Blender Visualization Tutorial SS2013 II Part 1/2

Based on ct'2012, Heft 21/22, by Heinrich Hink,
Extensions/Changes by Björn Sommer,
CELLmicrocosmos Cell Modeling Project SS2013, Bielefeld University,
Version 14.05.2013

Forum:
http://www.cellvisualization.org

Direct link to this forum entry:
http://www.cellmicrocosmos.org/Cmforum/viewtopic.php?f=50&t=721

Actual Version of Blender:
http://www.blender.org

Here, Blender 2.66a is used.

Target

Build a *manta ray* [Manta birostris] and its environment.

This is only a protocol of actions which has to be done to build the manta ray. For an explanation en detail, please get the articles from ct'2012 Heft 21 and 22.

http://www.heise.de/video/artikel/Blender-Fertige-3D-Animation-eines-Rochen-1724381.html

http://www.heise.de/ct/inhalt/2012/21/164/

http://www.heise.de/ct/inhalt/2012/22/172/

To use this protocol, please finish first the “Blender Visualization Tutorial SS2013 I“. Most methods used here were already discussed there.

Abbreviation

RMB Right Mouse Button

LMB Left Mouse Button

! For using most of the shortcuts discussed in this tutorial, you have to be sure that the mouse cursor is WITHIN the view port of the 3D View !

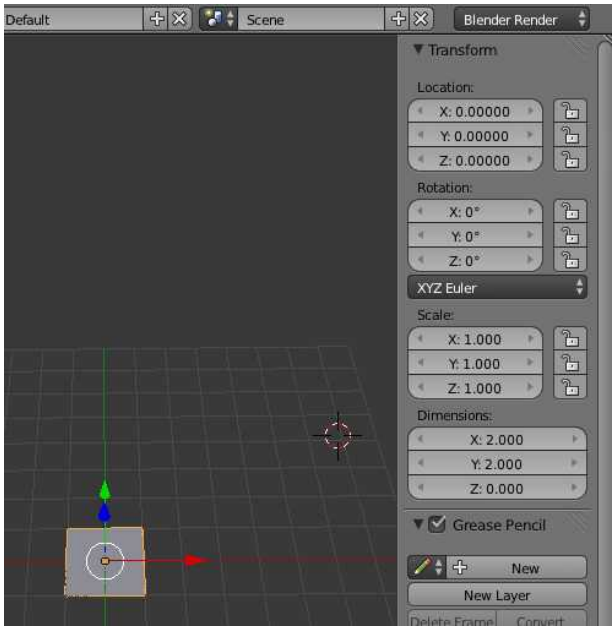
Modeling the Base

Start Blender

Delete all objects in the scene (with *A* and *DEL*)

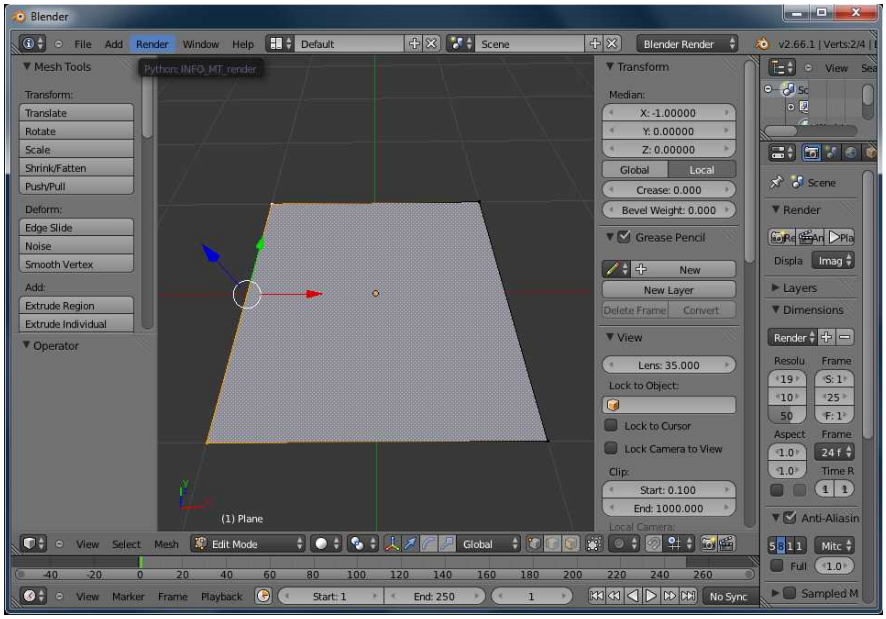
Add a Plane
Add → Mesh → Plane

Center Plane
use Transform information in Window toggled with *N*

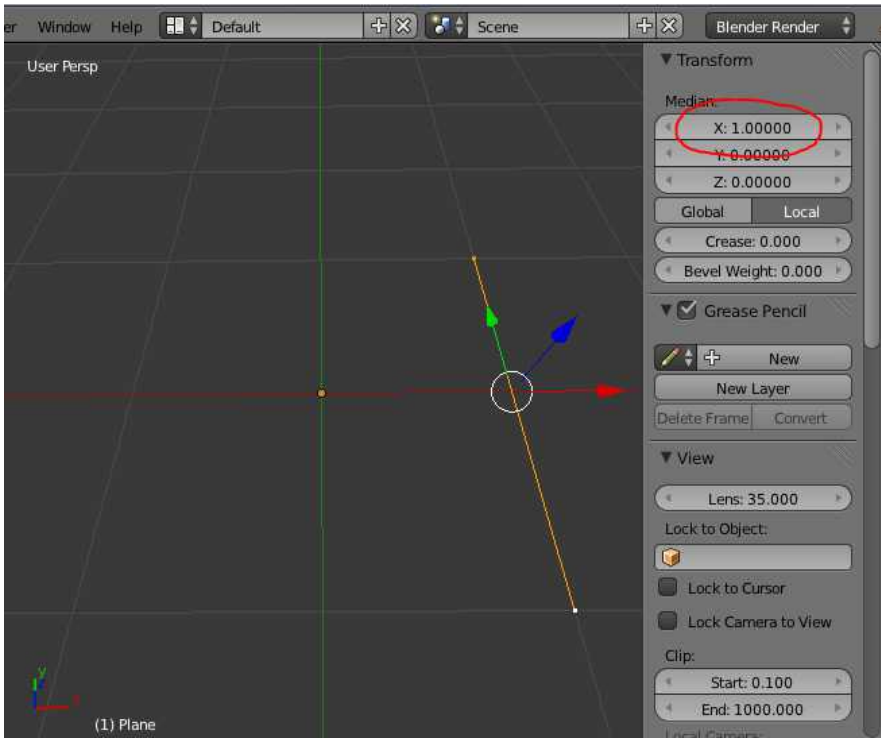


Change to Edit Mode with *TAB*

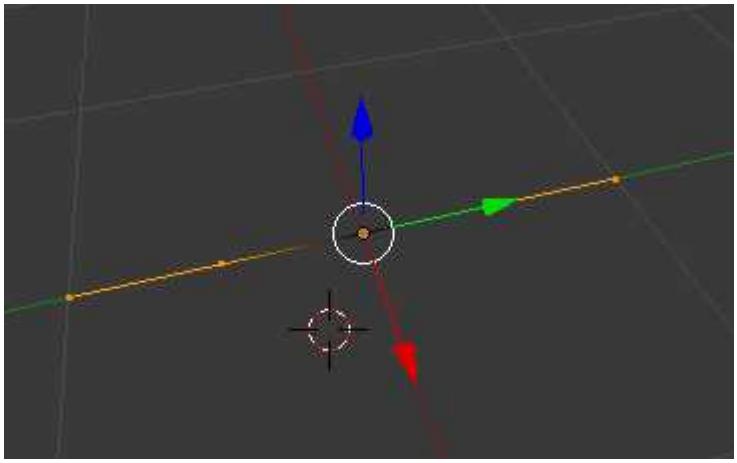
select the left two vertices (e.g. with *RMB* while holding *SHIFT*) and delete them



select the remaining two vertices and shift them to the center by substituting the 1 shown in Transform → Median for X by 0

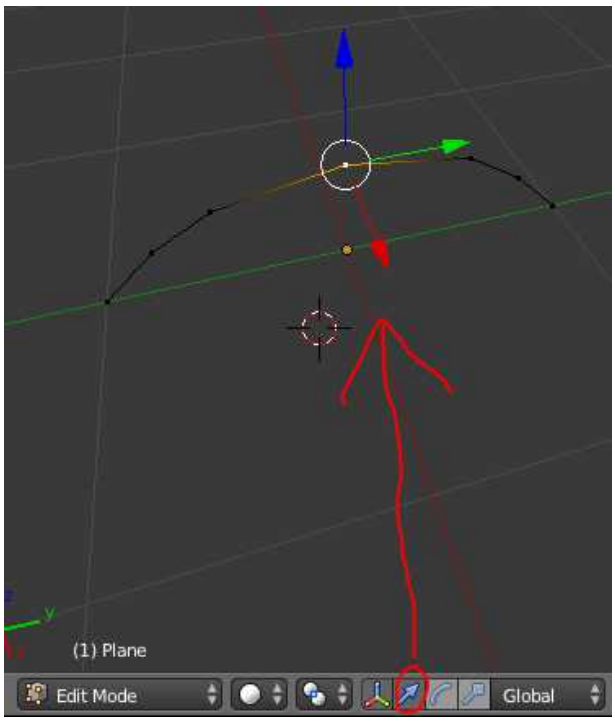


make sure both vertices are selected and subdivide it 2 times by selecting *W* opening the Specials dialog and then choosing *"Subdivide",* deselect now the point in the center by holding *SHIFT* and *RMB* ...



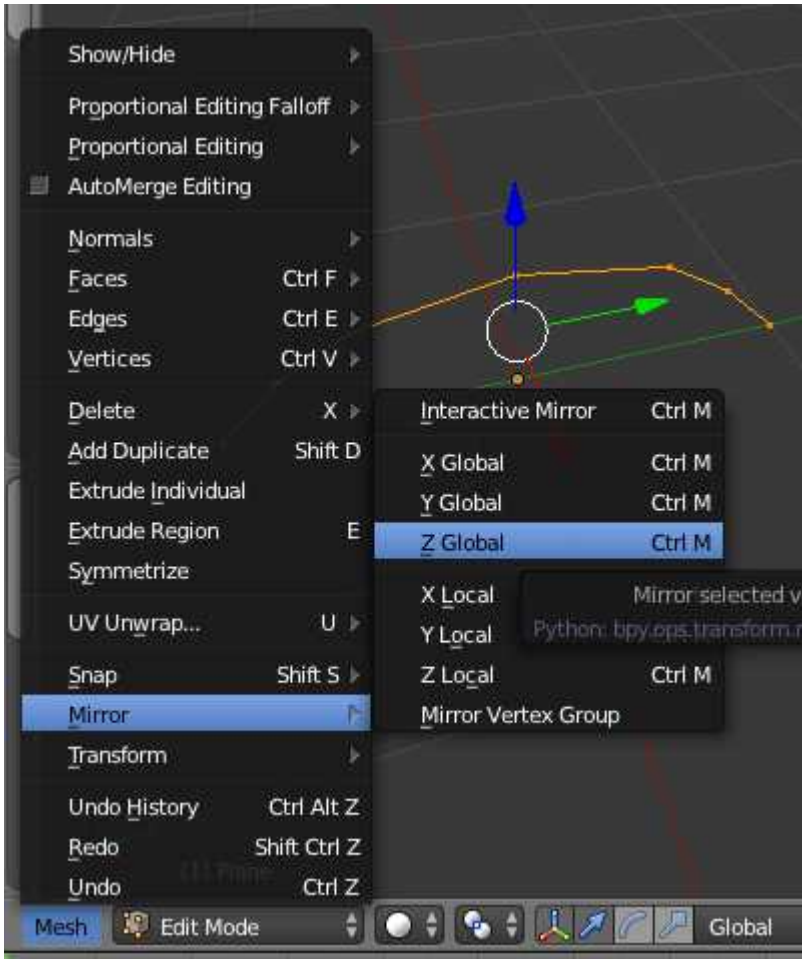
… and subdivide one last time; the result is a line with seven vertices

use now the shown transformer to form a curve out of the vertices by moving the vertices along the Z-axis upwards; leave the outermost vertices at their position



Select now all vertices and duplicate the curve by pressing *SHIFT + D* and then *ENTER* to finish the process; the copied curve has to be now at the same position just like the original one

now mirror the curve by using the menu Mesh → Mirror → Z Global

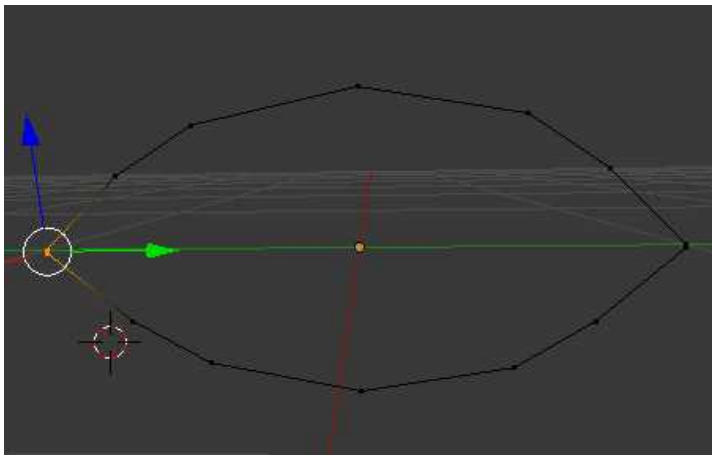


move the curve now down along the Z axis to form an oval with the original curve

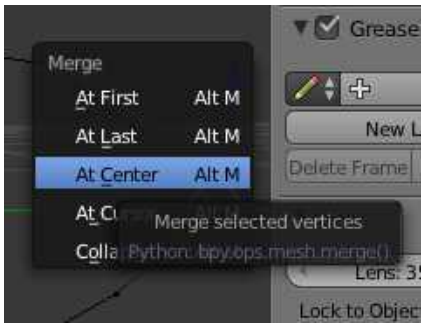
Press *A* to deselect all

make sure that this button is deactivated

use now *CTRL* + *LMB* to select only the 2 left outermost vertices of both curves



press now *ALT* + *M* and select “at center”

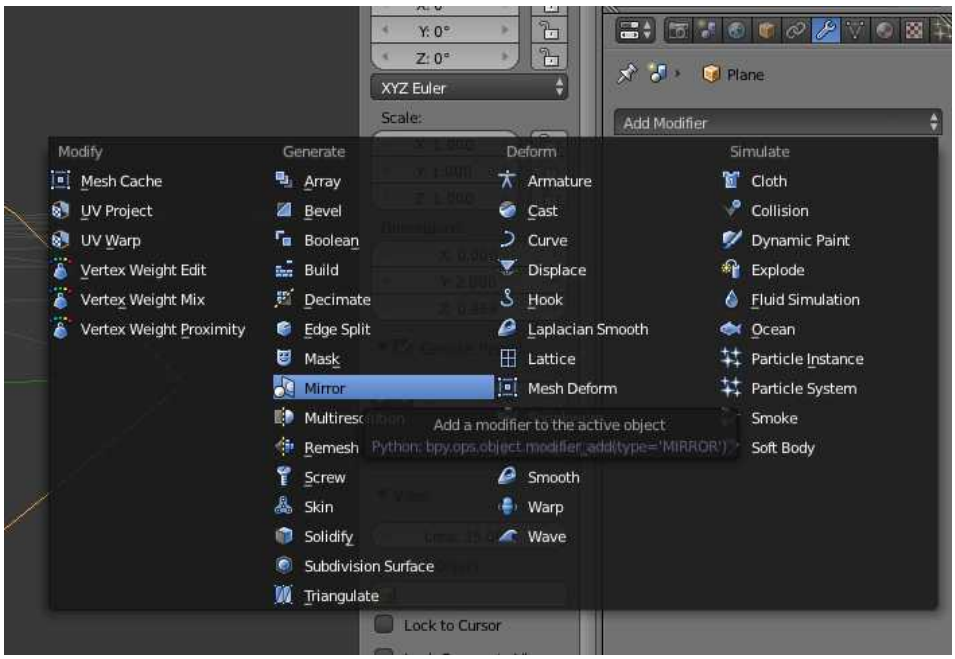


repeat the same steps for the 2 right outermost vertices

now we have an ellipse-like two-dimensional structure; prior extending into the third dimension, we will add a mirror modifier to generate both sides of the manta ray in parallel

go to object mode with *TAB* and make sure that the curve (and only the curve) is selected

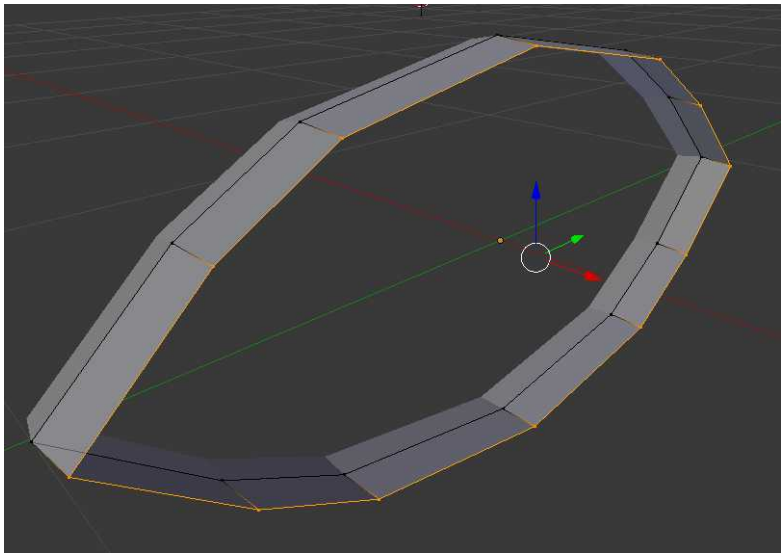
add now the modifier “Mirror” by going to the Properties window, selecting “Object Modifiers”, “Add Modifiers” and finally the “Mirror” modifier



the effect you will see in the next step

switch to Edit Mode again with *TAB*

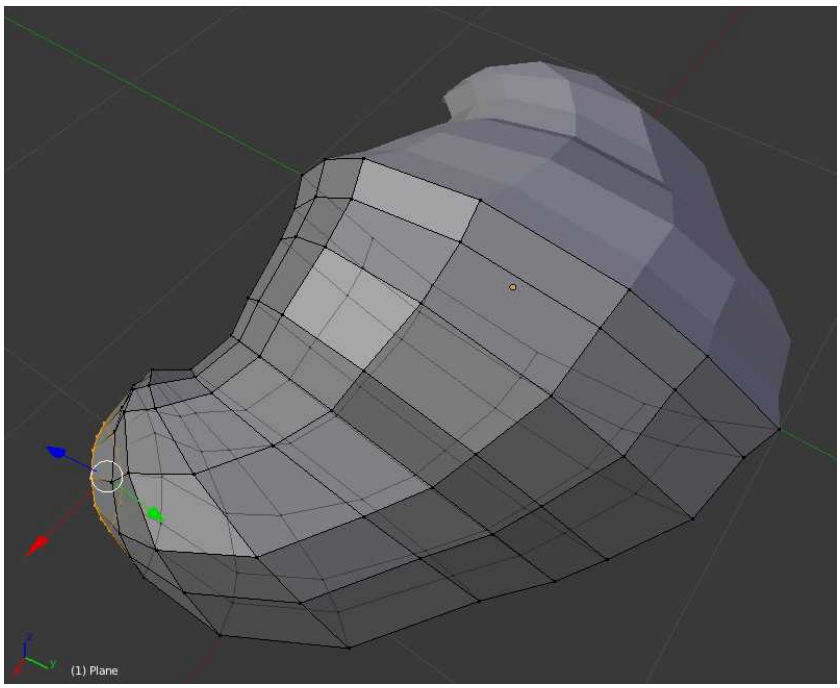
select the complete by using *A* and press the *E* to extrude the curve, and this will happen:

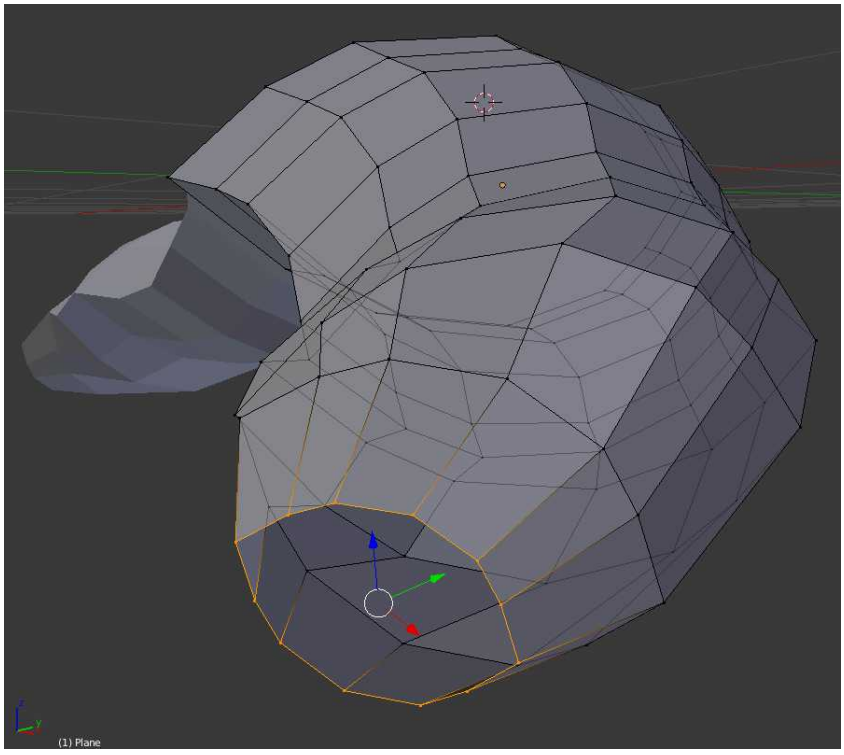


the object was extruded to both sides

now use the shortcuts *S* for Scale, *R* for Rotate and *G* for Grap to move and transform each segment and remember that these modes should be combined with the keys *X*, *Y* and *Z* to restrict the transformation to a single axis

after one segment is finished, continue with the next one, until a form similar to this one is built:





note that the ellipses are rotated towards the end along the Z axis

this is still an ugly manta ray, but we will see that it will be easy to improve it within the next steps

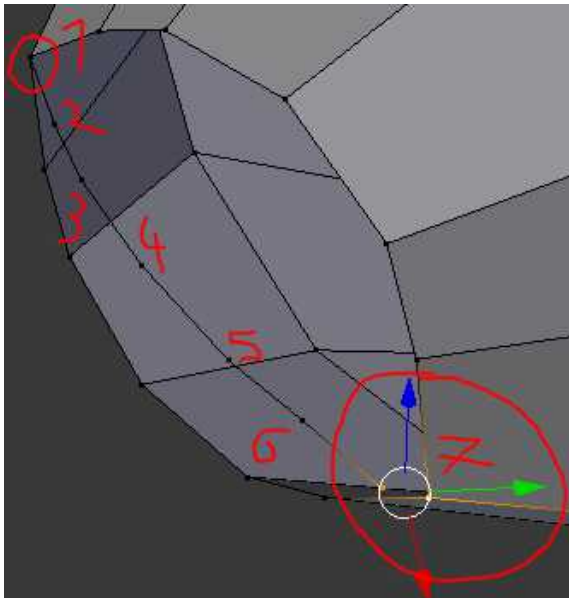
but first, you see the hole in the last image; this we will have to close now

let us toggle of  again, so that only the outer shape is shown

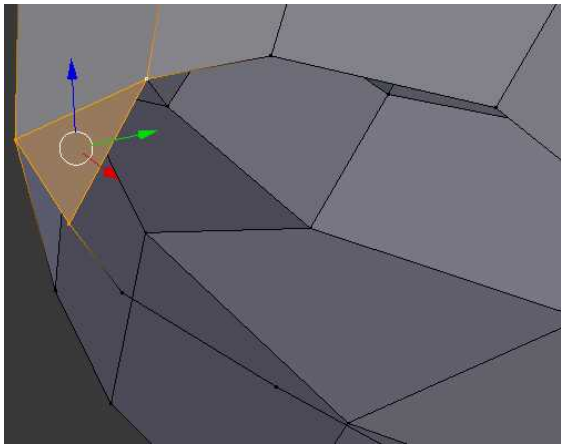
select now a single vertex at a corner of the ellipse forming a hole (image: 1)

now extrude again with *E*; but this time only small lines will appear, do this 6 times and try to place each vertex in the center between the upper and lower neighboring vertex of the ellipse

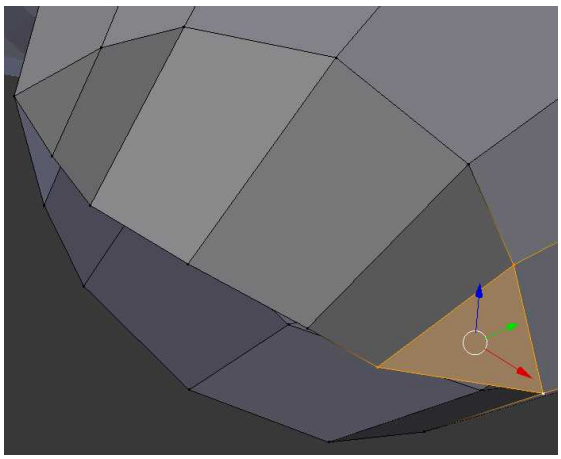
then, select the last vertex and the vertex at the opposite edge of the ellipse (image: 7) and merge them with *ALT* + *M*, but this time select “At Last”, to position the last created vertex on top of the edge vertex



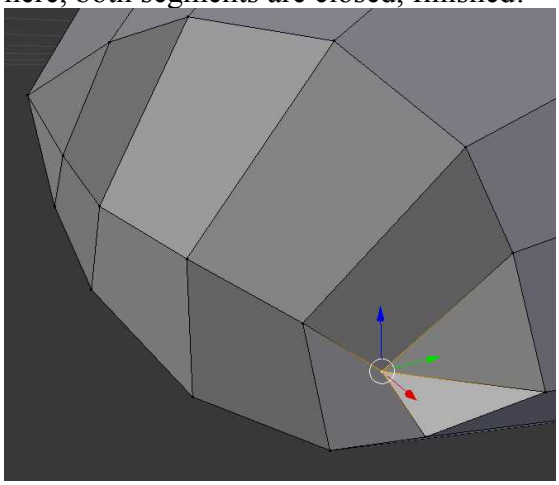
now it is time to close the whole; for this purpose, select always the three of four vertices surrounding an area and press then *F*



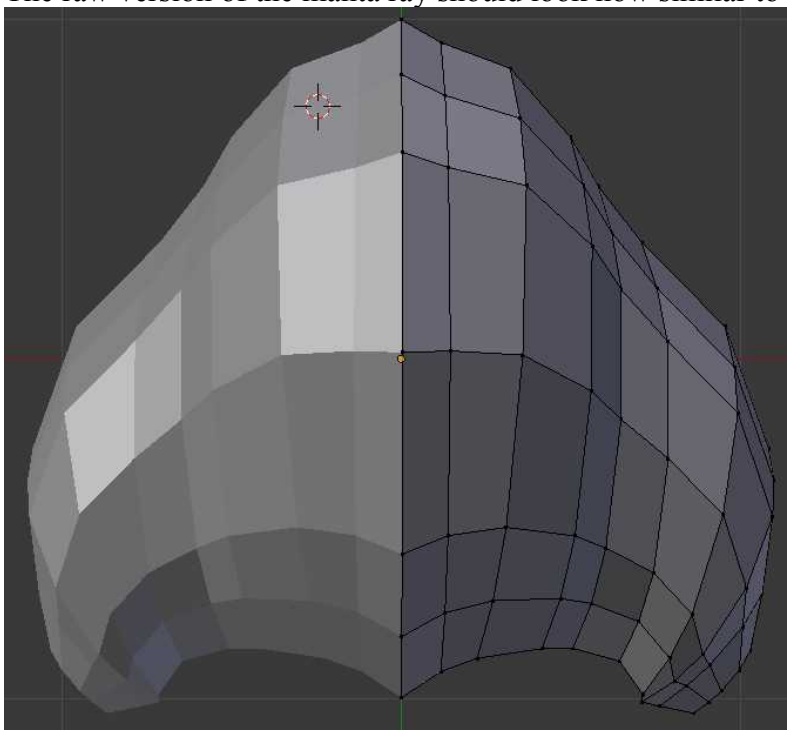
here, the upper segment is closed:



here, both segments are closed, finished!



The raw version of the manta ray should look now similar to this:

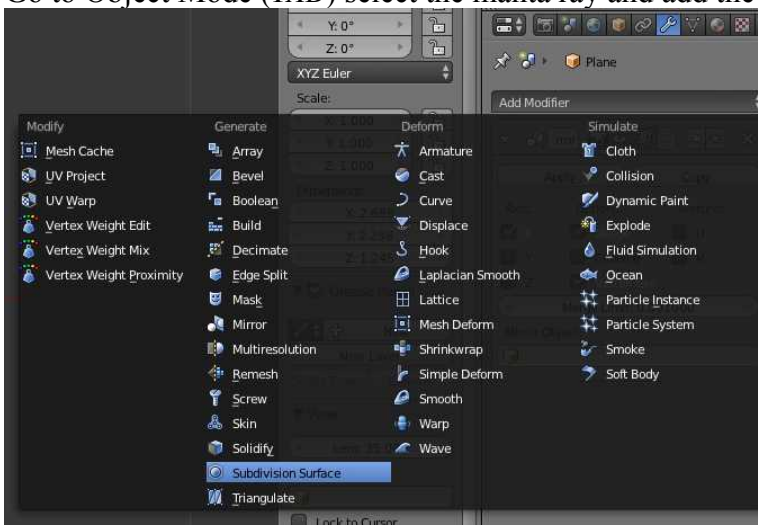


→ ct_Rochen__3_0_base.blend

Smoothing the Base

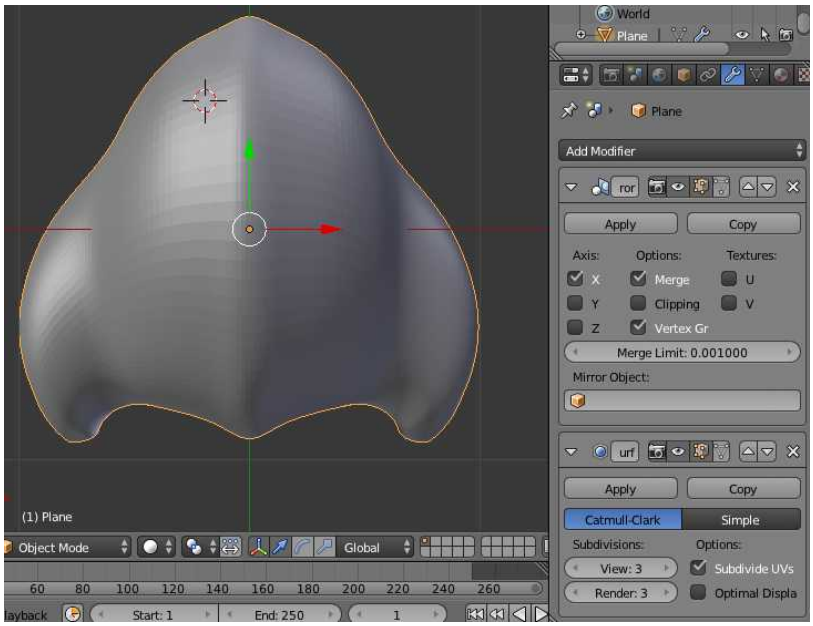
let us first improve its outer shape

Go to Object Mode (*TAB*) select the manta ray and add the “Subdivision surface” modifier like this

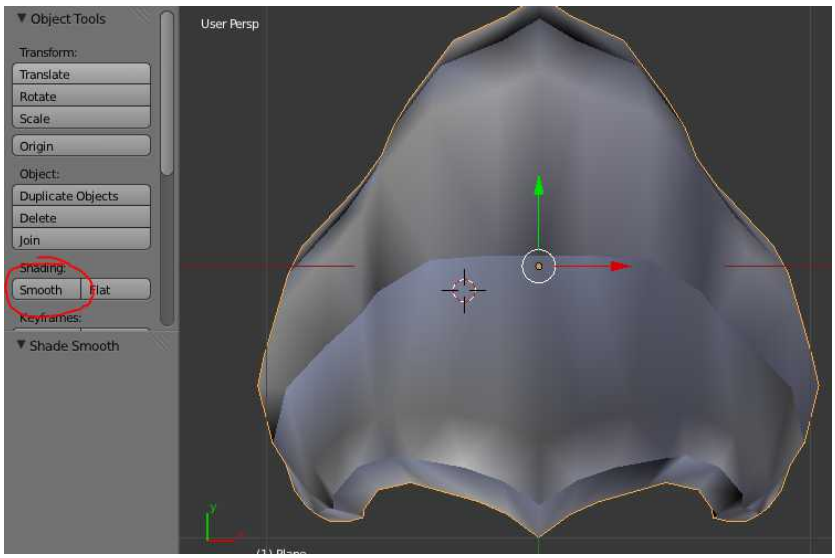


Change change the “Render” setting of the Subdivision surface modifier to 3 which will only affect the images rendered in the end, but you may change the “View” setting, then the mesh in the 3D View is improved, but for the further work, it will be better to define the View setting as 0, because we will have to work with the standard mesh

this image shows how the mesh looks like with “View” setting changed to 3

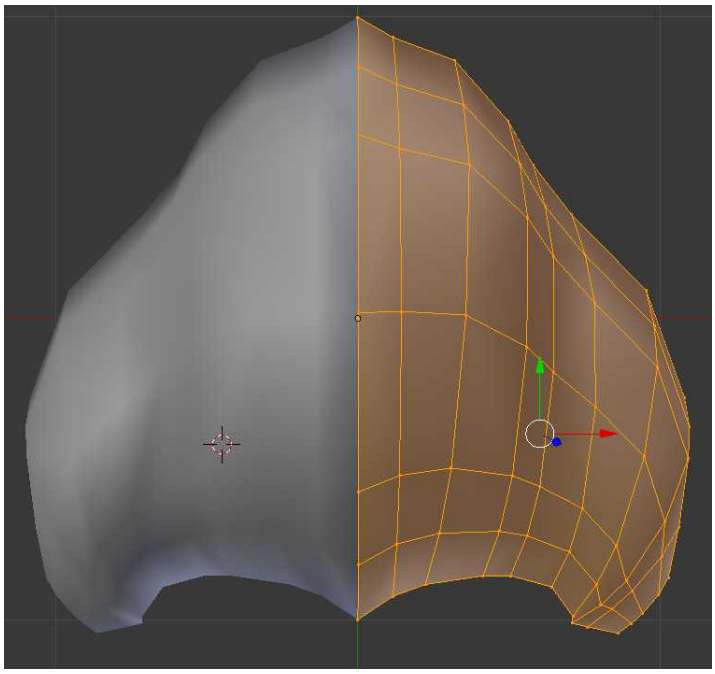


now let us apply normals to improve the way the mesh is shaded



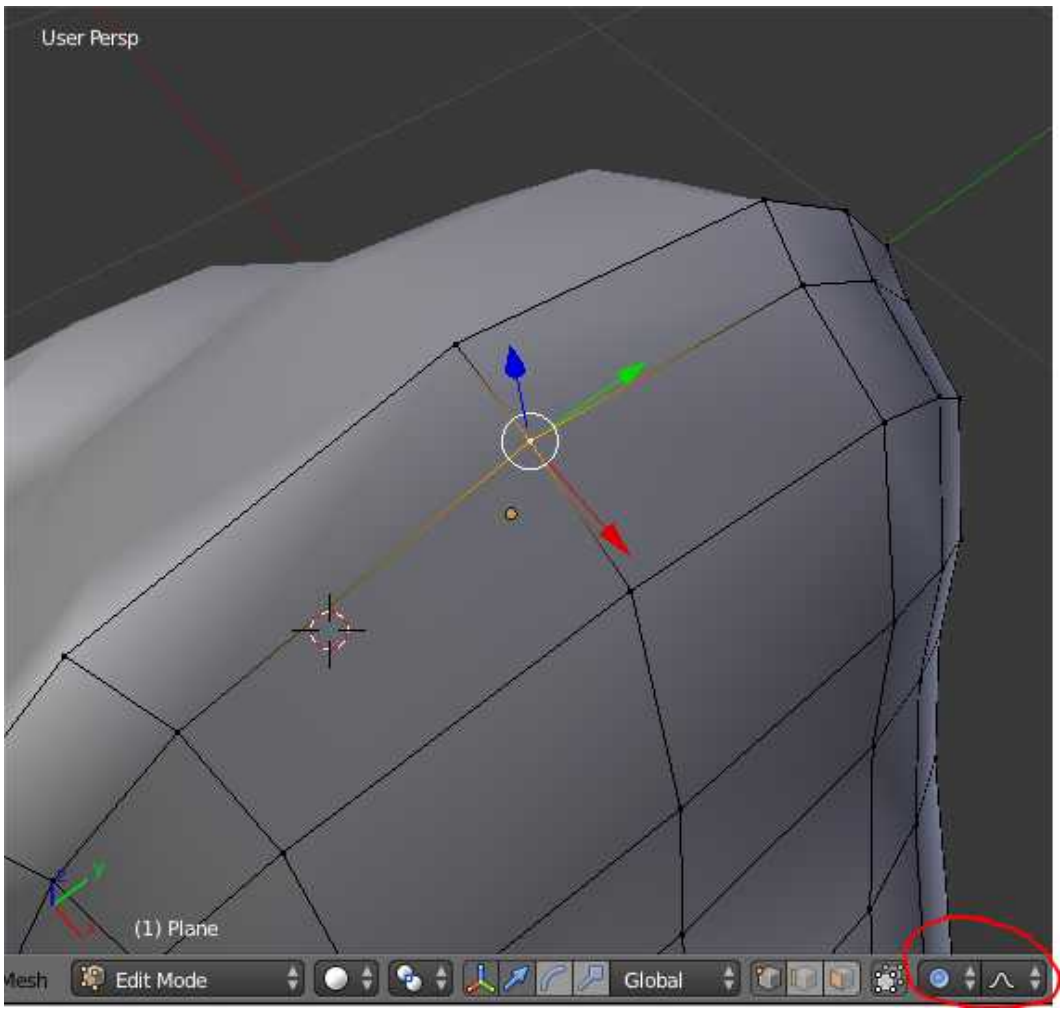
aha, looks strange! The reason is that the normals are not oriented in the same direction

just go to “Edit Mode” with *TAB*, press *A* to select all, and press then *CTRL+N* to fix the normals, problem solved!



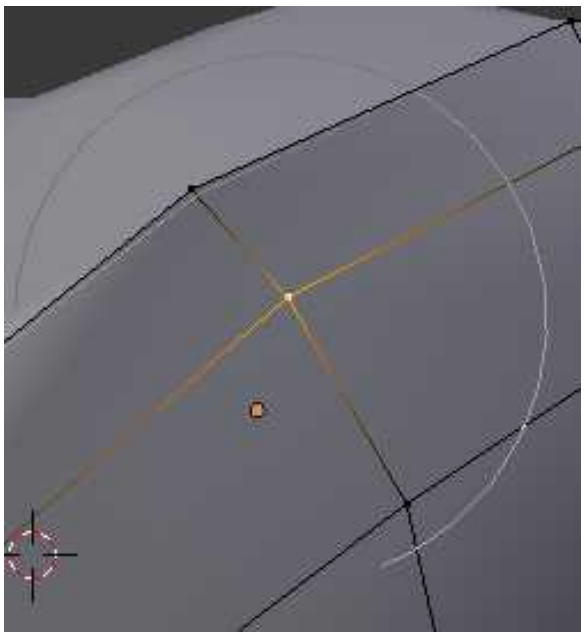
Still, this Manta ray is quite fat (maybe your one looks better, but this one has eaten too much these days), now we will use modeling techniques to optimize its shape

in “Edit Mode” activate the “Proportional Editing Mode”, marked at the following image, and use the “Falloff mode” which is shown right of the switch for the “Proportional Editing Mode”



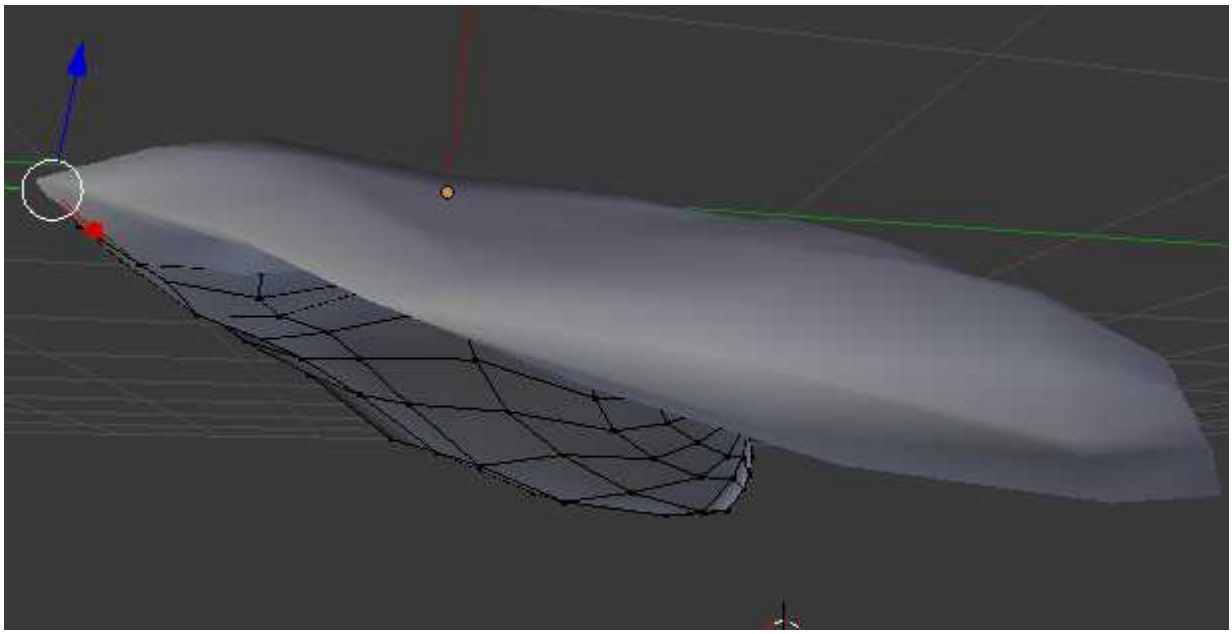
again, use the previously applied *S*, *R* and *G* methods (also sometimes in combination with *X*, *Y* and *Z*) to change the shape of the Manta ray

to change the radius of the affected neighboring vertices, use in parallel to the transformations the mouse wheel, the image shows the white circle indicating the radius during Grap mode toggled with *G*



use these methods to improve the shape of the Manta Ray and combine it with regular editing (without falloff)  or with falloff for connected nodes  . in this case, only nodes directly connected to the selected node(s) will be affected. This maybe useful if e.g. only the upper side of the wing should be affected

so, job done may look like this:

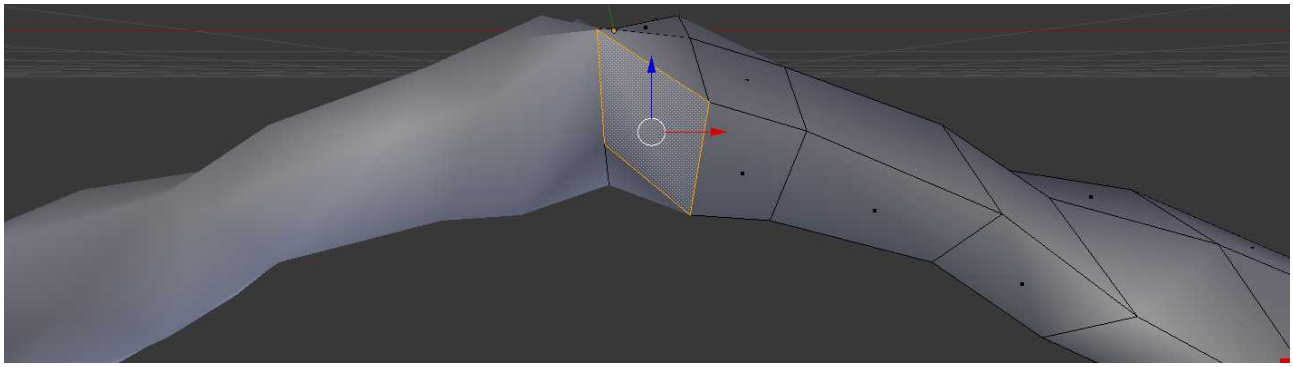


what is still missing? The tail! So let us model the tail!

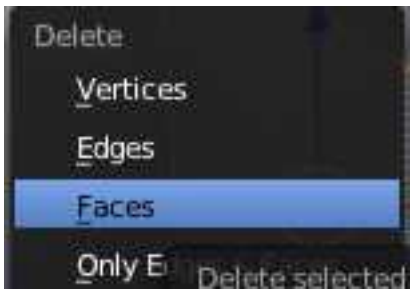
Go to the back of your Manta ray. During “Edit Mode” (deactivate the proportional editing now!) you go to the back of your Manta Ray

Press *CTRL+TAB* and change to “Face” Mode

select now the position where the tail should be attached to



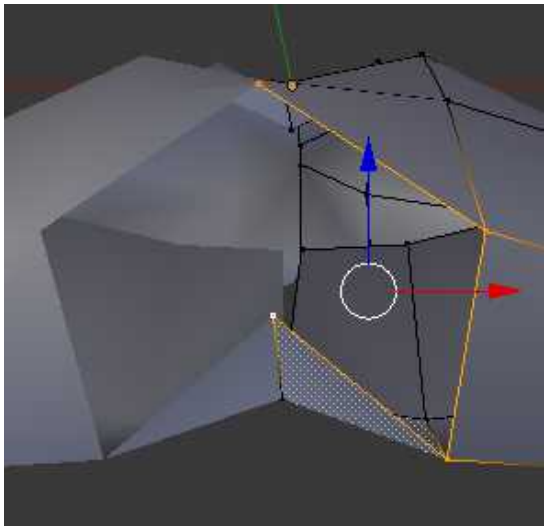
hit *DEL* and choose “Faces”



a hole appears

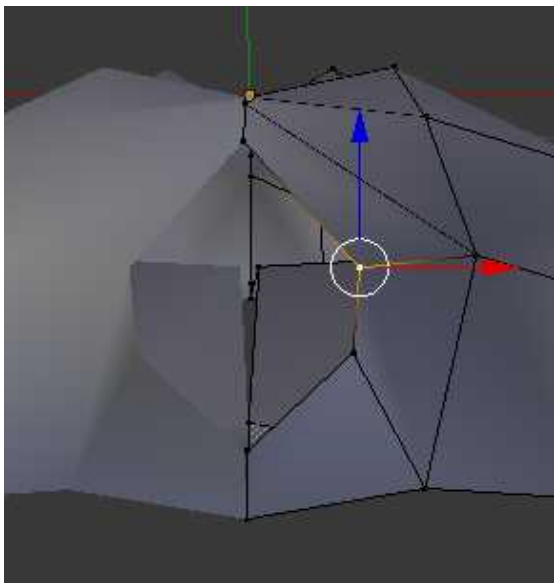
Now press *CTRL+TAB* and change back to “Vertex” Mode

Shift + *RMB* the four vertices surrounding the hole

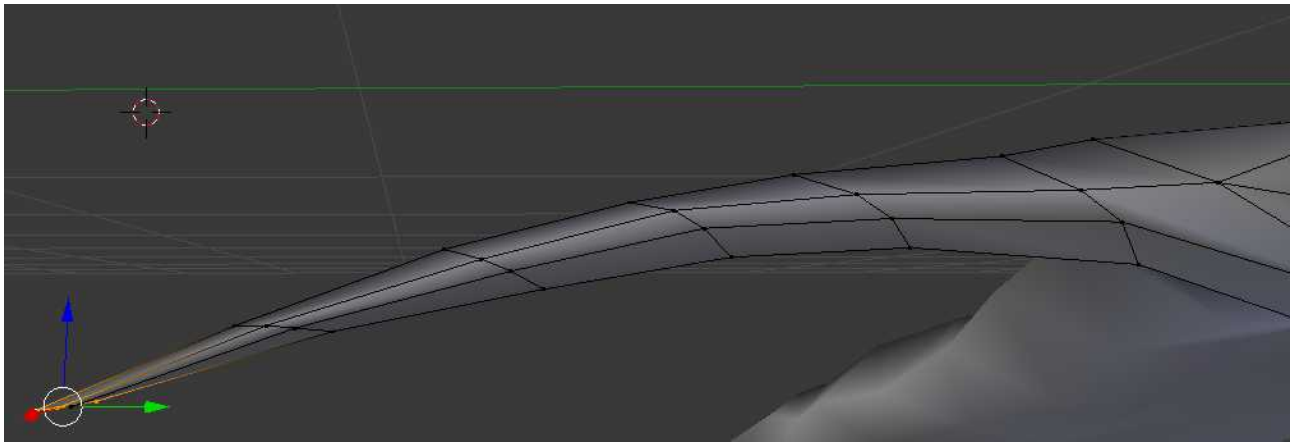


now you know the game! Extrude with *E* (combine it with *Y* to make sure that the vertices are translated along the Y axis, otherwise the tail will be holey) and apply the same methods once used to model the basic shape of the Manta Ray

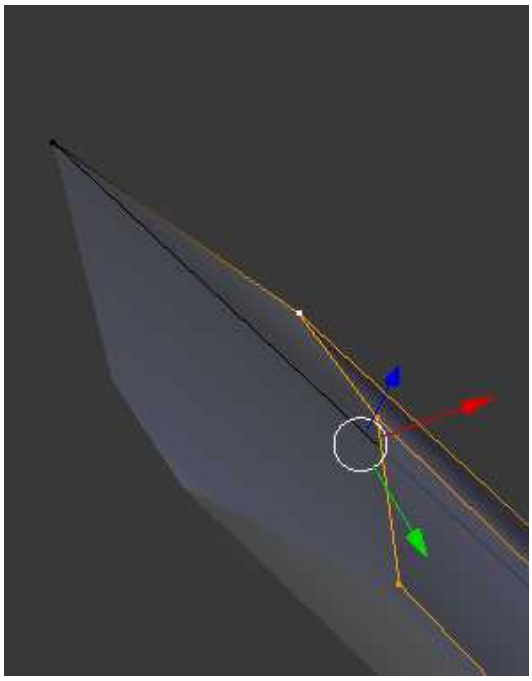
especially the final shape of the first extension has to be optimized for the shape of the tail



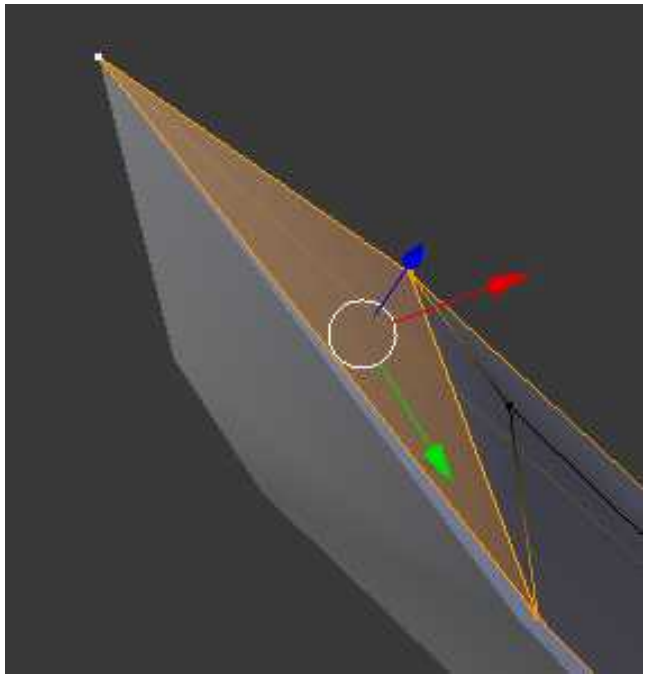
the final tail should contain around 5 segments



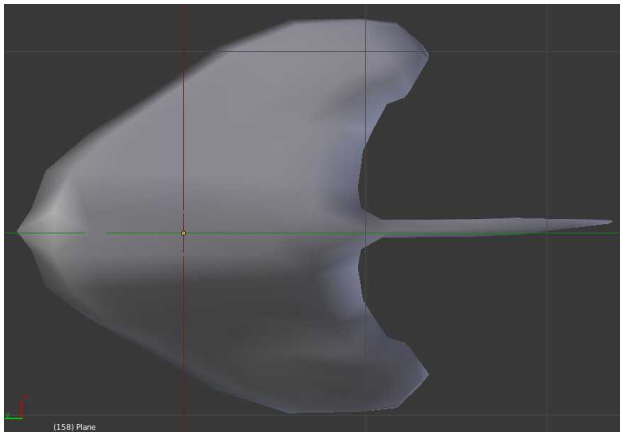
in the end, close the whole of the tail by selecting 3 vertices surrounding the hole by *SHIFT+RMB* and then *F*, in my example I only have to this two times and the tail is closed:



1st time



2nd time



the result

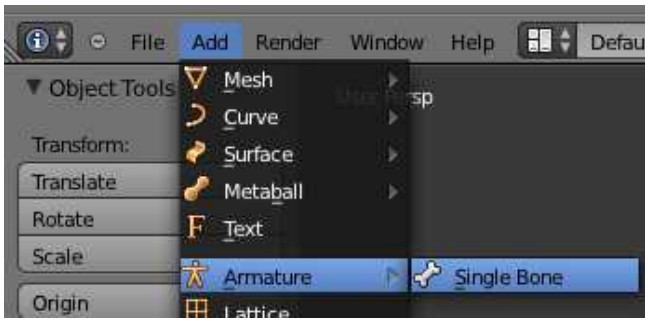
→ ct_Rochen__3_1_smoothed.blend

Bone to the Flesh

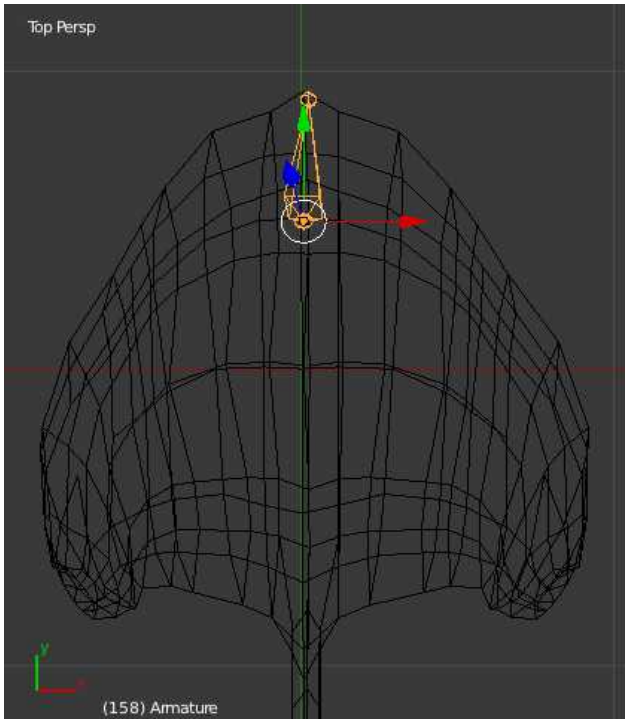
Now we want to animate our Manta ray. For this purpose, a simple skeleton is needed.

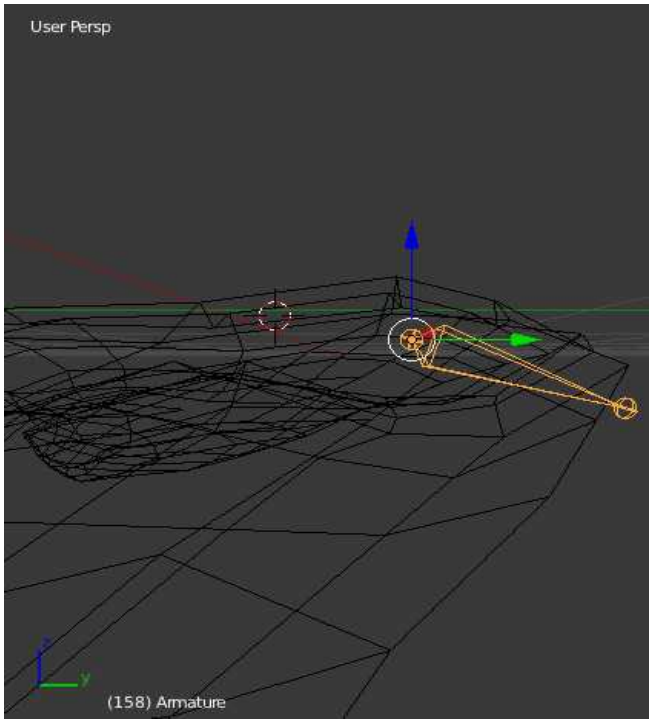
First, go to “Object Mode” and make sure that the Manta ray is still located in (0,0,0) by controlling its transforms (remember the *N* window)

then add a bone by using Add → Armature → Bone



place the first bone like this:



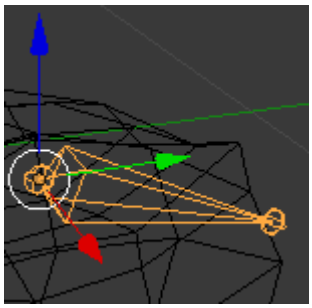


here, the wireframe visualization was chosen:

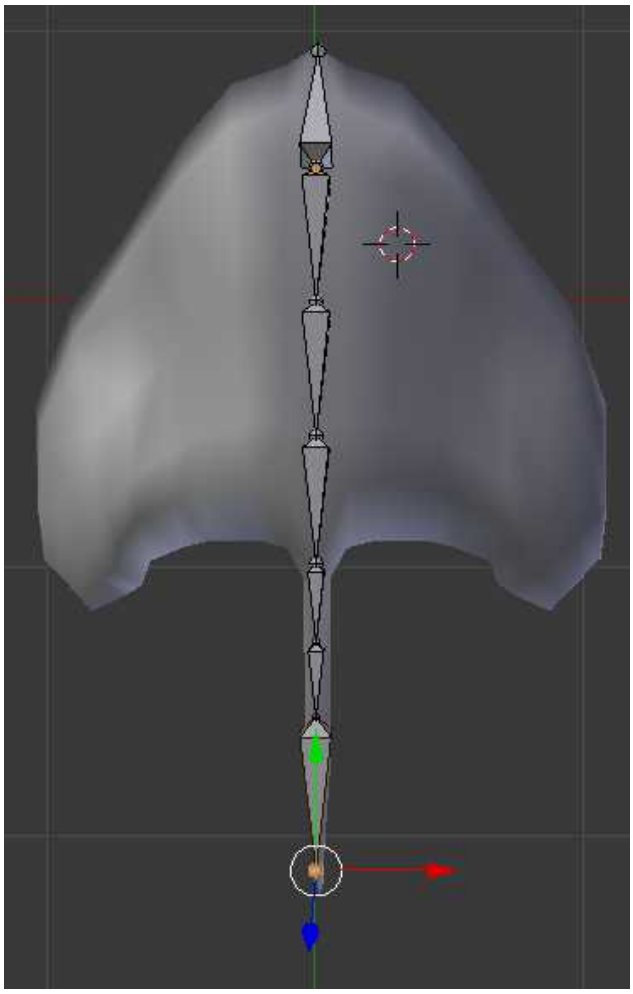
make sure that it is parallel to the upper edge in the center of the Manta ray (left image) and inside the mesh (right image)

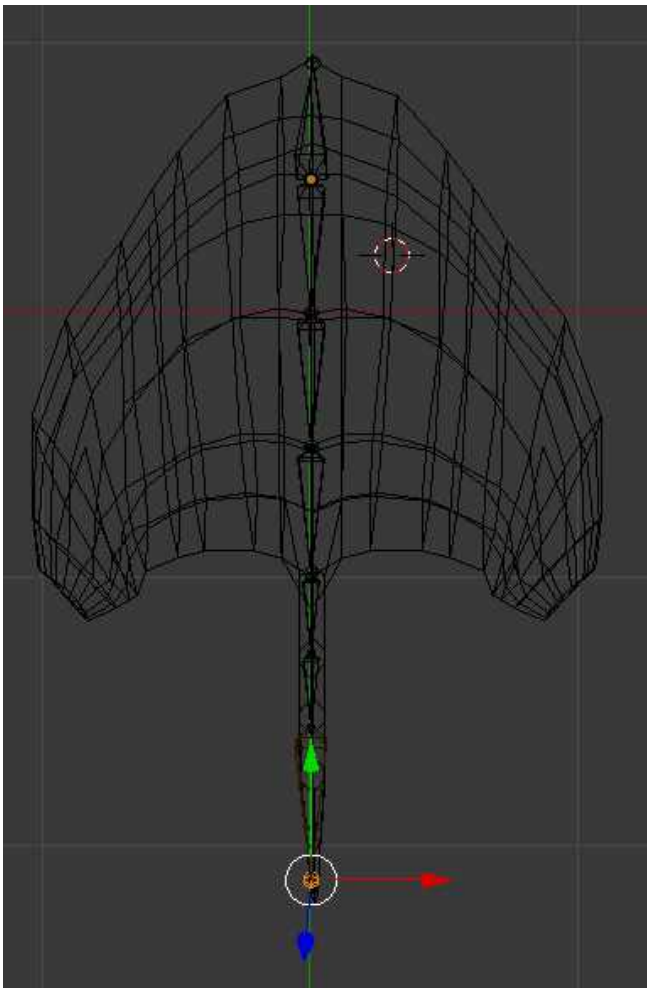
moreover, turn the X-Ray option on, this will be better if you work again with the solid rendering method  . you may change during the following procedure between these two methods

go now to “Edit Mode“, click on the back segment of the head bone in extrude it by pressing *E*

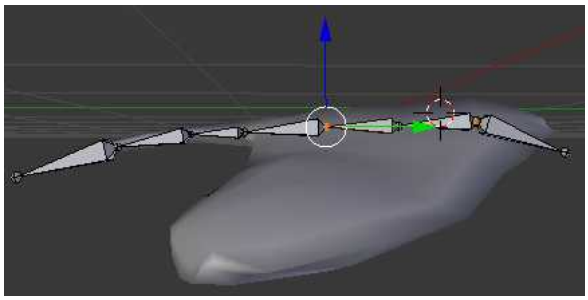


apply the standard procedures until your Manta Ray looks like this (make sure that the joints of the bones – the small spheres on top of each bone – are located on top of an edge):





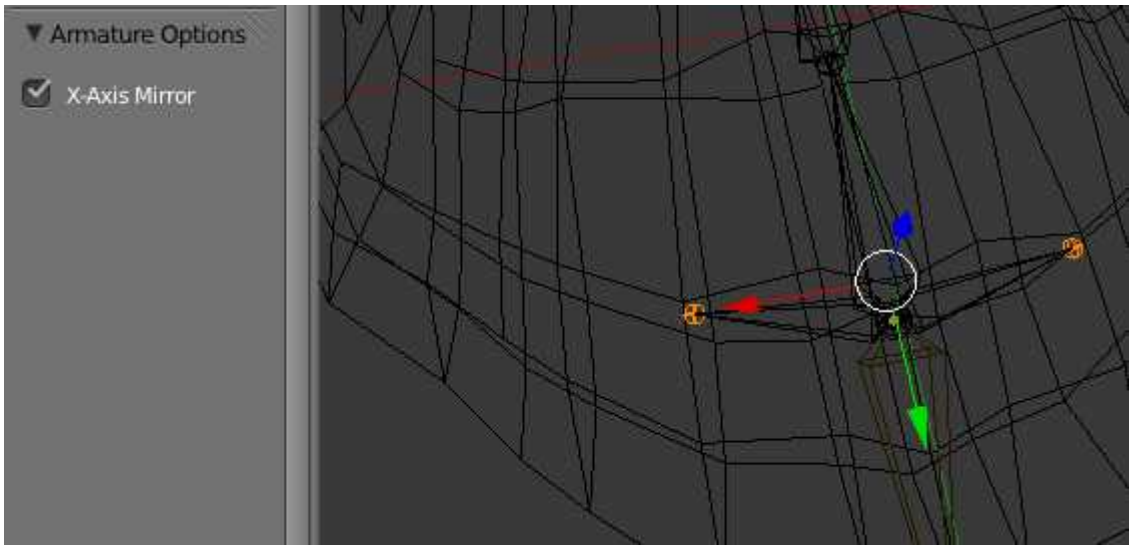
again make sure that the bones are also at the correct position if you look from the side



the backbone and the tail are finished, but now the wings have to be addressed

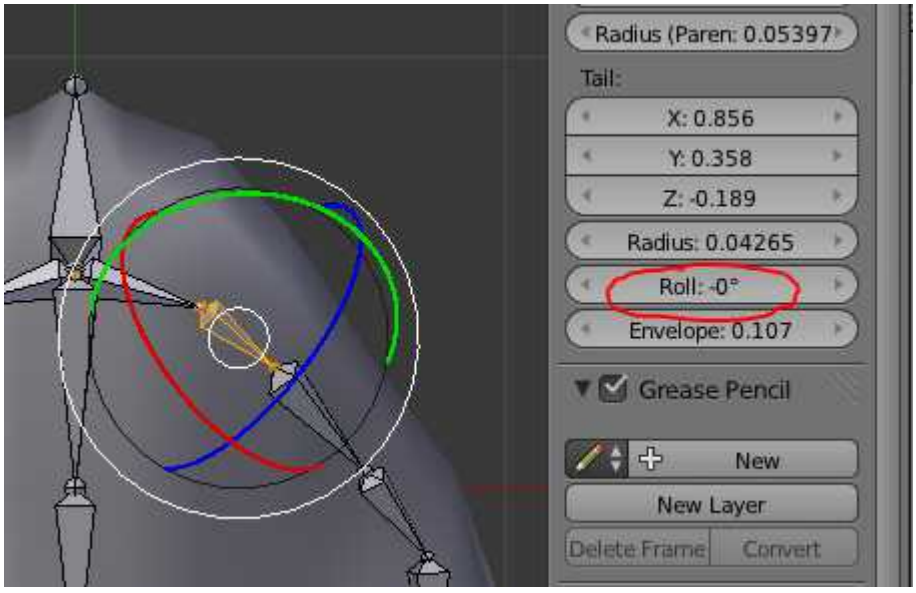
for this purpose, first make sure to activate the „Armature Option“ „X-Axis Mirror“ located at the left side of the window

now select the joint behind the head bone and extrude it, but this time use *SHIFT* + *E*!!!

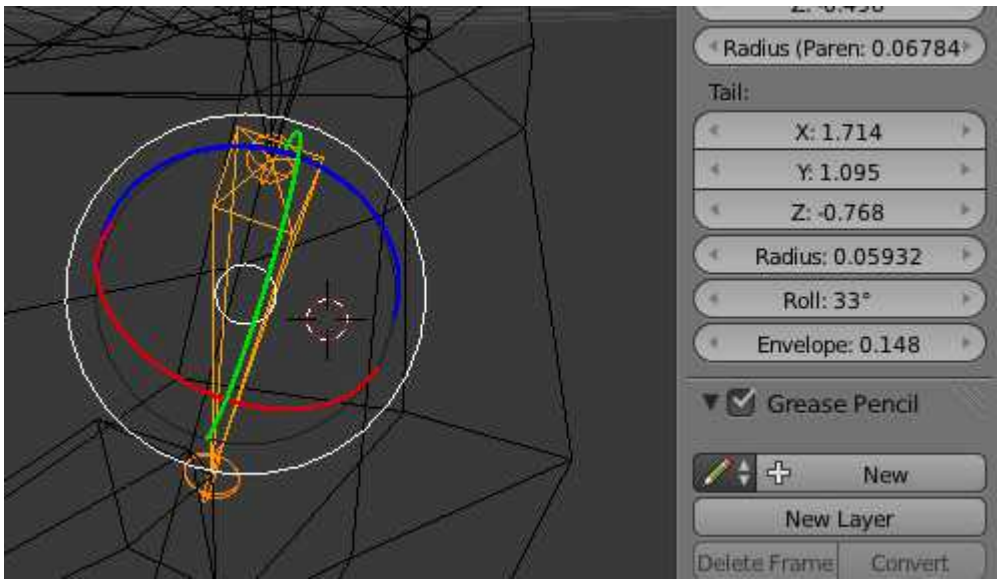


now you will see that the extruded bone is mirrored along the X-axis and the result should look this way, the skeleton is nearly finished now!

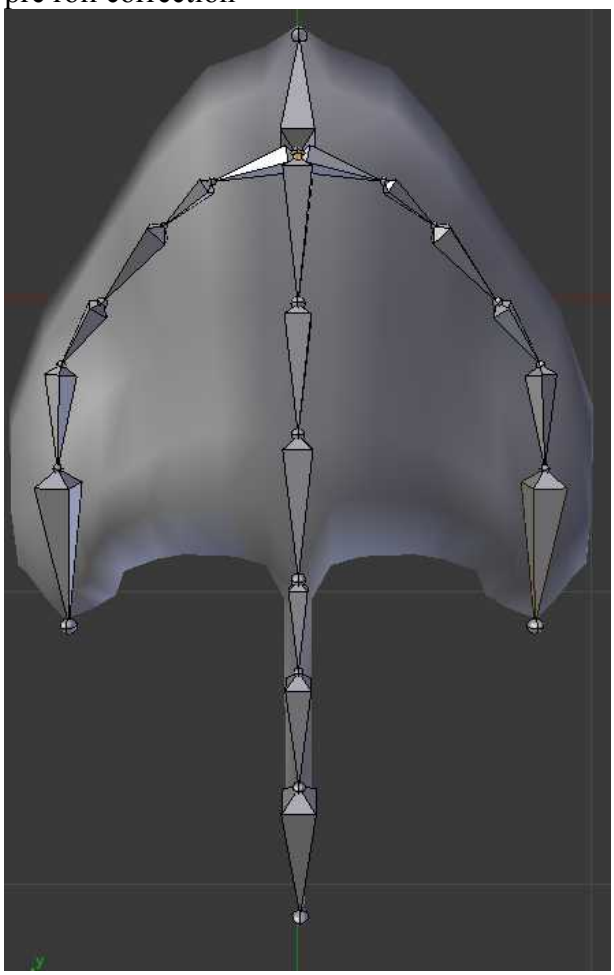
A small problem may occur if the bones along the wings were twisted several times along there axis. To eleminate this problem, the roll parameter of each single wing bone should be set to 0



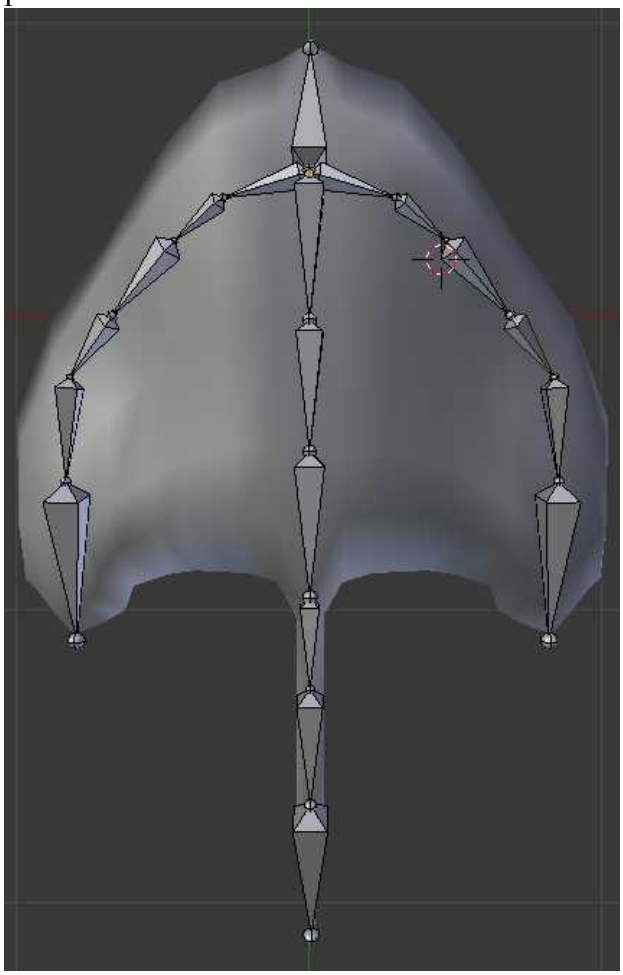
then, the bones are each twisted a little bit, so that their edges are more or less parallel to the outer mesh/faces, please directly change the role parameter in the roll-out shown above



pre roll correction



post roll correction



the skeleton is finished!

→ ct_Rochen__3_2_bones.blend