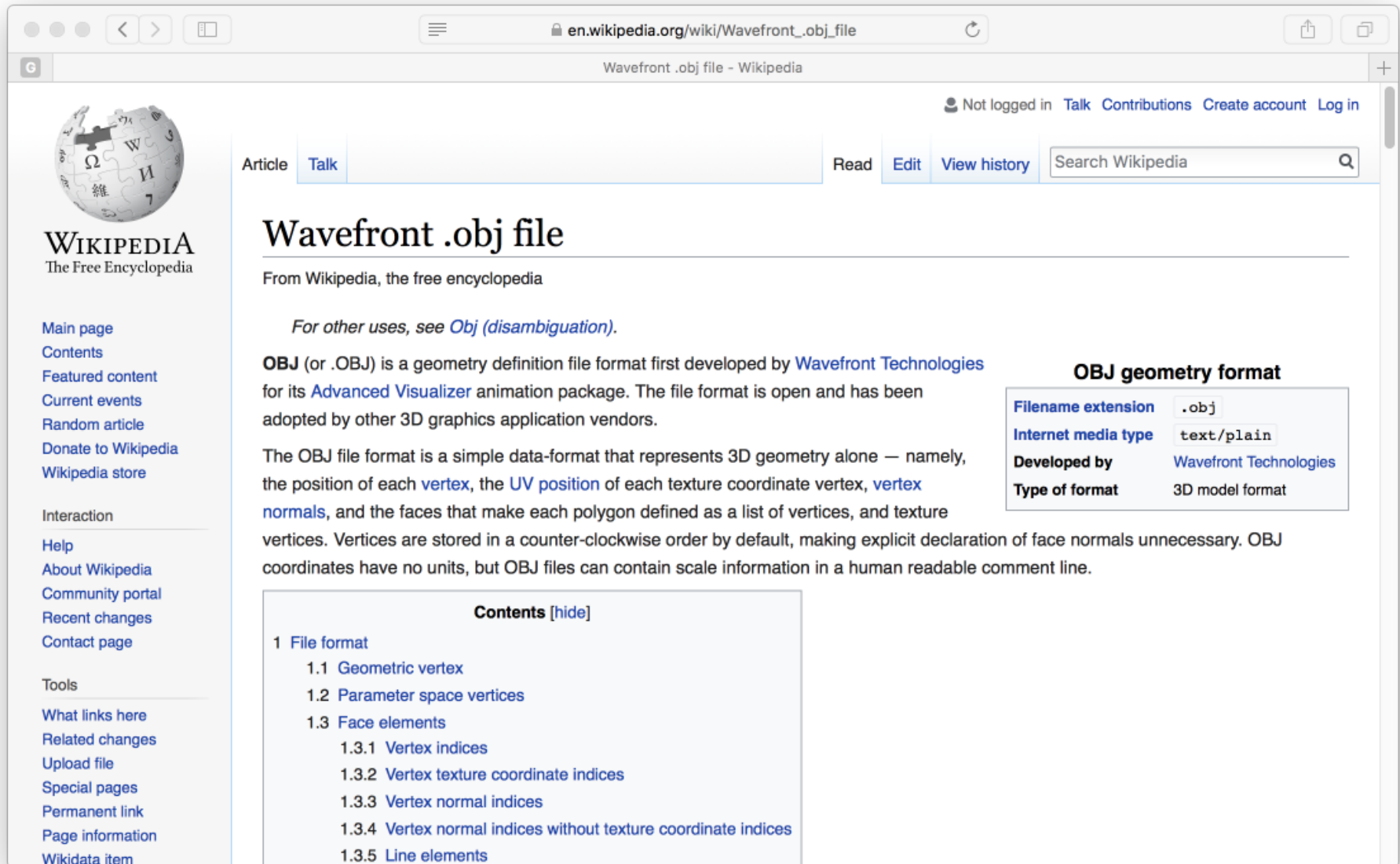


Lecture 5: 3D Modeling and Tools

September 8, 2020

OBJ Format - Review



The screenshot shows the Wikipedia article for "Wavefront .obj file". The page title is "Wavefront .obj file - Wikipedia". The article content includes a description of the OBJ format, a table of metadata, and a table of contents.

Wavefront .obj file

From Wikipedia, the free encyclopedia

For other uses, see [Obj \(disambiguation\)](#).

OBJ (or **.OBJ**) is a geometry definition file format first developed by [Wavefront Technologies](#) for its [Advanced Visualizer](#) animation package. The file format is open and has been adopted by other 3D graphics application vendors.

The OBJ file format is a simple data-format that represents 3D geometry alone — namely, the position of each [vertex](#), the [UV position](#) of each texture coordinate vertex, [vertex normals](#), and the faces that make each polygon defined as a list of vertices, and texture vertices. Vertices are stored in a counter-clockwise order by default, making explicit declaration of face normals unnecessary. OBJ coordinates have no units, but OBJ files can contain scale information in a human readable comment line.

Filename extension	<code>.obj</code>
Internet media type	<code>text/plain</code>
Developed by	Wavefront Technologies
Type of format	3D model format

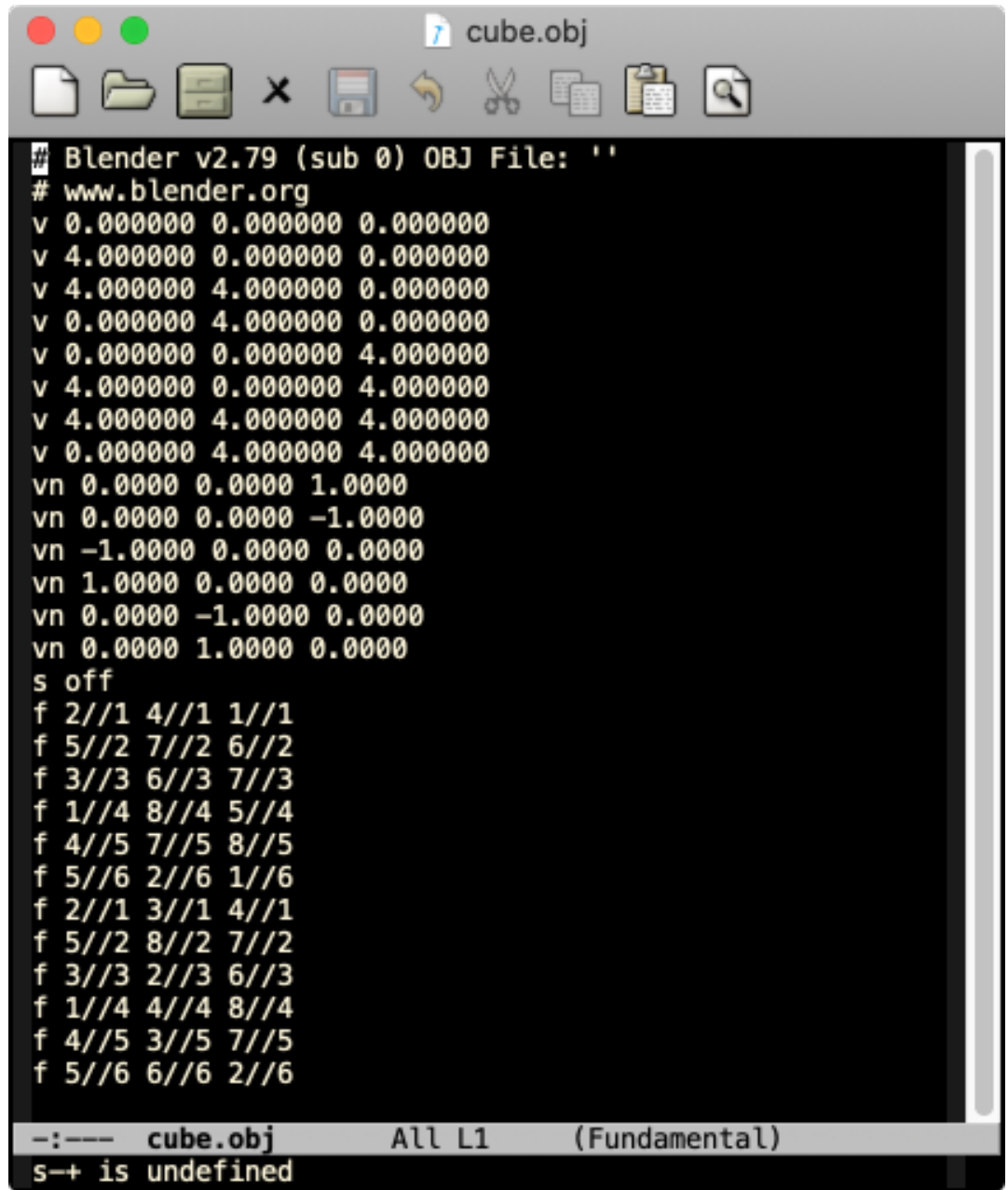
Contents [hide]

- 1 File format
 - 1.1 Geometric vertex
 - 1.2 Parameter space vertices
 - 1.3 Face elements
 - 1.3.1 Vertex indices
 - 1.3.2 Vertex texture coordinate indices
 - 1.3.3 Vertex normal indices
 - 1.3.4 Vertex normal indices without texture coordinate indices
 - 1.3.5 Line elements

OBJ Basics

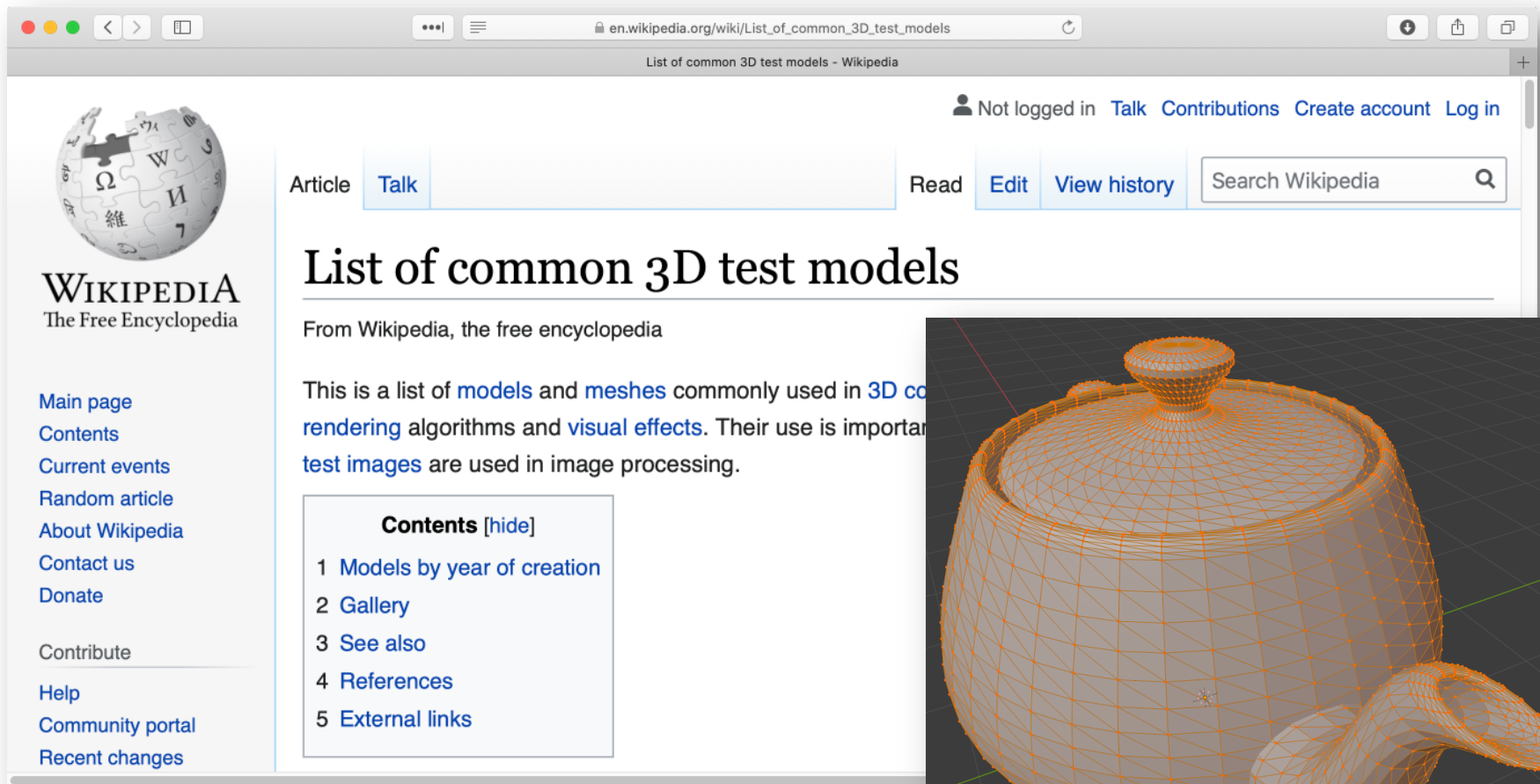
PARTS:

1. Header
Comment
2. Vertex Listing
3. Vertex Normals
4. Smoothing
Directive
5. Face Listing



```
Blender v2.79 (sub 0) OBJ File: ''
# www.blender.org
v 0.000000 0.000000 0.000000
v 4.000000 0.000000 0.000000
v 4.000000 4.000000 0.000000
v 0.000000 4.000000 0.000000
v 0.000000 0.000000 4.000000
v 4.000000 0.000000 4.000000
v 4.000000 4.000000 4.000000
v 0.000000 4.000000 4.000000
vn 0.0000 0.0000 1.0000
vn 0.0000 0.0000 -1.0000
vn -1.0000 0.0000 0.0000
vn 1.0000 0.0000 0.0000
vn 0.0000 -1.0000 0.0000
vn 0.0000 1.0000 0.0000
s off
f 2//1 4//1 1//1
f 5//2 7//2 6//2
f 3//3 6//3 7//3
f 1//4 8//4 5//4
f 4//5 7//5 8//5
f 5//6 2//6 1//6
f 2//1 3//1 4//1
f 5//2 8//2 7//2
f 3//3 2//3 6//3
f 1//4 4//4 8//4
f 4//5 3//5 7//5
f 5//6 6//6 2//6
-:--- cube.obj All L1 (Fundamental)
s-+ is undefined
```

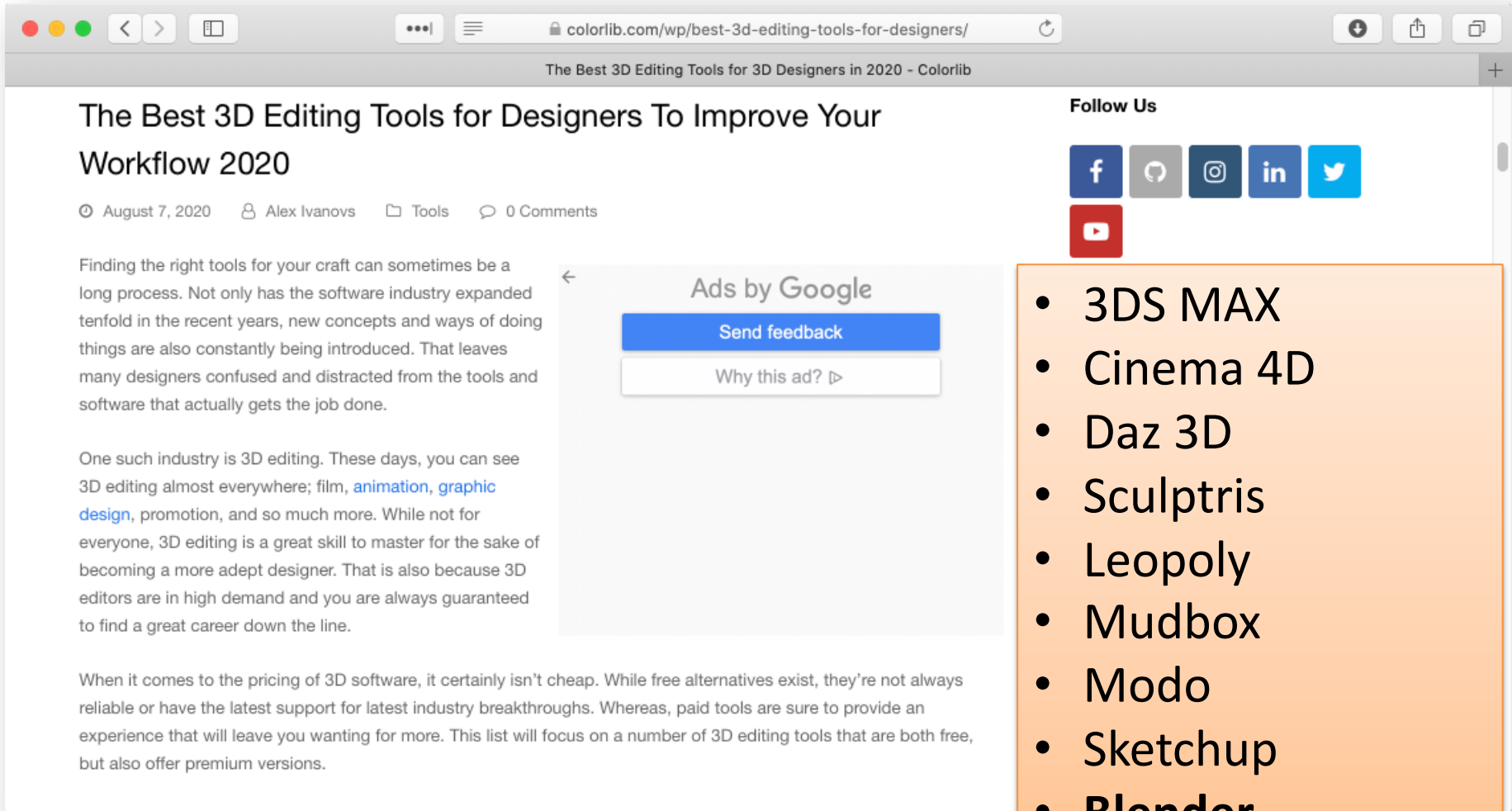
Polygons (Lots of Polygons)



The screenshot shows a web browser window displaying the Wikipedia article "List of common 3D test models". The browser's address bar shows the URL "en.wikipedia.org/wiki/List_of_common_3D_test_models". The page header includes the Wikipedia logo, the text "WIKIPEDIA The Free Encyclopedia", and navigation links such as "Main page", "Contents", "Current events", "Random article", "About Wikipedia", "Contact us", "Donate", "Contribute", "Help", "Community portal", and "Recent changes". The article title "List of common 3D test models" is prominently displayed, followed by the text "From Wikipedia, the free encyclopedia". Below this, a paragraph states: "This is a list of [models](#) and [meshes](#) commonly used in [3D computer graphics](#) rendering algorithms and [visual effects](#). Their use is important in [computer vision](#) and [test images](#) are used in image processing." A "Contents" section is visible, listing: "1 Models by year of creation", "2 Gallery", "3 See also", "4 References", and "5 External links". On the right side of the article, there is a 3D wireframe model of a teapot, rendered in orange lines, illustrating the concept of polygons in 3D modeling.

- Until recently 3D: object = polygons

Many 3D Tools

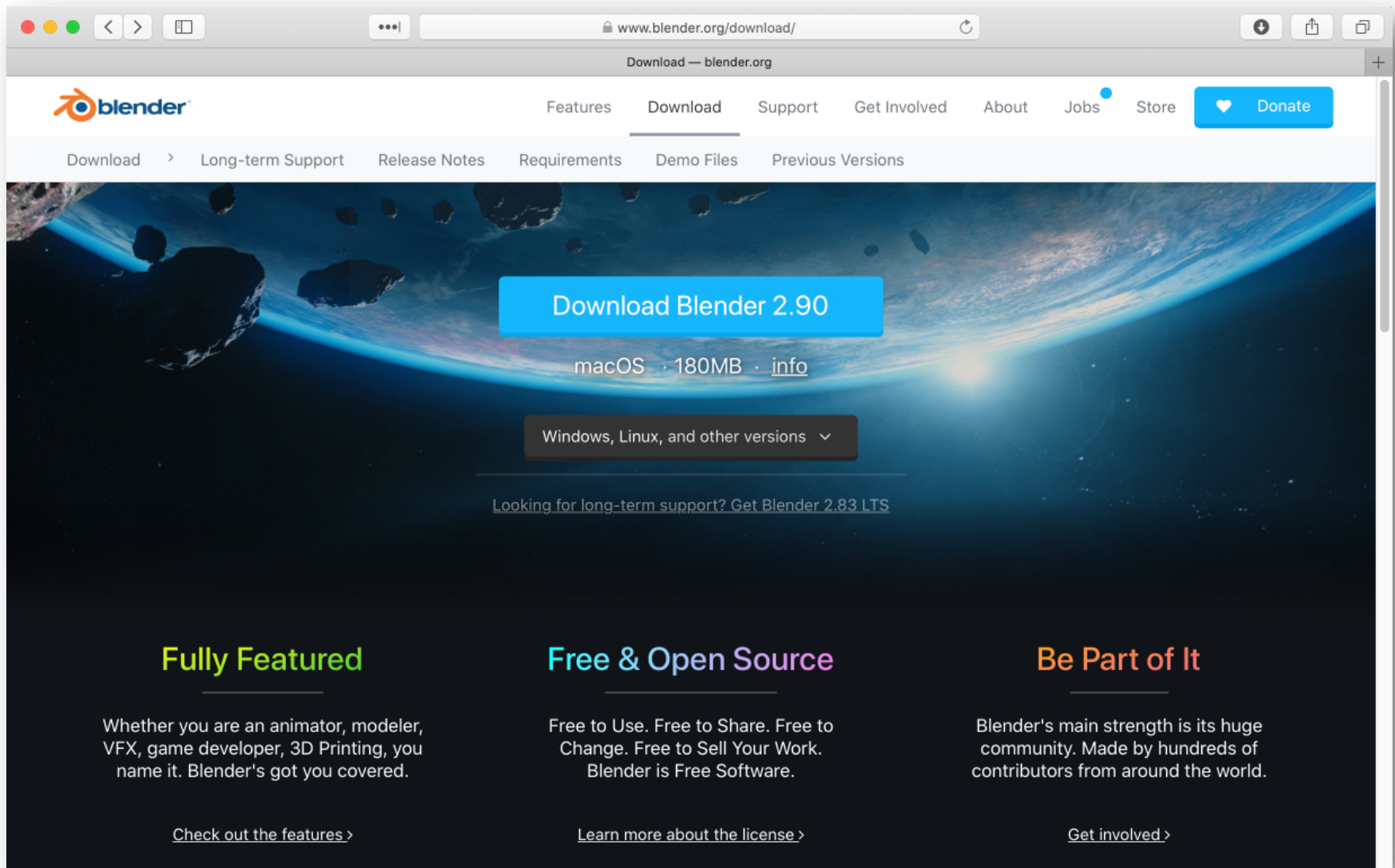


Blender – First Glance



Interface makes PhotoShop looks simple 😞

Downloading Blender

A screenshot of a web browser displaying the Blender website's download page. The browser's address bar shows 'www.blender.org/download/'. The page features a navigation menu with links for Features, Download, Support, Get Involved, About, Jobs, Store, and a blue Donate button. Below the navigation, there are sub-links for Download, Long-term Support, Release Notes, Requirements, Demo Files, and Previous Versions. The main content area has a dark blue background with a space-themed image of Earth and asteroids. A prominent blue button says 'Download Blender 2.90', with 'macOS · 180MB · info' below it. A dropdown menu shows 'Windows, Linux, and other versions'. A link for 'Get Blender 2.83 LTS' is also present. At the bottom, three columns highlight 'Fully Featured', 'Free & Open Source', and 'Be Part of It', each with a brief description and a link to learn more.

blender

Features Download Support Get Involved About Jobs Store [Donate](#)

Download > Long-term Support Release Notes Requirements Demo Files Previous Versions

Download Blender 2.90

macOS · 180MB · [info](#)

Windows, Linux, and other versions ▾

[Looking for long-term support? Get Blender 2.83 LTS](#)

Fully Featured

Whether you are an animator, modeler, VFX, game developer, 3D Printing, you name it. Blender's got you covered.

[Check out the features >](#)

Free & Open Source

Free to Use. Free to Share. Free to Change. Free to Sell Your Work. Blender is Free Software.

[Learn more about the license >](#)

Be Part of It

Blender's main strength is its huge community. Made by hundreds of contributors from around the world.

[Get involved >](#)

Blender on CS Machines

- Blender is available on CS Dept. Machines.
- Remote execution may be slow.

```
cs410@helena:~ — ssh -Y cs410@helena.cs.colostate.edu — 109x21
[[cs410@helena ~]$ which blender
/bin/blender
[[cs410@helena ~]$ blender --version | more
Blender 2.83.1
  build date: 2020-06-25
  build time: 00:00:00
  build commit date: 1970-01-01
  build commit time: 00:00
  build hash: unknown
  build platform: Linux
  build type: Release
  build c flags: -Wall -Wcast-align -Werror=implicit-function-declaration -Werror=return-type -Werror=vla -Wstrict-prototypes -Wmissing-prototypes -Wno-char-subscripts -Wno-unknown-pragmas -Wpointer-arith -Wused-parameter -Wwrite-strings -Wlogical-op -Wundef -Winit-self -Wmissing-include-dirs -Wno-div-by-zero -Wtype-limits -Wformat-signedness -Wrestrict -Wnonnull -Wabsolute-value -Wuninitialized -Wredundant-decls -Wshadow -Wno-error=unused-but-set-variable -Wimplicit-fallthrough=5 -O2 -g -pipe -Wall -Werror=format-security -Wp,-D_FORTIFY_SOURCE=2 -Wp,-D_GLIBCXX_ASSERTIONS -fexceptions -fstack-protector-strong -grecord-gcc-switches -specs=/usr/lib/rpm/redhat/redhat-hardened-cc1 -specs=/usr/lib/rpm/redhat/redhat-annobin-cc1 -m64 -mtune=generic -fasynchronous-unwind-tables -fstack-clash-protection -fcf-protection -fuse-ld=gold -fopenmp -std=gnull -msse-pipe -fPIC -funsigned-char -fno-strict-aliasing -msse2
  build c++ flags: -Wredundant-decls -Wall -Wno-invalid-offsetof -Wno-sign-compare -Wlogical-op -Winit
```


Why Blender Now?

- You will want a way to view and compare 3D models store in wavefront OBJ format.
- Blender can do this easily
 - Like buying a jeep for the seat – but ...
 - .. Blender is now solid on Mac, Linux, Windows
 - Other options really are not, e.g. SketchUp
- Also ... as we move through the semester
 - Many concepts will now be ‘visible’ in Blender
 - Camera, Materials, Lights, etc.

Blender Intro Goals 1

- Basic 3D navigation
- Three button mice and hitting the ground
 - I don't mean hitting the ground running
 - I just mean hitting the ground (ouch)
 - It takes practice to simply manipulate the view
- Practice, having a good view is worth it!

Blender Intro Goals 2

- Load one – or two – OBJ files
- Move objects in ‘world’ coordinates
 - Modifier key ‘G’ - See results in OBJ file
- Edit faces and watch output in OBJ file
 - Start making sense of what is in these files.
- About triangles
 - What does it mean to represent a face

Blender Intro Goals 3

- A complementary view of camera modeling
- There is a camera (of course) in Blender
- It can be manipulated
 - So many ways to place the camera
 - Let us consider only one – match user view
- Camera used to render 2D views of a scene
- A consumers view of rendering

Blender and CS410 Expectations

- Expertise using Blender itself not a goal
 - Questions about using Blender not on exams
- Blender basics almost essential
 - You can view and build models many ways
 - But it is hard to imagine something better
- Key concepts illustrated with Blender
 - Both in lecture and then possibly on exams

Blender is relatively new to CS410.

Most students get what they want/need.

And this matters ... Blender is a lot of FUN!