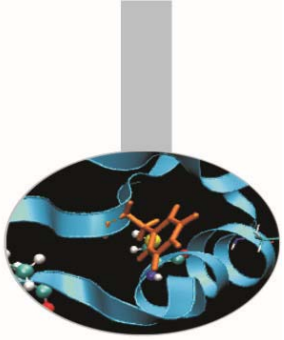
OBJECT MODE



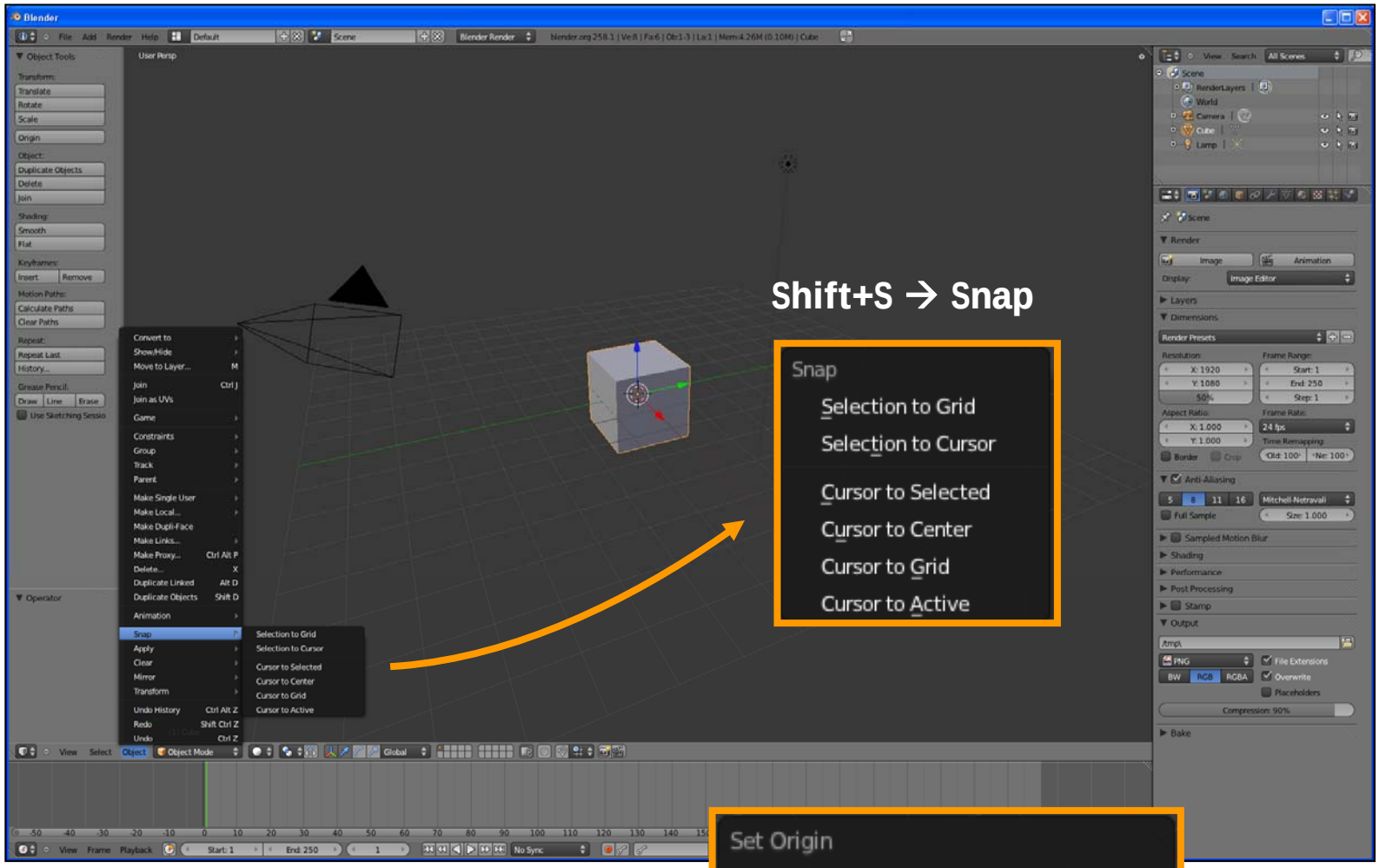


OBJECT MODE

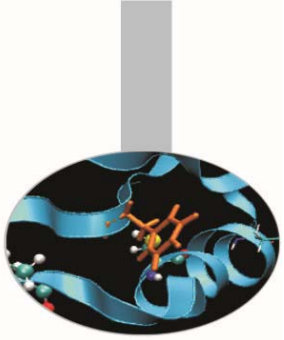




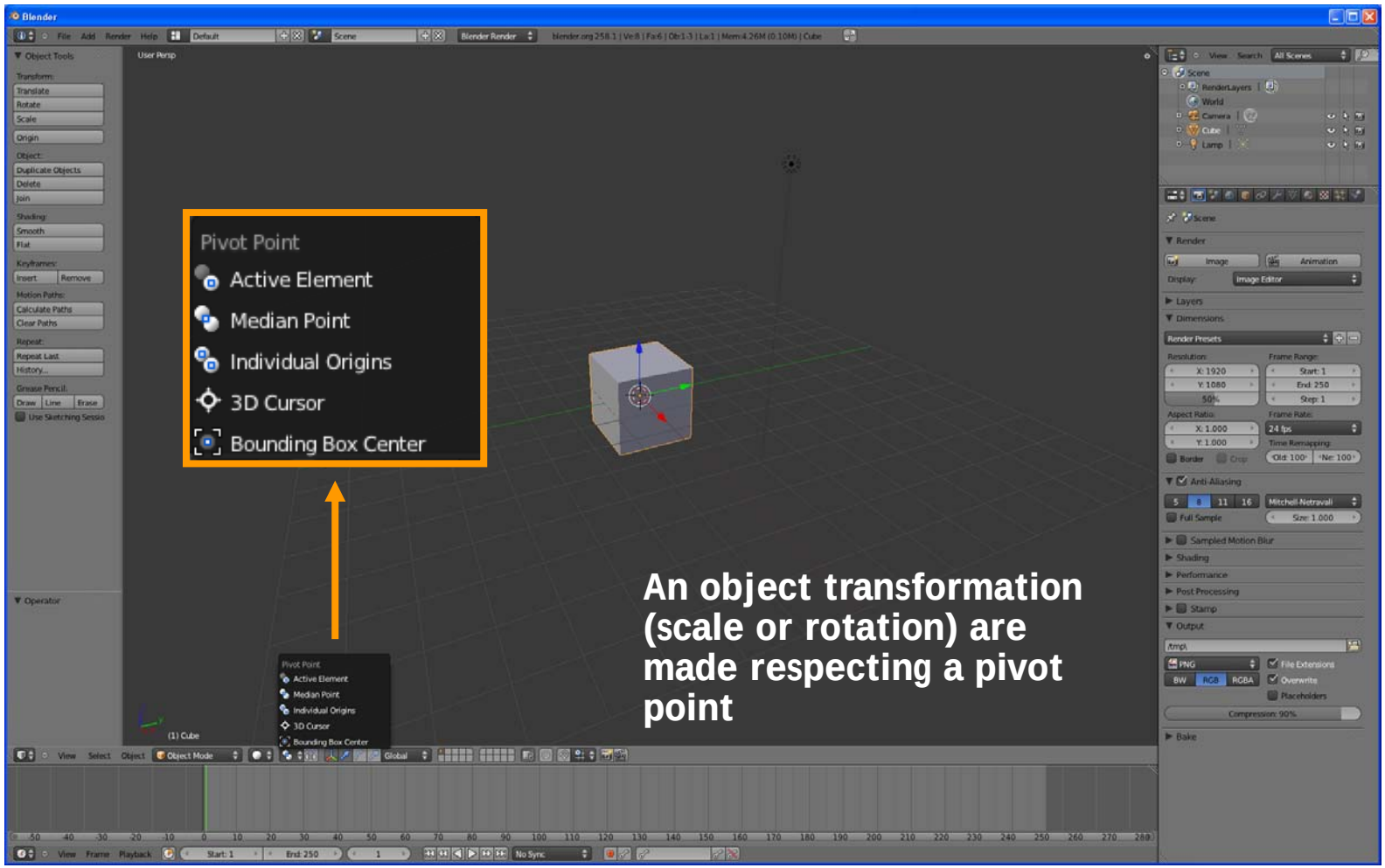
SNAP

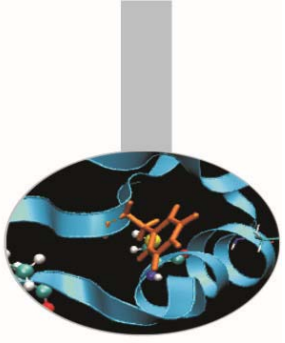


SHIFT + CTRL + ALT + C → set origin

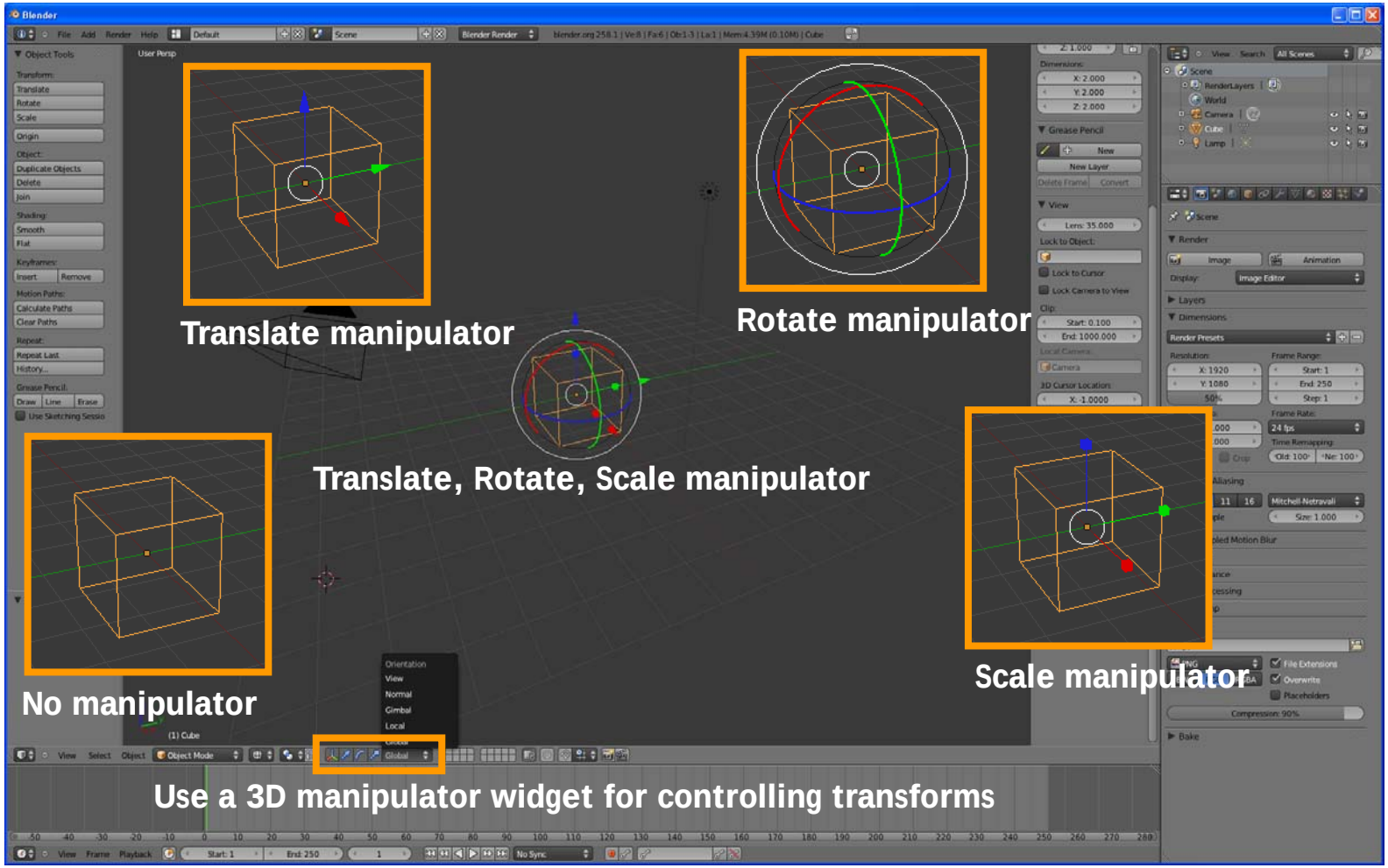


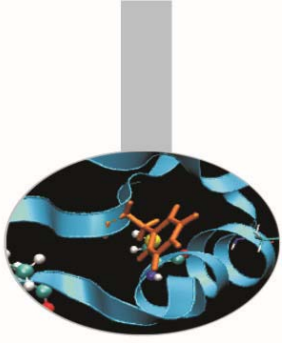
PIVOT POINT


Pivot Point
Active Element
Median Point
Individual Origins
3D Cursor
Bounding Box Center
An object transformation (scale or rotation) are made respecting a pivot point

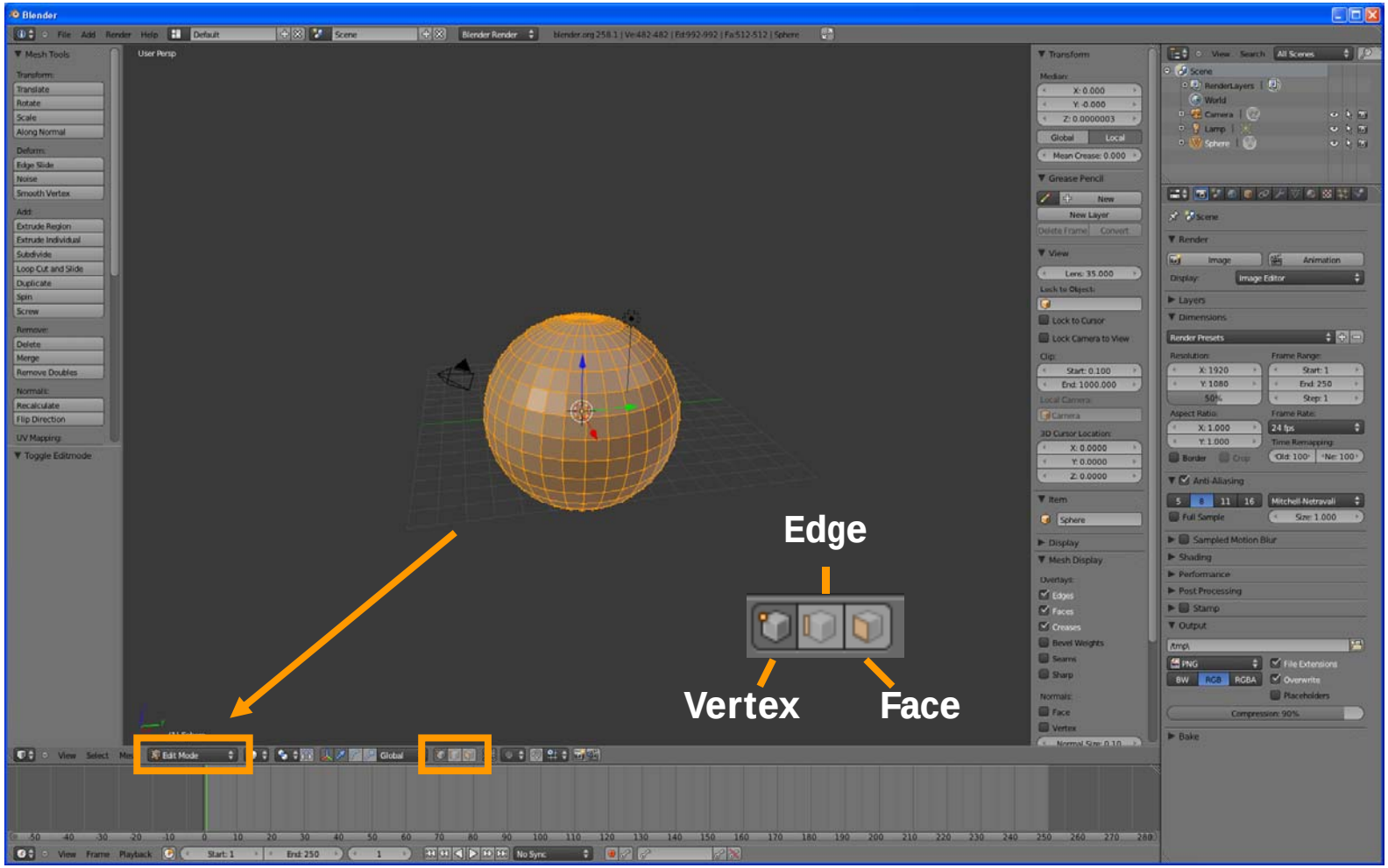


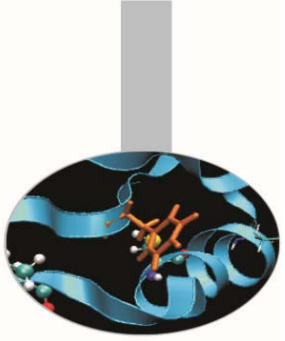
3D MANIPULATOR



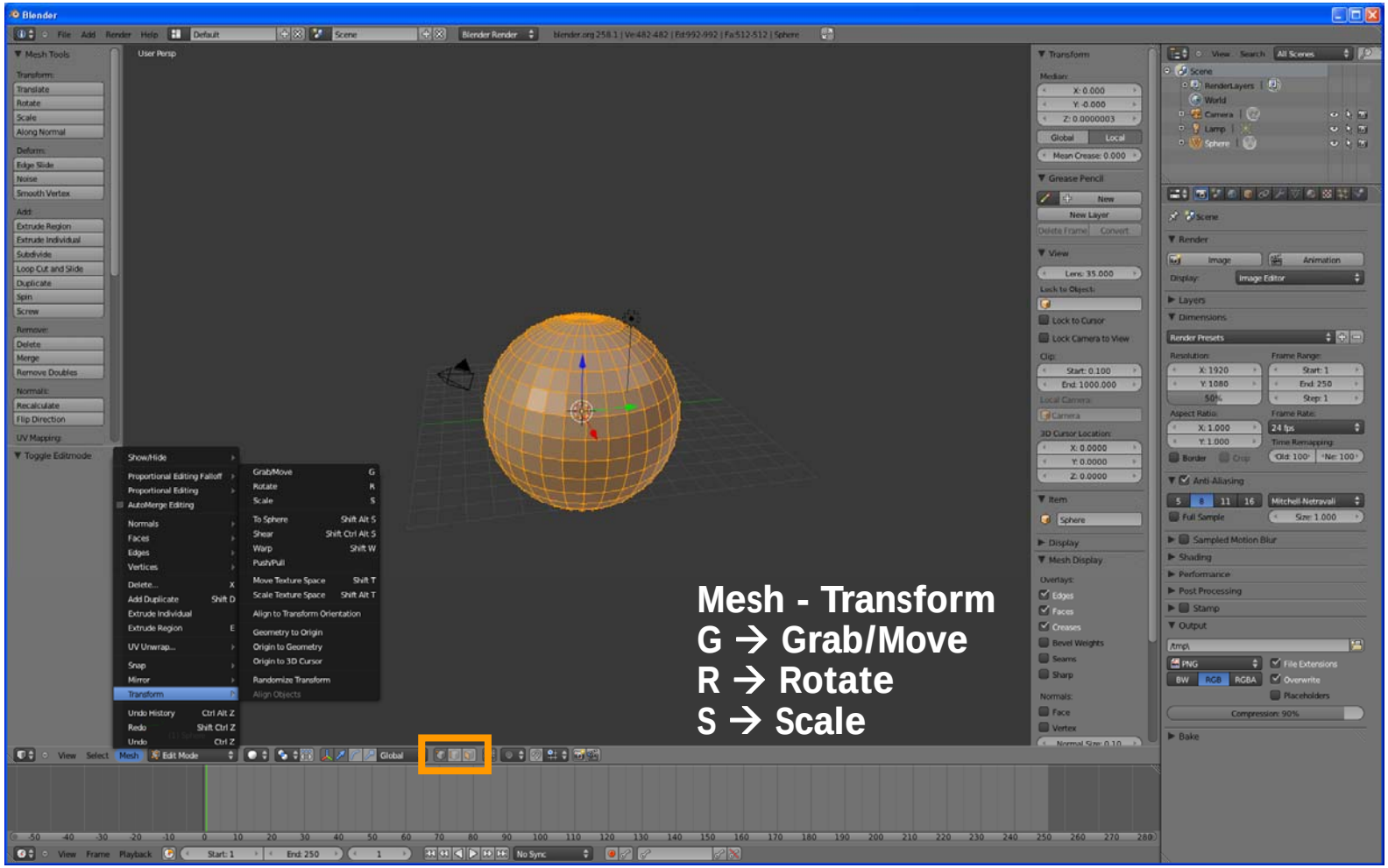


EDIT MODE

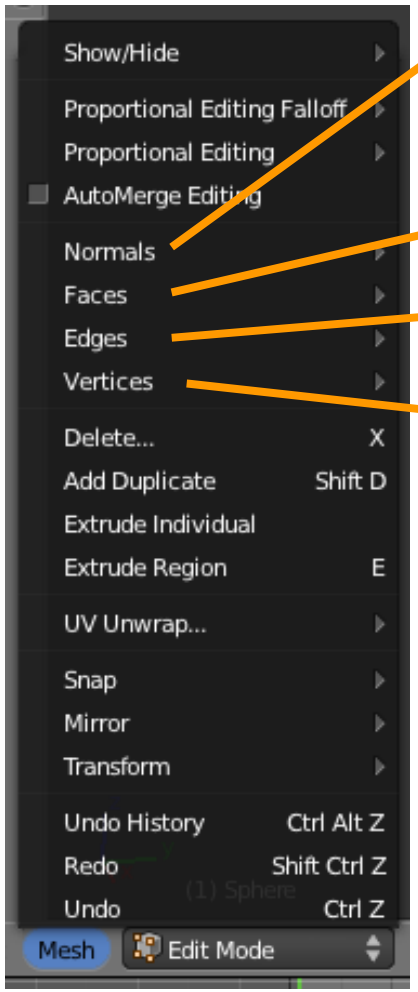


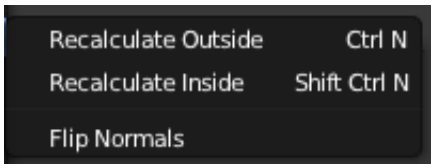


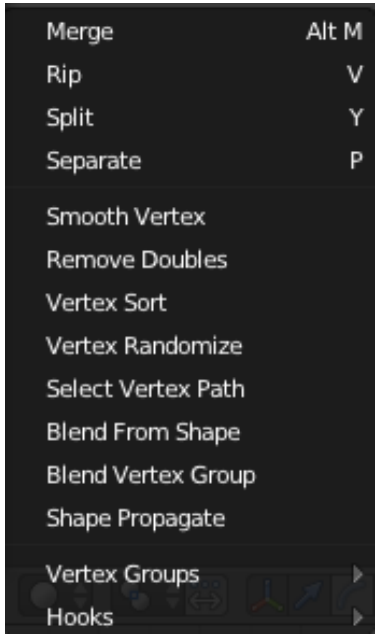
EDIT MODE



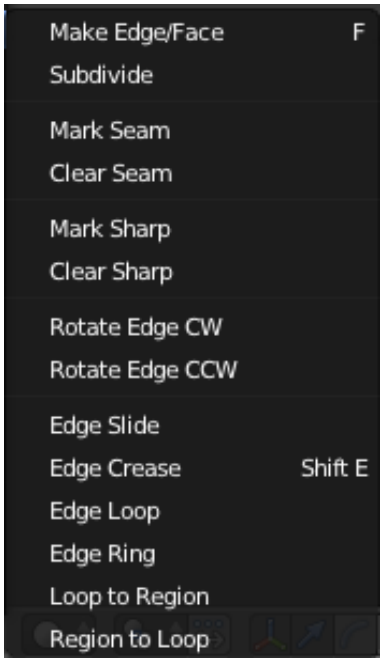
EDIT MODE





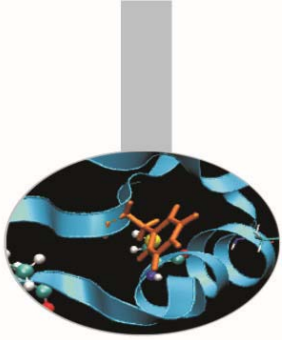


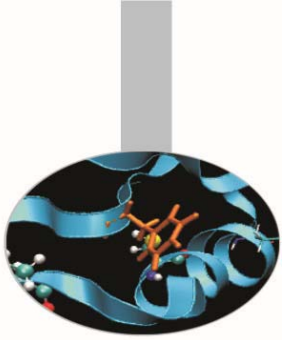
Ctrl+V



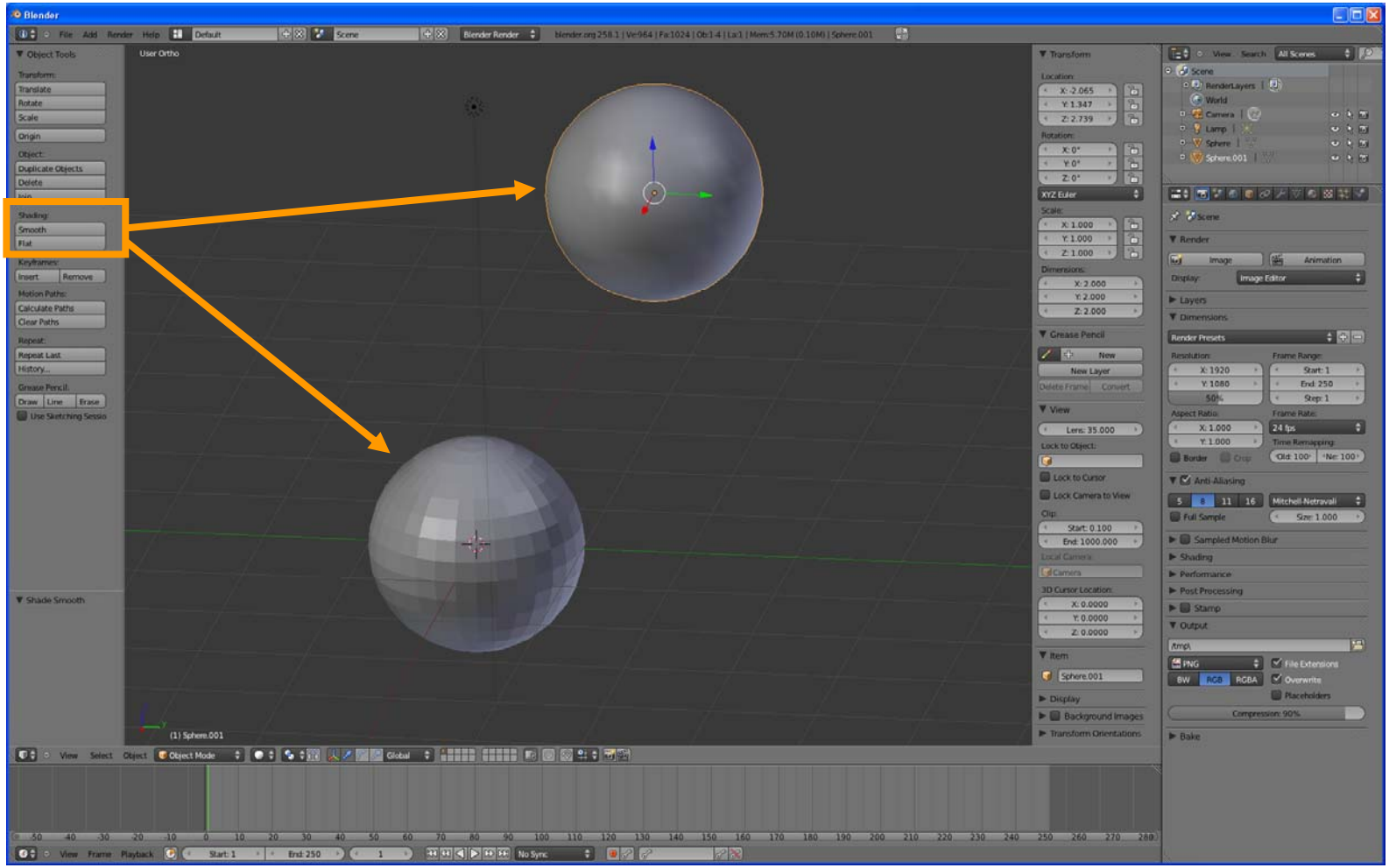
Ctrl+E

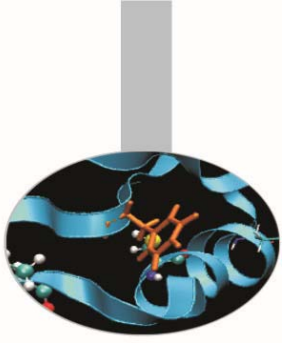
Ctrl+F



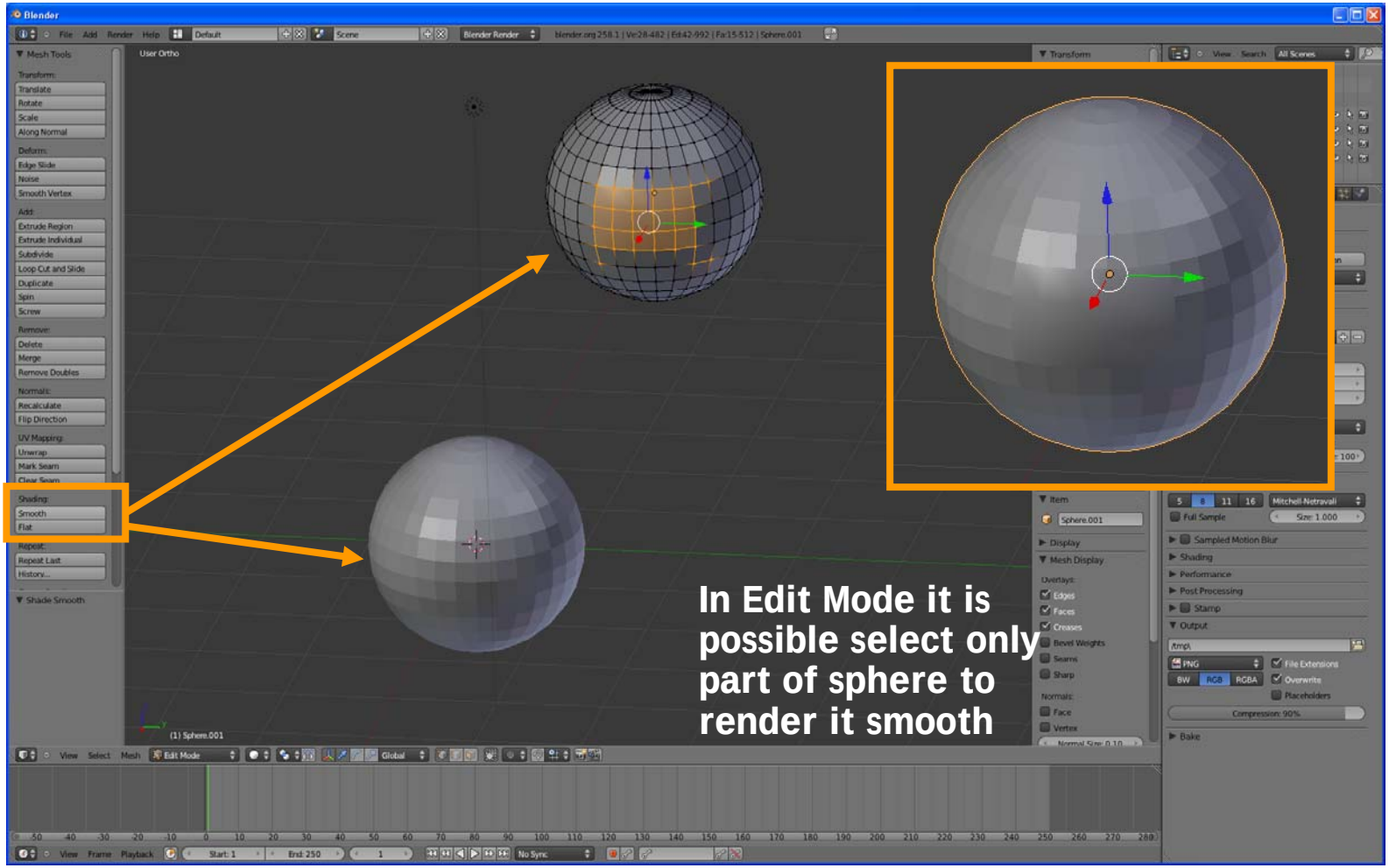


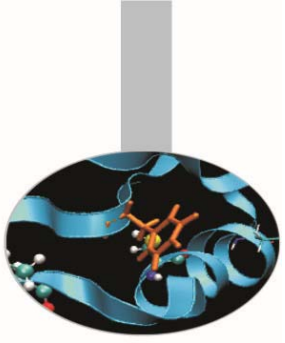
OBJECT MODE - SMOOTH SHADING



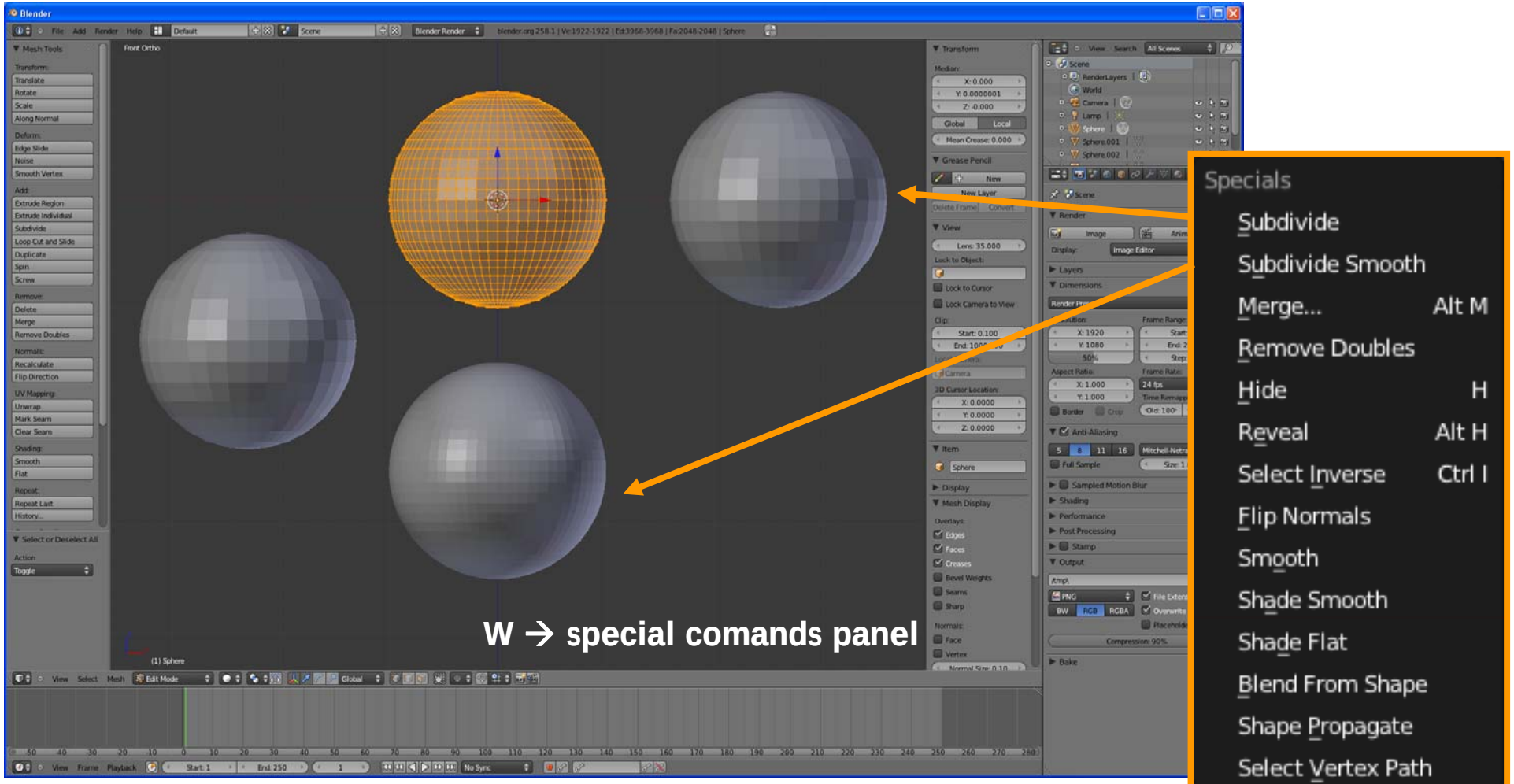


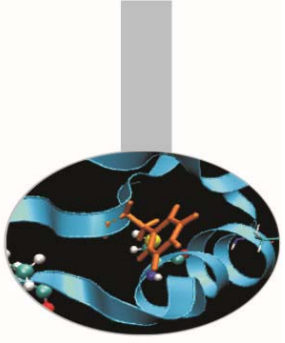
EDIT MODE – SMOOTH SHADING



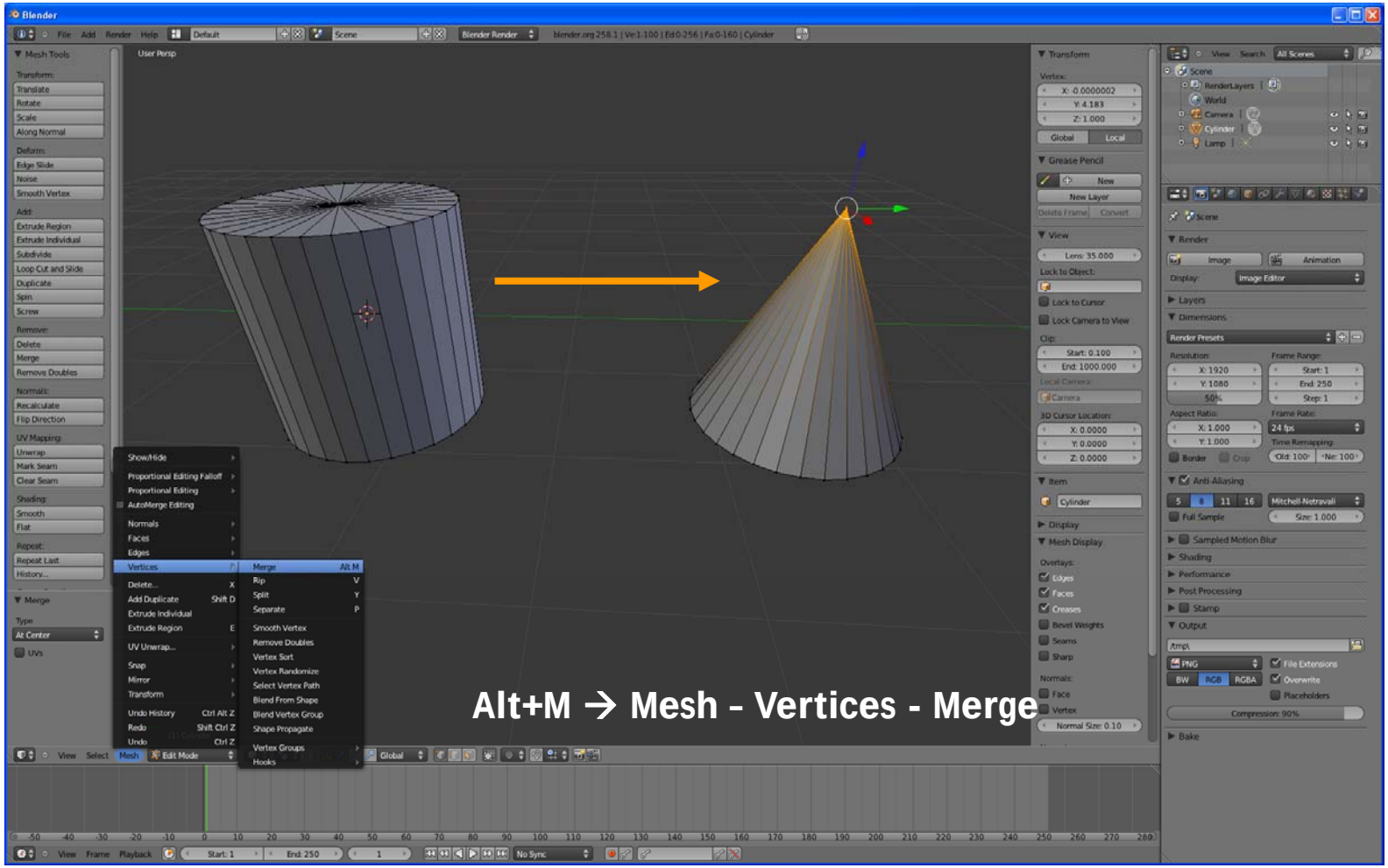


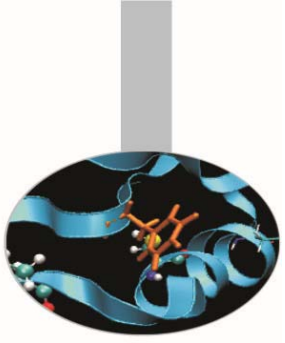
EDIT MODE - FACES - SUBDIVIDE



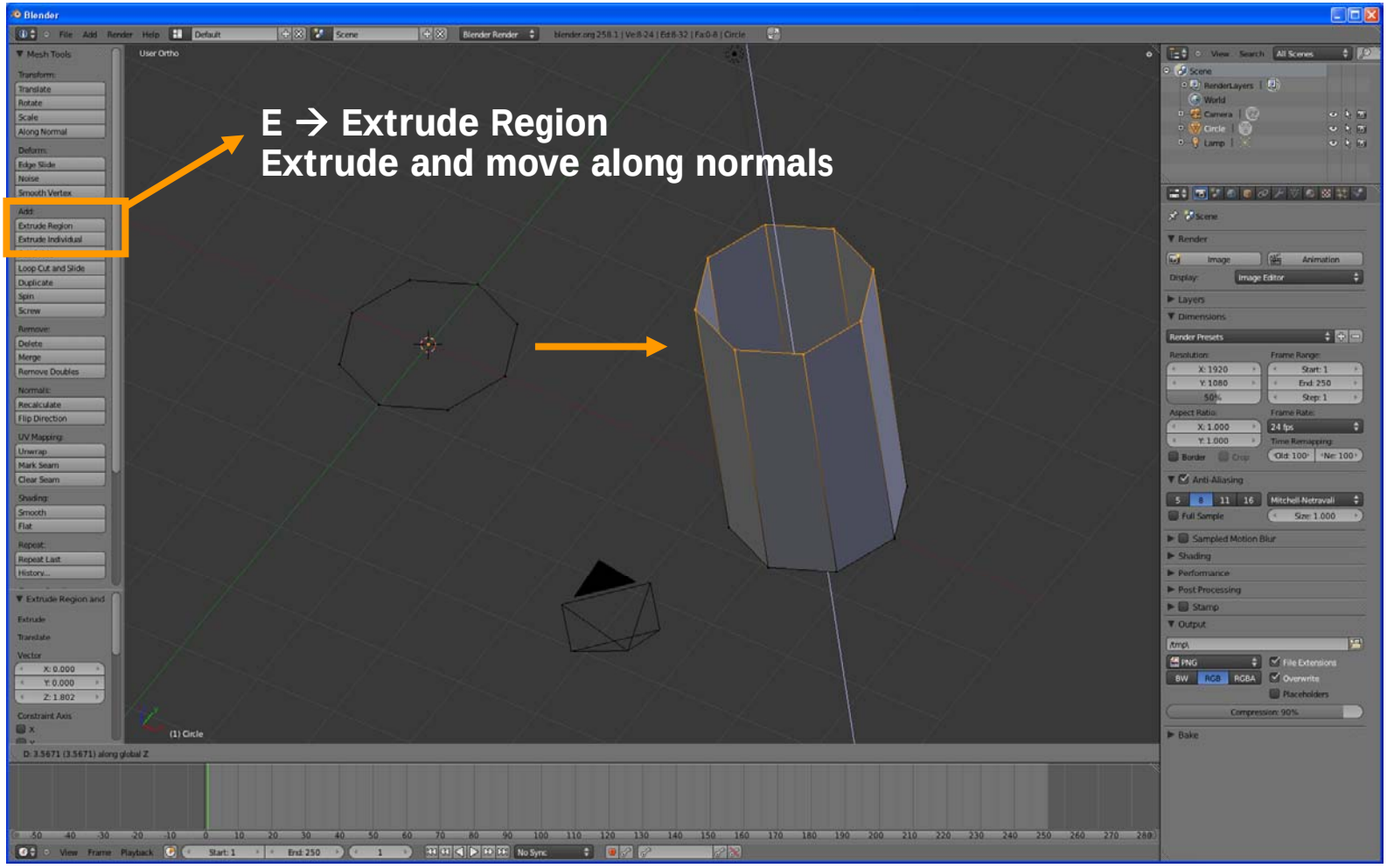


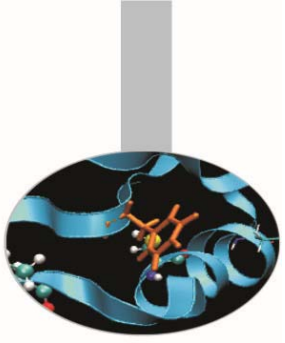
EDIT MODE - VERTEX - MERGE



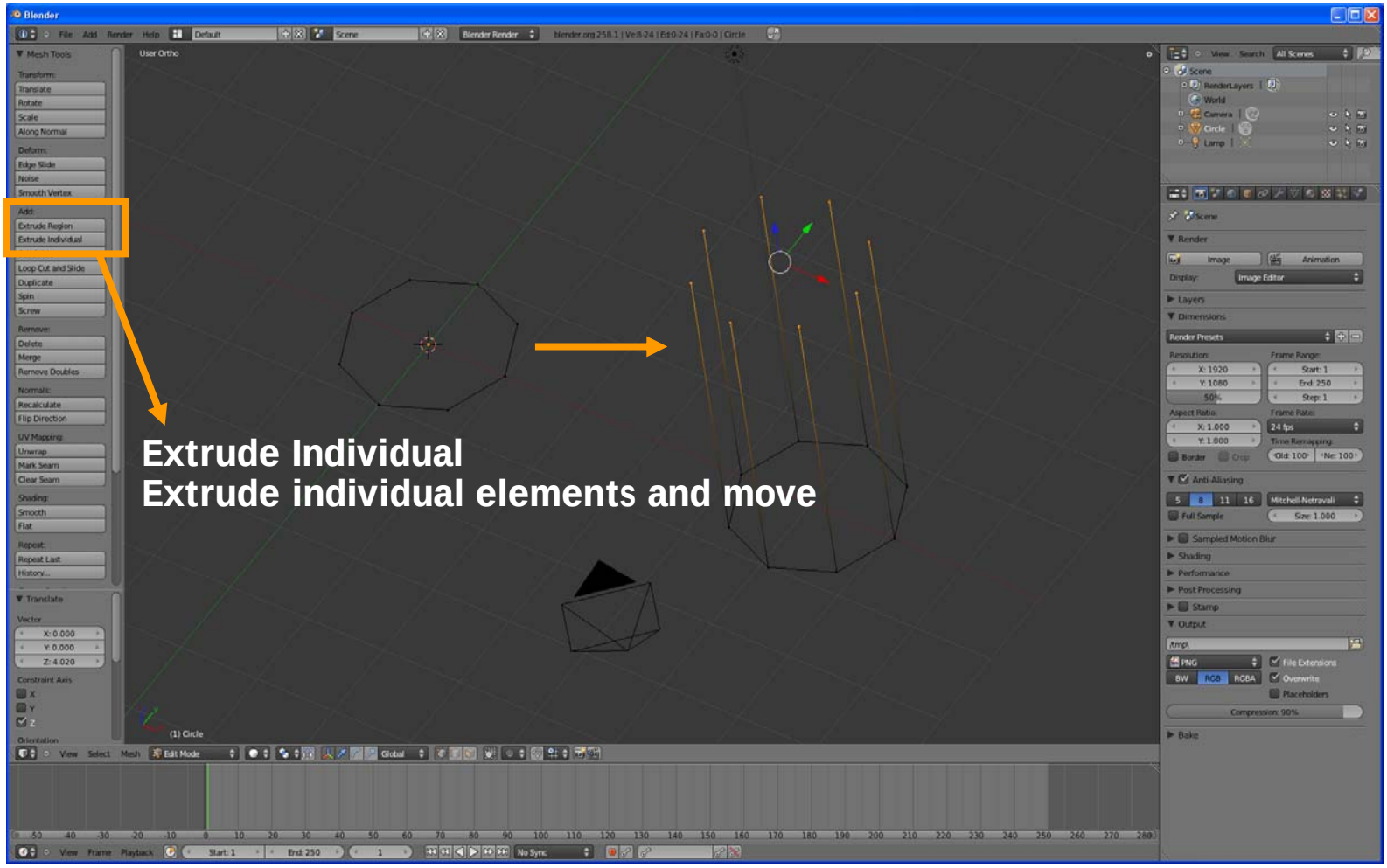


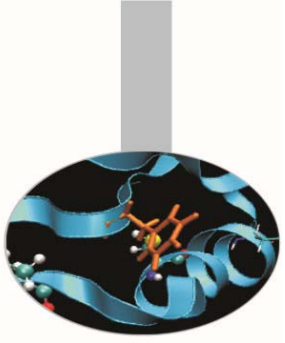
EDIT MODE - EXTRUDE



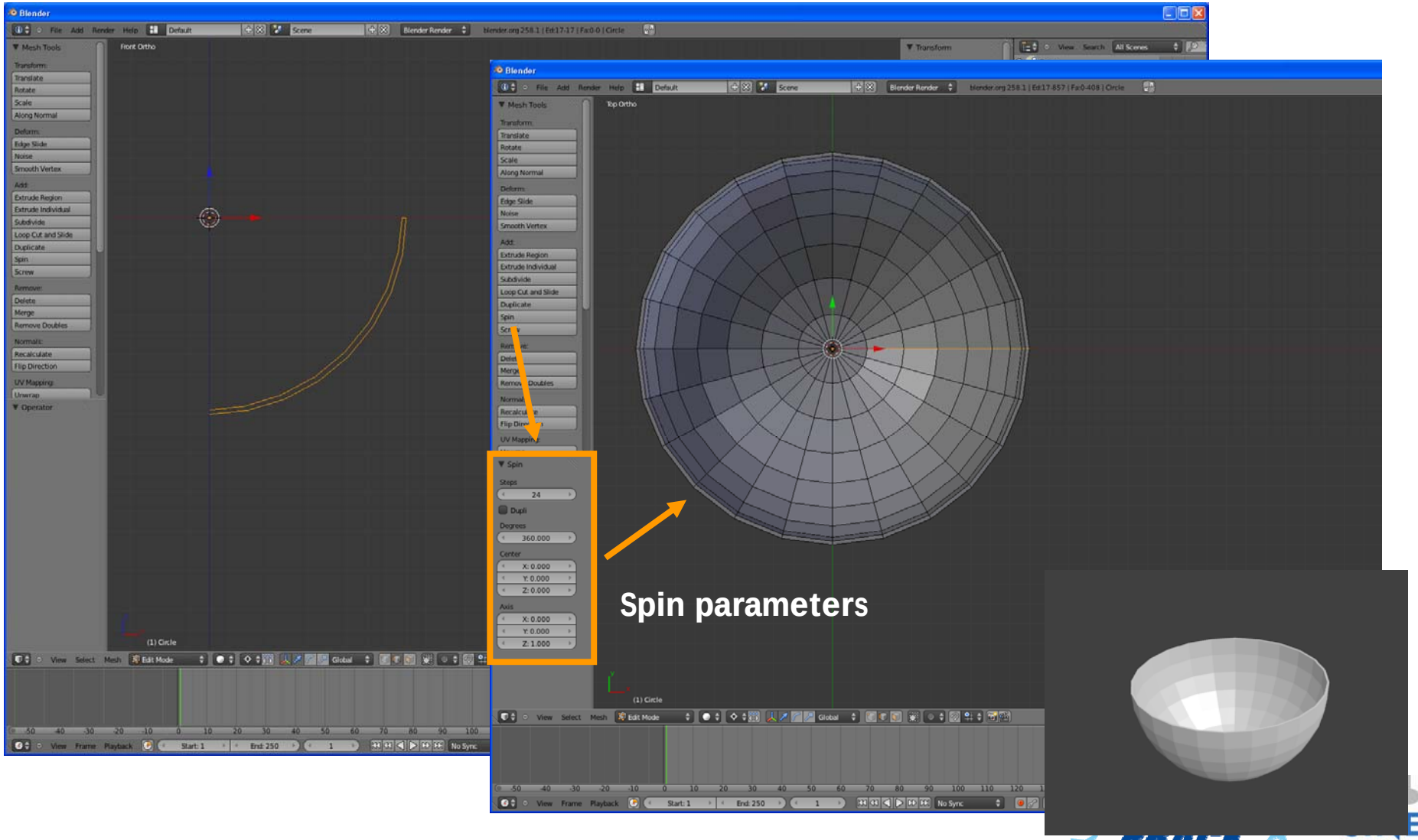


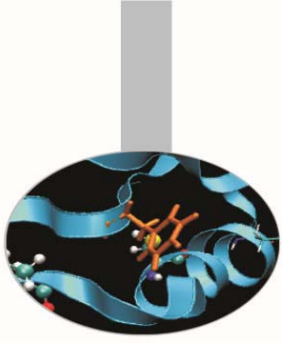
EDIT MODE - EXTRUDE



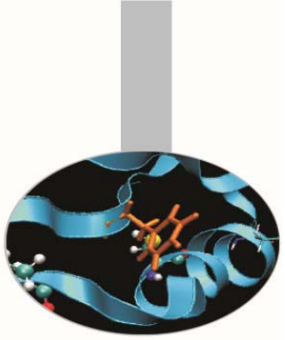


EDIT MODE - SPIN





Properties



PROPERTIES

Render

Scene

World

Object

Object Constraints

Modifiers

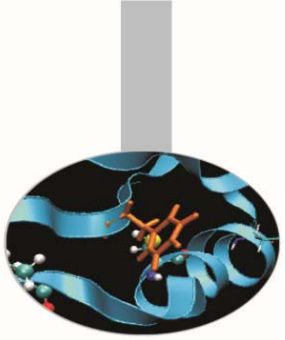
Object Data

Material

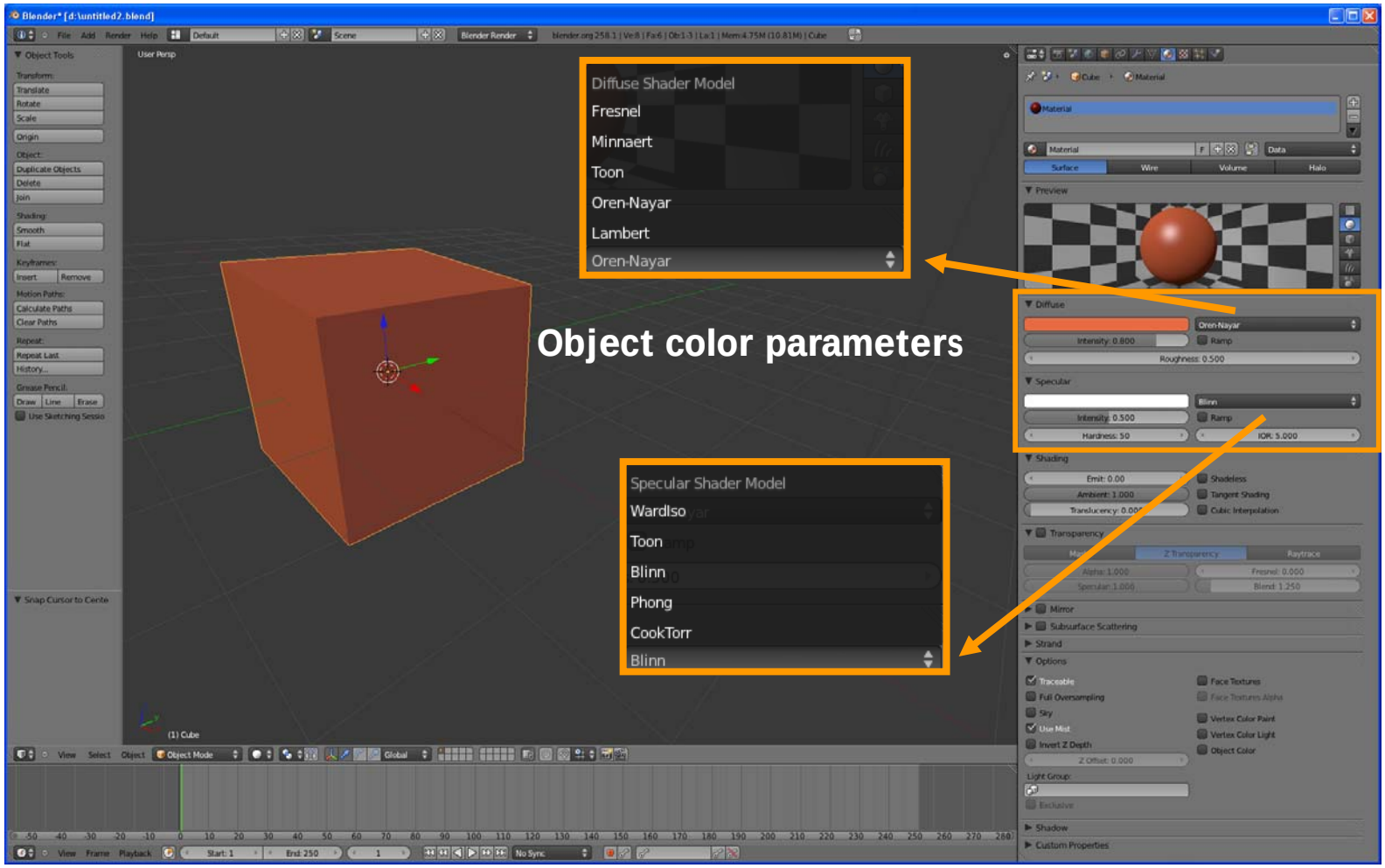
Texture

Particles

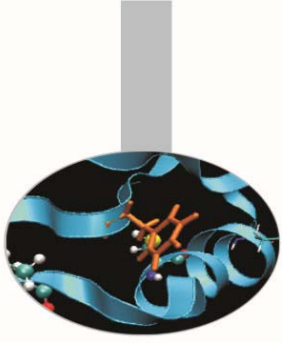
Physics



PROPERTIES - MATERIAL



http://wiki.blender.org/index.php/Doc:Manual/Materials/Properties/Diffuse_Shaders



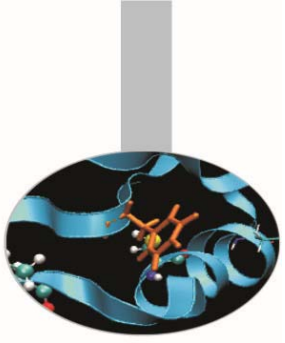
CPK coloring

"In chemistry, the CPK coloring is a popular color convention for distinguishing atoms of different chemical elements in molecular models."
"Typical CPK color assignments include:

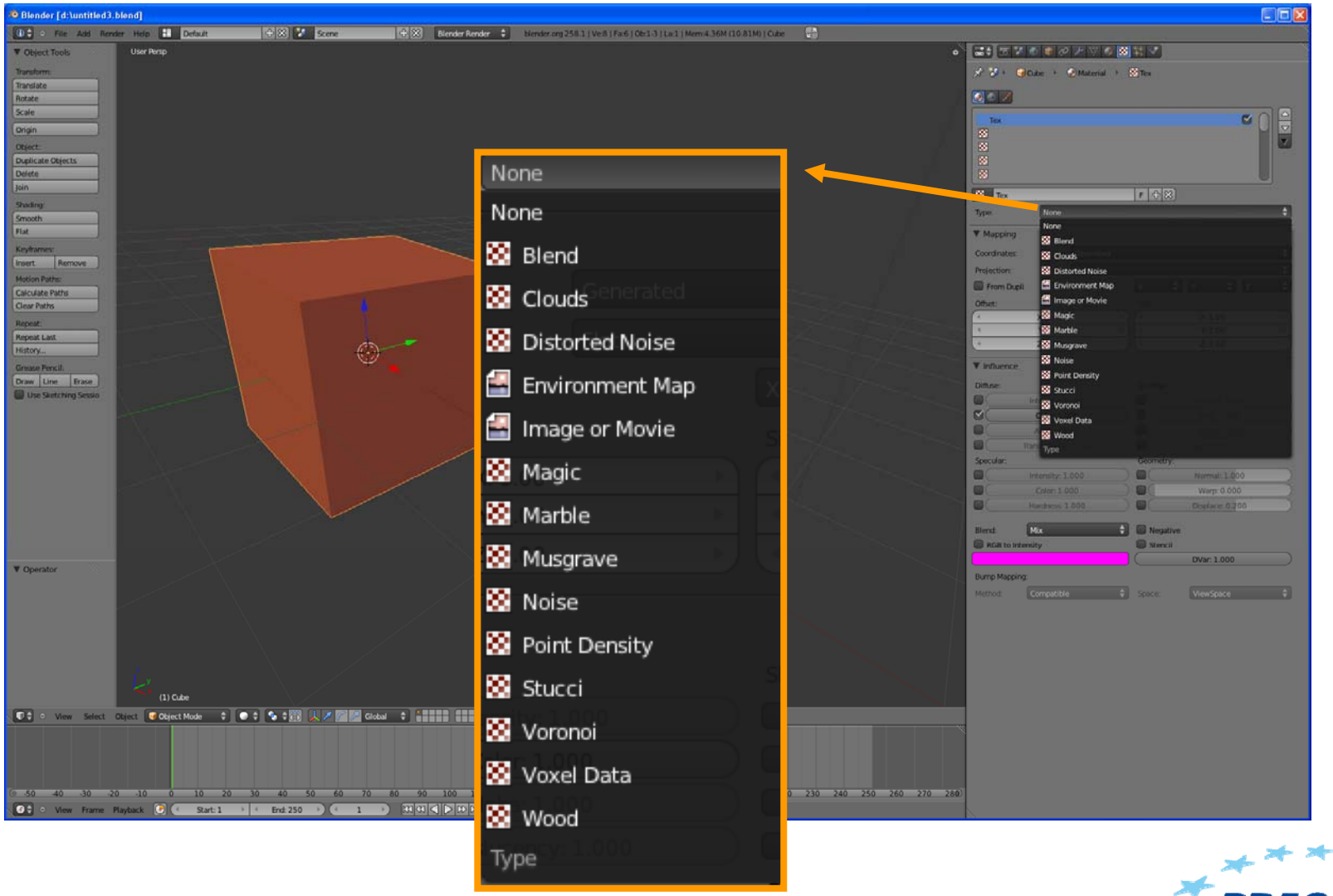
	hydrogen (H)	white
	carbon (C)	black
	nitrogen (N)	dark blue
	oxygen (O)	red
	fluorine (F), chlorine (Cl)	green
	bromine (Br)	dark red
	iodine (I)	dark violet
	noble gases (He, Ne, Ar, Xe, Kr)	cyan
	phosphorus (P)	orange
	sulfur (S)	yellow
	boron (B), most transition metals	peach, salmon
	alkali metals (Li, Na, K, Rb, Cs, Fr)	violet
	alkaline earth metals (Be, Mg, Ca, Sr, Ba, Ra)	dark green
	titanium (Ti)	gray
	iron (Fe)	dark orange
	other elements	pink

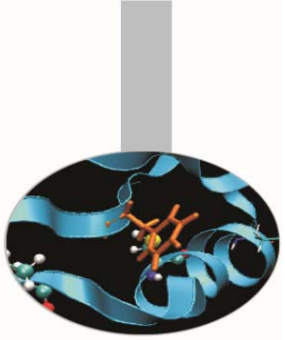
Several of the CPK colors refer mnemonically to colors of the pure elements or notable compound."

https://en.wikipedia.org/wiki/CPK_coloring

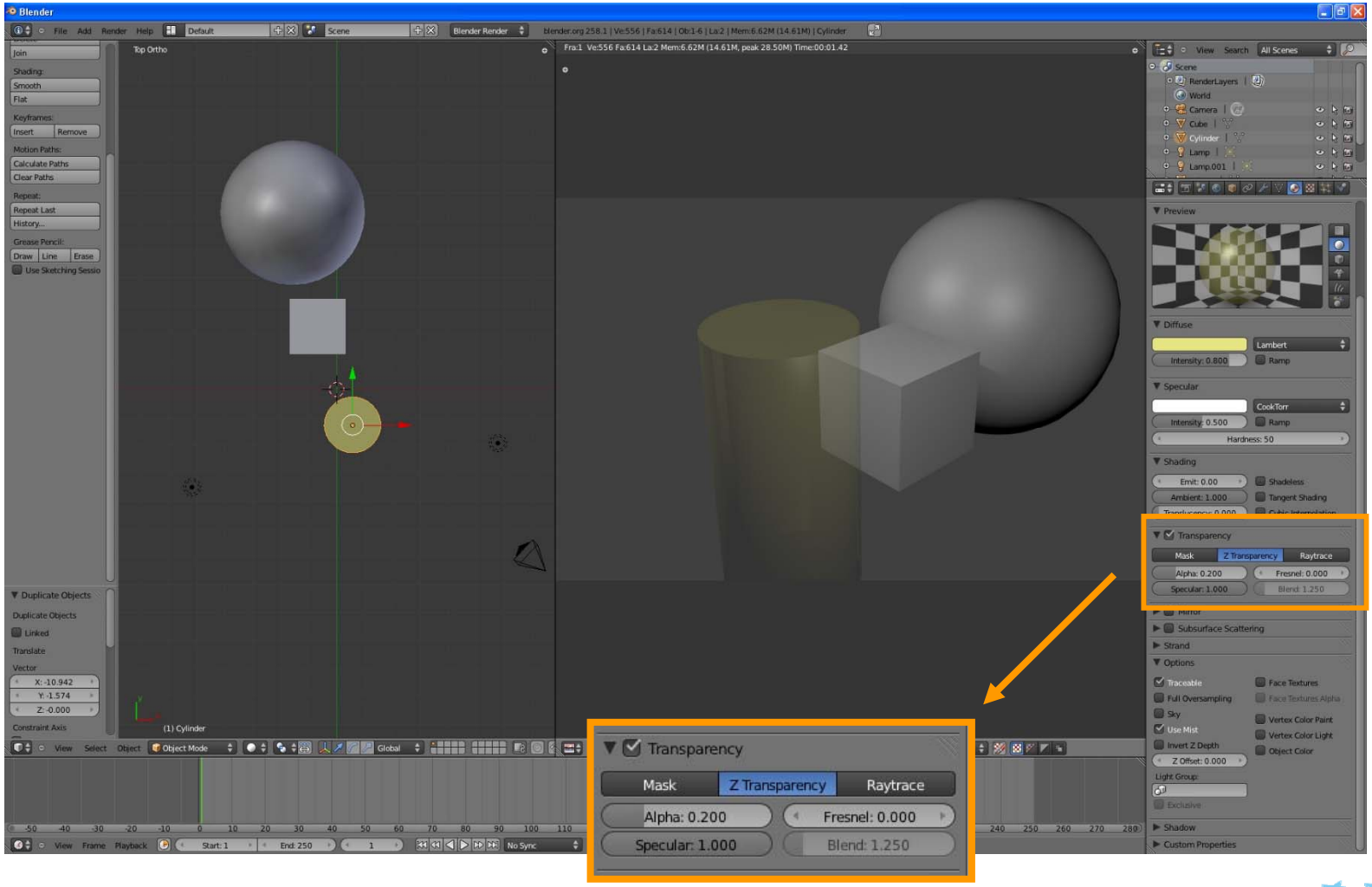


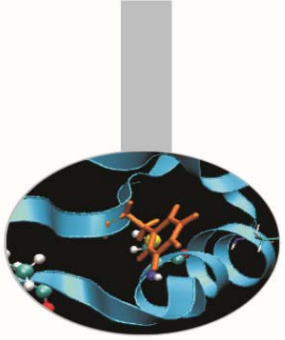
PROPERTIES - TEXTURE



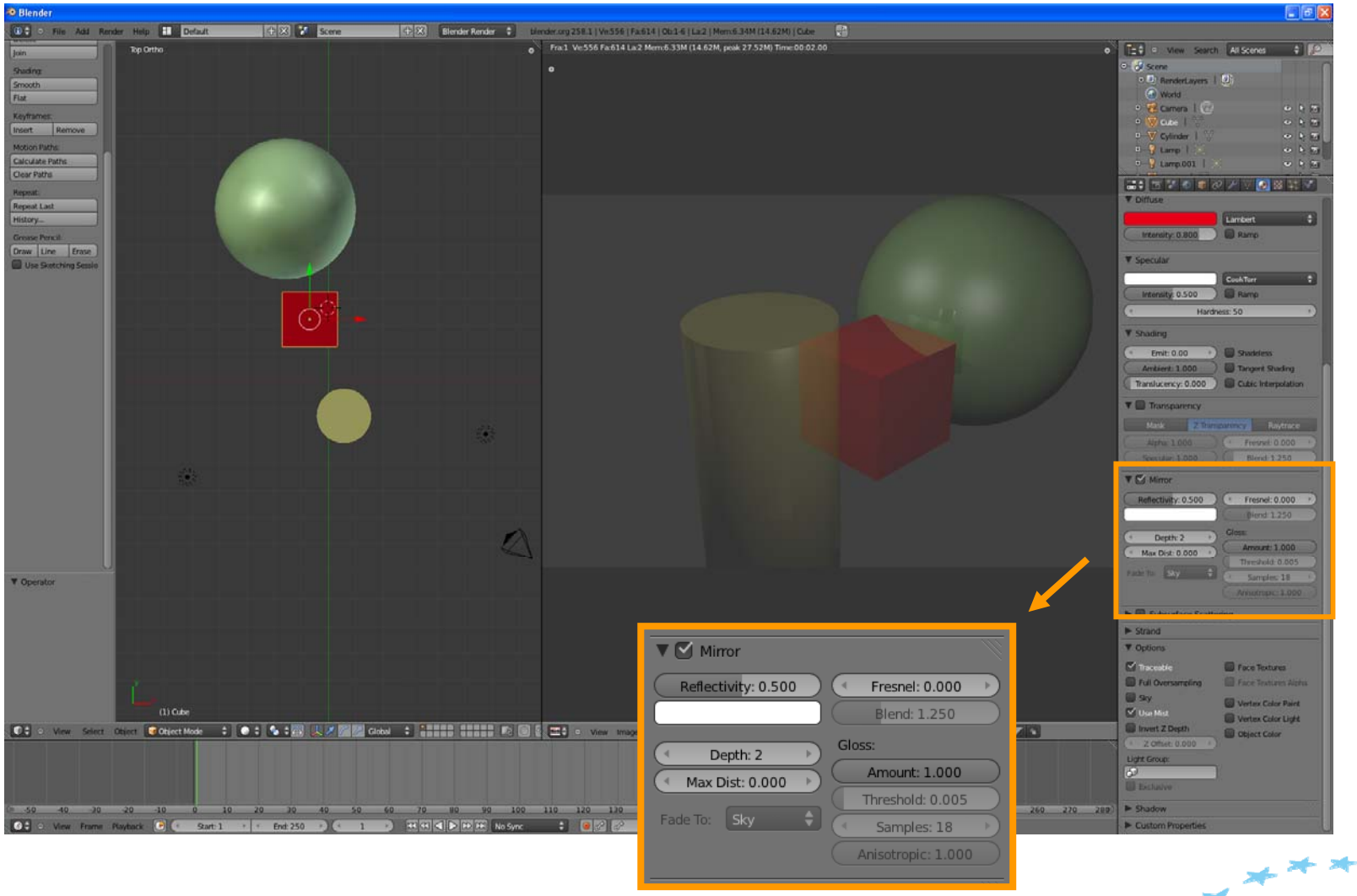


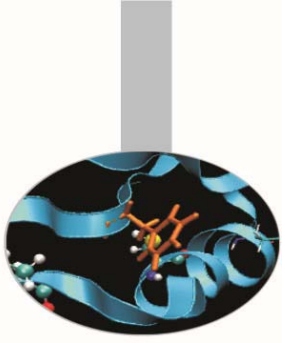
PROPERTIES - MATERIAL



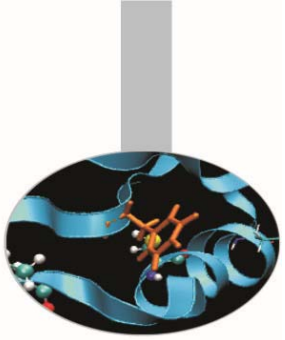


PROPERTIES - MATERIAL

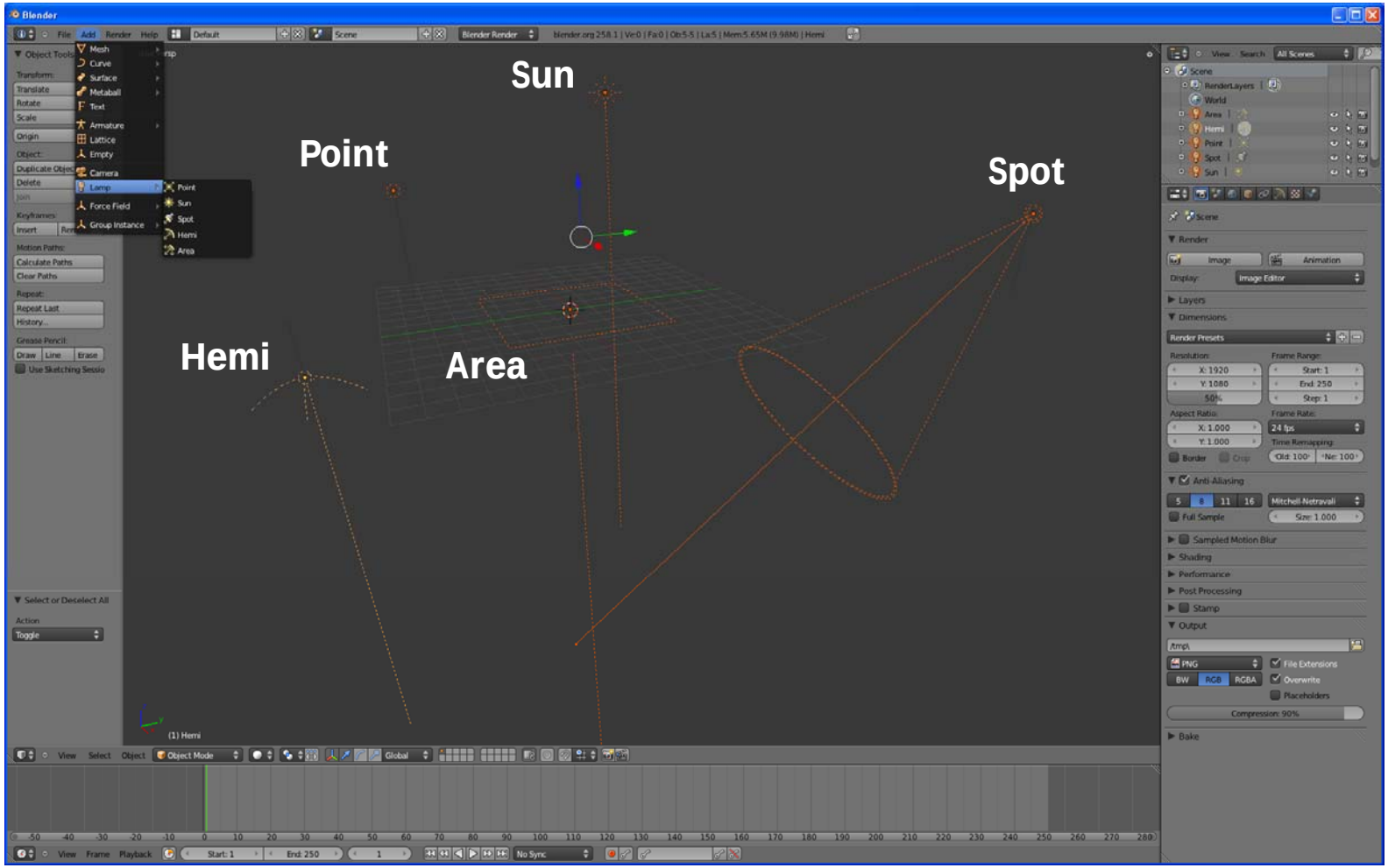


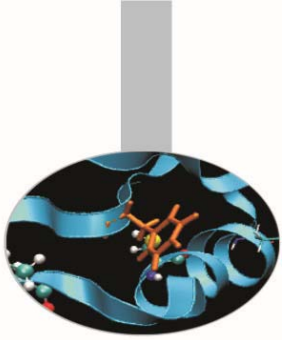


Render an image

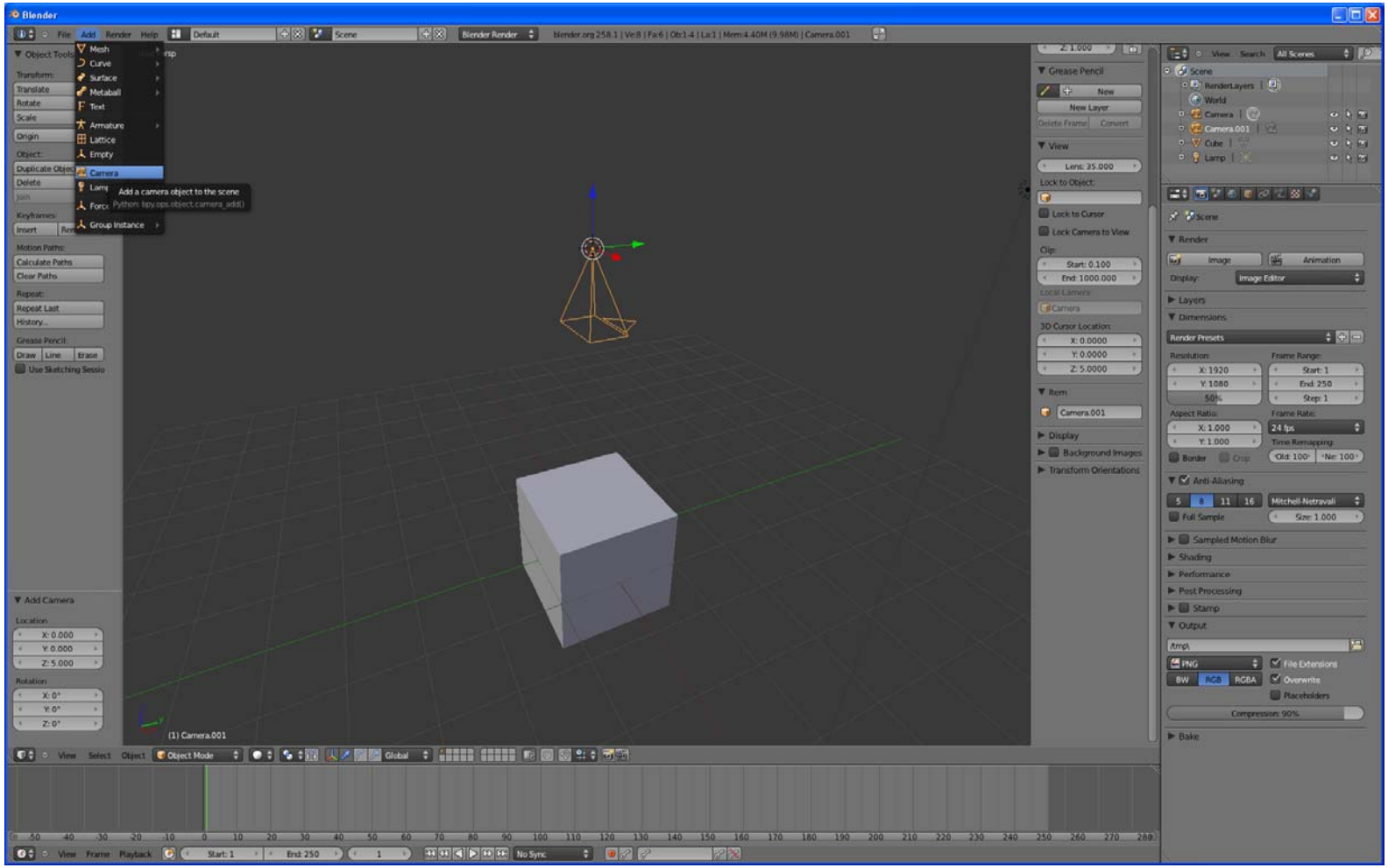


ADD LAMP

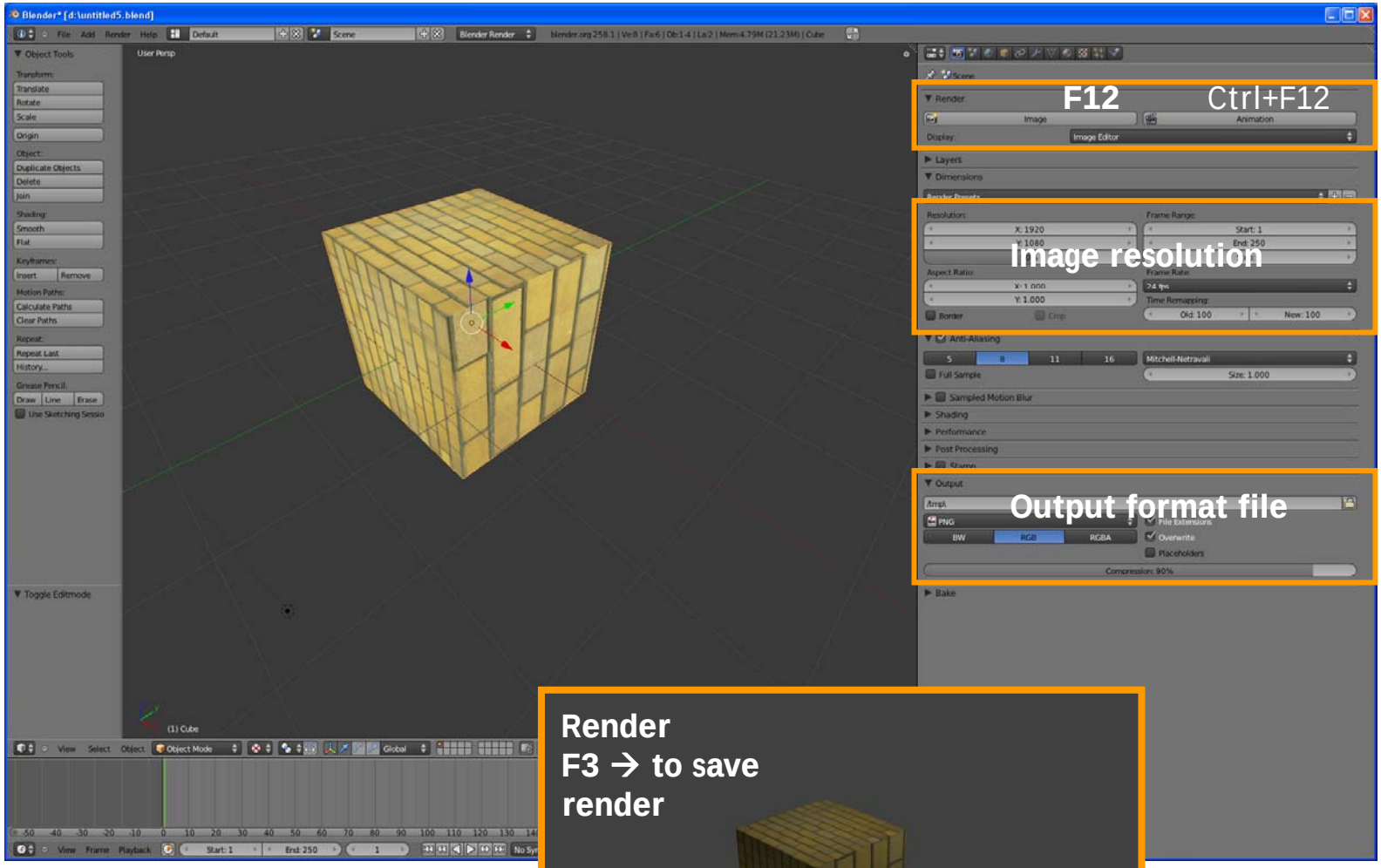




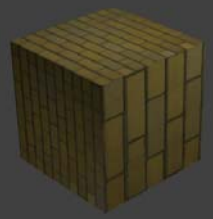
ADD CAMERA


Blender
Add
Render
Help
Default
Scene
Blender Render
Mesh
Curve
Surface
Metaball
Text
Armature
Lattice
Empty
Camera
Lamp
Force Field
Group Instance
Add a camera object to the scene
Python: bpy.ops.object.camera_add()
Object Tools
Transform:
Translate
Rotate
Scale
Origin
Object:
Duplicate Objects
Delete
Join
Keyframes:
Insert
Motion Paths:
Calculate Paths
Clear Paths
Repeat:
Repeat Last
History...
Grease Pencil:
Draw
Line
Erase
Use Sketching Sessio
Add Camera
Location
X: 0.000
Y: 0.000
Z: 5.000
Rotation
X: 0°
Y: 0°
Z: 0°
(1) Camera.001
View
Select
Object
Object Mode
Global
Grease Pencil
New
New Layer
Delete Frame
Convert
View
Lens: 35.000
Lock to Object:
Lock to Cursor
Lock Camera to View
Clip:
Start: 0.100
End: 1000.000
Local Camera:
Camera
3D Cursor Location:
X: 0.0000
Y: 0.0000
Z: 5.0000
Item
Camera.001
Display
Background Images
Transform Orientations
View
Search
All Scenes
Scene
RenderLayers
World
Camera
Camera.001
Cube
Lamp
Render
Image
Animation
Display:
Image Editor
Layers
Dimensions
Render Presets
Resolution:
X: 1920
Y: 1080
50%
Frame Range:
Start: 1
End: 250
Step: 1
Aspect Ratio:
X: 1.000
Y: 1.000
Frame Rate:
24 fps
Time Remapping:
Old: 100
New: 100
Border
Crop
Anti-Aliasing
5
8
11
16
Mitchell-Netravali
Full Sample
Size: 1.000
Sampled Motion Blur
Shading
Performance
Post Processing
Stamp
Output
/tmp\
PNG
File Extensions
BW
RGB
RGBA
Overwrite
Placeholders
Compression: 90%
Bake
View
Frame
Playback
Start: 1
End: 250
1
No Sync

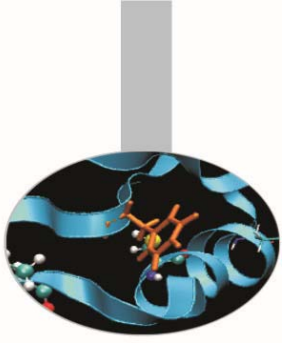
PROPERTIES - RENDER



Render
F3 → to save render



CINECA SCAI
SuperComputing Applications and Innovation



Tutorial 1
Import obj file

PRACE

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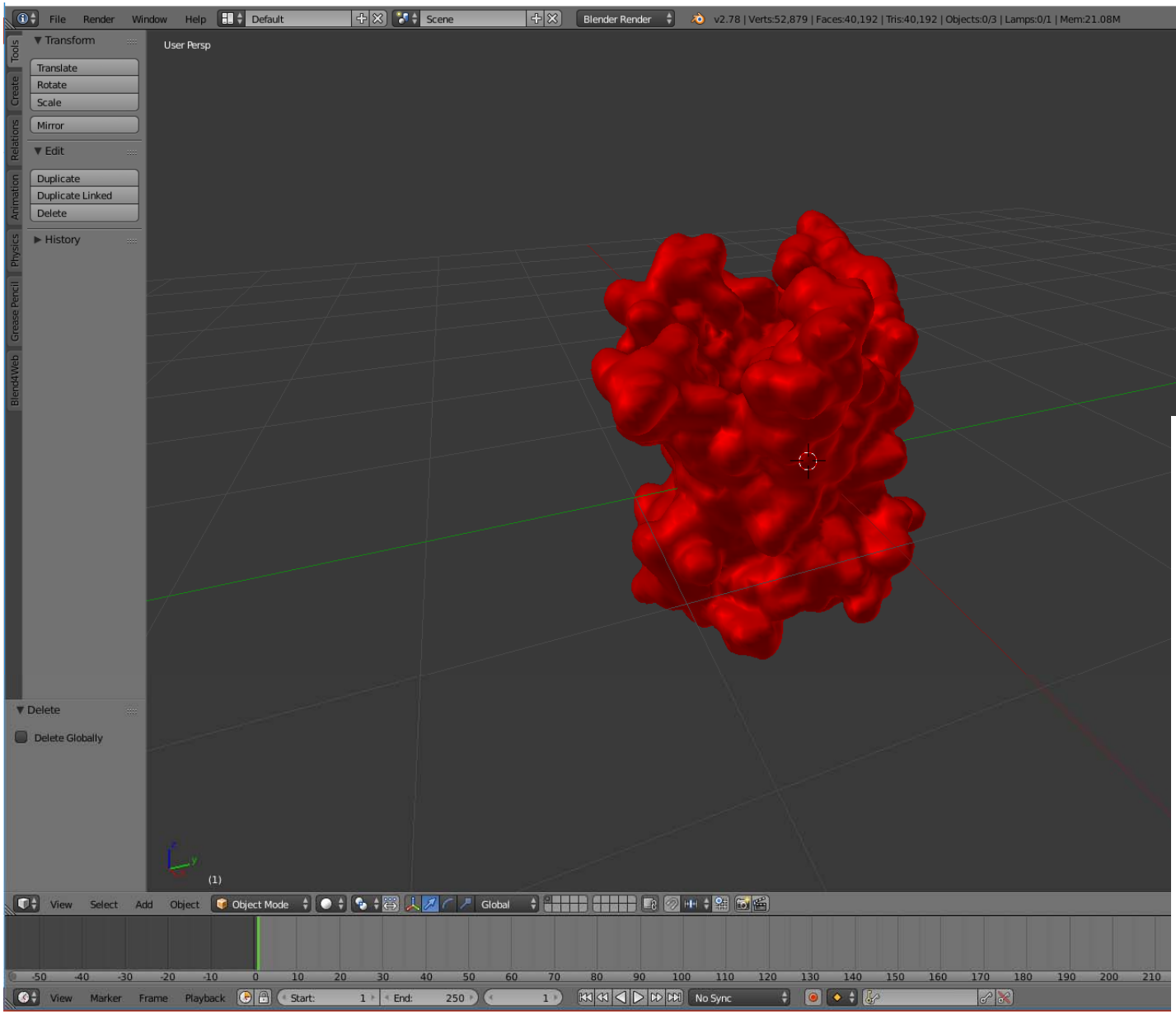
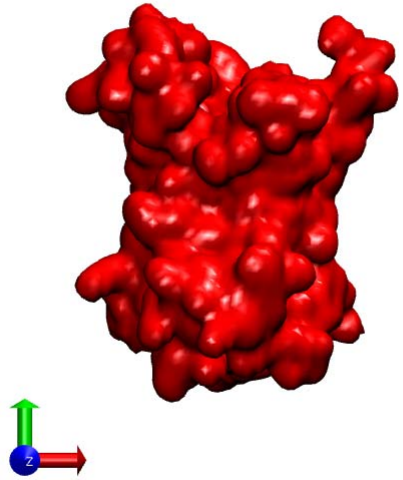
ATP/ADP MITOCHONDRIAL CARRIER





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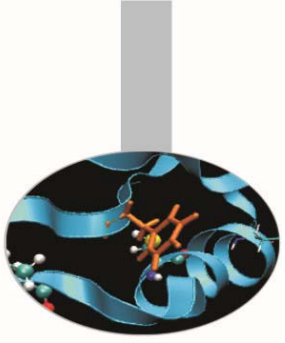

Tutorial 2
Create molecules in Blender

PRACE

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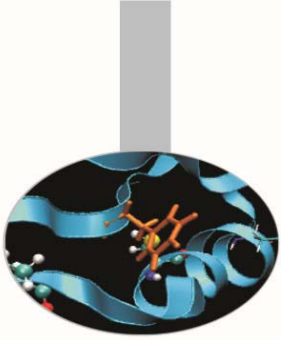
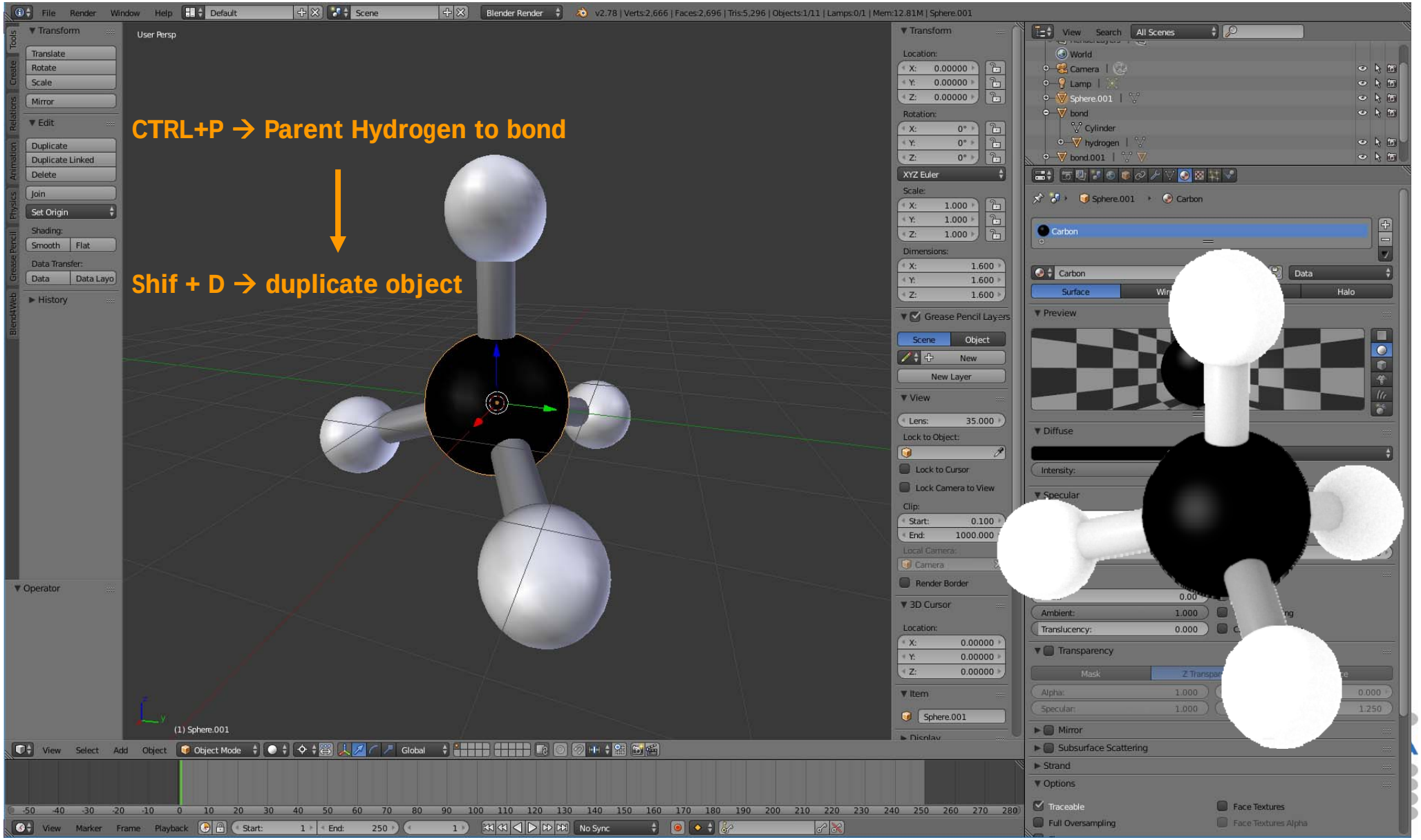
METHANE MOLECULE (CH_4)





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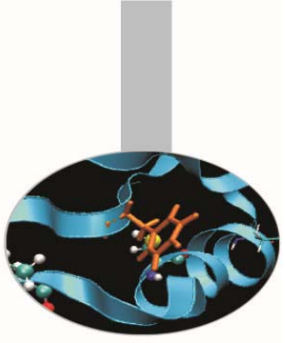
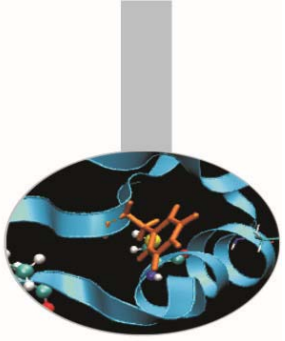
SuperComputing Applications and Innovation



Tutorial 3
Import PDB file

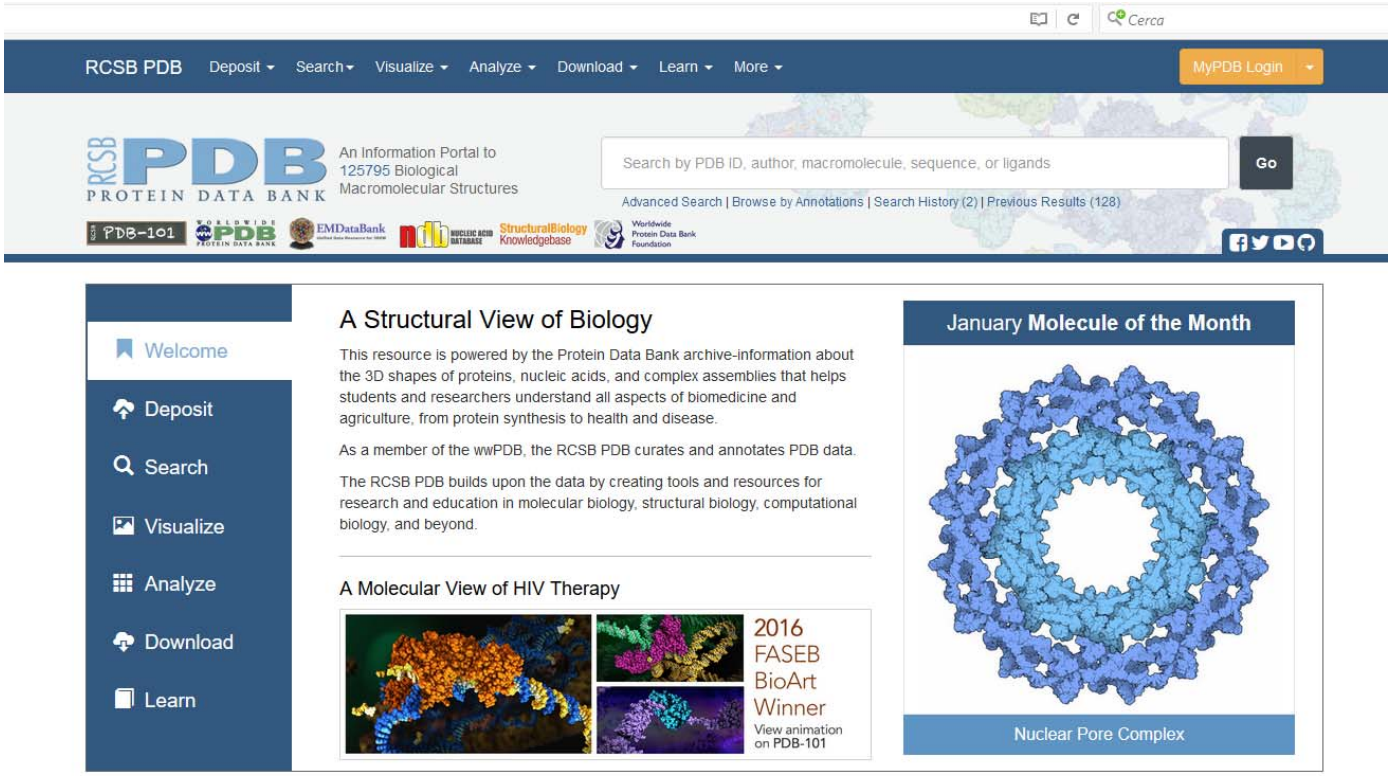
PRACE

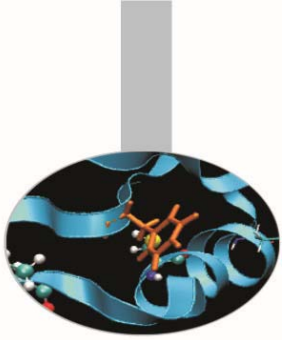
CINECA



PDB

www.rcsb.org/





PDB

RCSB PDB Deposit Search Visualize Analyze Download Learn More MyPDB Login

RCSB PDB PROTEIN DATA BANK An Information Portal to 125795 Biological Macromolecular Structures

Go

Advanced Search | Browse by Annotations | Search History (2) | Previous Results (128)

PDB-101 wwPDB EMDataBank NDB Nucleic Acid Database StructuralBiology Knowledgebase Worldwide Protein Data Bank Foundation

Advanced Search Interface

Structure Title

Search by title record (PDB 'TITLE' record or mmCIF _struct.title value)

Contains: b-dna

Result Count
128
PDB Entries (Structures)
52

Retrieve only representatives at 90%
Match all of the above conditions.

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RCSB Partners

Structure Summary | 3D View | Experiment | Literature

Biological Assembly 1

View in 3D: NGL or JSmol or PV (in Browser)

Display Files | Download Files

- FASTA Sequence
- PDB Format
- PDB Format (gz)
- PDBx/mmCIF Format
- PDBx/mmCIF Format (gz)
- PDBML/XML Format (gz)
- Structure Factors (CIF)
- Structure Factors (CIF - gz)
- Biological Assembly (PDB format - gz) (A+S)

3BSE

Crystal structure analysis of a 16-base-pair B-DNA

DOI: 10.2210/pdb3bse/pdb **NDB**: BD0105

Classification: DNA
Deposited: 2007-12-23 **Released**: 2008-12-23
Deposition author(s): Narayana, N.

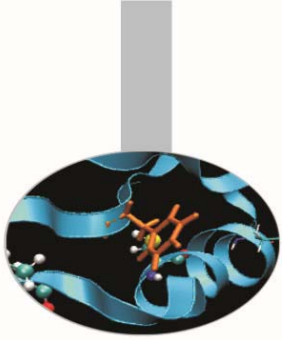
Structural Biology Knowledgebase: 3BSE SBKB.org

Experimental Data Snapshot

Method: X-RAY DIFFRACTION
Resolution: 1.6 Å
R-Value Observed: 0.221

wwPDB Validation

Metric Per
Rfree
Clashscore
RSRZ outliers
Worse Better
Percentile relative to all X-ray structures
Percentile relative to X-ray structures of similar resolution



PDB

RCSB PDB Deposit Search Visualize Analyze Download Learn More MyPDB Login

RCSB PDB PROTEIN DATA BANK An Information Portal to 125795 Biological Macromolecular Structures

Go

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- PDB Format
- PDB Format (gz)
- PDBx/mmCIF Format
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- PDBML/XML Format (gz)
- Structure Factors (CIF)
- Structure Factors (CIF - gz)
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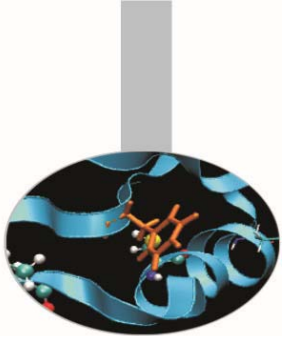
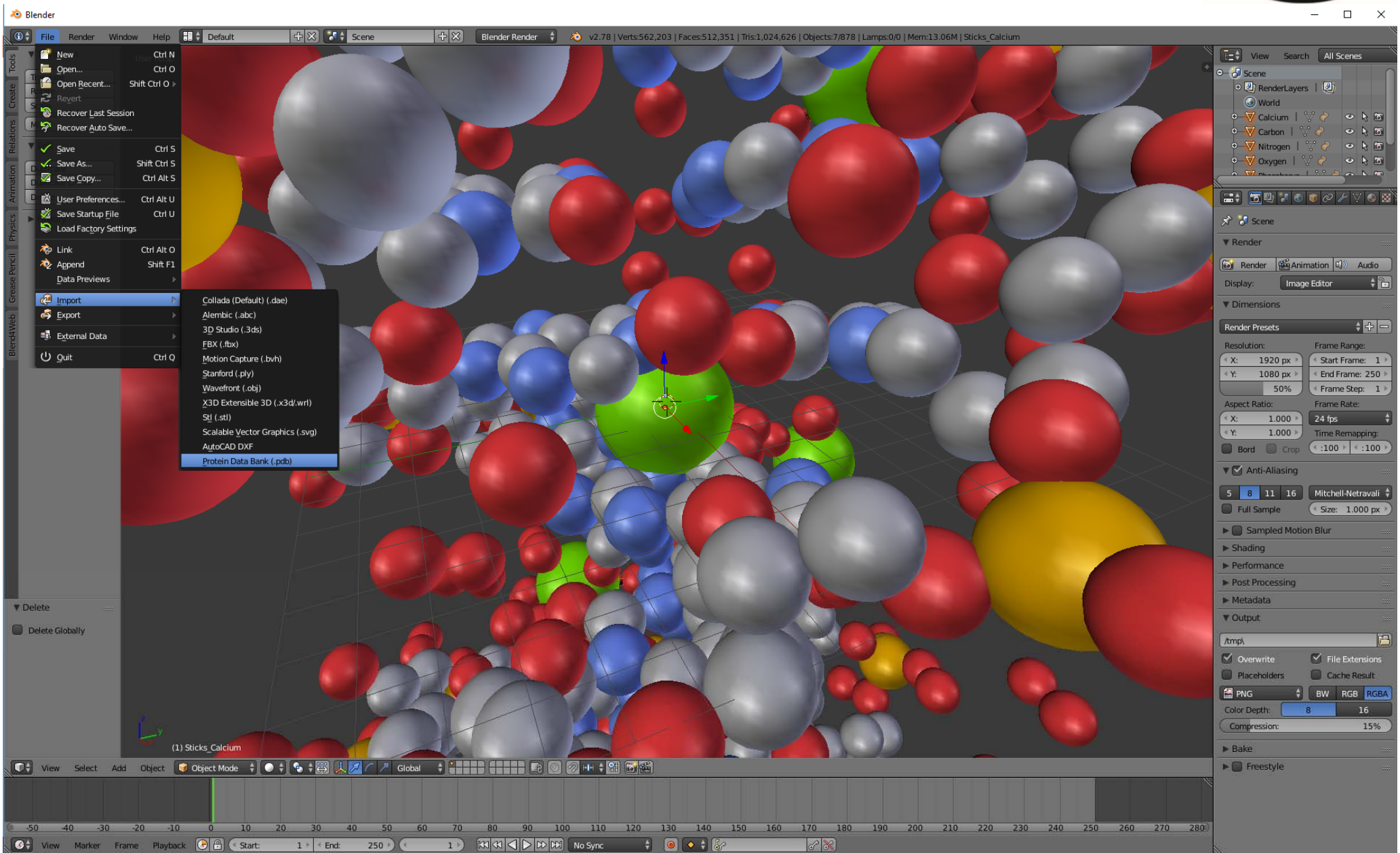
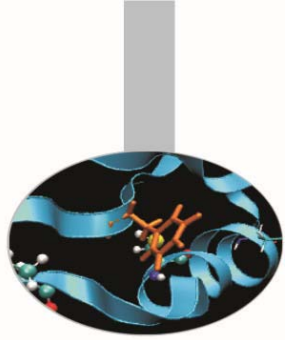
Rfree
Clashscore
RSRZ outliers
Worse Better
Percentile relative to all X-ray structures
Percentile relative to X-ray structures of similar resolution

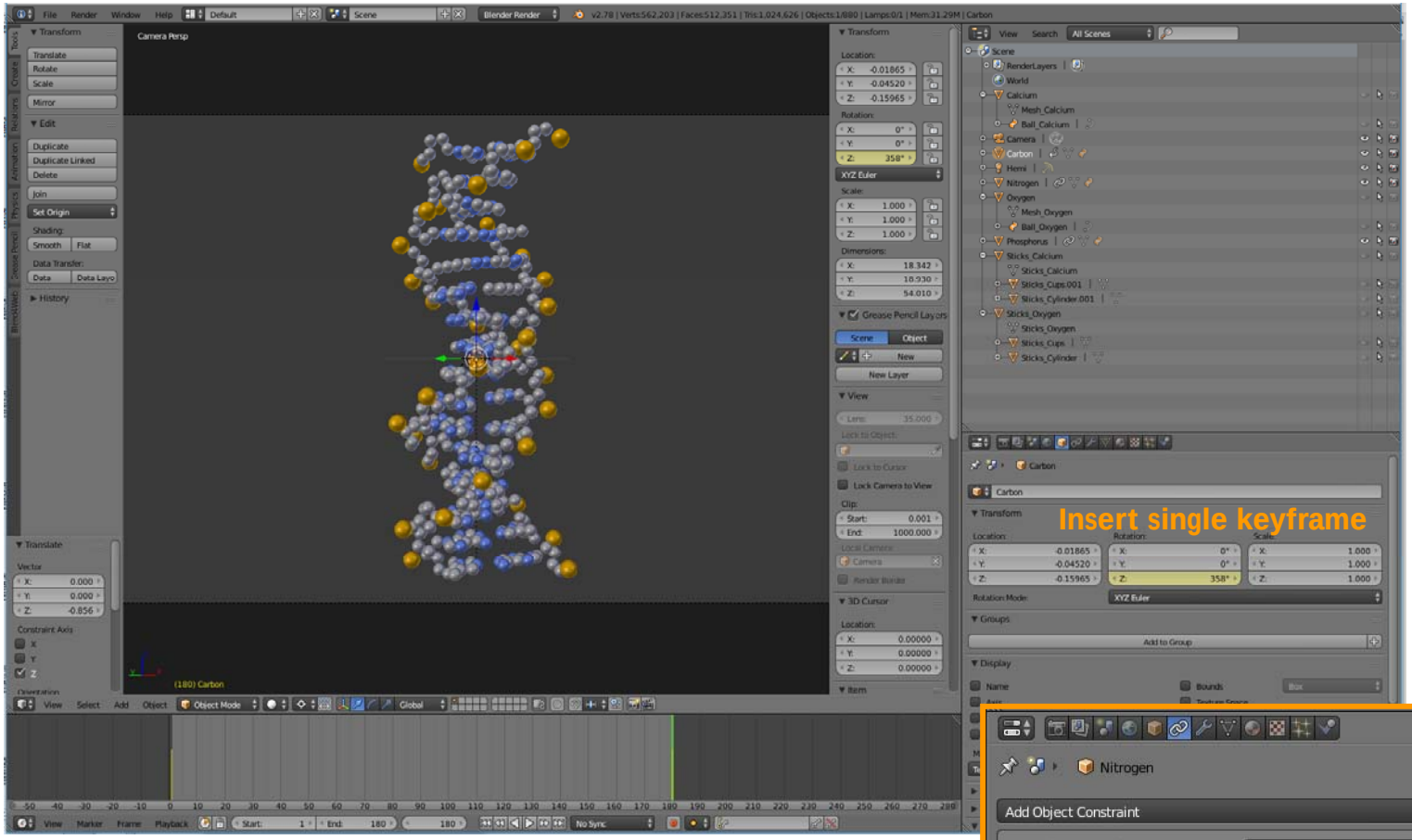


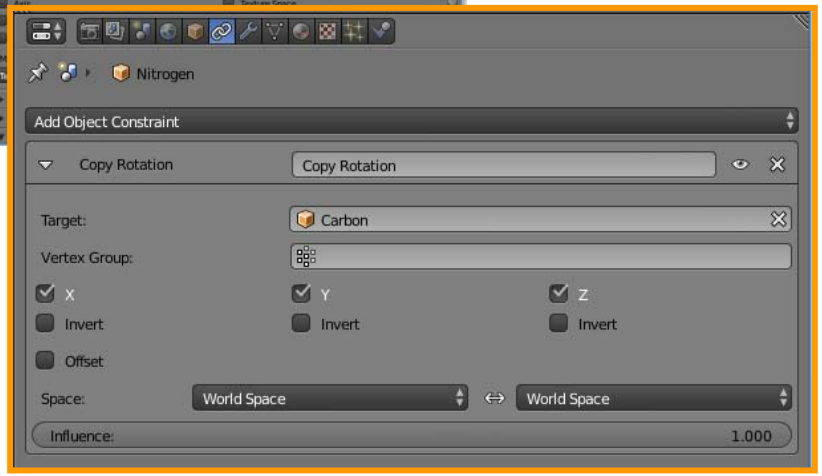
PDB


Blender
File Render Window Help
Default Scene Blender Render
v2.78 | Verts:562,203 | Faces:512,351 | Tris:1,024,626 | Objects:7/878 | Lamps:0/0 | Mem:13.06M | Sticks_Calcium
New Ctrl N
Open... Ctrl O
Open Recent... Shift Ctrl O
Revert
Recover Last Session
Recover Auto Save...
Save Ctrl S
Save As... Shift Ctrl S
Save Copy... Ctrl Alt S
User Preferences... Ctrl Alt U
Save Startup File Ctrl U
Load Factory Settings
Link Ctrl Alt O
Append Shift F1
Data Previews
Import
Export
External Data
Quit Ctrl Q
Collada (Default) (.dae)
Alembic (.abc)
3D Studio (.3ds)
FBX (.fbx)
Motion Capture (.bvh)
Stanford (.ply)
Wavefront (.obj)
X3D Extensible 3D (.x3d/.wrl)
Stl (.stl)
Scalable Vector Graphics (.svg)
AutoCAD DXF
Protein Data Bank (.pdb)
Delete
Delete Globally
(1) Sticks_Calcium
View Search All Scenes
Scene
RenderLayers
World
Calcium
Carbon
Nitrogen
Oxygen
Render
Render Animation Audio
Display: Image Editor
Dimensions
Render Presets
Resolution:
X: 1920 px
Y: 1080 px
50%
Frame Range:
Start Frame: 1
End Frame: 250
Frame Step: 1
Aspect Ratio:
X: 1.000
Y: 1.000
Frame Rate:
24 fps
Time Remapping:
Bord Crop
Anti-Aliasing
5 8 11 16
Mitchell-Netravali
Full Sample
Size: 1.000 px
Sampled Motion Blur
Shading
Performance
Post Processing
Metadata
Output
/tmp\
Overwrite
File Extensions
Placeholders
Cache Result
PNG
BW RGB RGBA
Color Depth: 8 16
Compression: 15%
Bake
Freestyle
View Select Add Object
Object Mode
Global
View Marker Frame Playback
Start: 1
End: 250
No Sync



PDB





Add object constraint → copy rotation

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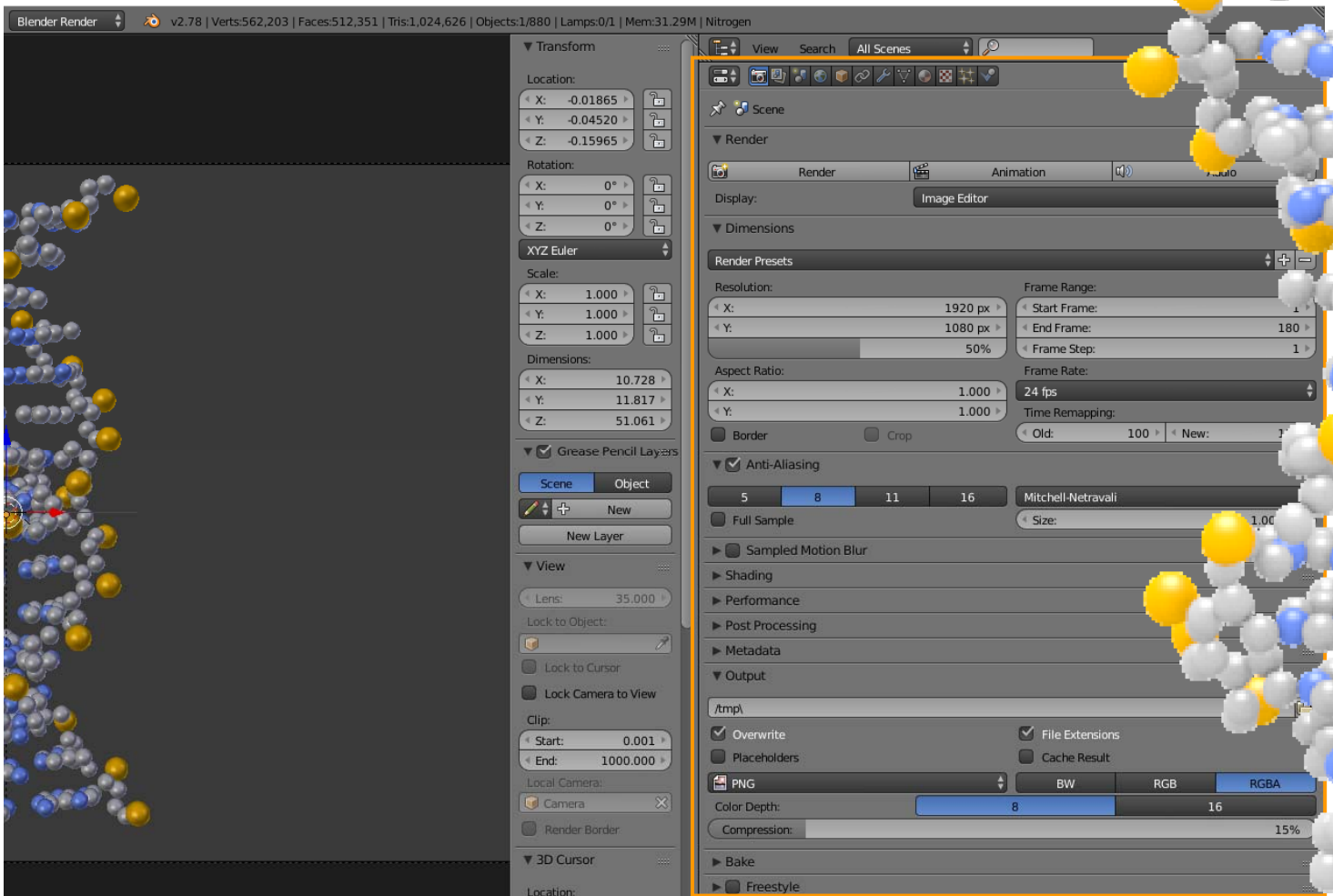
RENDER IMAGE WITH TRANSPARENT BACKGROUND



PRACE

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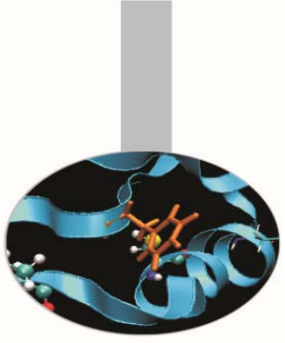

Tutorial 4
Simulation Jmol files

PRACE

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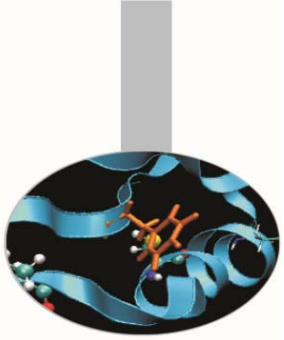
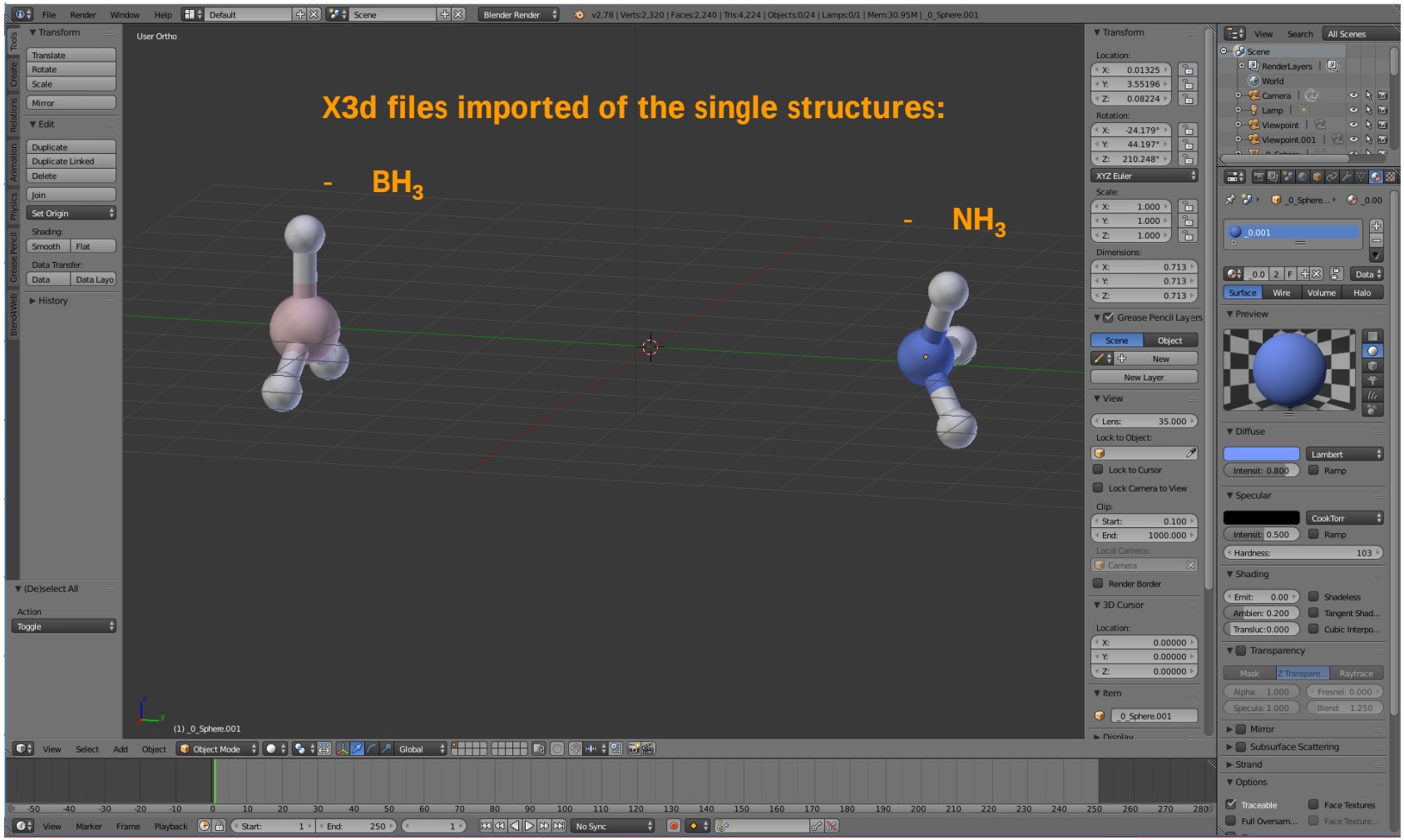
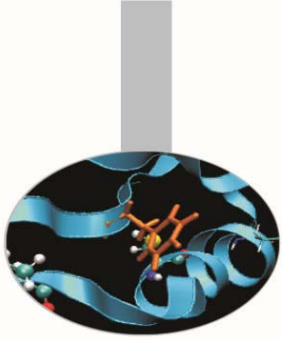
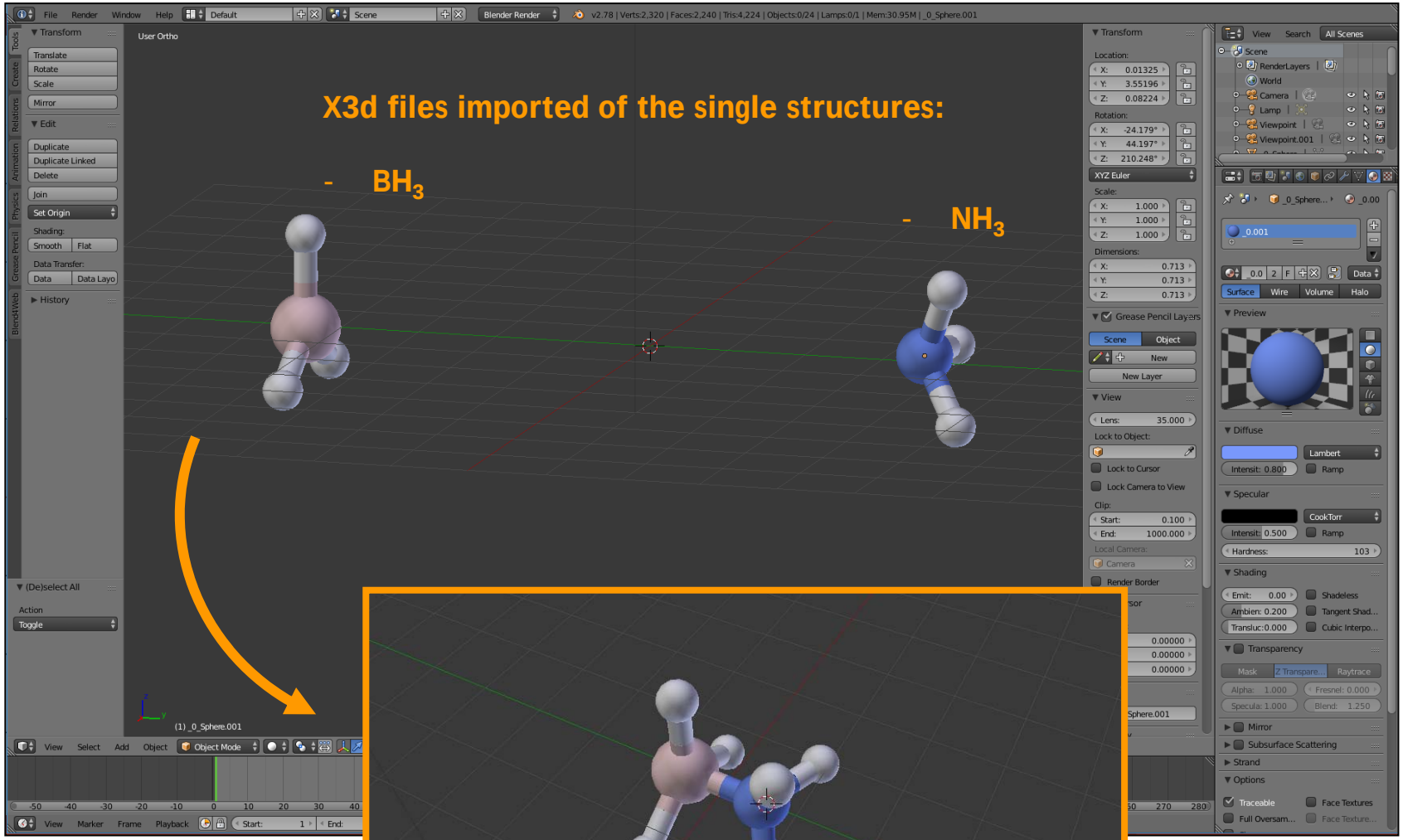


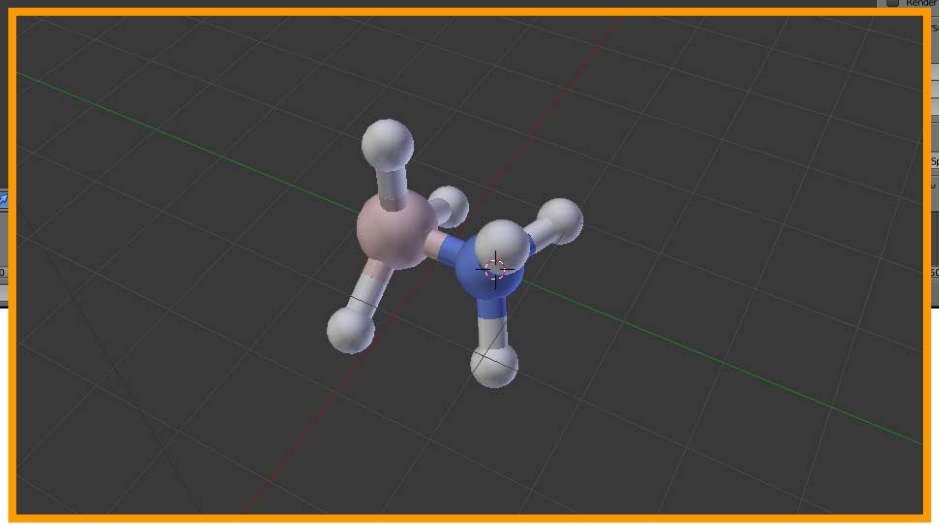
JMOL



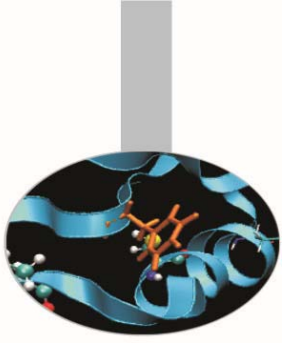


JMOL





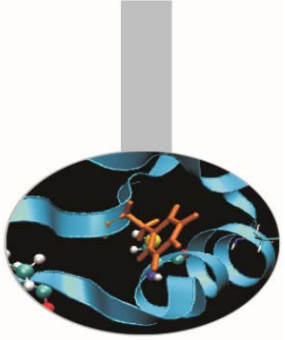
CINECA SCAI
SuperComputing Applications and Innovation



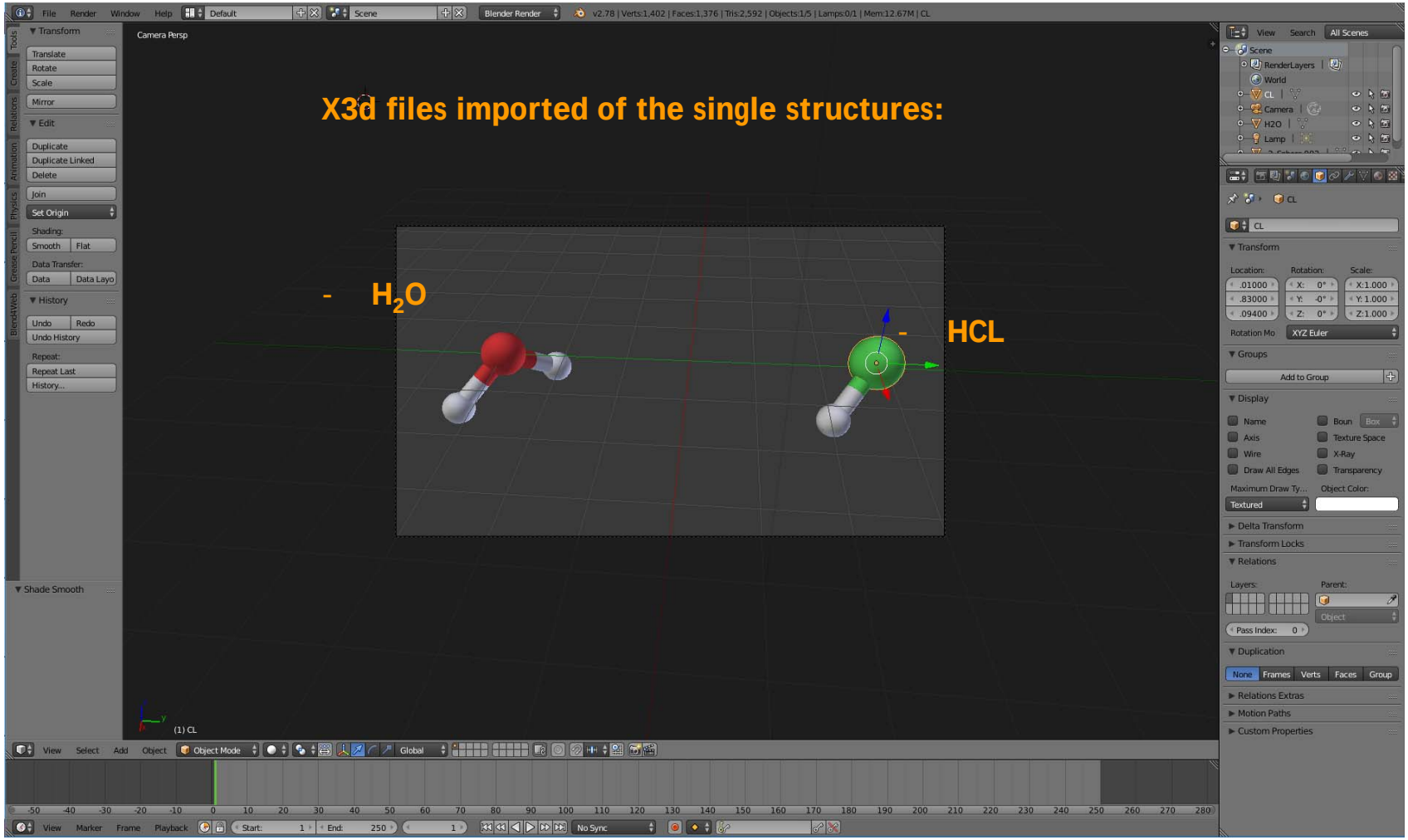
Tutorial 5
Simulation Jmol files

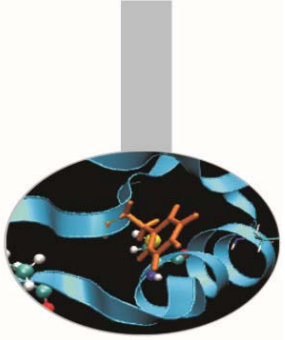
PRACE

CINECA



JMOL





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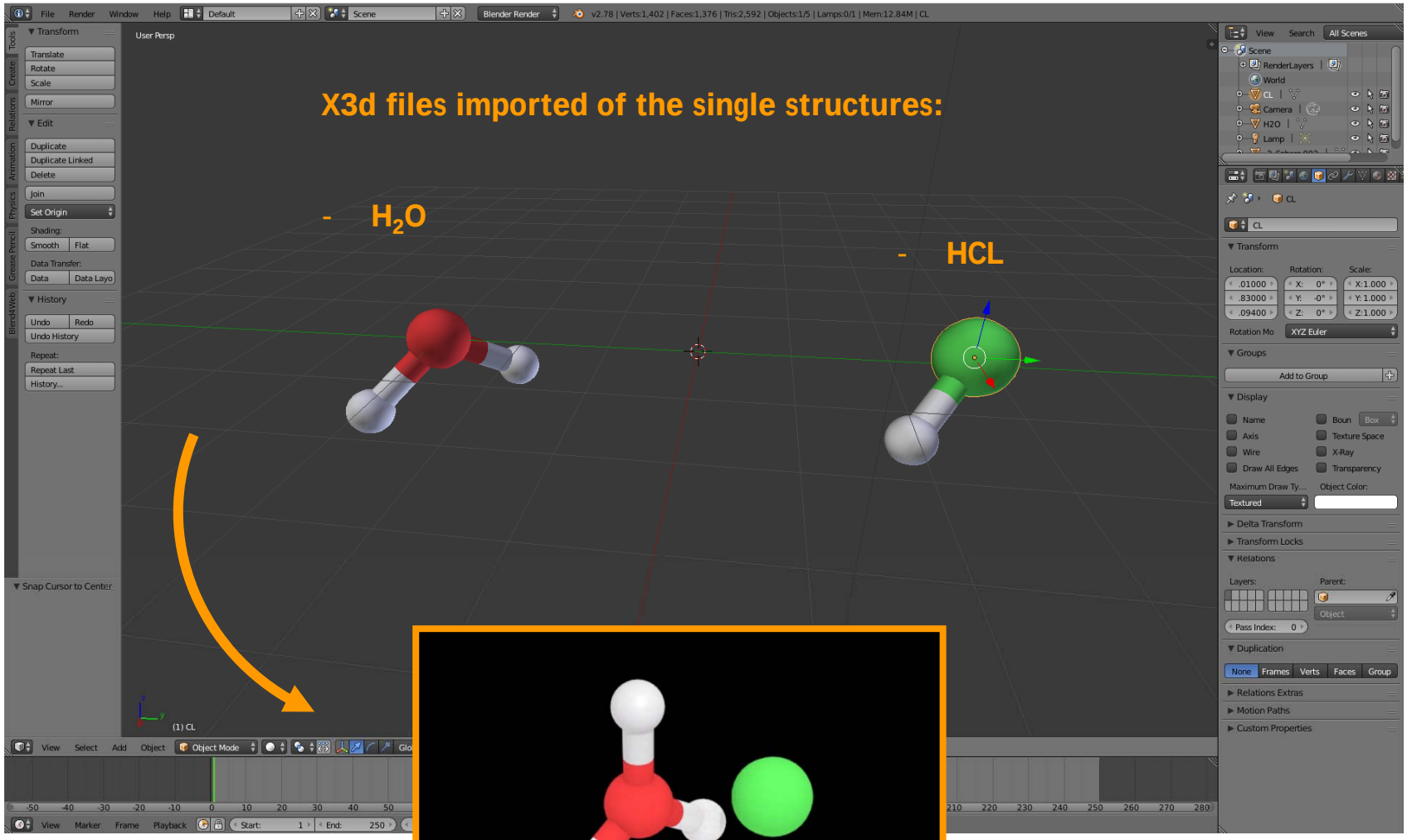

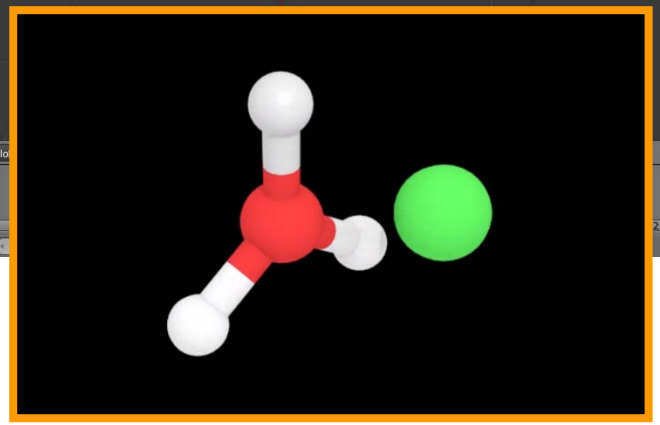

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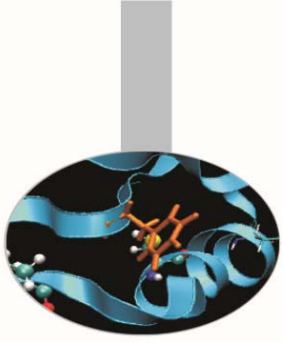
SuperComputing Applications and Innovation



Tutorial 6
Elaborate and create a video

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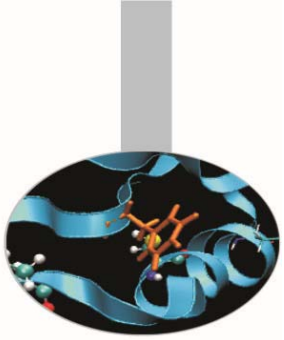
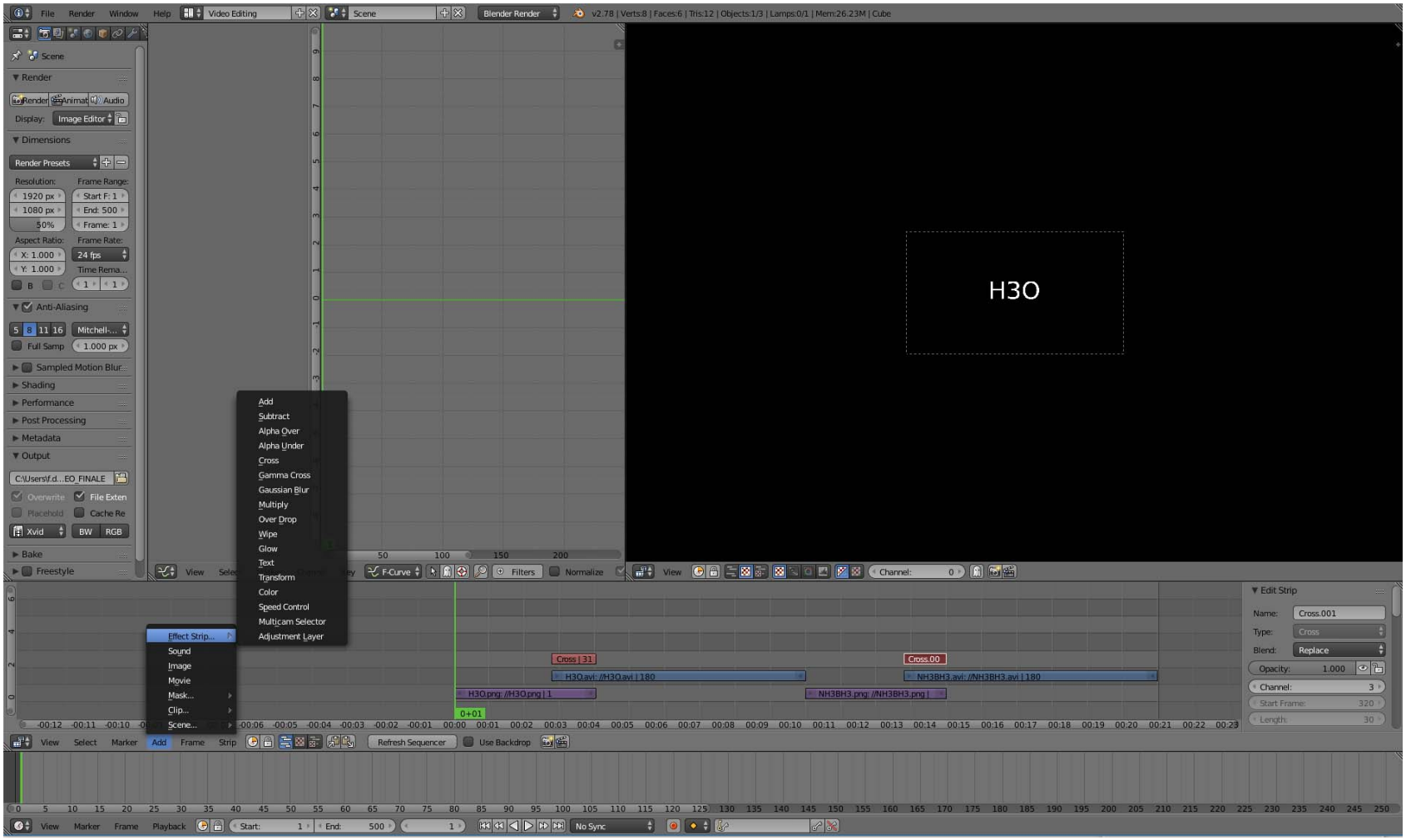


VIDEO EDITING



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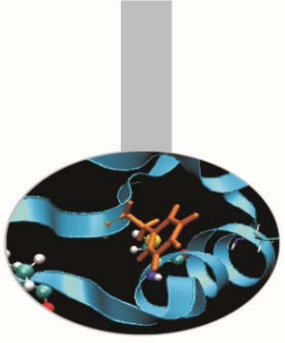

Tutorial 7
Import obj from VMD

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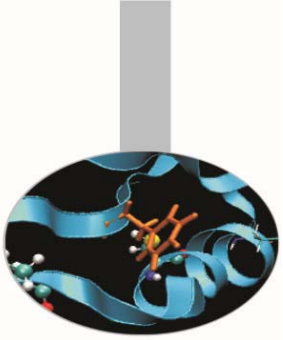
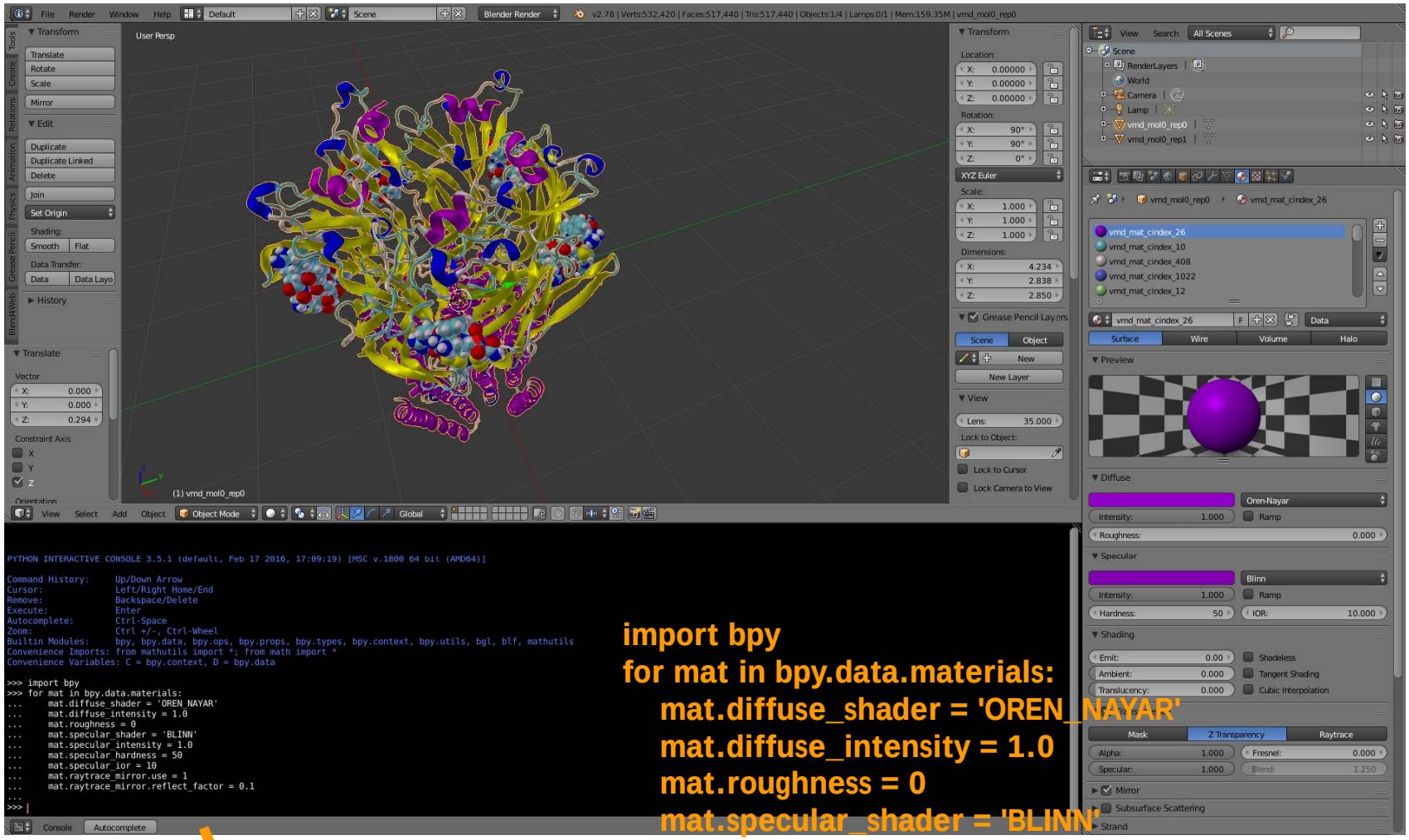
VMD






```
import bpy
for mat in bpy.data.materials:
    mat.diffuse_shader = 'OREN_NAYAR'
    mat.diffuse_intensity = 1.0
    mat.roughness = 0
    mat.specular_shader = 'BLINN'
    mat.specular_intensity = 1.0
    mat.specular_hardness = 50
    mat.specular_ior = 10
    mat.raytrace_mirror.use = 1
    mat.raytrace_mirror.reflect_factor = 0.1
```

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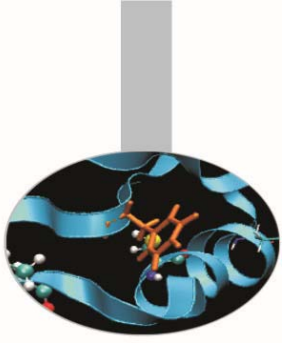


LINK

→Official website:

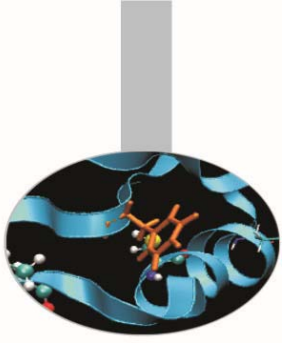
-http://www.blender.it
-http://www.blender.org

→Documentation:

-http://wiki.blender.org/index.php/Main_Page
-http://www.blendermagazineitalia.it/
-http://en.wikibooks.org/wiki/Blender_3D:_Noob_to_Pro

→Library:

-http://www.blendswap.com/



SOME LINK OF SPECIFIC TUTORIAL

Blender for chemistry:

http://blender.freemovies.co.uk/chemistry/

Blender for biologist:

http://www.bioblender.eu/

http://www.bioblender.eu/Database/BioBlenderTutorial.pdf

https://www.youtube.com/watch?v=1QHR8WU2y4w