



Release the beast, step by step

How to make high detailed model for VFX ?

Table of contents

Table of contents.....	3
I. Introduction.....	4
II. Pretexturing.....	5
1. Introduction to XYZ files.....	5
2. Processing our model (UVs, export,).....	6
III. Zbrush sculpting	9
1. Keeping your mesh in one piece	9
2. Splitting into subtool per UDIM.....	11
3. Utilities creation in Zbrush	13
A. Export the cavities	14
B. Export the curvature	15
C. Export the AO	16
D. Custom masks.....	16
IV. Texturing in Mari	17
1. Albedo creation	19
A. Create the primary colors.....	21
B. Secondary colors :	23
C. Tertiary colors and weathering	27
2. Specular	29
3. Specular roughness	31
V. Look development.....	34
1. Set up your look development studio:.....	34
2. Set up your displacement:.....	34
3. Set up your shader.	36
A. Albedo	36
B. Specular weight	37

I. Introduction

I am Gael Kerchenbaum, a modeler and texture artist specialized in creatures. I've been doing 3D as a professional for a few years now, but I decided pretty early to specialize on the organic side. I am a constant user of XYZ displacement packs. To be honest, I embraced them as soon as they went out; they are now indispensable part of my workflow. I wrote the first tutorial to explain to artists how to combine XYZ files into one projection texture. Then I decided to put together this tutorial to share with you most of my creative process when it comes to creature making for VFX. In this tutorial, I start by explaining to you how to get the most of XYZ files from a modeling point of view. We will then get to discover how we can use our displacement to help us create a full procedural texturing. And finally, we will get to a quick part on how to get everything to work for our look development creation.

Link to the my demoreel :
<https://vimeo.com/233727458>

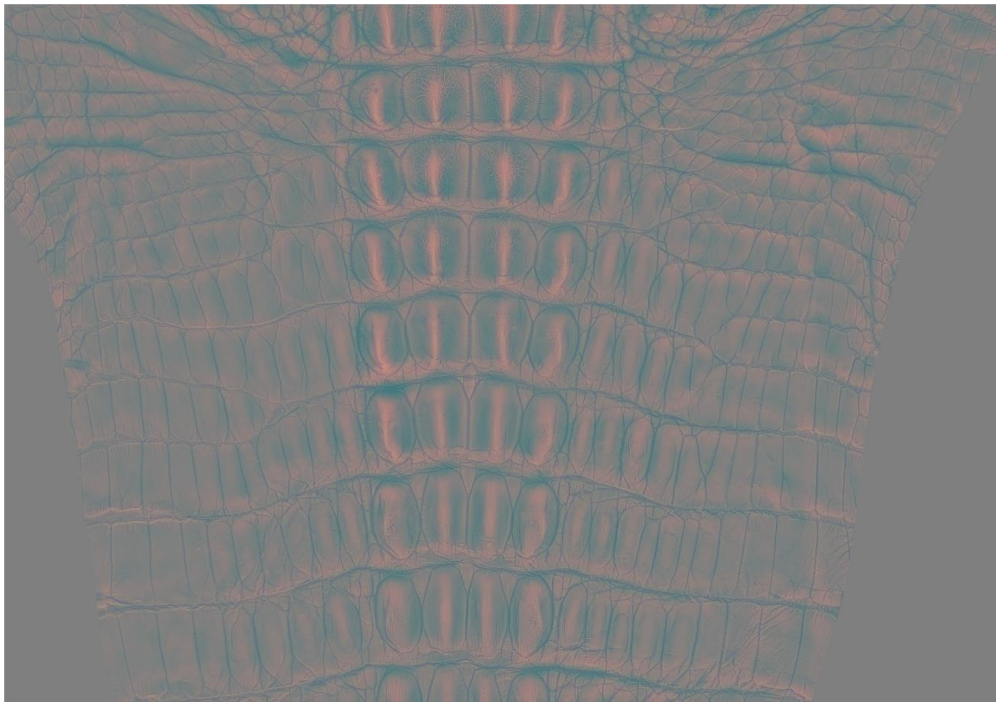


II. Pretexturing

1. Introduction to XYZ files

TexturingXYZ provides displacement resources as well as albedo, specular and specular roughness and even more data. This is one of the only website that provides references of pure color or accurate specular captured directly from the subject. A few Software allow to project both the color and surface information, like Substance Painter for example. However working in VFX ask a lot of resolution. We will need a lot of UDIM. Unfortunately, Painter is pretty limited. Also, we cannot project everything in Mari because the software only allow a three channel paint through at one time. For this reason we can keep the albedo, specular and specular roughness maps for references. The following working will explain you how to deal with the height and bump map in order to populate your models with details. We will then use these projections in zBrush to get be able to customise everything.

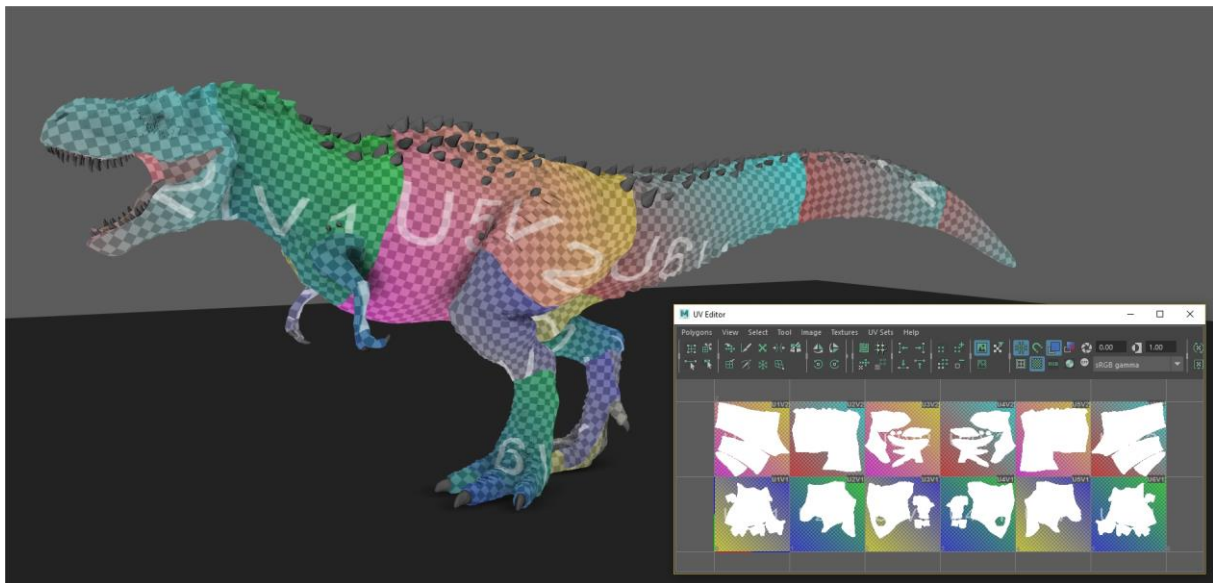
- Preparing XYZ creature disp
 - Unzip your pack. Start by combining the Height and Bump in Photoshop or nuke. Be sure to check my former tutorial if you are not sure how to combine them correctly : <https://texturing.xyz/pages/surface-displacement-maps>
 - Put the Height in the Red channel. Put the Height in the Green channel. You can keep the Blue empty, just fill it with mid grey. Or you can use one of the utility that XYZ provides. I like to use the cavities. I could use it later to create some masks for my albedo or my specular maps.
 - Cut the maps into smaller pieces to load them quickly in Mari. As a reminder, Mari does not allow to project file larger than 16K.



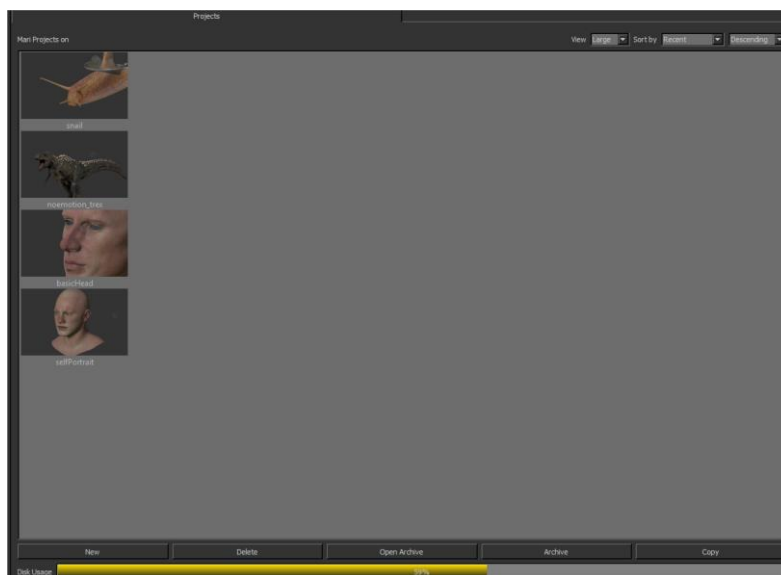
2. Processing our model (UVs, export,)

I will use my t-rex for example for this tutorial. It has 12 UDIMs. The render has to size 12K, so I decided to create 8K maps. More is always better than less: it takes a second to downscale the maps in Nuke, however we can't upscale them without lost.

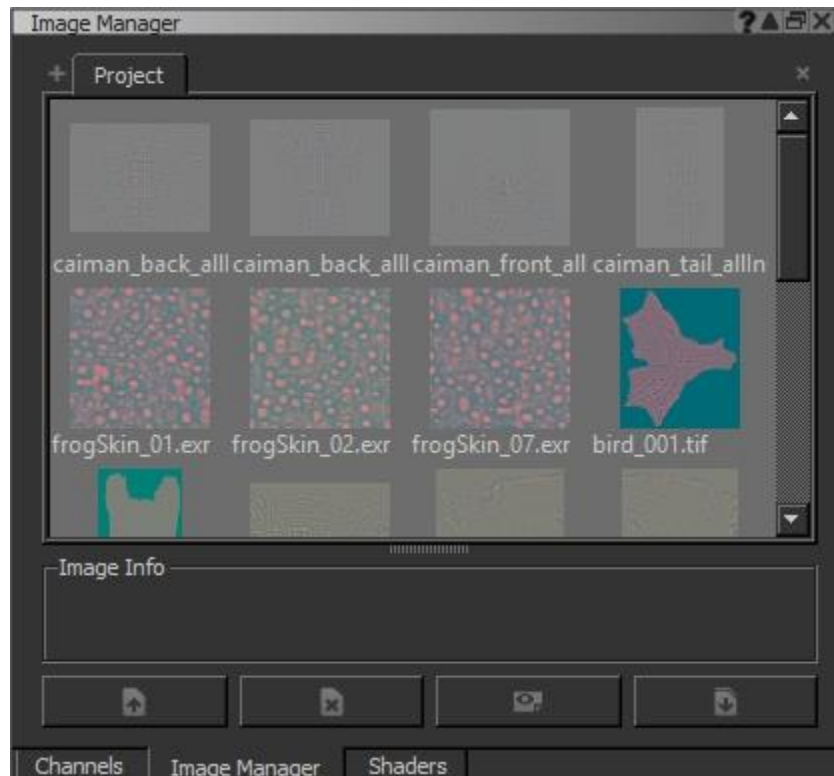
Following is a screenshot of my UVs. Keep the aspect ratio across all the UDIM of a single object. Objects that are separated can use a different ratio. Even if my object are separated, I avoid overlap so I can get a clear sight on all my textures. This allows to import only one file node in Maya per map.



I create a Mari project and bring my body GEO.



In the image manager, I import the XYZ files that I previously proceeded.

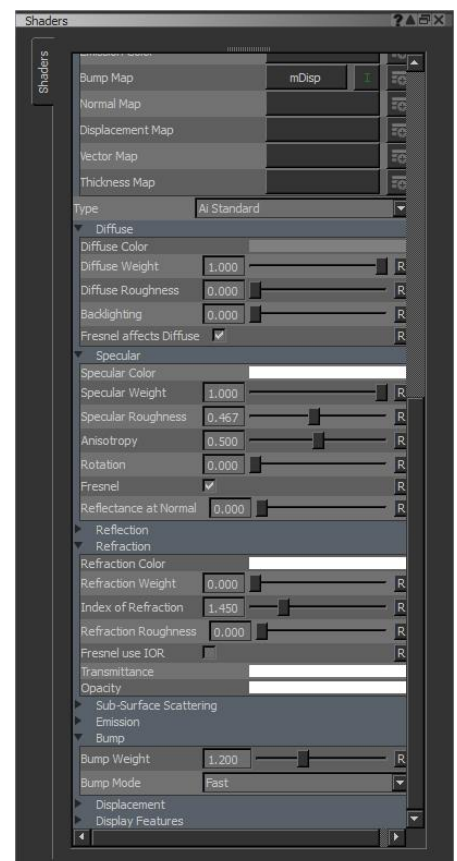


I create one channel that I name mDisp, it stands for mari displacement. The channel is 8k, 16 bit minimum, sRGB with a 50 grey for base color.

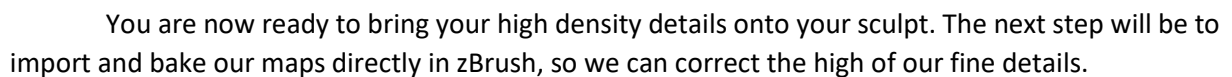
The shader is set as following for a clear display in Mari's viewport:

Aistandard

- Albedo : Grey 50
- Spec amount 1
- Spec color : white
- Spec roughness between 0.4 and 0.5
- Use fresnel checked
- Fresnel use iOR
- Refraction : iOR set to 1.45
- Bump value to 1.X, we can adjust it later
- Plug your mDisp channel in the bump slot of your shader



When you paint your displacement, switch between Flat and Shaded lighting mode. Shaded allows to see the volume, whereas the flat display will make you sure that you don't leave any empty area in the map. Once done, you need to export the red and green channel separated. Isolate the red channel using the former Copy channel you created. Then do the same for the green channel by changing the copy channel to the correct input.



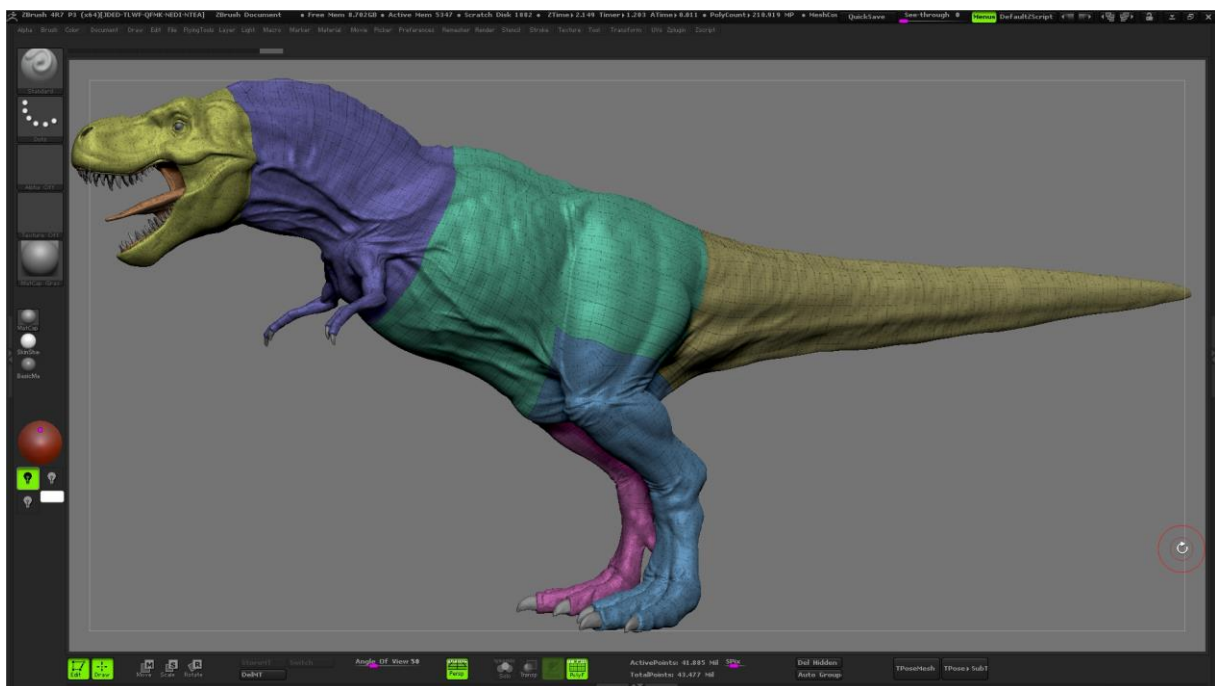
III. Zbrush sculpting

This is how you can prepare your model for high res sculpting :

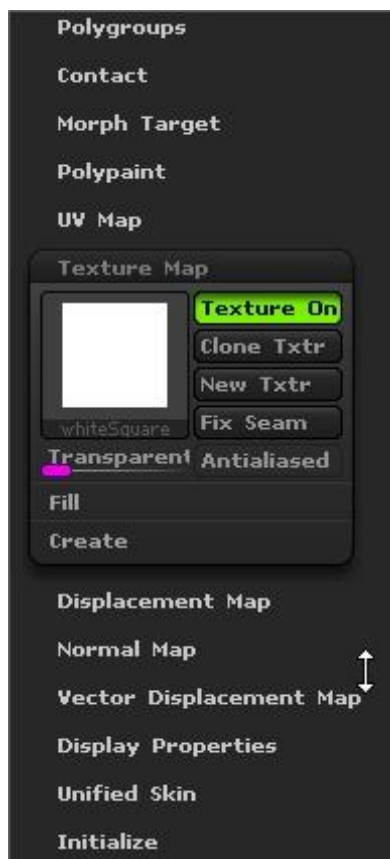
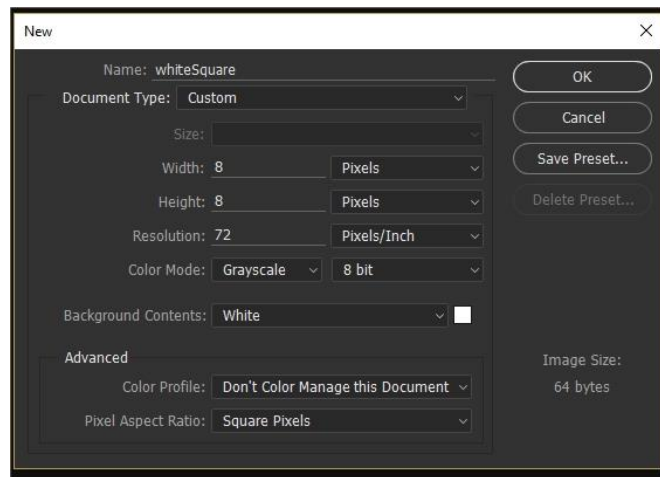
There are two ways of doing things here: either you decide to subdivide your model a lot, in order to reach about 40M polygons. Keep in mind that your zBrush may become unstable, save a lot of increments. The second option is to split the model into subtool per UDIM. It allows you to subdivide your model even more, in order to reach around 4 times the former polycount. You can reach around 160M poly for a single one geometry. There are pro and cons: the pro is obviously the total polycount that you can reach, the con is that you need to separate all body's parts into different subtools. The seams may have to be cleaned later on. During this process I recommend you to always keep an eye on the task manager!

1. Keeping your mesh in one piece

- Divide your model in order to reach around 40M polygons. Do not go too high, 100M poly for only one subtool may kill zbrush
- Go on the lvl1 and do a polygroup per UV.



- Go on the highest lvl, add a layer in record. ZBrush needs a white texture map applied on the mesh to bake the displacement. You can create a simple 8x8 pixels white texture in Photoshop for that. Import it in the texture tab. Then apply it as texture map on your subtool. If you want to see the colors of your polygroups again, active or not the texture color.



- Do a CTRL + Shift + Click on the polygroup that corresponds to the 1001 UV tile.
- Go in the texture tab, import your Mari displacement for corresponding tile. Select it and click on Flip V. Once flipped, click on your texture, and do a Make alpha.
- In the geometry tab, locate the displacement slot. Select your map.
- Click on Disp on, then rise the intensity at low value, 0.05 for example. Click on Apply. Keep this value in mind because you'll need to apply it on all the UDIM.
- Once done, perform a CTRL + Shift click on an empty space to recover your full model.

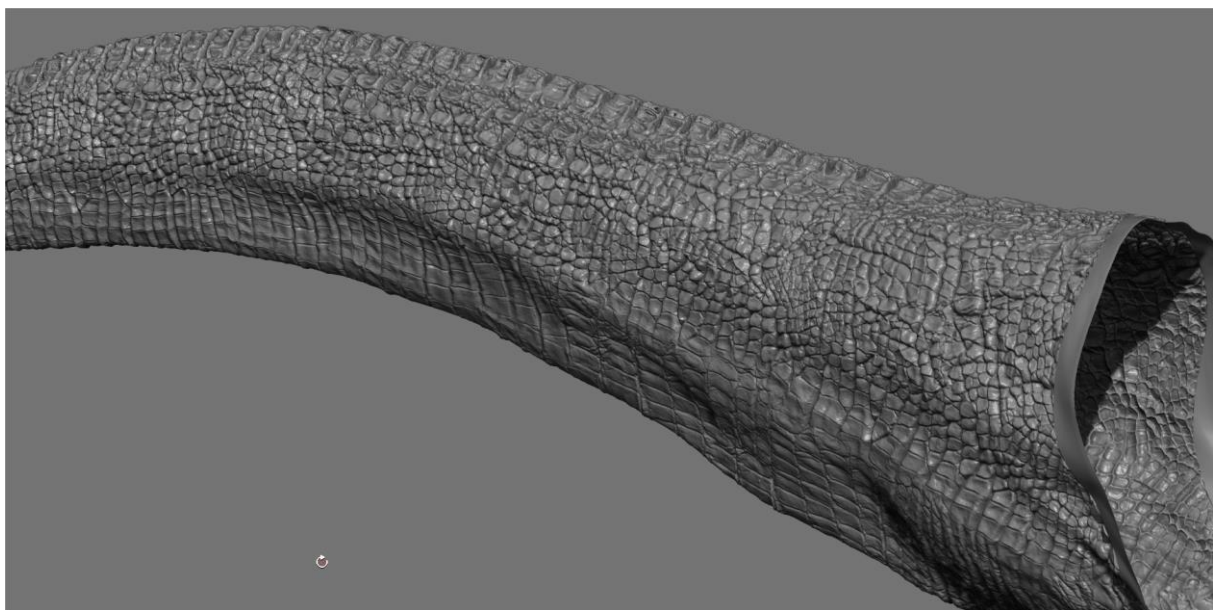
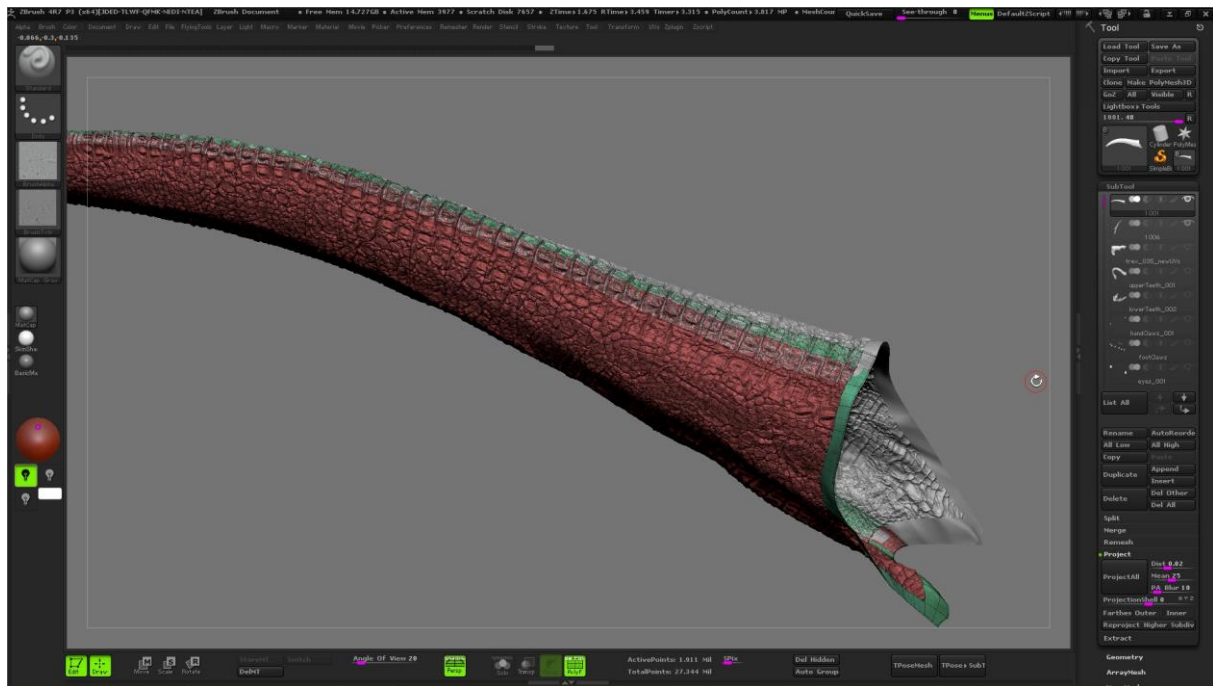
- Keep an eye on your Task manager! If zBrush go crazy on RAM, go in the Edit tab, and click on delete Undo. Also, never forget to do a Quick save frequently.
- You have to repeat the 5 former steps for all the other tiles. Then you'll have all your displacement available directly in zBrush !
- Create a new layer for each exported channel in Mari (Height and Bump)

Link to the timelapse video:

<https://vimeo.com/238017315>

2. Splitting into subtool per UDIM

- Go on lvl 1 and do a polygroup per UVtile. Duplicate your subtool one time per polygroup.
- Select the transpose brush and CTRL + Click on the polygroup that you want. With the paint select brush add 1 loop around your selected polygroup. Click on CTRL + W to create a new polygroup.
- Go on the highest lvl and delete the lower subdivisions. Isolate the wanted Polygroup by doing a CTRL + Shift click on it. Delete the hidden poly in the geometry menu. You have to do that for all the duplicated geometry in order to isolate each UDIM as a single subtool.
- Once done, recreate the subdivision levels.
- Crease the border of your model. You can subdivide one or two more time each subtool.
- Never forget to do a quick save! Keep an eye on your task manager, if zbrush starts to eat your RAM like candies, go in Edit and do a delete Undo.
- Follow the Single mesh workflow from step 3. You'll not have to import the displacement for the borders around your UDIM for each subtool. Instead, you will be able to recover the displacement for the other subtool by performing a projection.



Link to the timelapse video:

<https://vimeo.com/238019356>

I recommend to keep only one subtool per ZTL file. Otherwise, each time you'll add a new layer to sculpt on you'll double the size of the tool on the saved file.

You can now start with the sculpting magic. I only use basic brushes. The clay tube is my favorite. You can also use the Dam standard to dig deeper in the mesh, or the move to enhance the volume.

Always start by working on lower levels of subdivision, then move up slowly. If you don't want to break the information of your bump layer, do not forget to hide it before you sculpt.

Once done, you can bake all layers if you want to preserve memory. Then, with the multimap exporter, export your displacement maps with the following settings:

- UV tile ID format <UDIM>
- Displacement : 32 bits, exr, smooth UVs, Mid 0, scale 1

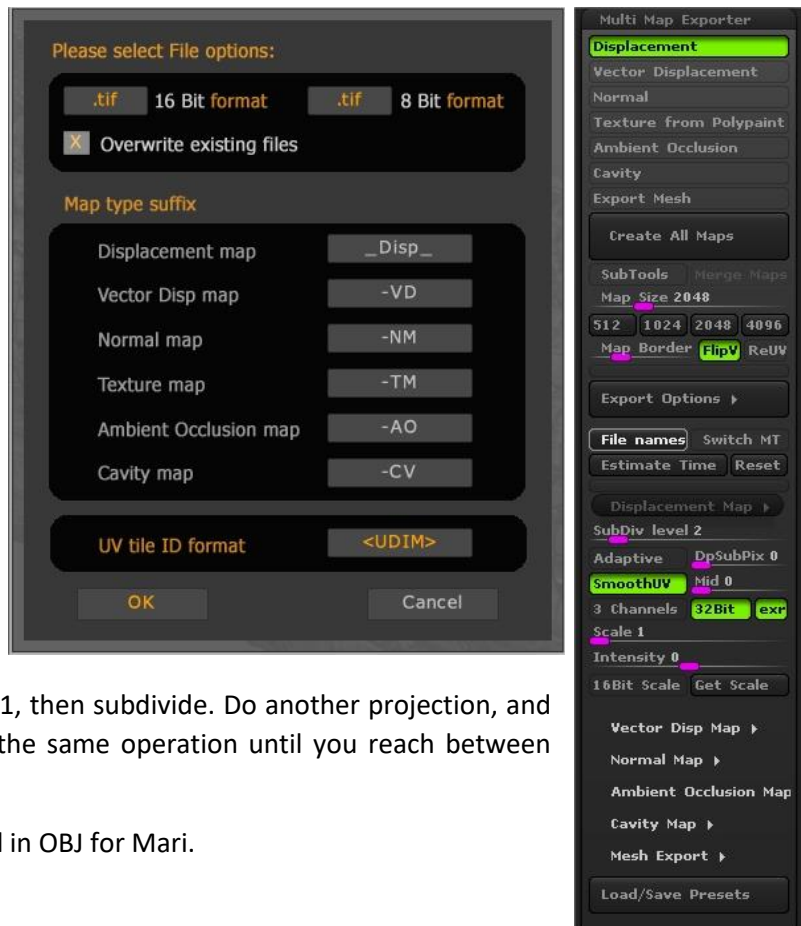
For display purposes in Mari we can also export the Normal map from the lvl4 or 5.

We now need to prepare the texturing resolution for Mari. If you kept your model as a single subtool, just export the lvl 4 or 5 as an obj. You want to have between 500K to 2M poly in Mari.

If you split your model into subtools. Import all your tool into one zBrush project. Import back your body geometry.

Do a projection on the lvl1, then subdivide. Do another projection, and subdivide one more time. Redo the same operation until you reach between 500K to 2M poly.

Export this high res model in OBJ for Mari.



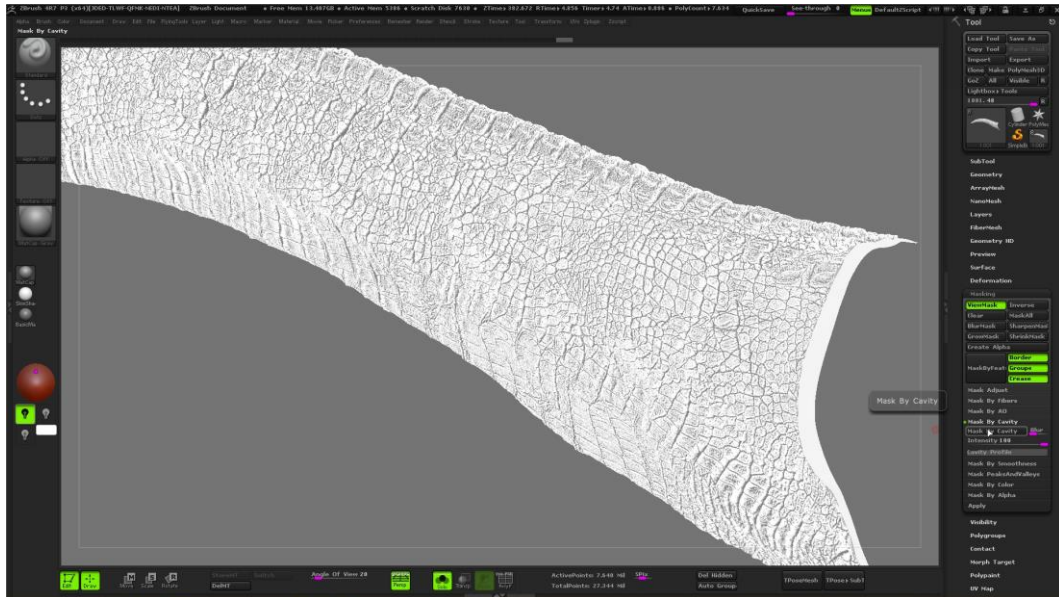
3. Utilities creation in Zbrush

In order to texture our model correctly in Mari, we need to use some maps that help us to take the most of our sculpted details within the color. We will extract some utilities from zBrush to mask out the cavities of our model. You can also ask to another software to extract these utilities. For example, Substance Painter does an amazing job to calculate automatically these maps for you. What you have to do is just to export all your normal maps from your lower levels out of zBrush. Then you import them in Substance Painter and place them on the normal map slot. Afterward, just click on Bake, and you get your utilities! I don't want to overweight the process with a lot of software, so for this workflow I'll stay within zBrush.

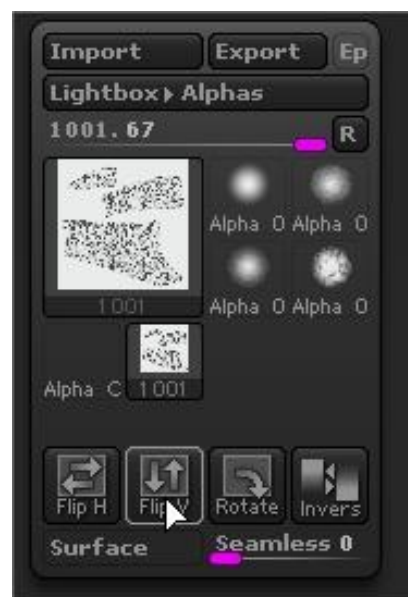
Before you follow these steps, make sure you have polygrouped your models by UV tiles. In the UV tab, select the size of the map you want to export, higher is better.

A. Export the cavities

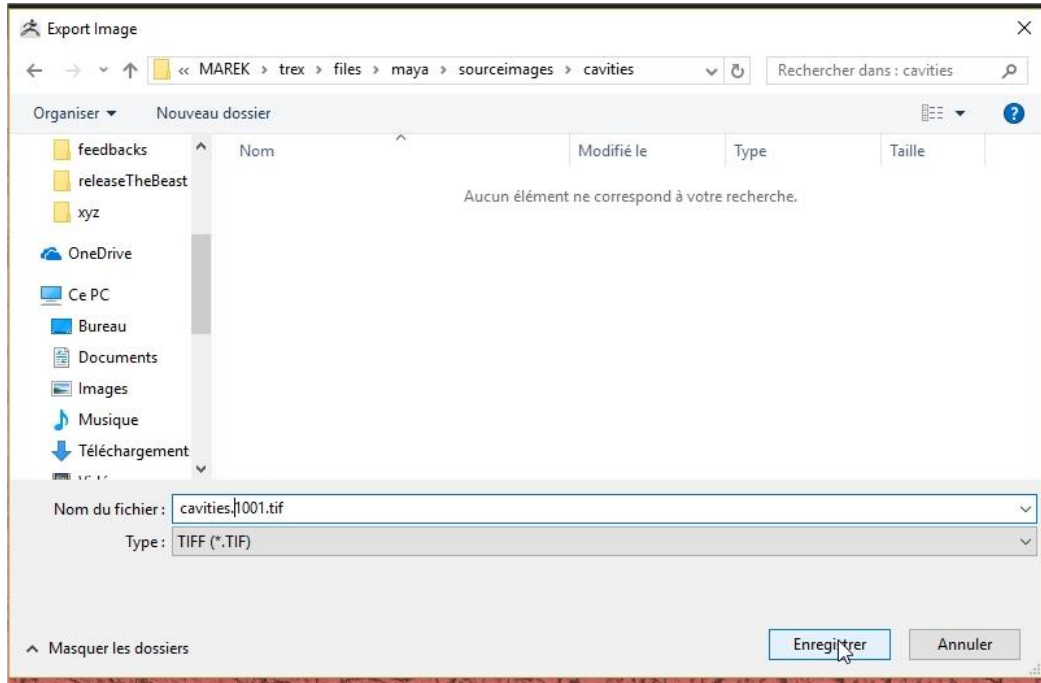
- Go on the highest level
- In the mask tab, go to mask by cavities
- Click on mask by cavities



- You can adjust the mask, to blur it a bit, using the adjust mask feature
- Isolate the UDIM that you want by CTRL + Shift + click on it
- In the mask tab, click on create alpha
- In the alpha tab, select your newly created map and click on Flip V



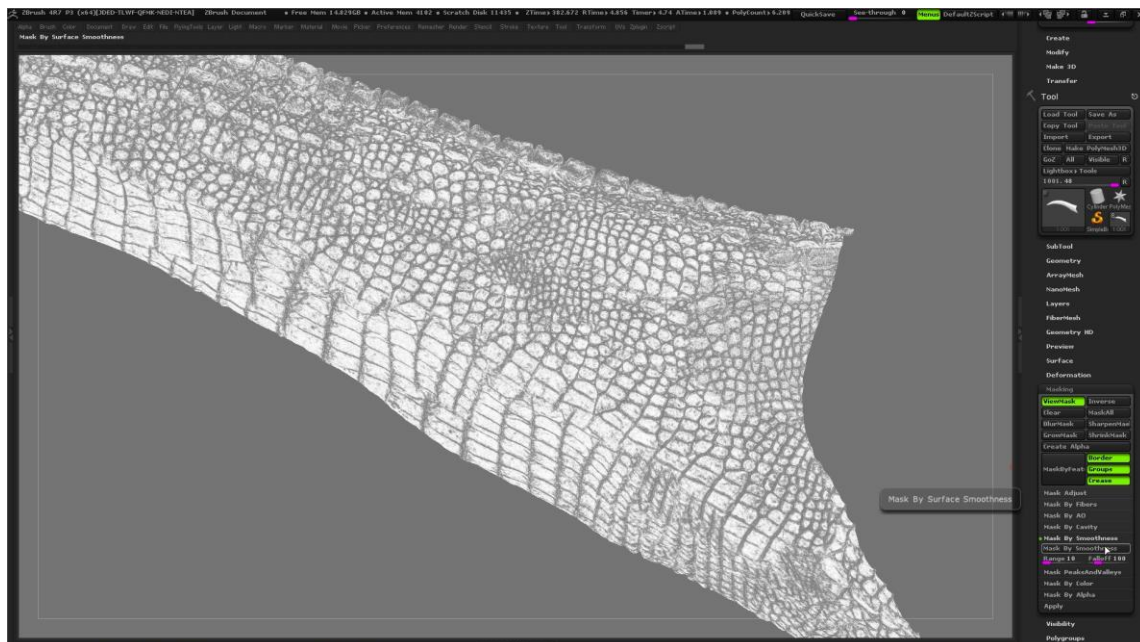
- Export this map out of zbrush, make sure you name it with the correct UDIM tag.



- Repeat this process for each UDIM

B. Export the curvature

- Go on the highest level
- In the mask tab, go to mask by smoothness
- Click on mask by smoothness

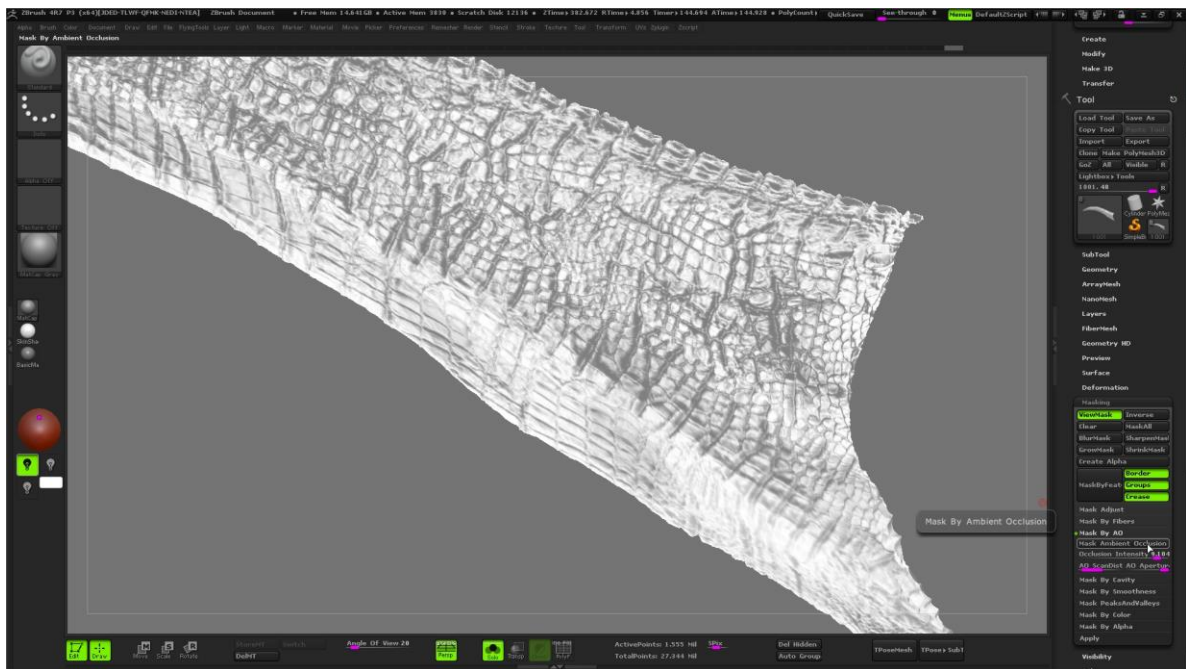


- You can adjust the mask, to blur it a bit, using the adjust mask feature
- Isolate the UDIM that you want by CTRL + Shift + click on it
- In the mask tab, click on create alpha

- In the alpha tab, select your newly created map and click on Flip V
- Export this map out of zbrush, make sure you name it with the correct UDIM tag.
- Repeat this process for each UDIM

C. Export the AO

- For this one, you don't want to click on mask by AO on the highest lvl unless you want to kill your computer. Go on a medium resolution level, between 500K poly to 2M poly.
- In the mask tab, go to mask by AO
- Click on mask by AO and adjust the intensity if you're not satisfied



- You can adjust the mask, to blur it a bit, using the adjust mask feature
- Isolate the UDIM that you want by CTRL + Shift + click on it
- In the mask tab, click on create alpha
- In the alpha tab, select your newly created map and click on Flip V
- Export this map out of zbrush, make sure you name it with the correct UDIM tag.
- Repeat this process for each UDIM

D. Custom masks

- You can create custom mask directly inside of zBrush to mask out some parts of your model. For example something I like to do is a mask for the inner mouth parts. Another one for interior of the eyes or so to block out the specular later. Either you decide to do them in Mari, or if you like you can do them directly in zBrush.
- Go on the highest lvl
- Hold on the CTRL button and paint your mask on the wanted area
- In the mask tab, click on create alpha
- In the alpha tab, select your newly created map and click on Flip V
- Export this map out of zbrush, make sure you name it with the correct UDIM tag.

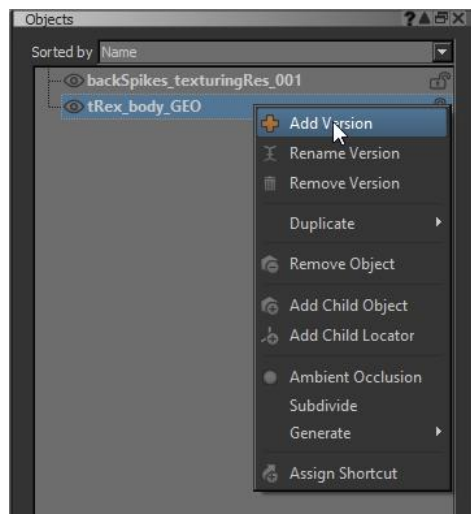
- Repeat this process for each UDIM
- Empty your mask and repeat this process for the other isolation masks that you need.

IV. Texturing in Mari

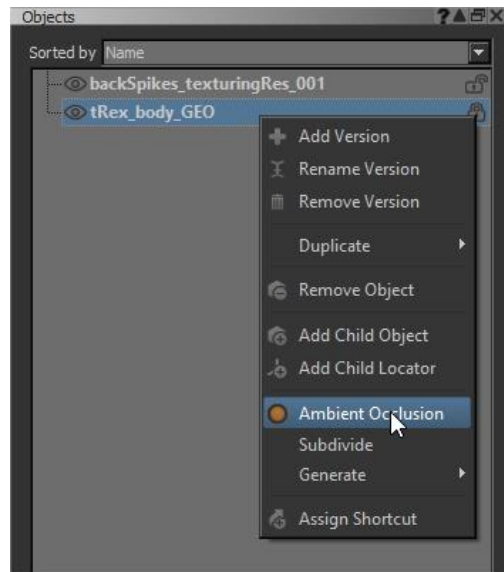
We can now move on to the texture painting in Mari. This process should be very creative. Spend some time to analyze your references. You need to know what will be the different color hues that you'll paint on your model. The albedo of a creature is a very living thing. It presents a lot of vibrations, even if the animal you're making looks flat. Because there is a lot happening on the surface, you need to paint a lot of colors so everything looks natural. You'll also have to add aging and weather on top of your map. Following, I describe my workflow when it comes to create my albedo. As opposed to photo projection, I prefer a lot doing procedural texturing so I can take advantage of my displacement.

Import your sculpted version of your model in your former Mari project.

- Select the new version



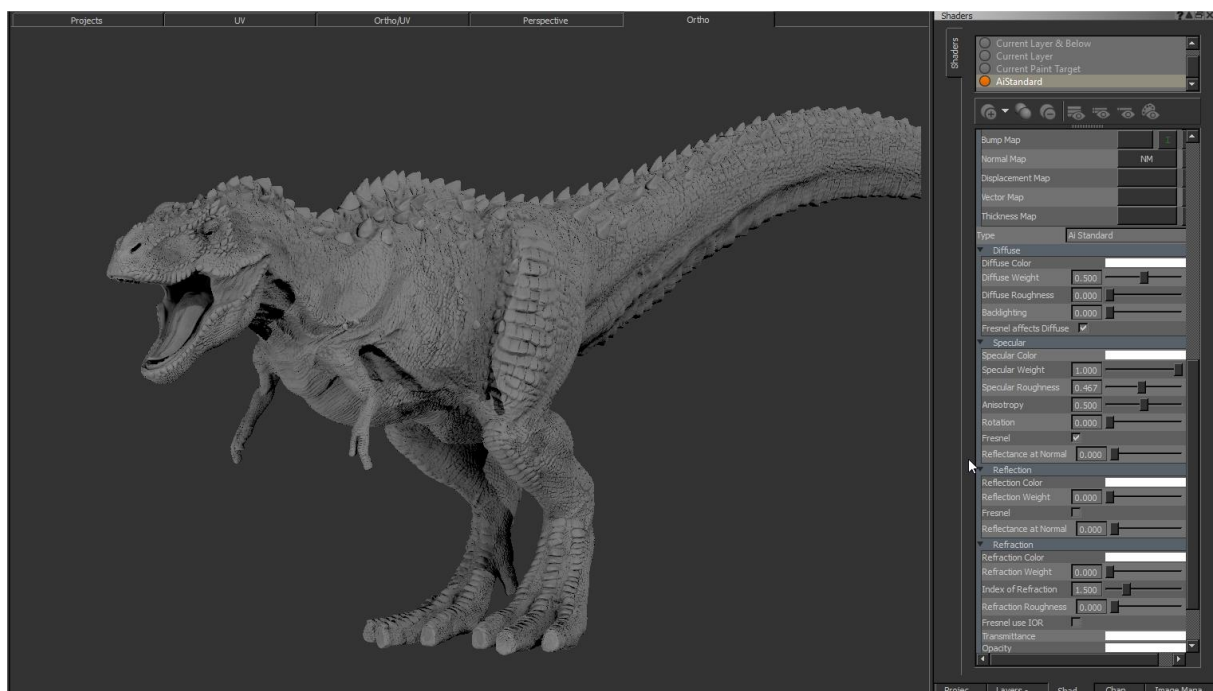
- Generate the ambient occlusion for display purpose, or use the one exported from zBrush for masking purpose later

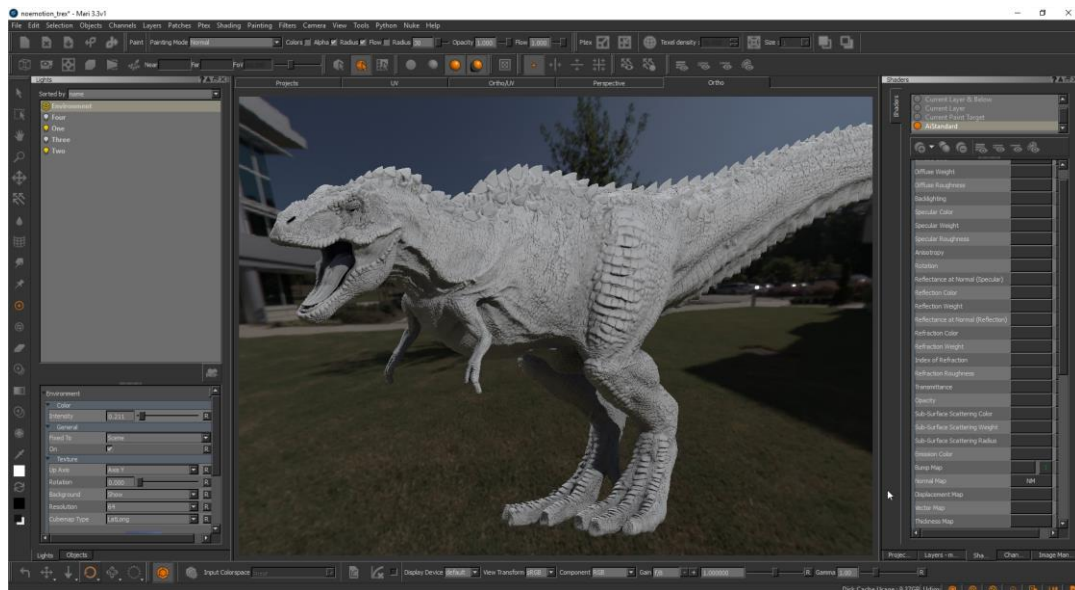


releaseTheBeast_023_mAO.jpg

Create one channel per utility

- Import each utilities as a painted layer per channel
- Adjust your shader
- Create a normal map channel in sRGB.
- Import your normal map exported from the high definition model in this channel.
- Convert your channel from sRGB to linear.
- In your shader, plug your normal channel in the normal slot
- Empty the former bump slot, the normal map will do the job here



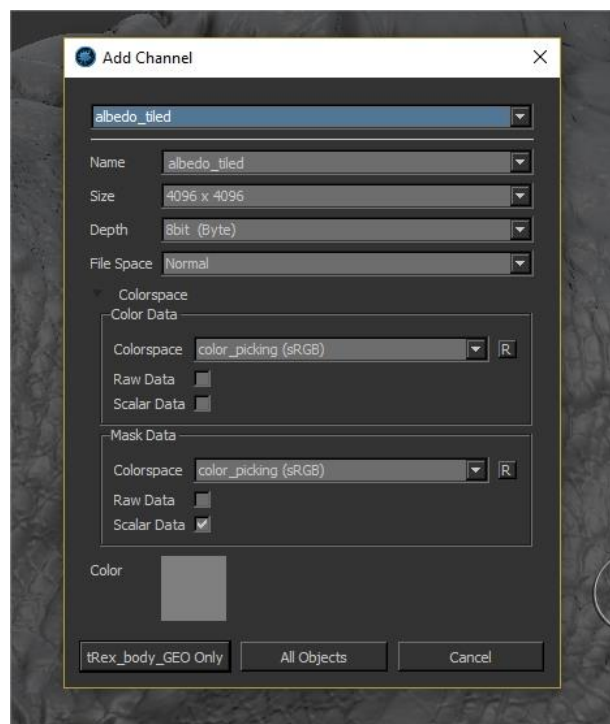


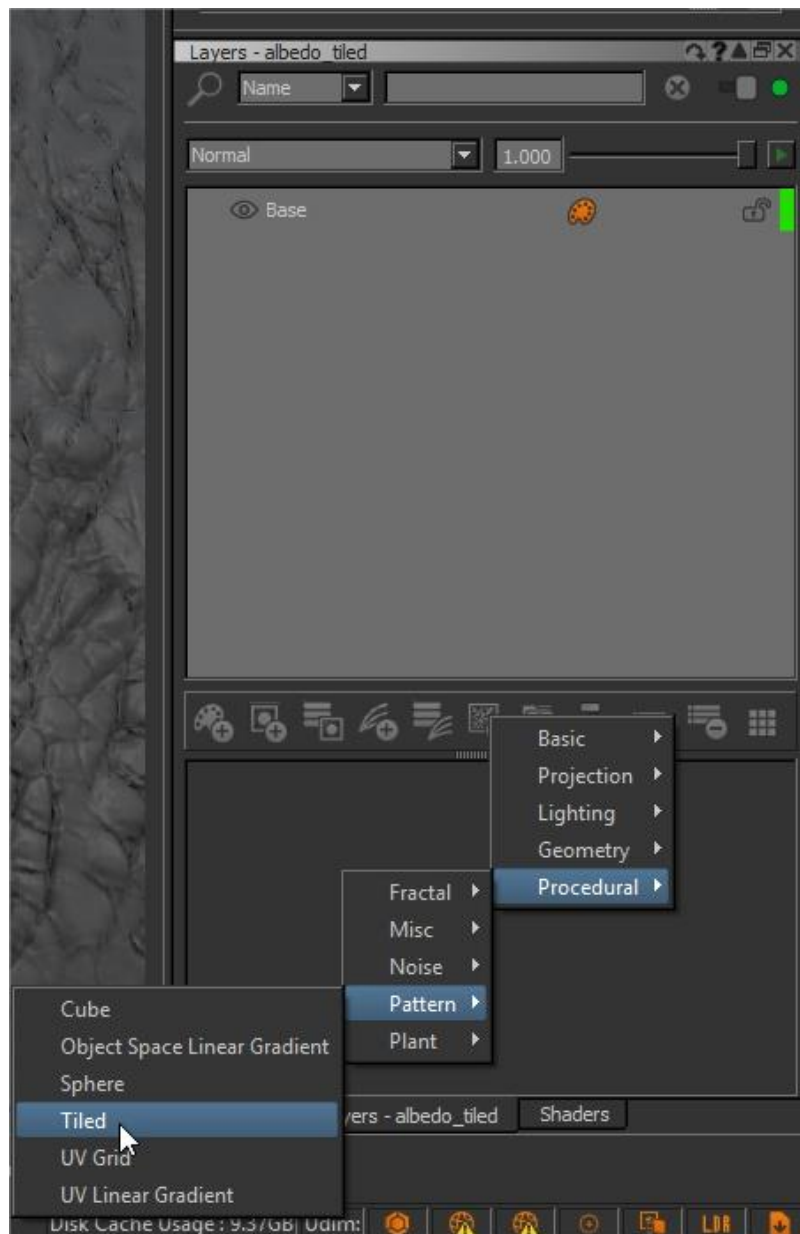
1. Albedo creation

- Create a new channel, call it `albedo_tiled`.

We now need a good tileable. Most of the time I use a marble texture that a good friend from Weta borrow to me. It needs to have a lot of vibration in it.

- Create a Pattern, under the procedural layers. Import your tileable file in it. Adjust its tile values.
- Create a new layer, use the paint through and paint on seams to clean them.

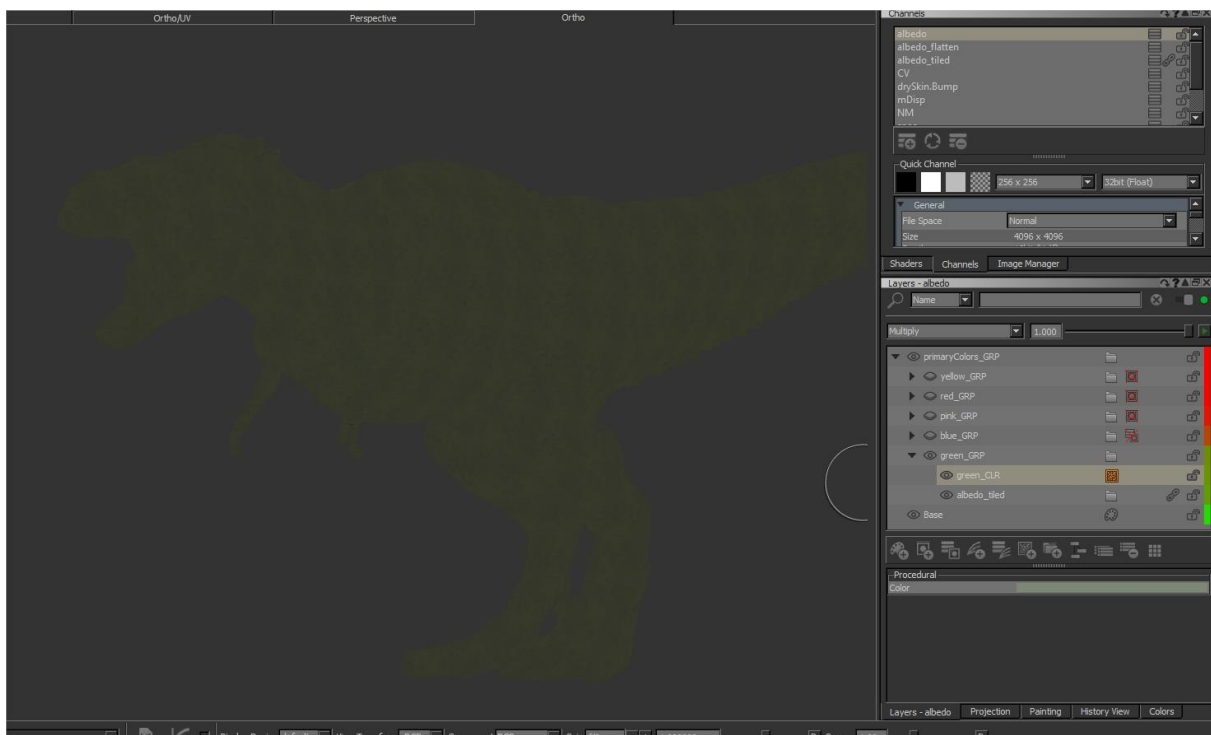




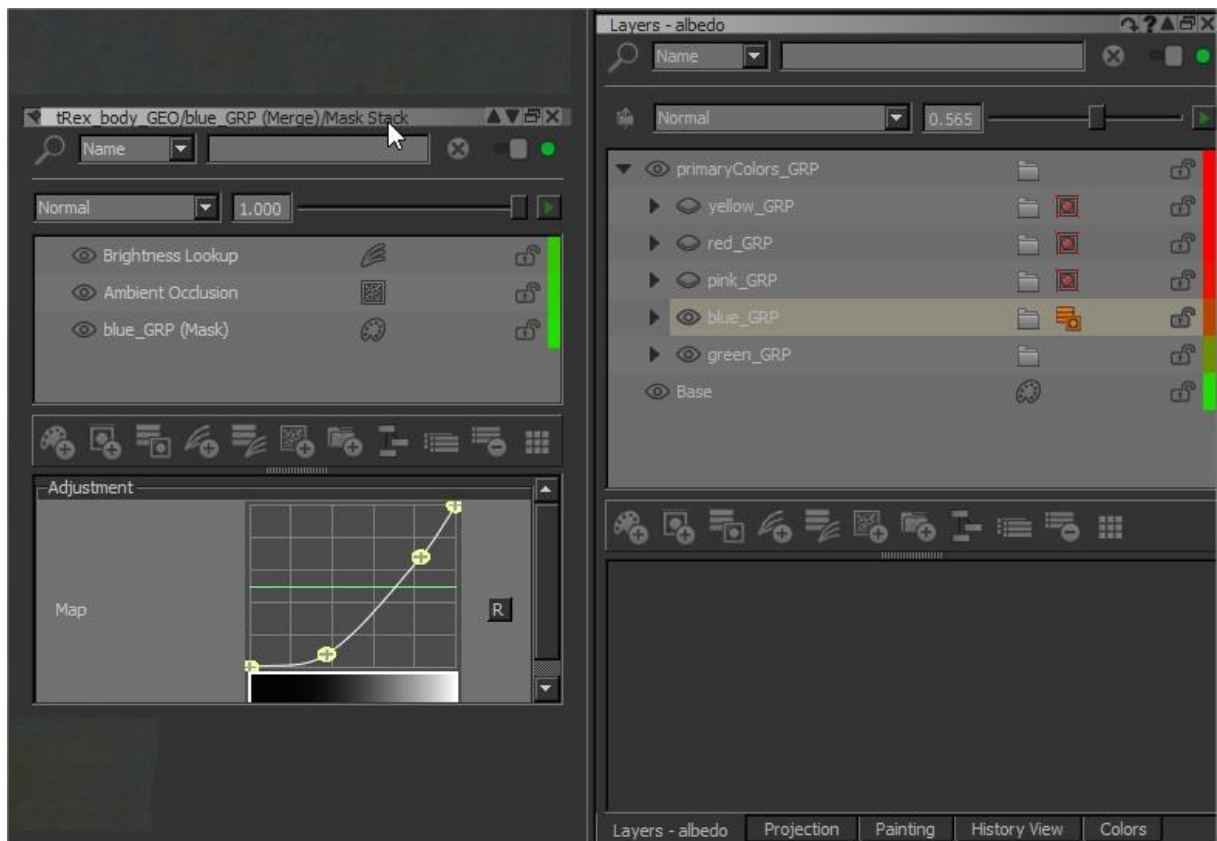
Create a new channel, call it albedo.

A. *Create the primary colors*

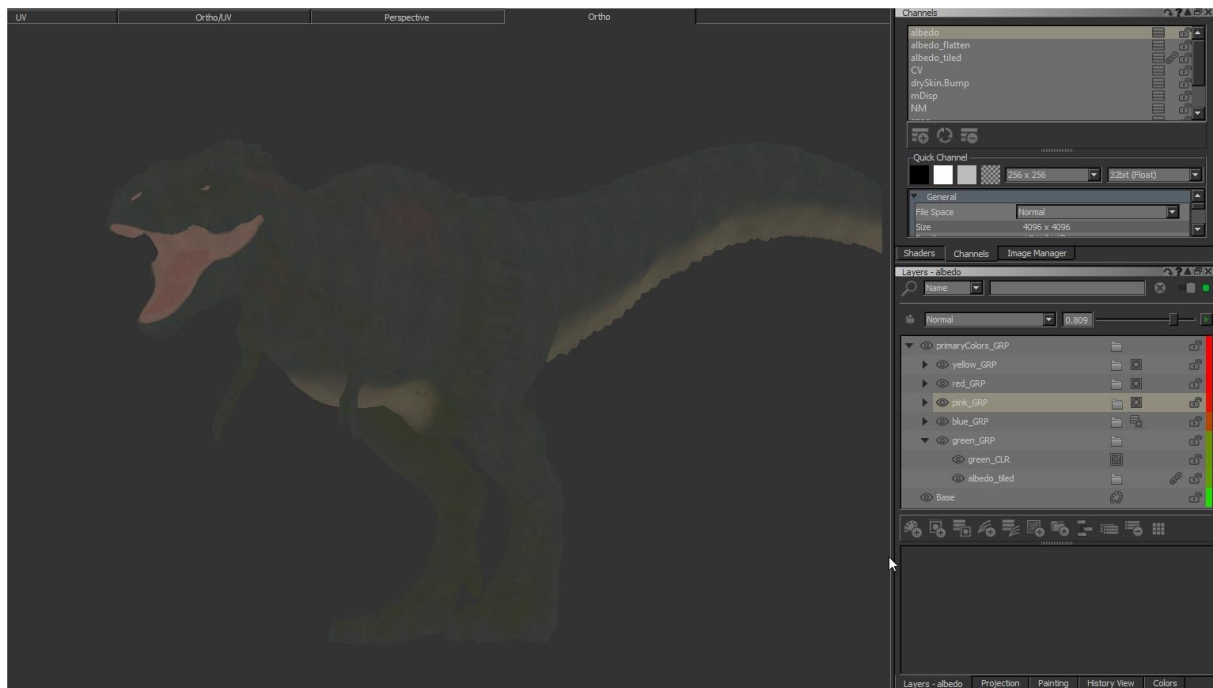
- Create a group for your primary colors.
- Share your albedo_tile channel directly into this group. You can do that by holding SHIFT + click and dragging your albedo_tile channel in your primary color group.
- Adjust your color the way you want with some adjustment layers. I like to give more contrast with the level adjustment.
- To create a tint, use a procedural color layer. Select the tint that you want. Put your layer on top of your shared channel in Multiply mode. The more you saturate it, the more your tileable will earn color.



- Create a new group to add another color to your model.
- In this group, share your albedo_tile channel. Add a new procedural color layer in multiply mode. Select a new color.
- Select your group, right click on it, mask and hide everything.
- Now, simply paint with a brush the area where you want the color to appear.
- You can also use your ambient occlusion channel to unmask your second color.



- Right click on your second color, mask, create mask stack.
- In the mask stack, share your ambientOcclusion channel.
- Use a brightness lookup to invert your ambientOcclusion and to contrast it.
- Redo the same process for all the primary colors that you need: share you albedo tile. Add a procedural color in multiply mode. Make it appears with the mask options.



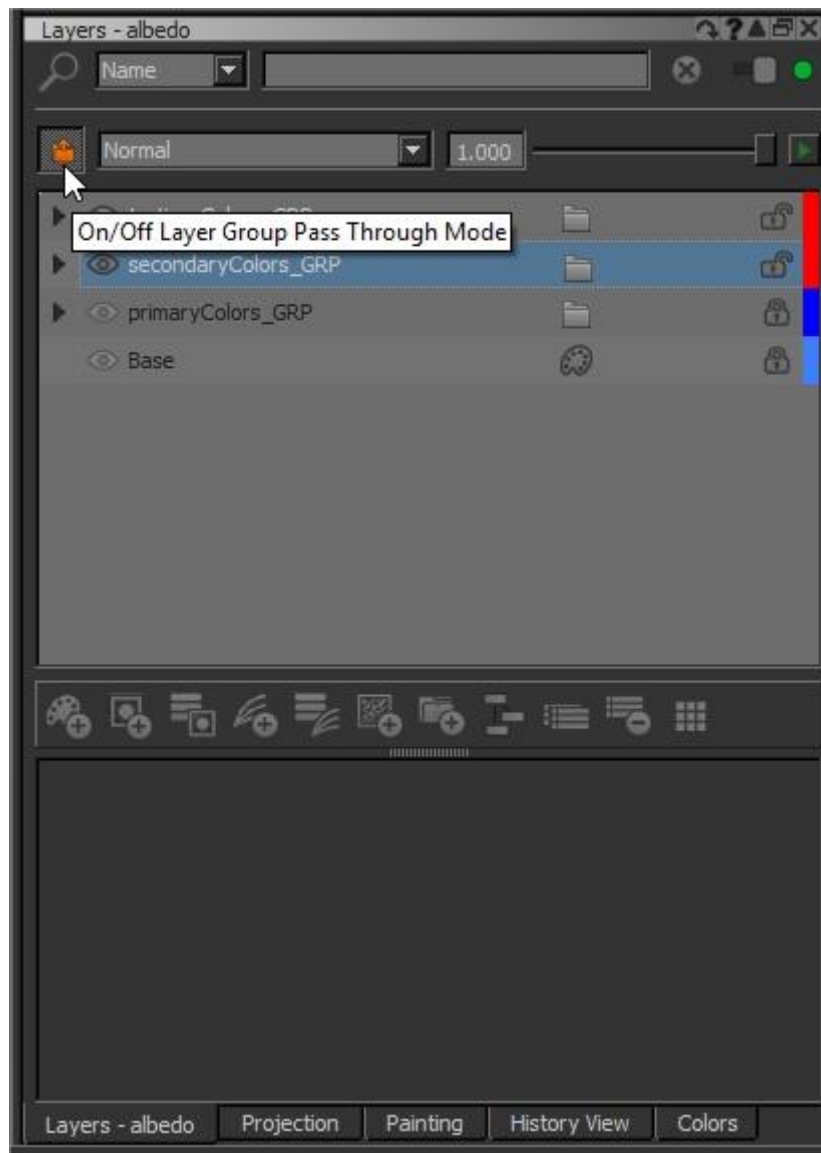
Link to the timelapse video :

<https://vimeo.com/238033798>

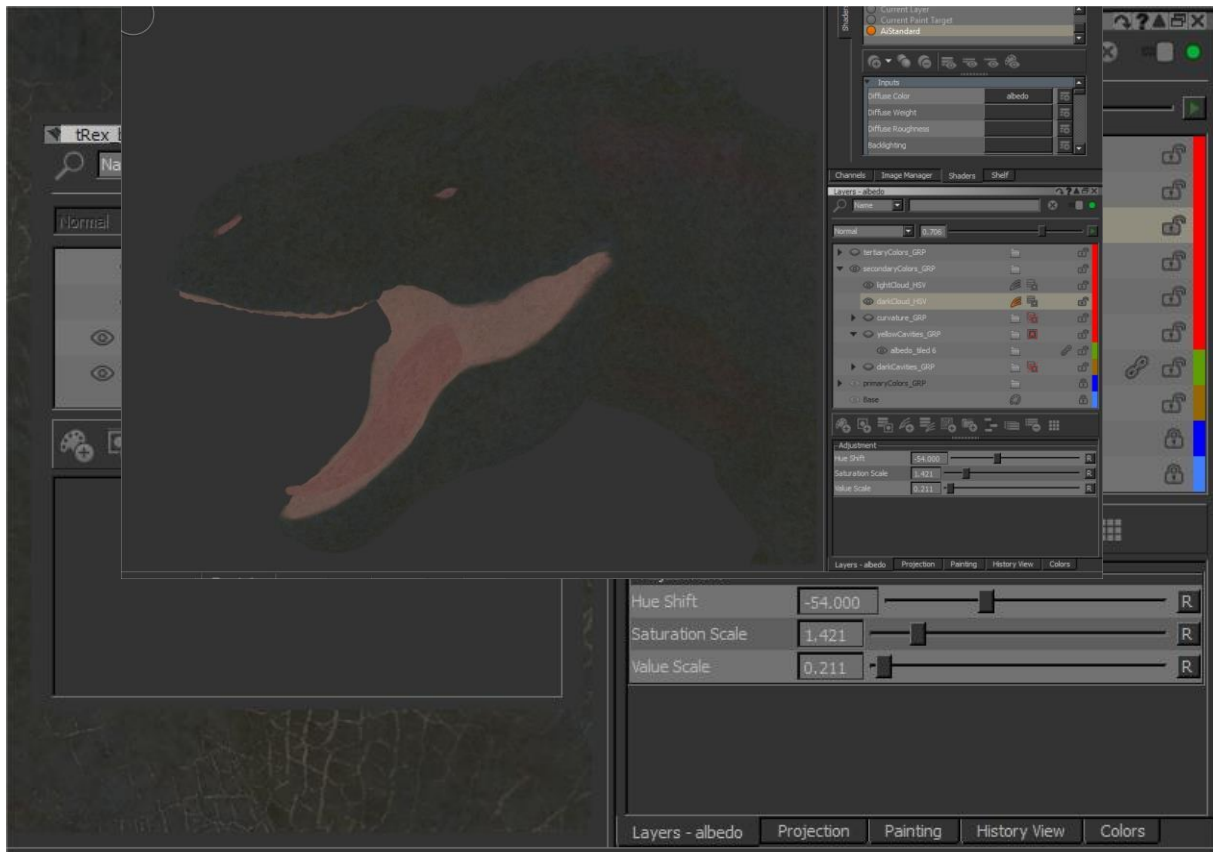
B. Secondary colors :

We can add more subtle tint. The following steps are more general tips rather than a straight forward workflow. You can follow these step in the order that you want, and adapt them with your own workflow.

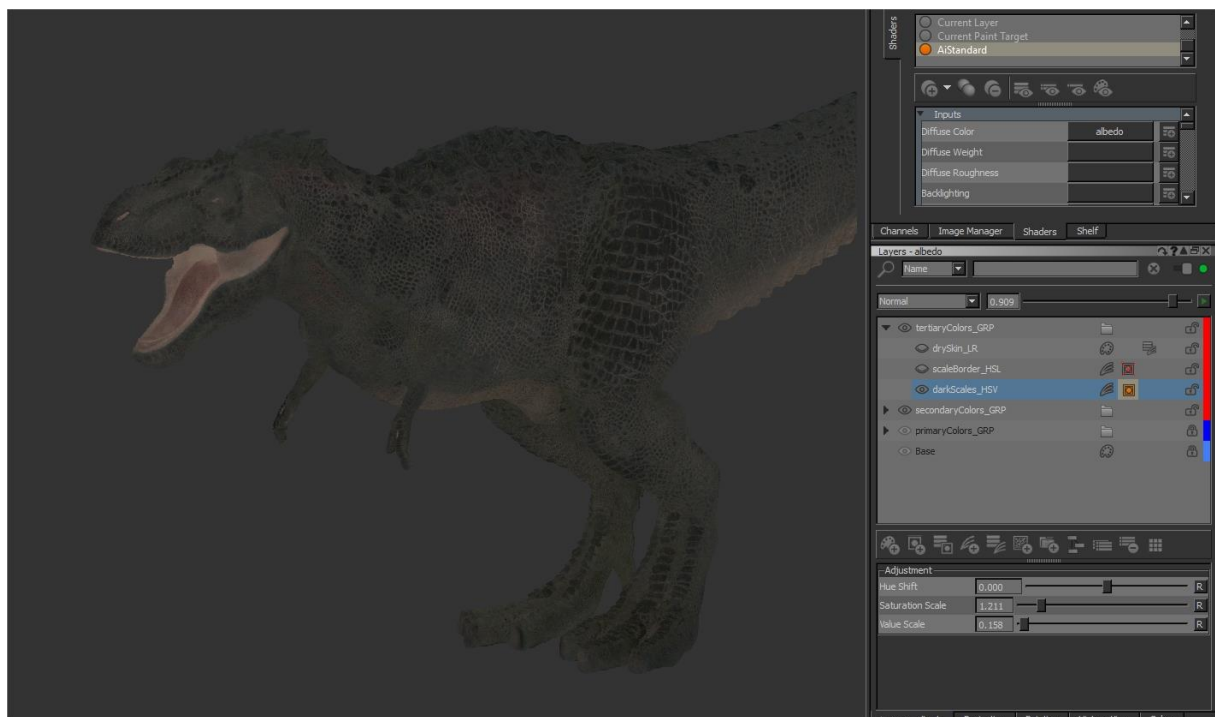
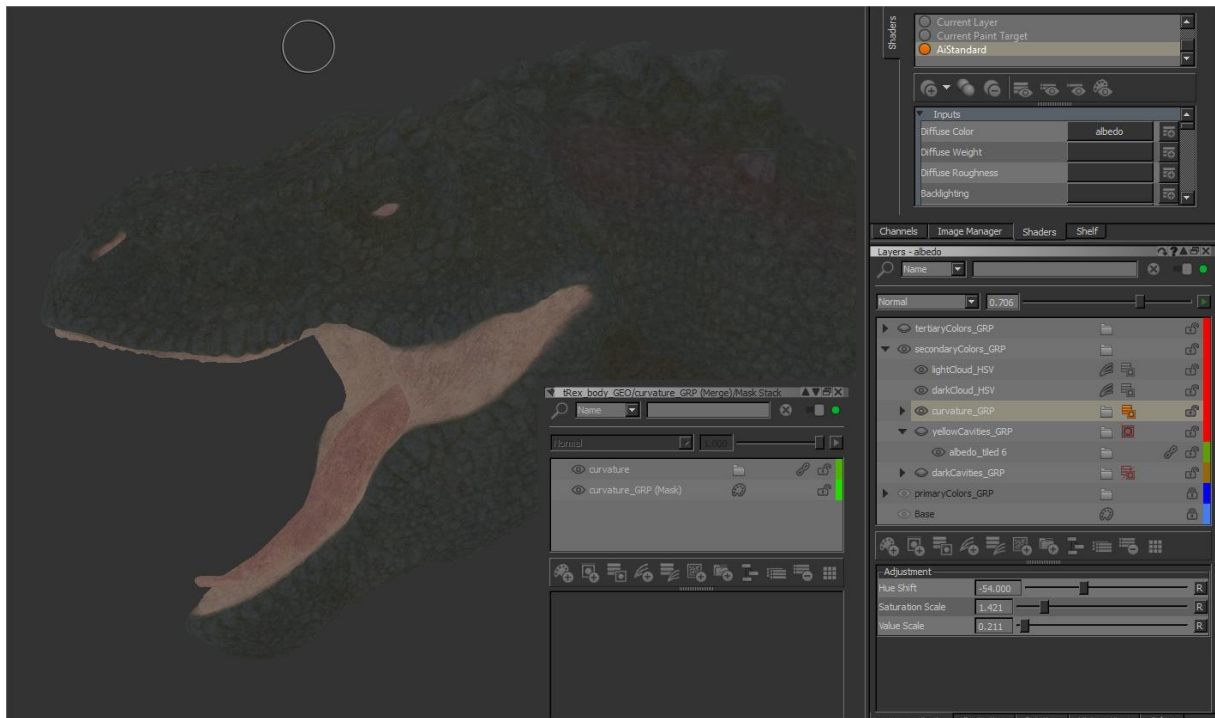
- Create a new group, and activate the transfer mode.



- Create a Hue Saturation Value adjustment layer. Give your albedo a new tint by changing the hue.
- Right click on it, mask, create a mask stack.
- In the mask stack, create a procedural noise cloud layer. Play with its size.



- Redo the same process for all the different tint that you want on your albedo. You can use as many HSV as you want to give a lot of vibration to your albedo. Just play with your masks.
- Create a Hue Saturation Value adjustment layer. Lower the value so everything looks darker.
- Right click on it, mask, create a mask stack.
- Share your cavities channel.
- Invert and contrast your cavity mask using a brightness lookup.

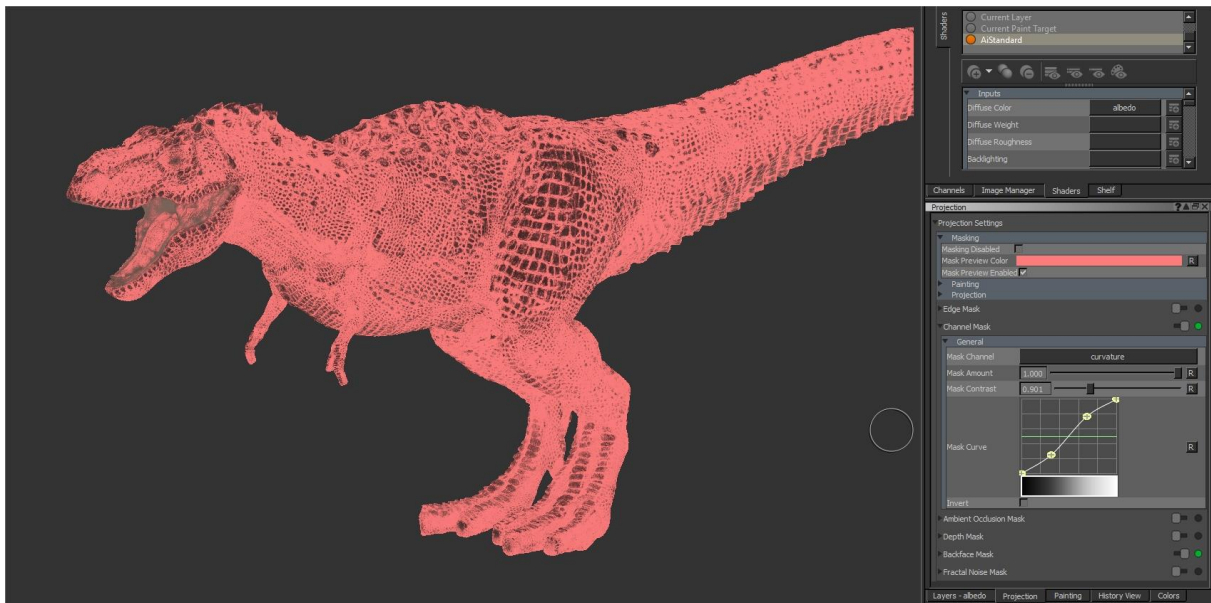


Link to the timelapse video :
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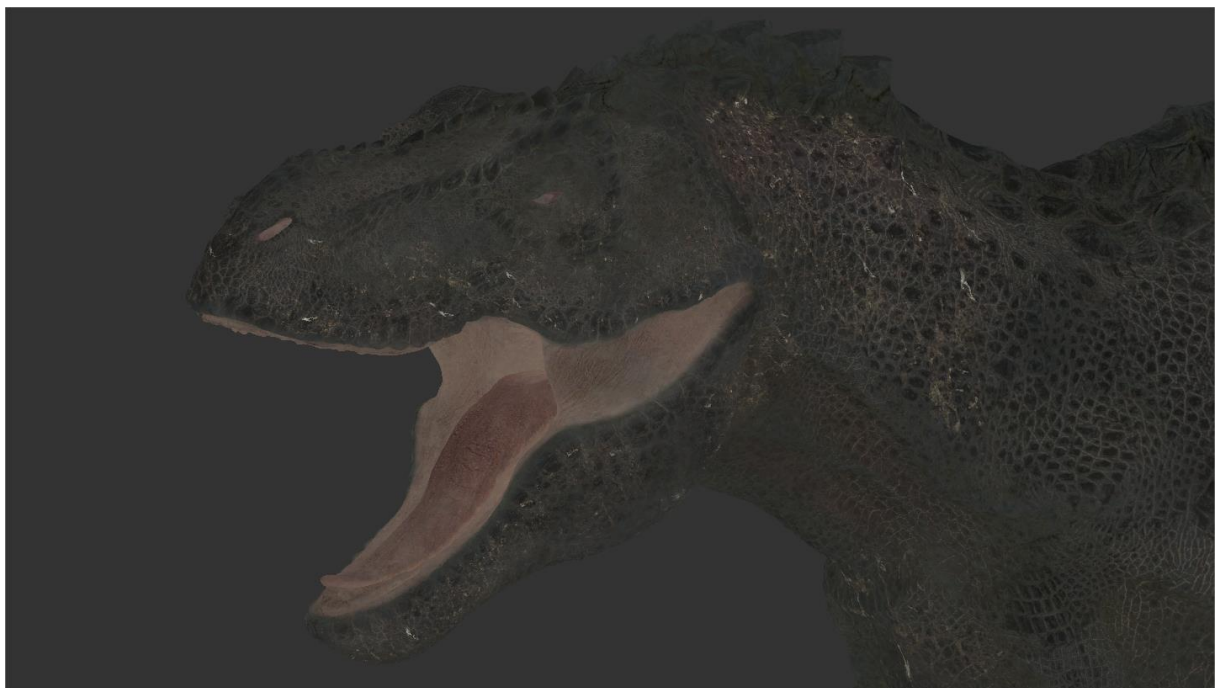
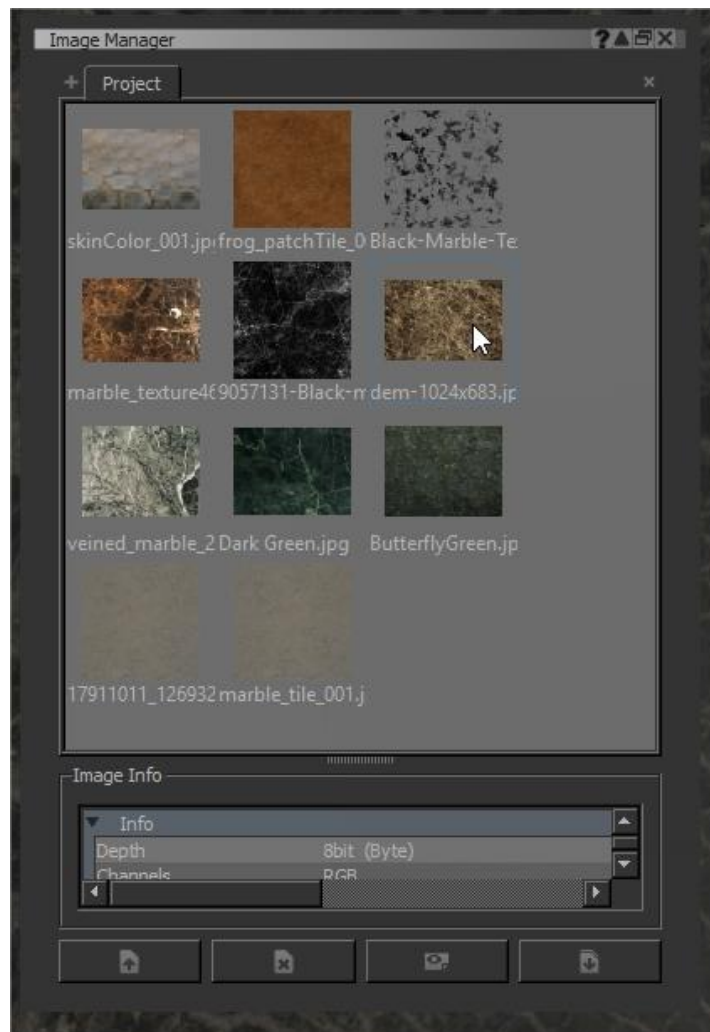
C. Tertiary colors and weathering

To create the tertiary colors, I like to use my utilities as channel mask to paint out some color information.

- Create a new group for the tertiary colors and put it in transfer mode.
- Add an HSL. Rise the luminance and lower the saturation
- In the projection tab, activate the channel projection. Plug in your curvature.
- Invert your channel mask, and contrast it with the curve.



- Select your HSL, right click on it, mask and hide all.
- Select your mask, use the paint tool with a brush that has a bit of texture in it. Start to paint on your model to create some aging effect. Lower the saturation give the creature skin an older look.
- Share your albedo tile channel.
- Create a mask to hide it completely
- In the projection tab, plug in your cavity and invert it.
- Select your shared channel's mask, paint in the cavities. This will make dirt appearing inside the cavities of your model.
- You can also other type of texture. For example using black marble texture with white veins on a layer that you put in screen mode will add some dead skin effect on top of your albedo.

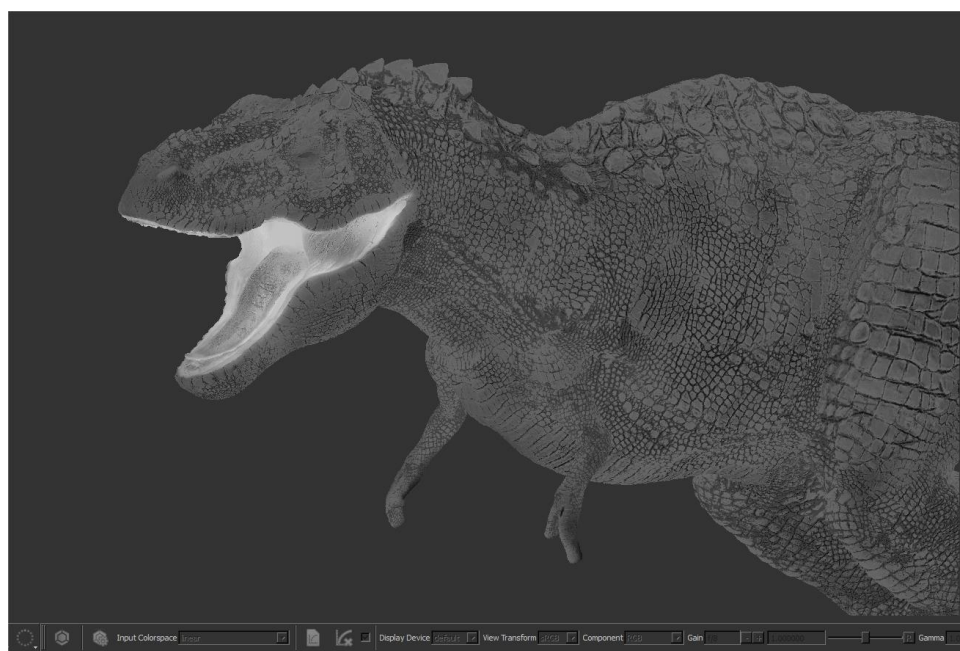
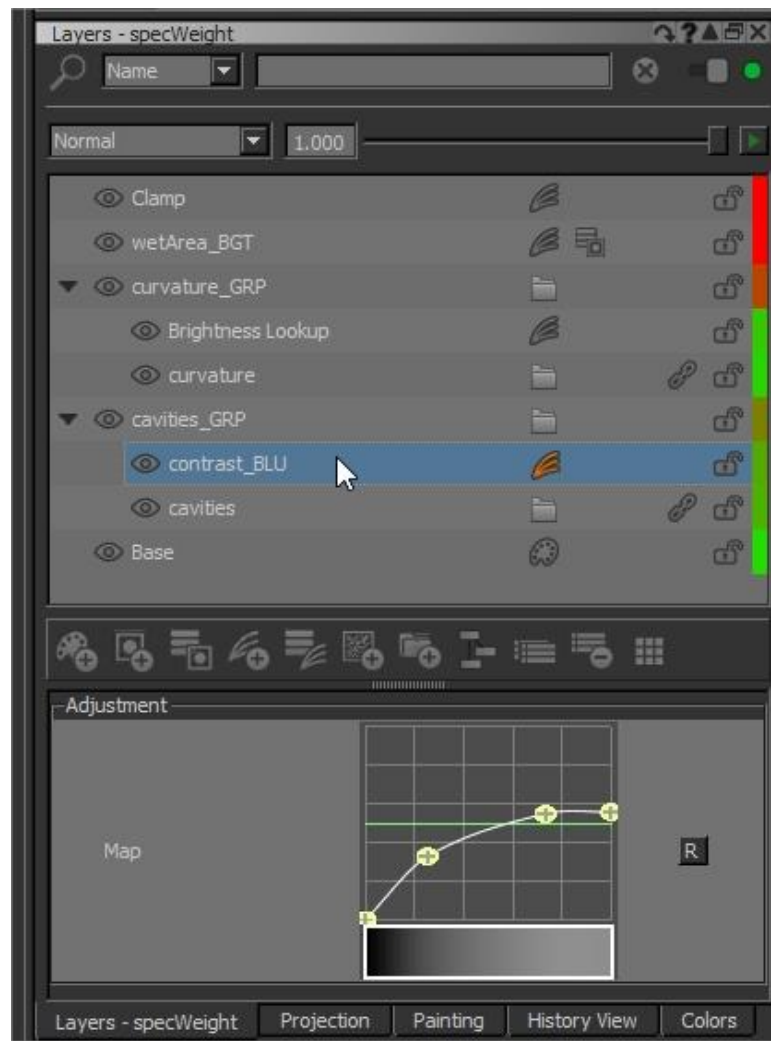


Link to the timelapse video :
<https://vimeo.com/238193282>

2. Specular

Let's now move on to the specular channels. For these maps, I tend to stay as simple as possible. I just want to get enough range so I can tweak my maps during the look development stage.

- Create a new channel, call it spec. The channel has to be 16 bits, in linear color profile and use a white color for base layer
- Share your curvature channel in it. You can put it in multiply
- Use a level or a brightness look up to adjust the effect of your curvature.
- Use your cavity channel as a mask shared inside a brightness adjustment layer. Invert your cavity mask using a reverse layer. Then lower the brightness value to get rid of the specular affecting the cavities of your sculpt.
- Test the influence of your map by plug it in the specular weight of your shader. Put the diffuse weight at 0. Go in the lighting tab, use an environment hdr and make it rotate. This will give you a good clue on how your shader will look like once rendered.



3. Specular roughness

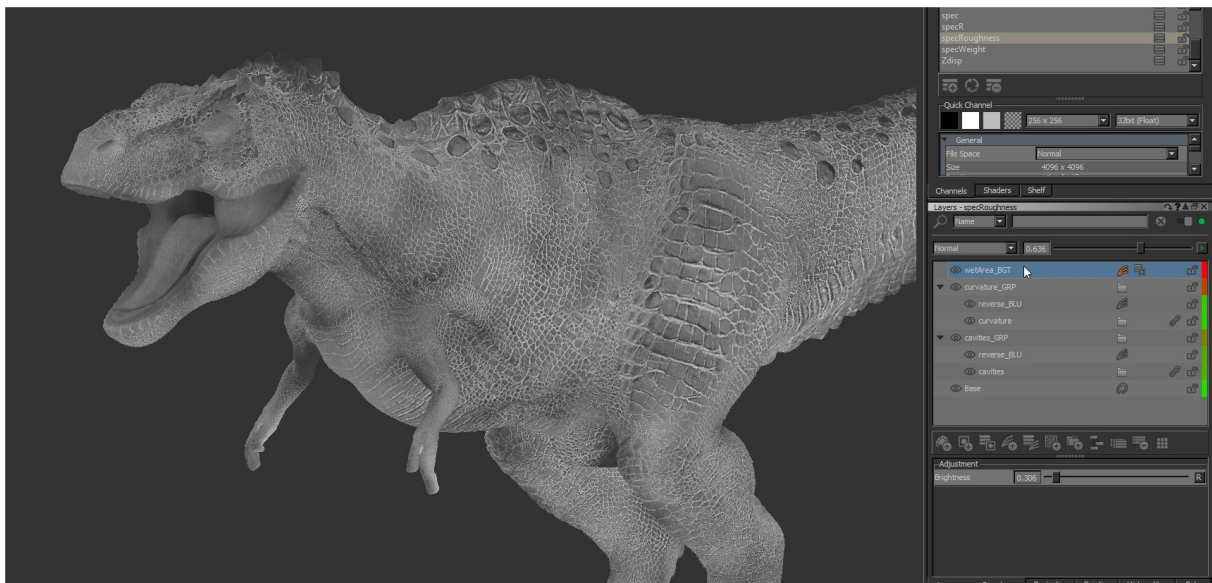
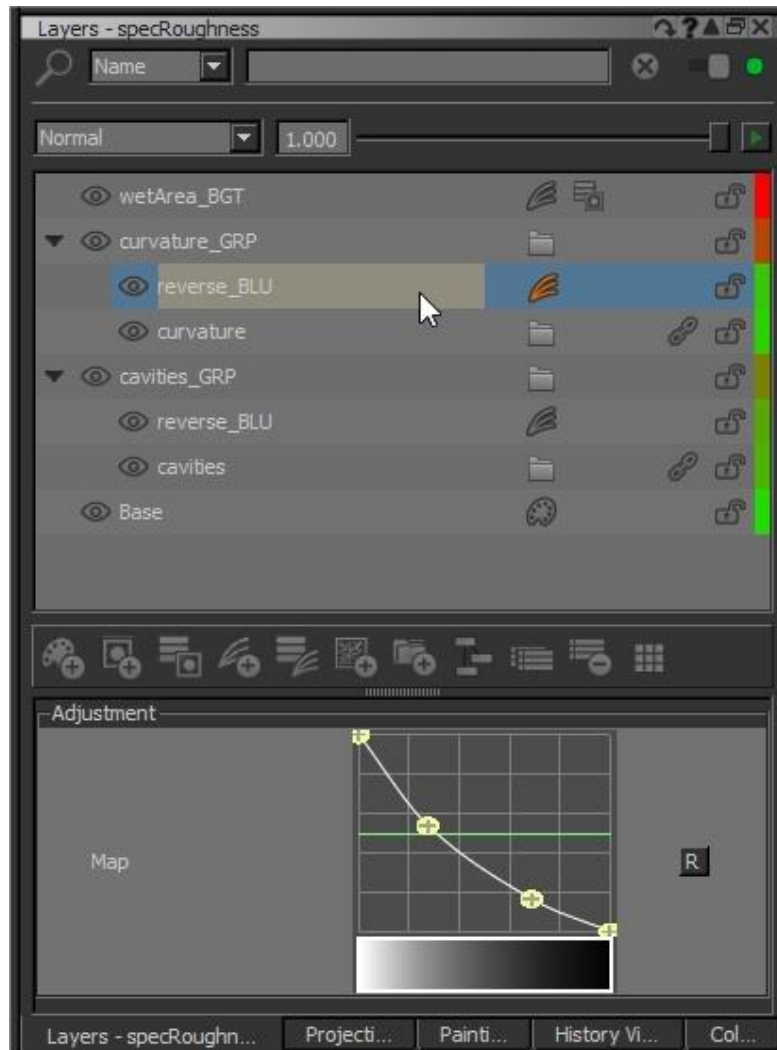
This one is really tricky. Most of the time it needs a lot of adjustment inside your rendering engine. The idea is just to make a map in Mari that has a lot of range to play with later on.

Create a new channel, name it specR. The channel has to be 16 bits, in linear color profile and use a mid grey for base layer.

Create a brightness, give it a mask stack. Share your cavity channel inside. Reverse it using a reverse layer.

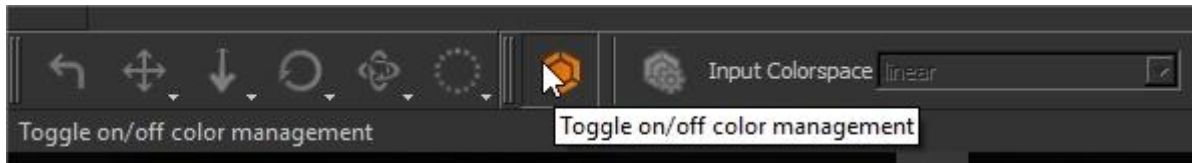


- Rise the value of this brightness so the cavities look whiter. White means a rough specular.
- You can create a new brightness and share your curvature channel inside its mask stack. This time make this brightness value lower to get a more shiny specular.
- Put your specR channel in the specular roughness slot. You can now adjust your map directly in the viewport like you did for the specular.



Link to the timelapse video :
<https://vimeo.com/238358496>

Tips : because the specular and specular roughness maps are in linear and most of the screen are in sRGB, I recommend you to switch of Mari's color management during the specular map generation. Move to the flat shaded mode, play with the values. Then reactivate the color management and use the Lighting plus shaded mode to see the impact of your textures.



We are now done with the texturing stage of our creature. You can now export everything in .exr format. Always remember that a texturing is never done, we will need a lot of going back and forth to make it correct. The render of a look development scene really helps to solve the maps bad information.

V. Look development

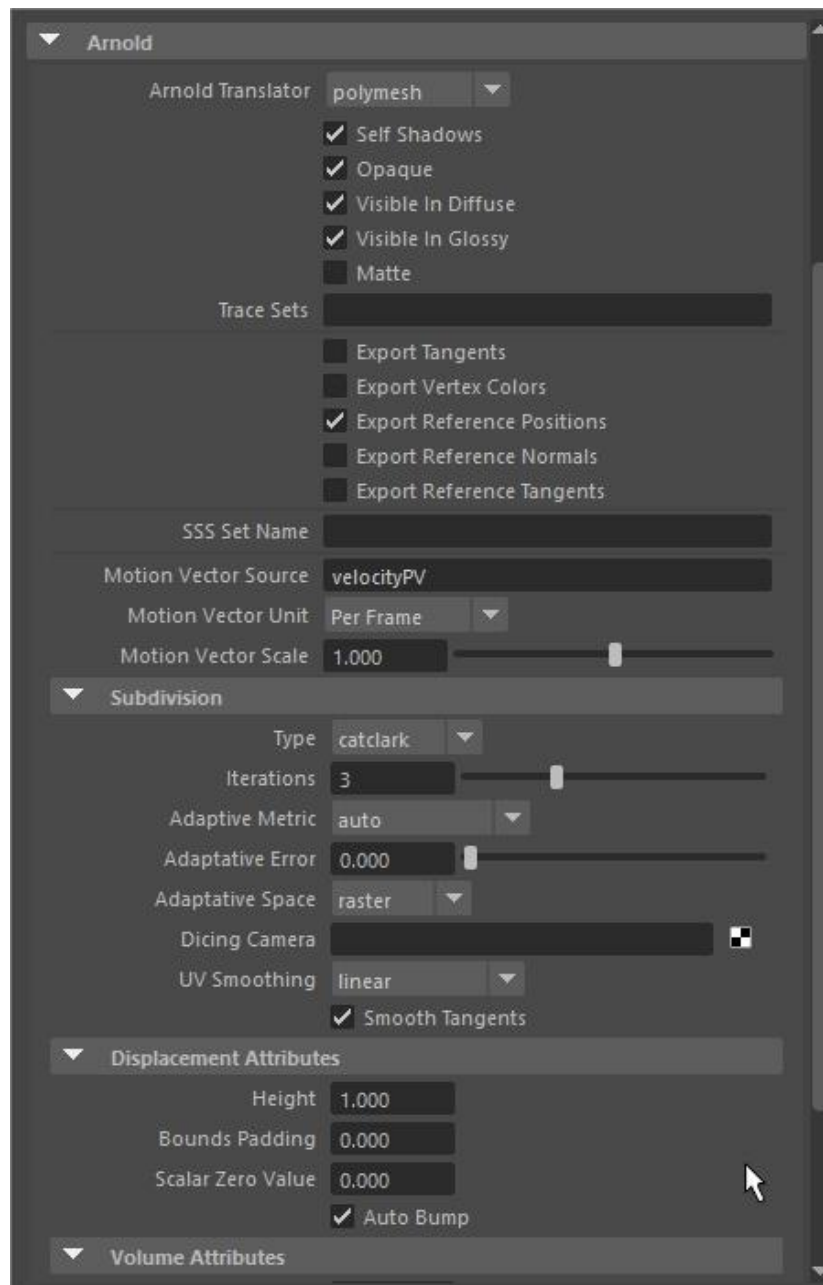
We can now move to the final stage of our asset development. I'll explain you how I do it in Maya and Arnold.

1. Set up your look development studio:

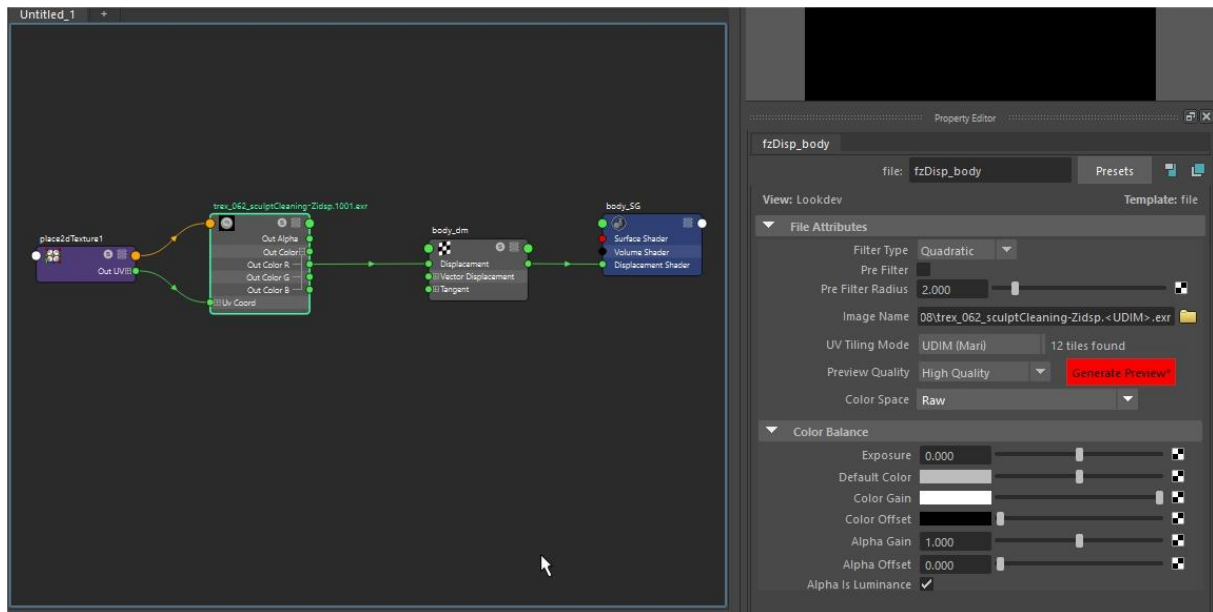
- Create a plane
- Create a skydome light, put an hdr in the texture slot
- Create two spheres next to your model
- Leave the lambert1 shader on the first one
- Create a new aiStandard. Put the diffuse weight at 0. Put the specular weight at 1. Select your second sphere and apply the shader on it.

2. Set up your displacement:

- Select your model, go in its attribute editor.
- Go in Arnold, displacement.
- Set the subdivision mode to Catclark, and add 3 or 4 levels to begin with. We could rise up this value later on when dealing with the actual render. Switch the auto bump on.



- Add a new alSurface shader, apply it to your model.
- Unwrap the shading network of your alSurface.
- In the displacement slot of your alSurface's shading group, add a file node. Import your zBrush displacement maps in it. Put the color profile in RAW. Check the UV tile format as Mari type.
- This is it! Just render one frame to see if everything is working correctly.



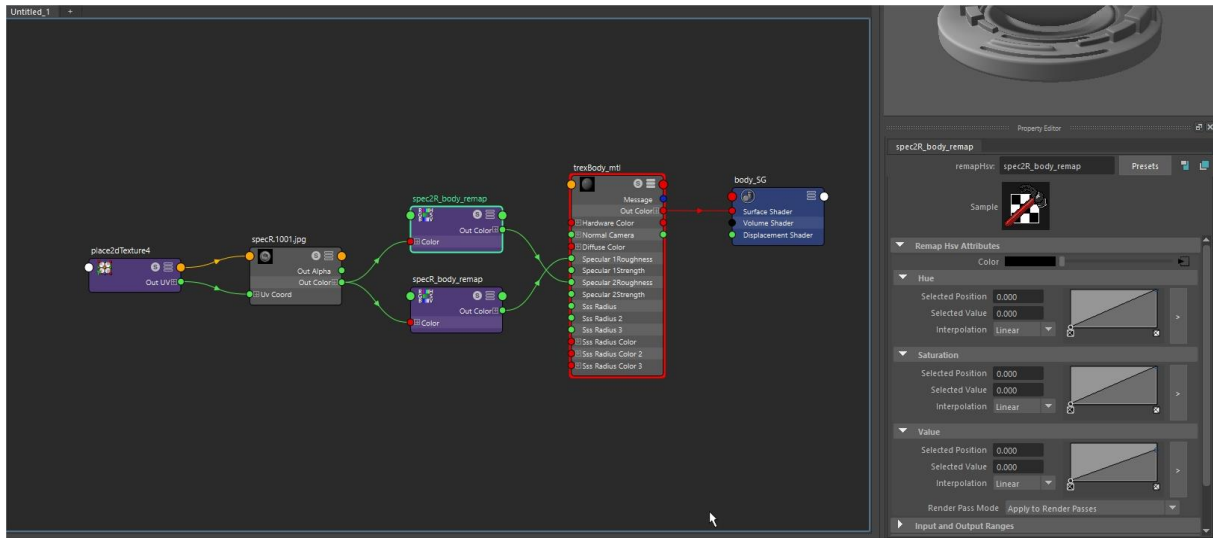
3. Set up your shader.

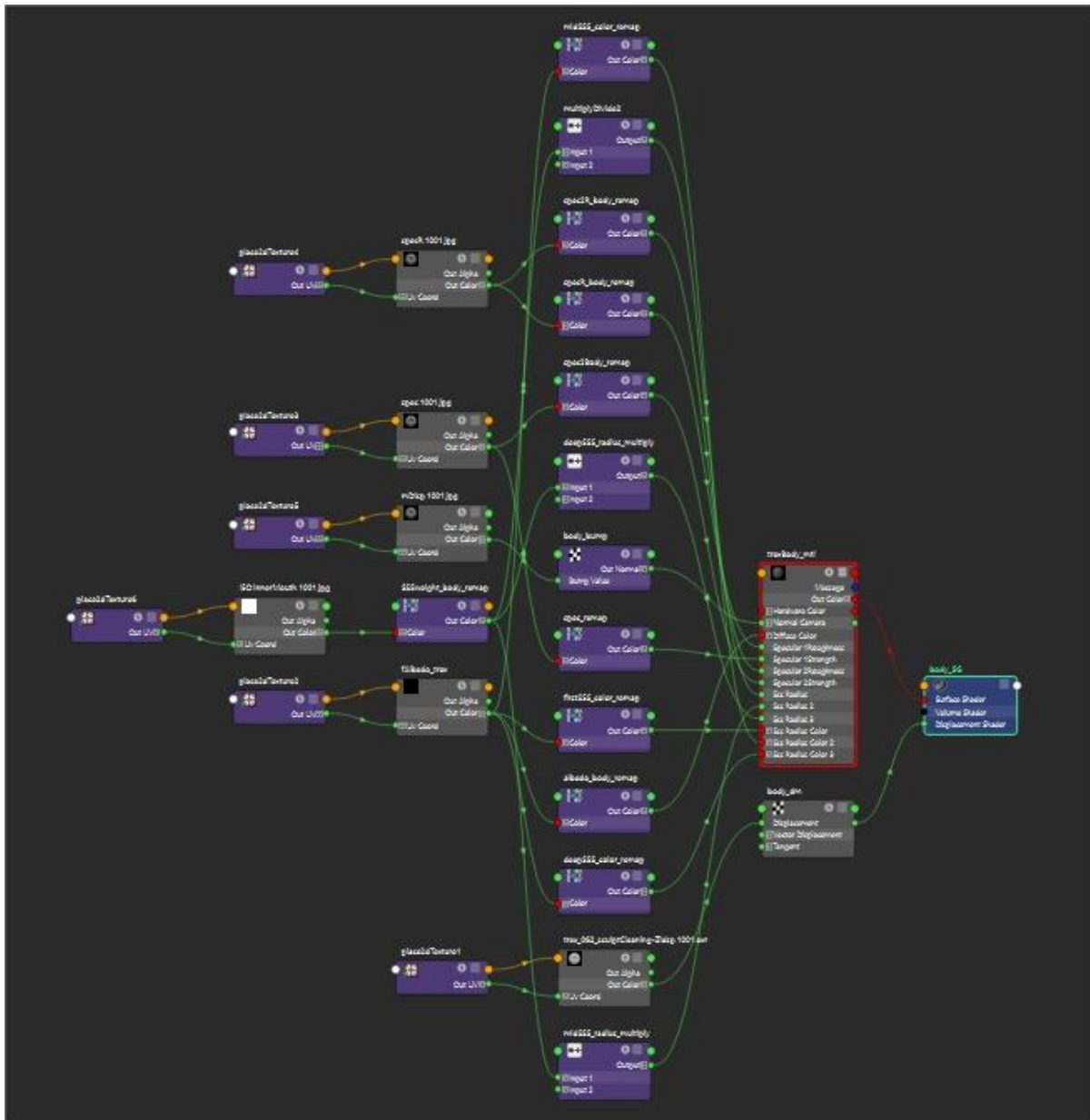
A. Albedo

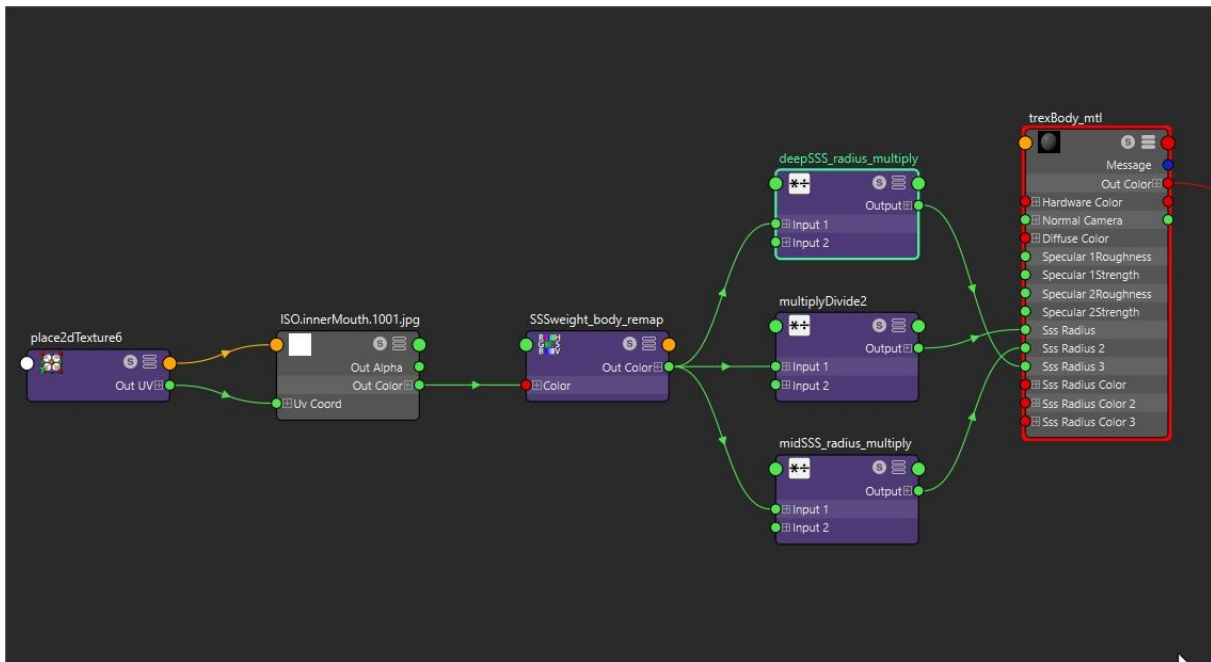
- Select the diffuse slot of your alSurface shader. Add a texture file node.
- Import your albedo channel. Put the color profile in RAW. Check the UV tile format as Mari type.

Try to render your model.

If you feel that the specular information are not correct, put the map into some HSV Remap and play with the value curves. This will help you to contrast your maps or tweak their data directly in Maya.







Tips : You don't have to go back in Mari to change your maps information. Most of the change can be done within maya using utilities like HSV Remap, alRemap, Multiply... This is exactly what the look development process is about. Also keep in mind that you have a lot of isolation masks that we exported from zBrush. We can use them as masks in Maya as well ; for example if we want to rise the wetness of the inside of the mouth. We could use the isolation map of the mouth plug it an alRemap node along with the specular roughness map. Then we just need to lower the exposure and plug the result in the specular roughness 2 slot of our shader.



We are now done with this step by step tutorial. I hope you find it useful. I tried to share with you most of my process when dealing with creatures. I can't wait to see your future project. And remember, if you're looking for a creature artist, I am always looking for new opportunities!

All the best.

Gael Kerchenbaum