Introduction to Substance Painter

Substance Painter Basics

Revision: 003

aie
SPECIALIST EDUCATORS IN
GAMES, ANIMATION & FILM VFX

Substance Painter | Overview

The aim of this lesson covers topics from the list below:

- What is Substance Painter?
- Planning and Setting up a Substance Project
- User Interface
- Navigation
- Baking Mesh Maps
- Layers and Masks
- Fill vs Paint Layers
- Procedurals
- Materials & Smart Materials
- Polygon Fill Tool
- Projection types
- Editing Layers and Channels
- Filters
- Exporting Textures

What is Substance Painter

Substance Painter | About

What?

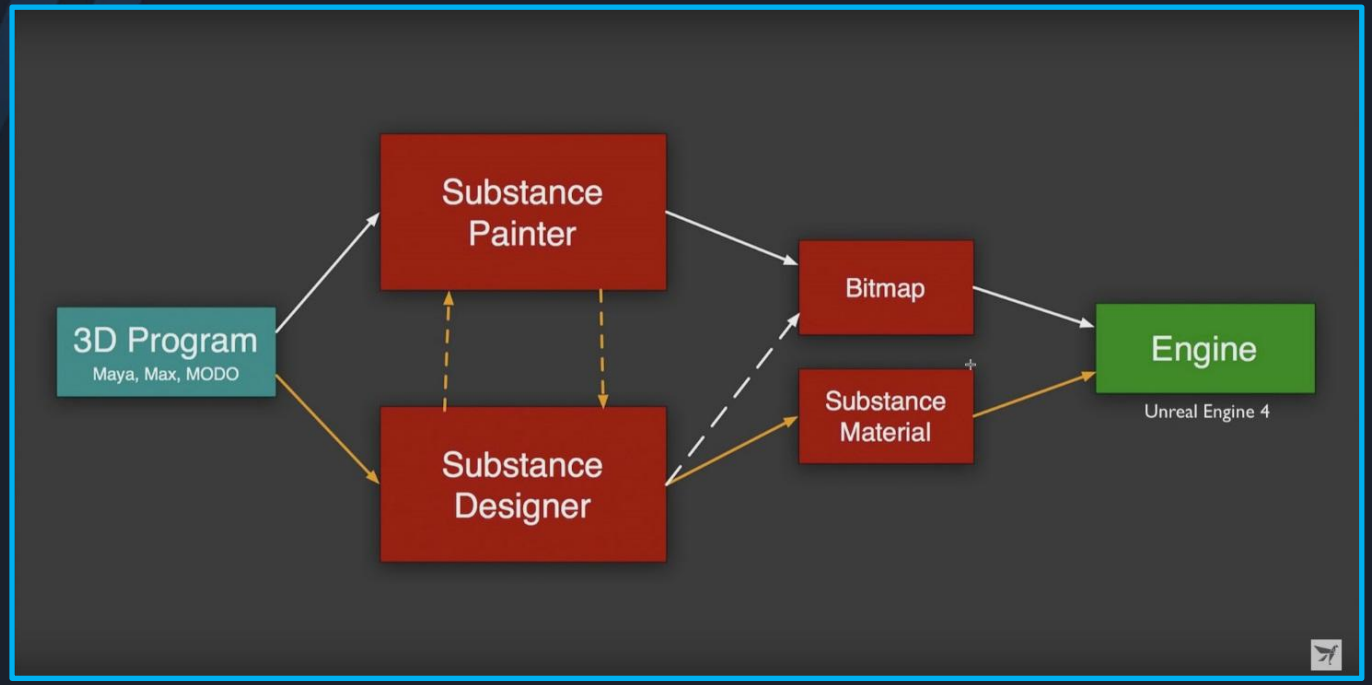
- Substance Painter is a 3D painting software that allows you to paint PBR materials directly onto your model.
- It also has a very powerful procedural masking and layering system that allows you to quickly and realistically texture 3D models.

Why use it?

- Substance Painter allows you to work quickly by leveraging some of it's procedural features driven by baked maps.
- It is an industry standard texturing tool for games and gaining popularity in film VFX production.
- Has a built in baker for baking high to low or low to low maps.

aie

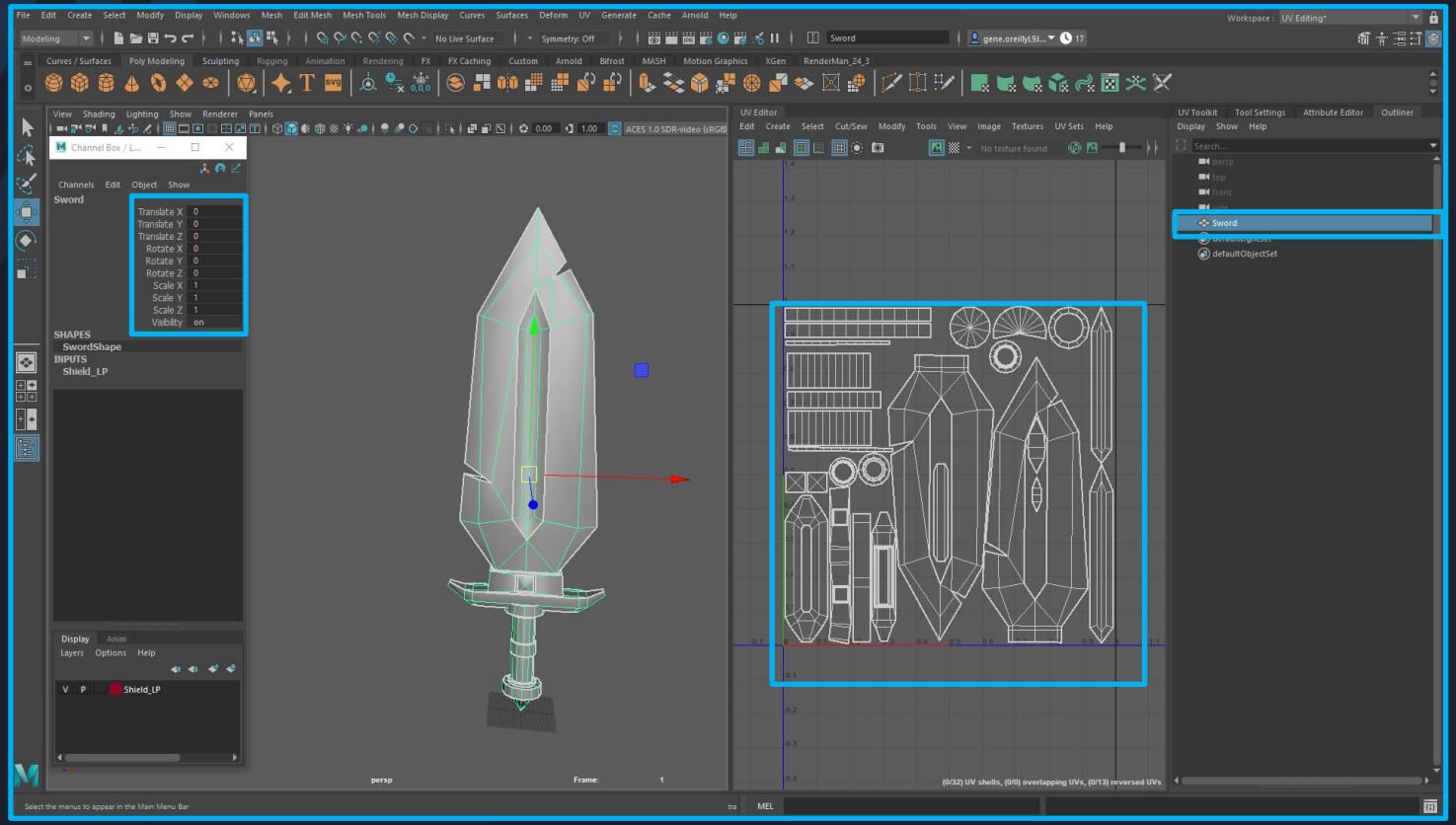
Substance Painter | Pipeline



- The image on the left, represents the standard pipeline for Substance Painter.
- Materials authored in Substance Designer can be imported to Painter, using a native format (.sbsar).
- Materials from Substance Designer can have exposed material parameter to easily and quickly make adjustments in Substance Painter.
- Export bitmaps for various platforms, including UE4 and Unity.

Planning for texturing in Substance Painter

Substance Painter | Export Preparation

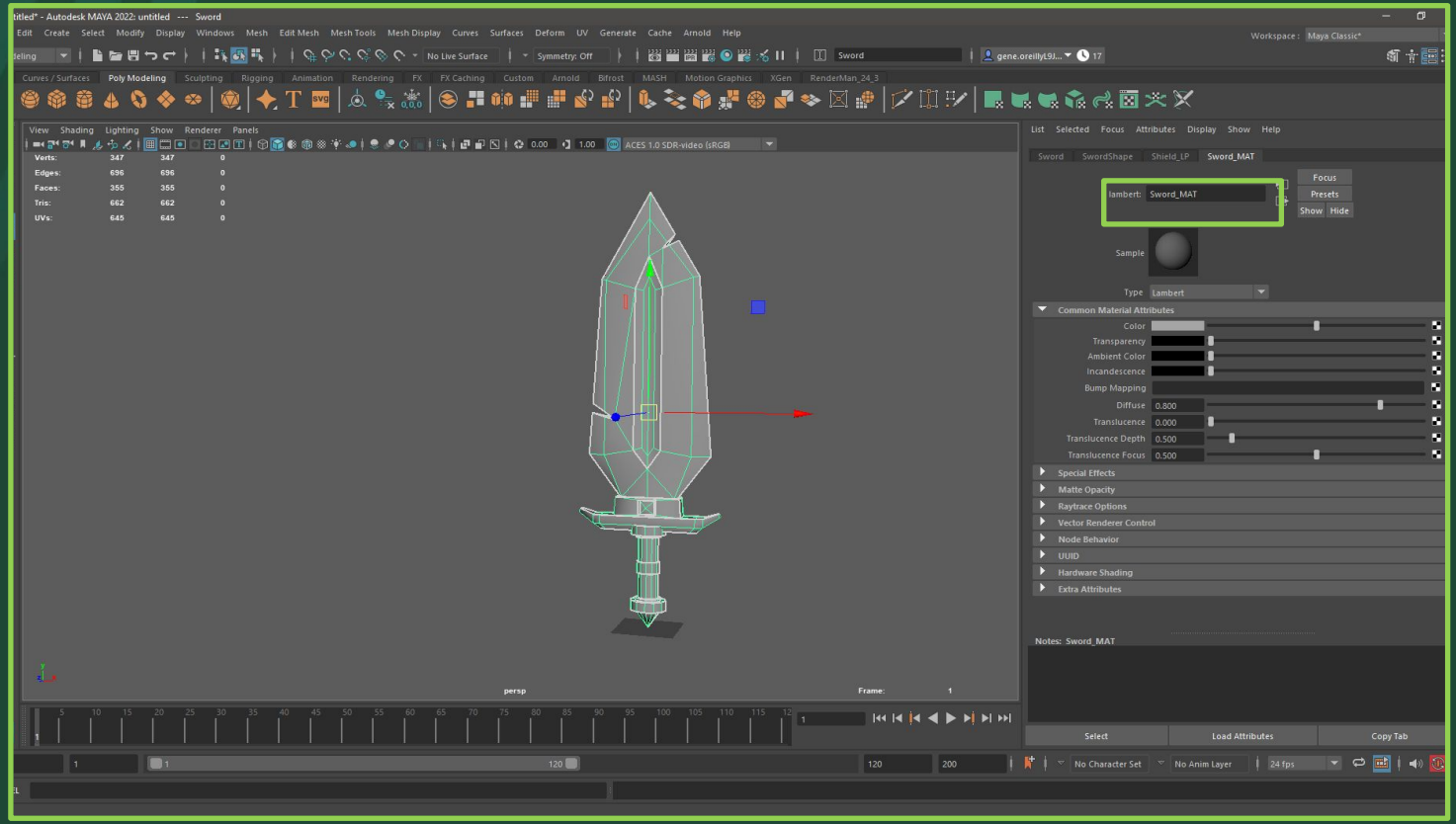


There are a couple things to consider before exporting models to be textured in Substance Painter.

Models

- Must be UV'd
- Positioned in 0,0,0 World Origin
- Freeze Transforms and Delete History
- Name Meshes in Outliner

Substance Painter|Export Preparation

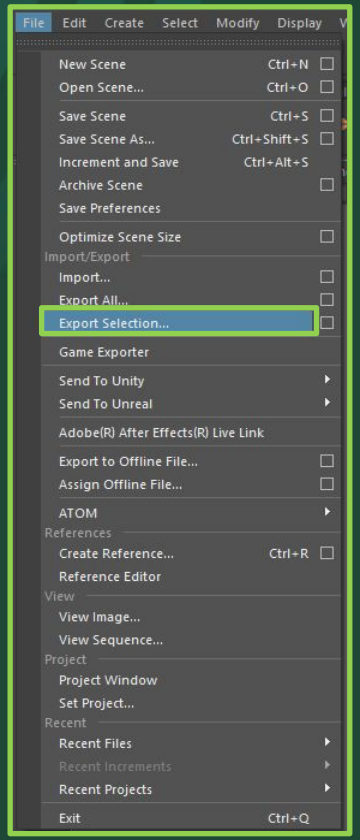


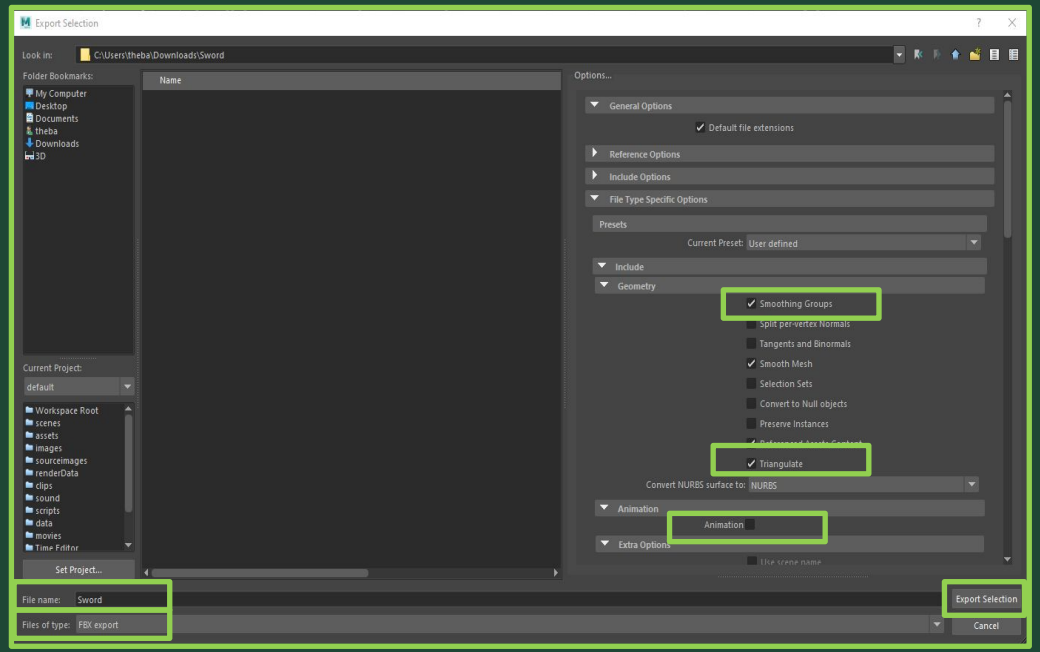
Each material that you apply to different meshes within a model file will come across to Painter as a unique texture set, locked to it's own 0-1 UV space.

Texture Sets should only be separated if the meshes have a different set of UVs, Or if you plan to use different shaders, Otherwise it's is ideal to keep everything on a single TextureSet.

1. In Maya, Assign a lambert material to the Sword model.
2. Rename the lambert material to Sword_MAT (This will be the name of the Texture Set for the imported model in Substance Painter).

Substance Painter | Export Preparation



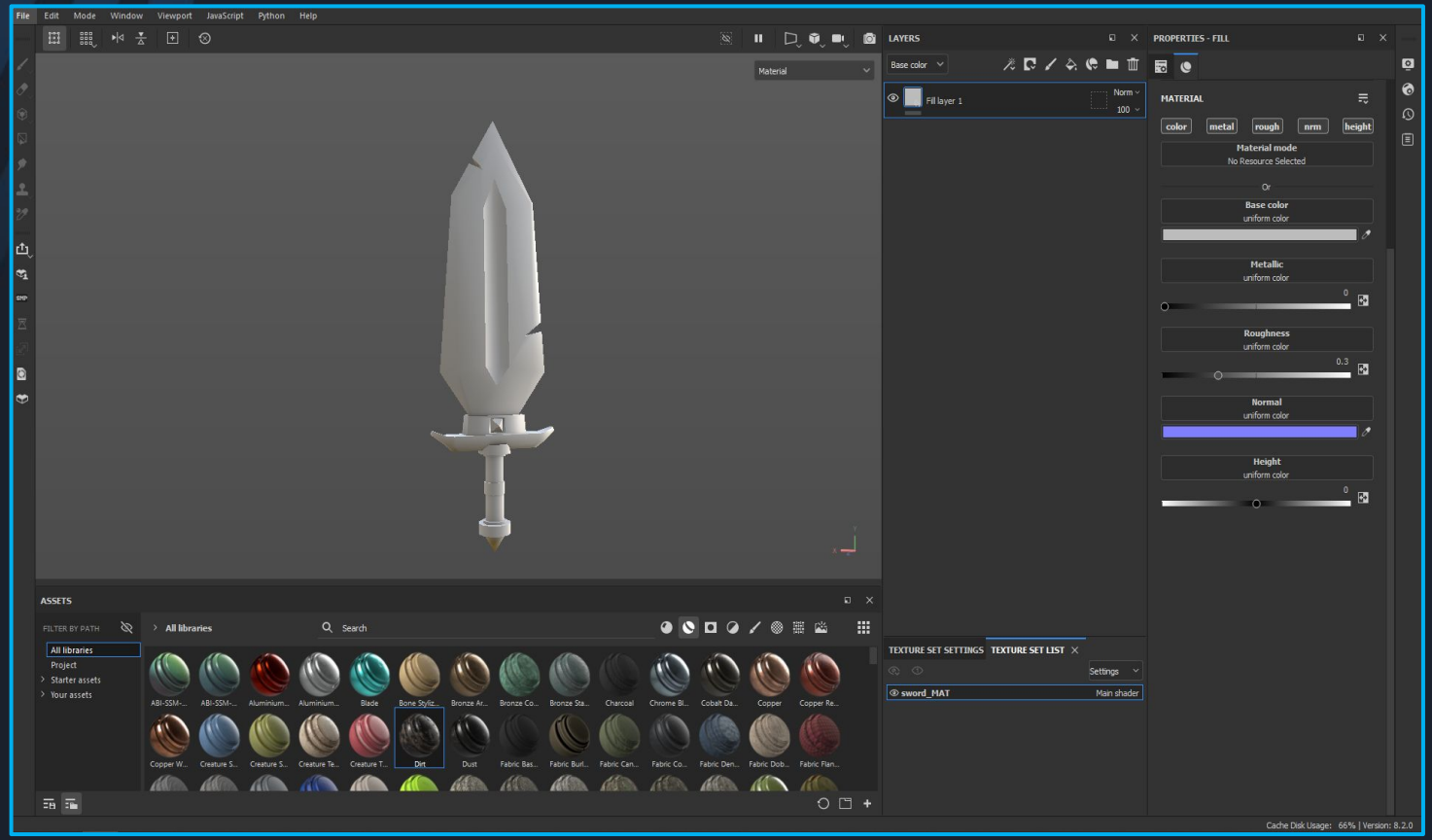


Exporting

- Select your Model
- Go to File > Export Selection
- Navigate to where you want to save.
- Set the format to FBX Export
- Name the file
- Turn on Smoothing Groups and Triangulate and leave Animation turned off
- Hit the Export Selection button

Setting a new project

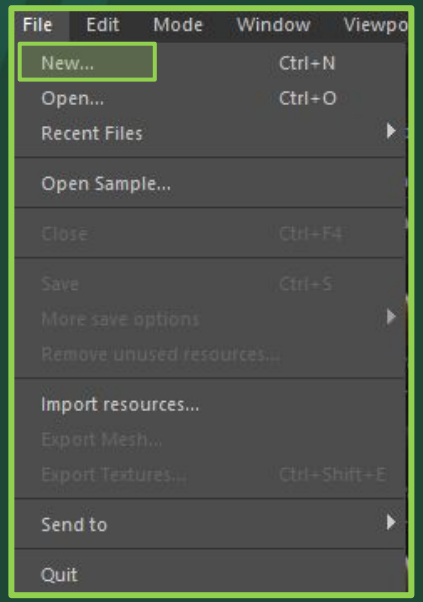
Substance Painter | Setting a Project



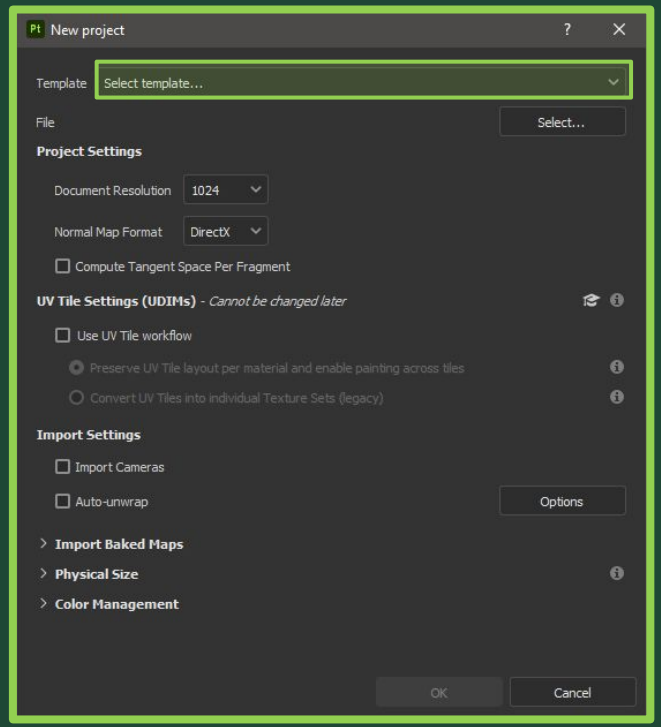
- Setting a project in Substance Painter is the first step required to start working with the software.
- Project settings define the parameters of the project.
- Most settings, such as resolution can be changed later in the editor.
- Some settings are dependent on the game engine you are planning to use.

Substance Painter | Setting a project

1



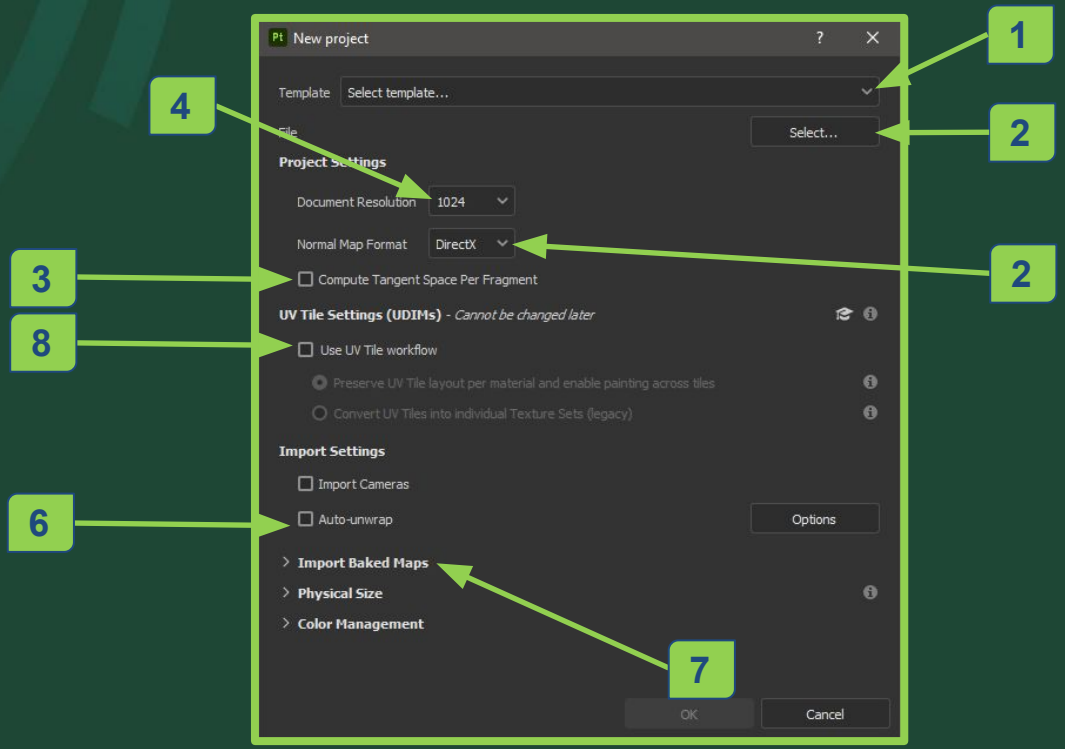
2



Launch Substance Painter and set up a new project.

1. File > New
2. Leave ‘Template’ blank (Select Template) which will choose the default **PBR - Metallic Roughness** template which we’ll be using for this lesson.

Substance Painter | Setting a project



The New project dialog window will pop up.

1. **Template:** Select from various templates which contain various channels and export settings useful for different software (Renderman, Unity, Unreal etc)

2. **File:** Click Select, and navigate to FBX mesh to paint on, ***Sword.fbx. Can be reimported later if required***

3. **Normal map format :**
   DirectX = -Y (Unreal)
   OpenGL = +Y (Unity, Toolbag)
   Select DirectX for this lesson. ***Can be changed later if required***

4. **Compute tangent space per fragment:** if exporting to UE4 tick on, otherwise leave it unticked.

5. **Document resolution: Resolution** Sets the size of the texture to be exported, set to 1024 for now. ***Can be changed later if required***

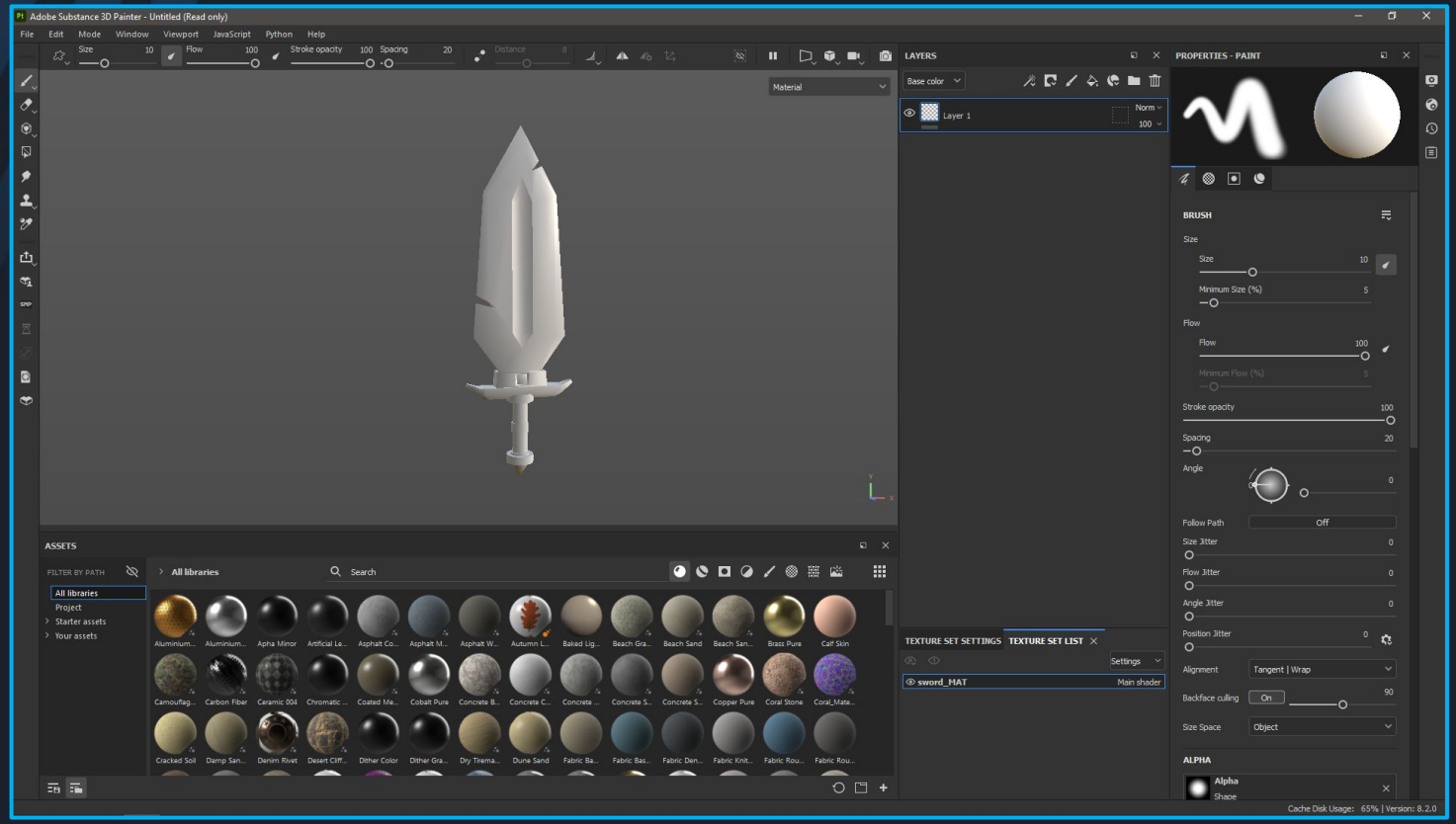
6. **Auto-unwrap**: Must be left unticked or this will replace the existing UVs on the model

7. **Import Baked Maps** You can import texture maps baked from external software.

8. **Use UV Tile**: Tick if you are using UDIM workflow for film assets. In this case we are working on a game asset and should be left un-ticked. ***Cannot be changed later***

Interface

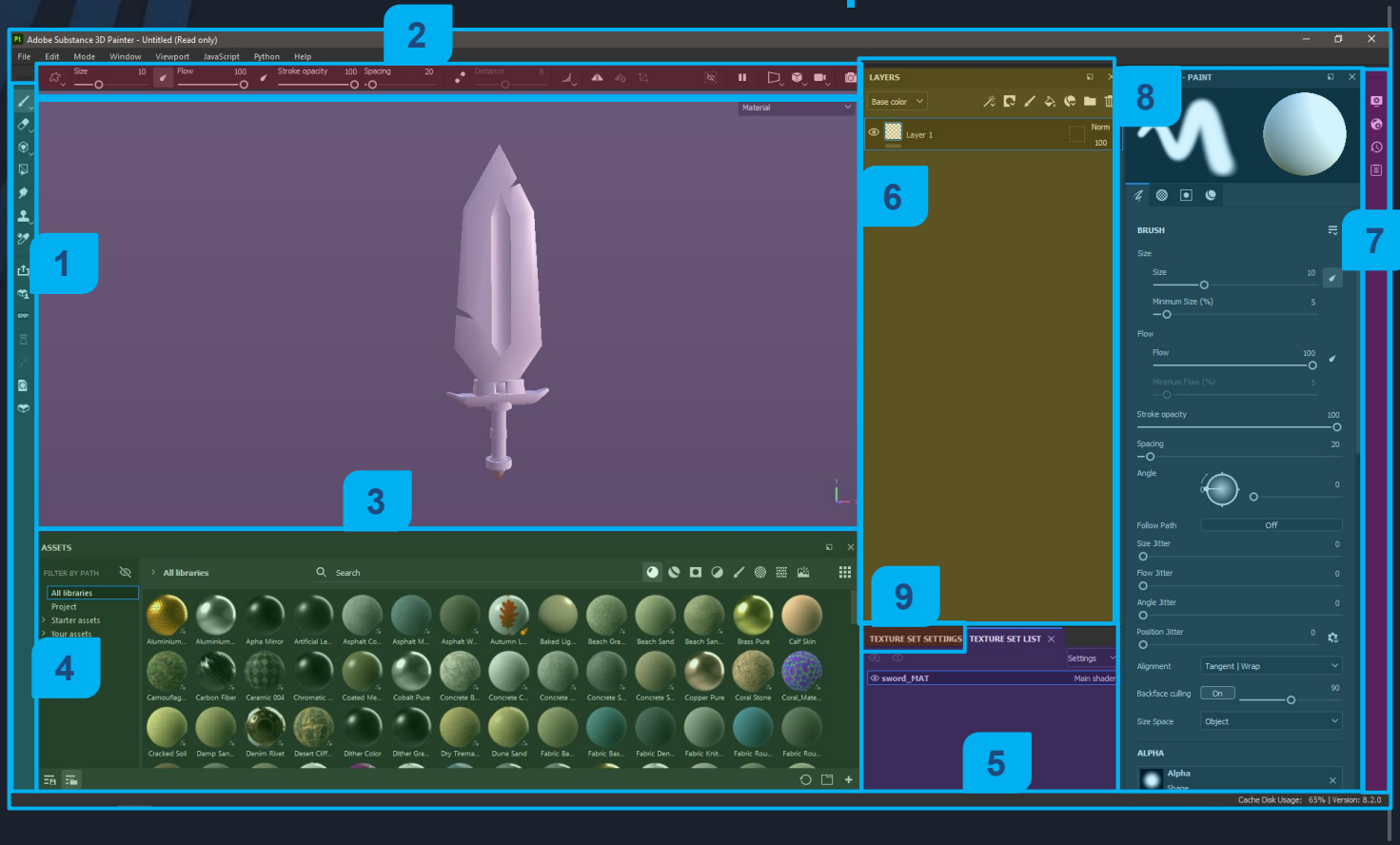
Substance Painter | Interface



- Once your project is created you will see your mesh loaded into the viewport.
- The interface of Substance Painter is similar to software packages you're familiar with.
- Menus, similar to Photoshop.
- 3D viewport navigation similar to Maya.
- **Note**: All UI Windows here can be rearranged and setup to your needs by clicking and dragging any of the windows around and docking them.

aie

Substance Painter | Interface



1. Toolbar
Tools for different ways of painting and masking on layers.

2. Tool Settings
Settings for tools selected from the toolbar.

3. Viewport
Viewport navigation similar to Maya.

4. Assets
Access a variety of texturing assets, including alphas, textures, brushes, materials, smart materials, smart masks.

5. Texture Set List
List of materials associated with your mesh and the shader being used.

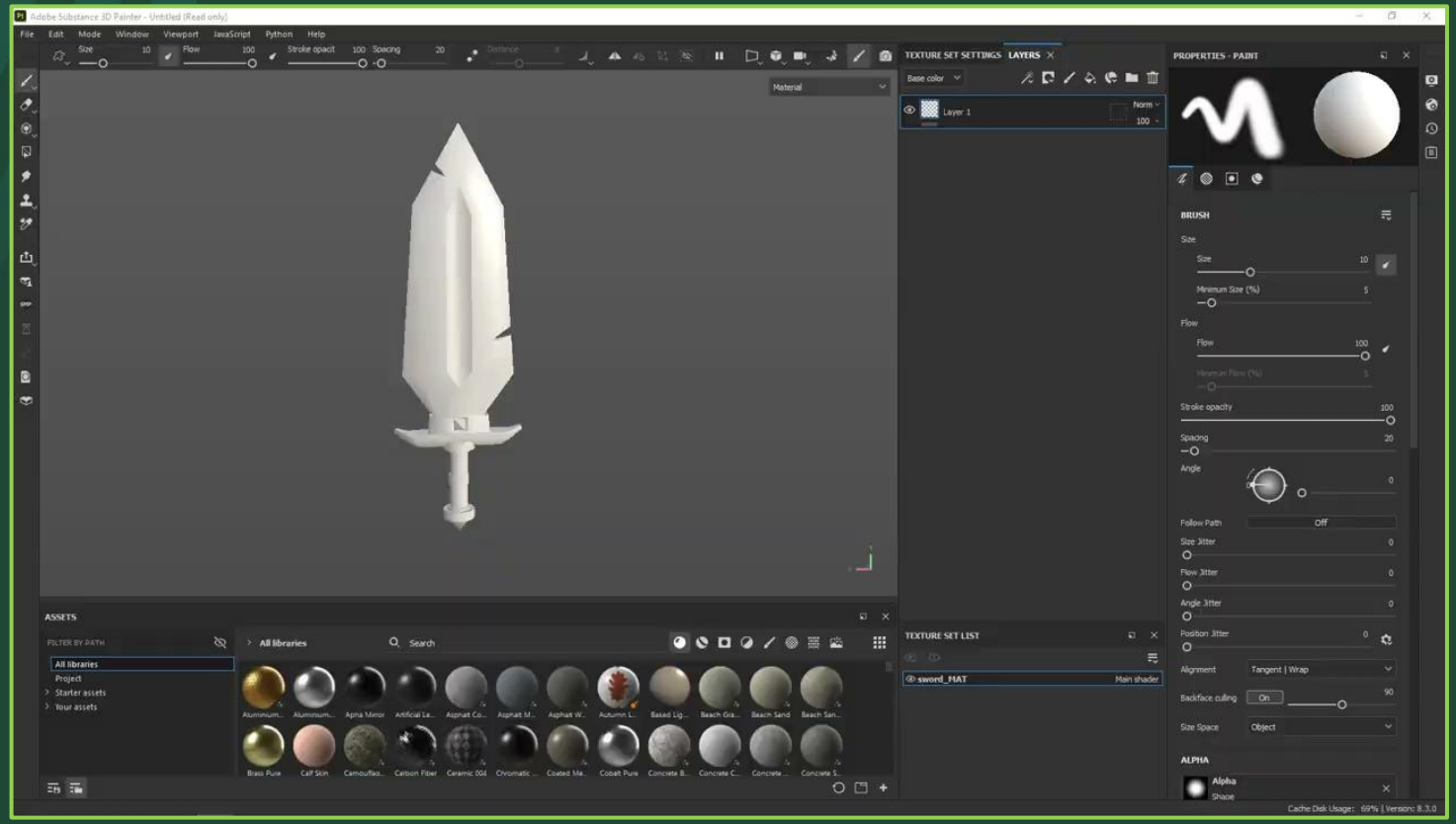
6. Layers
Layers editor used construct your material.

7. Settings
Menus for global setting, including display settings, shader settings and history.

8. Properties
Settings for texture sets including additional maps and baking.

9. Texture Set Settings
List and settings of your baked textures and channels.

Substance Painter|Viewport Navigation



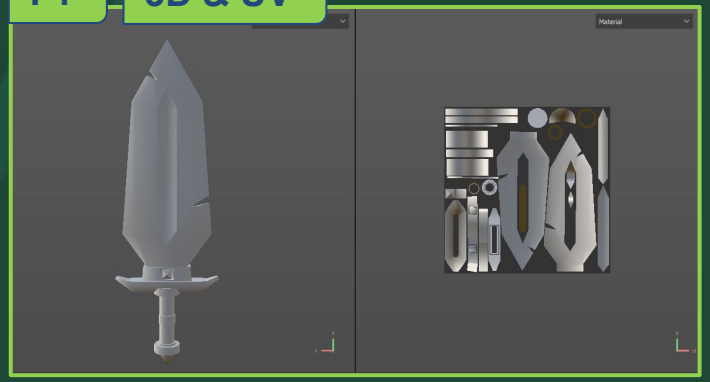
Painter has the same viewport navigation as Maya**. (Alt+Mouse buttons)**

Rotate: Alt+LMB
Pan: Alt+MMB
Zoom: Alt+RMB

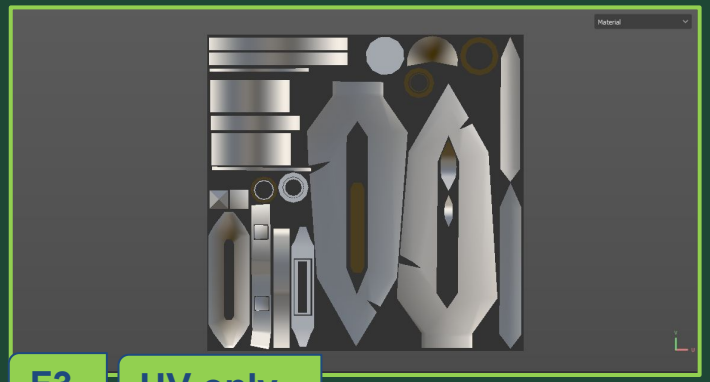
Hold **Alt+Shift+LMB** when navigating the viewport, to snap to orthographic views (Top, Front, Side, Bottom .etc)

Substance Painter | Viewport Modes

F1 3D & UV



F2 3D only



F3 UV only

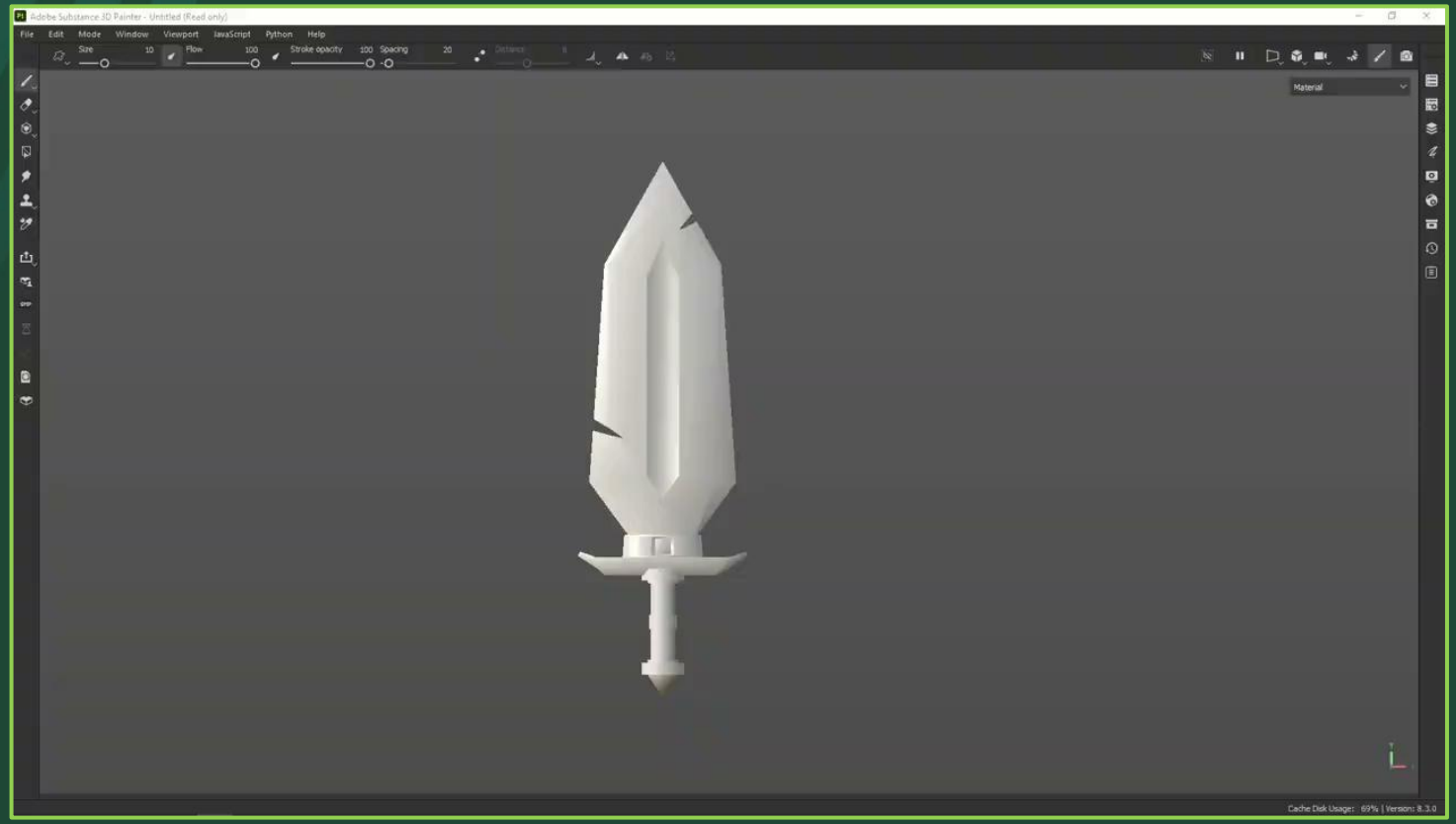
F5 **F6** Ortho vs Perspective

Below is a set of shortcuts to switch between various viewport modes.

F1 = 3D & UV Viewer
F2 = 3D Viewer
F3 = UV Viewer
F5 = Perspective Mode *(3d view)*
F6 = Orthographic Mode *(3d view)*

aie

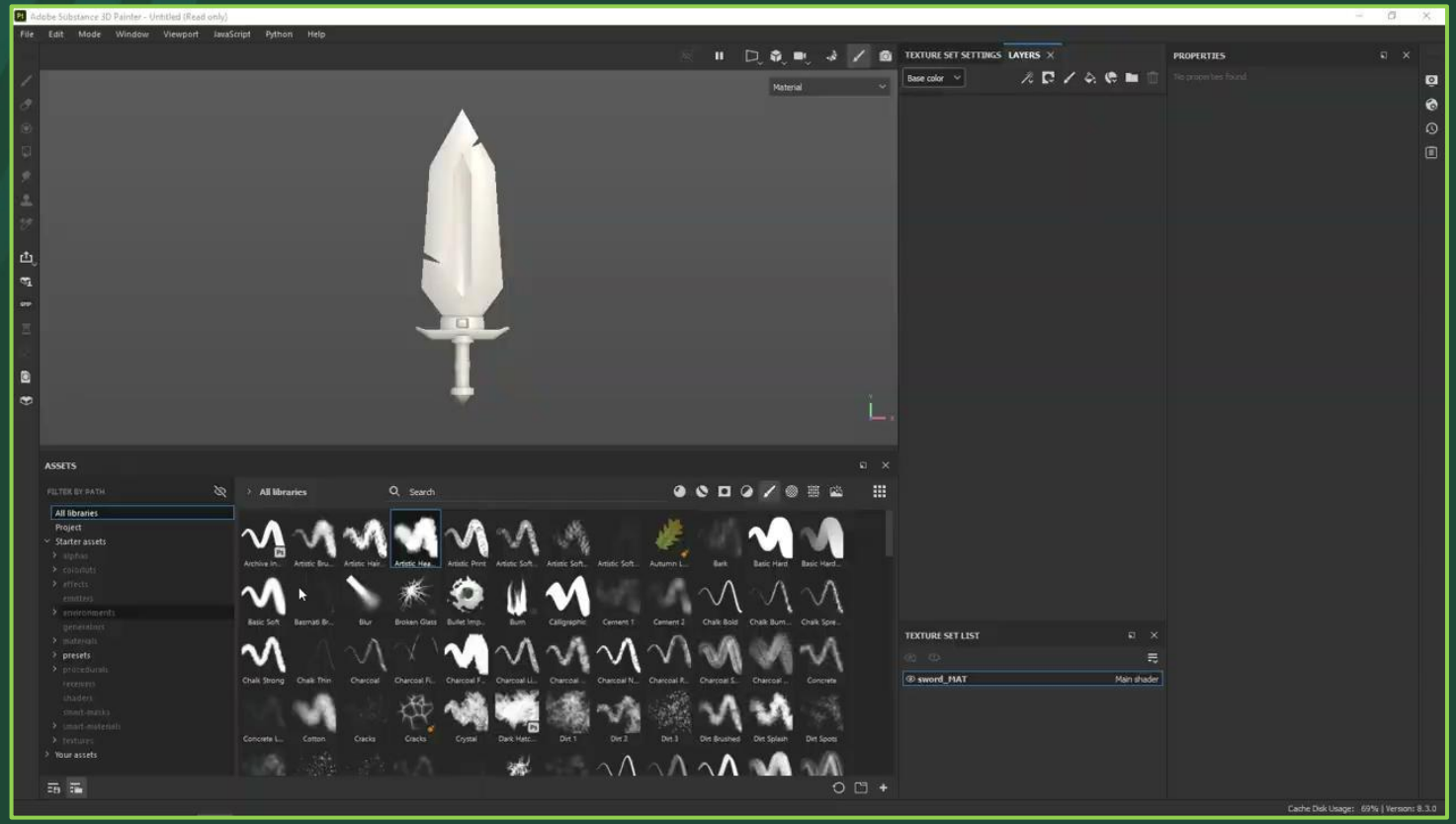
Substance Painter|Viewport Lighting



Rotating the environment lighting around a model can help you light your asset from various angles.

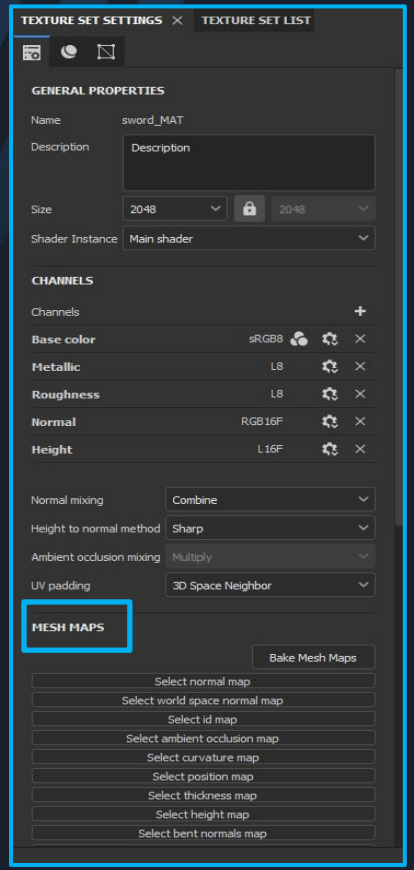
- Hold SHIFT+RMB and click dragging left and right to rotate the HDRI

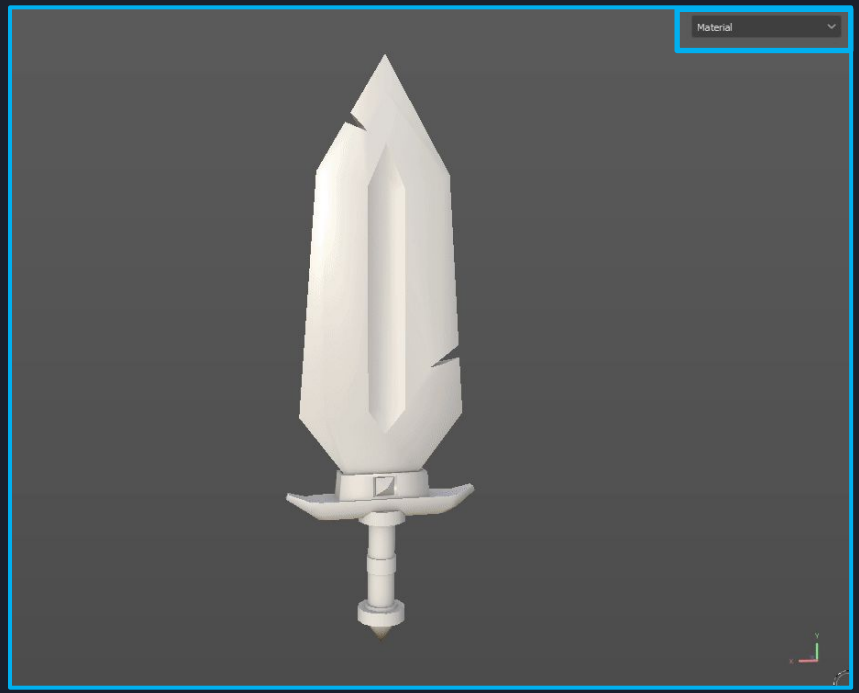
Substance Painter | Fullscreen



- TAB will toggle fullscreen mode
- F will frame the object

Substance Painter | Mesh Maps





Within your **Texture Set Settings** window there are a range of parameters that can change the various texture channels to work across within each Texture Set, Which Shader to use, as well as the Document Resolution for the texture sizes.

Underneath those settings are **Mesh Maps**: These are various texture maps baked out specific for the mesh in order for substance to calculate Smart Filters, Generators and Masks and assist with the texturing process.

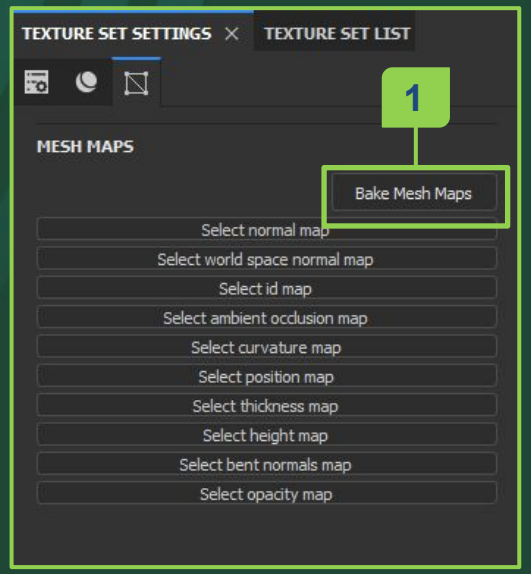
Important Maps to Bake: (These will be covered in more depth in later subjects).

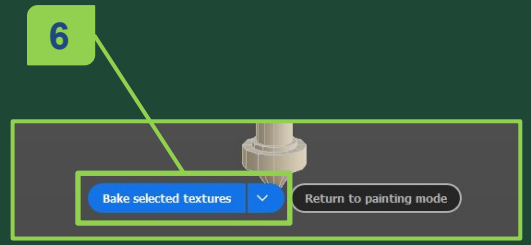
-Normal
-World Normal
-Ambient Occlusion
-Curvature
-Position
-Thickness

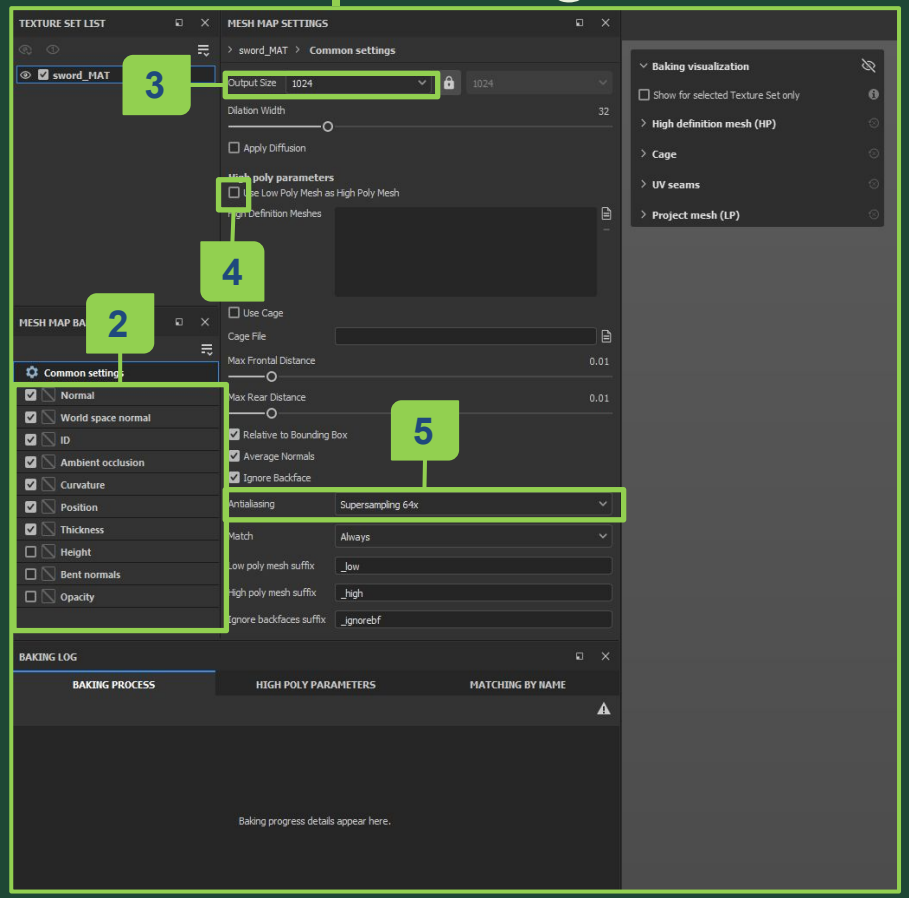
In order to create these maps we will need to bake them out using Substance Painter's baker.

aie

Substance Painter | Baking Low to Low







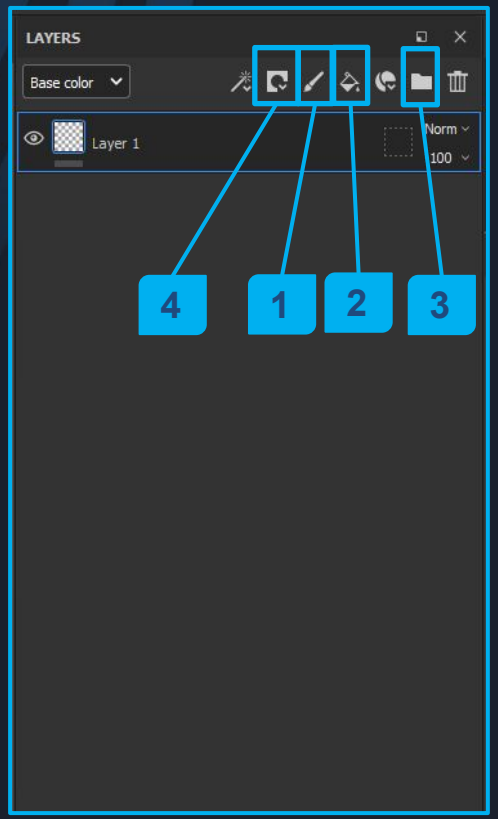
It is possible to bake your low poly model onto your low poly mesh. It is not common practice and baking will be covered in more depth in the next subject. The reason to bake your low poly mesh onto your low would be if you do not have a high poly source mesh to bake and you would like to generate the Mesh Maps.

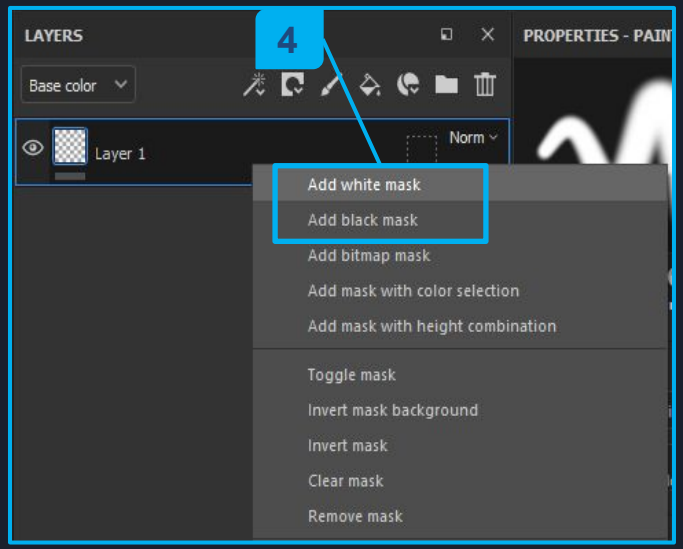
1. Opens the baking window
2. Textures that will be baked are ticked on
3. Bake texture resolution set
4. Tick to bake your low poly model onto your low poly mesh.
5. Increases the antialiasing and bake quality at the expense of bake time.
6. Click to start bake

aie

Layers

Substance Painter | Layers





There are three main layer types

1. Paint Layer
Allows you to paint directly onto the model

2. Fill Layer
Floods the model with a material

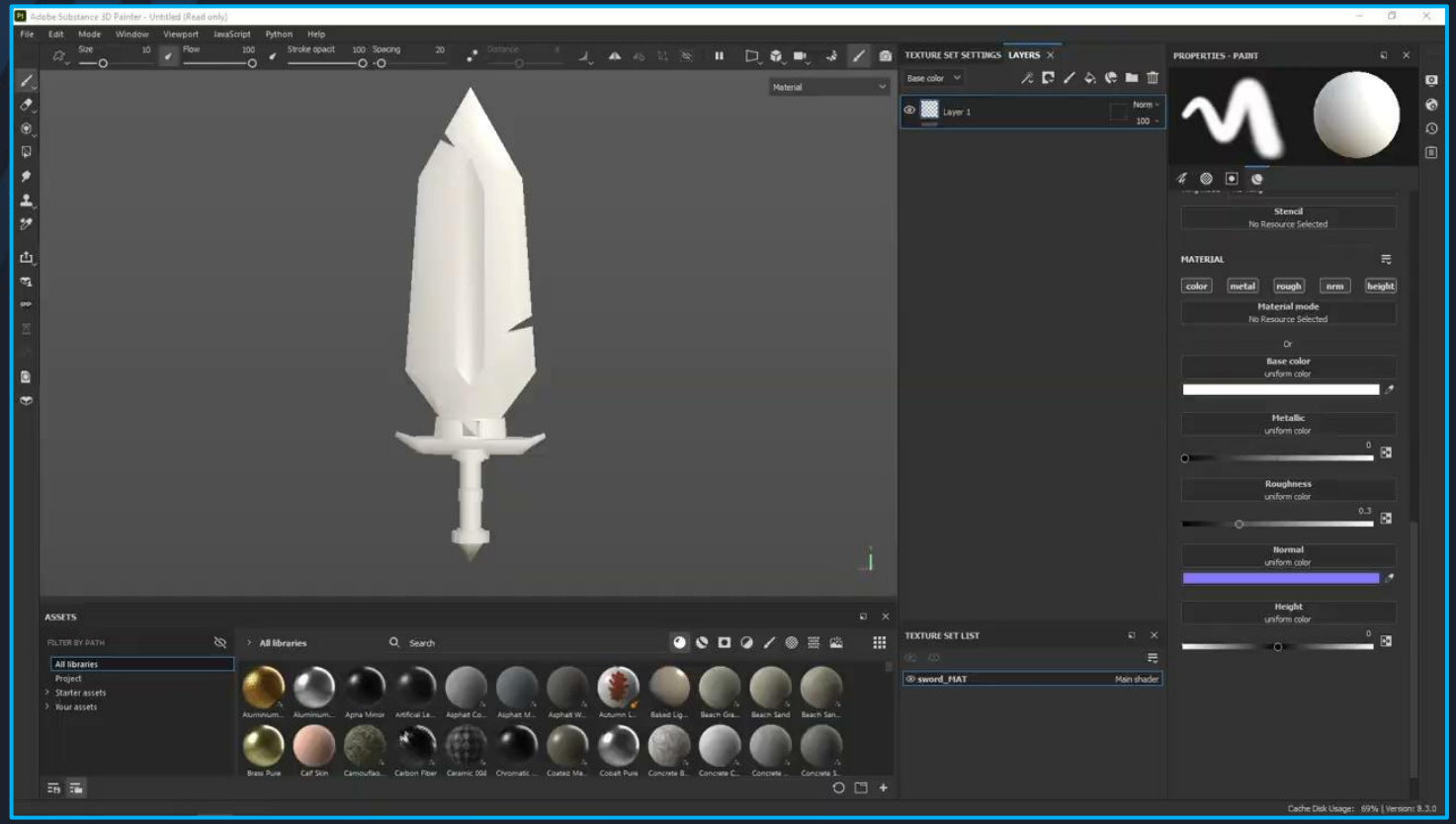
3. Folders
A container for both types of layers. Applying a mask onto a folder is a good way to organise different material types on your object.

4. Mask
Adds a mask to a paint layer, fill layer, or folder. Alternative way to add mask is to right clicking on the Paint layer, Fill layer, or Folder.

Note: Double click the layer name to rename it.

Paint Layers

Substance Painter | Paint Layers

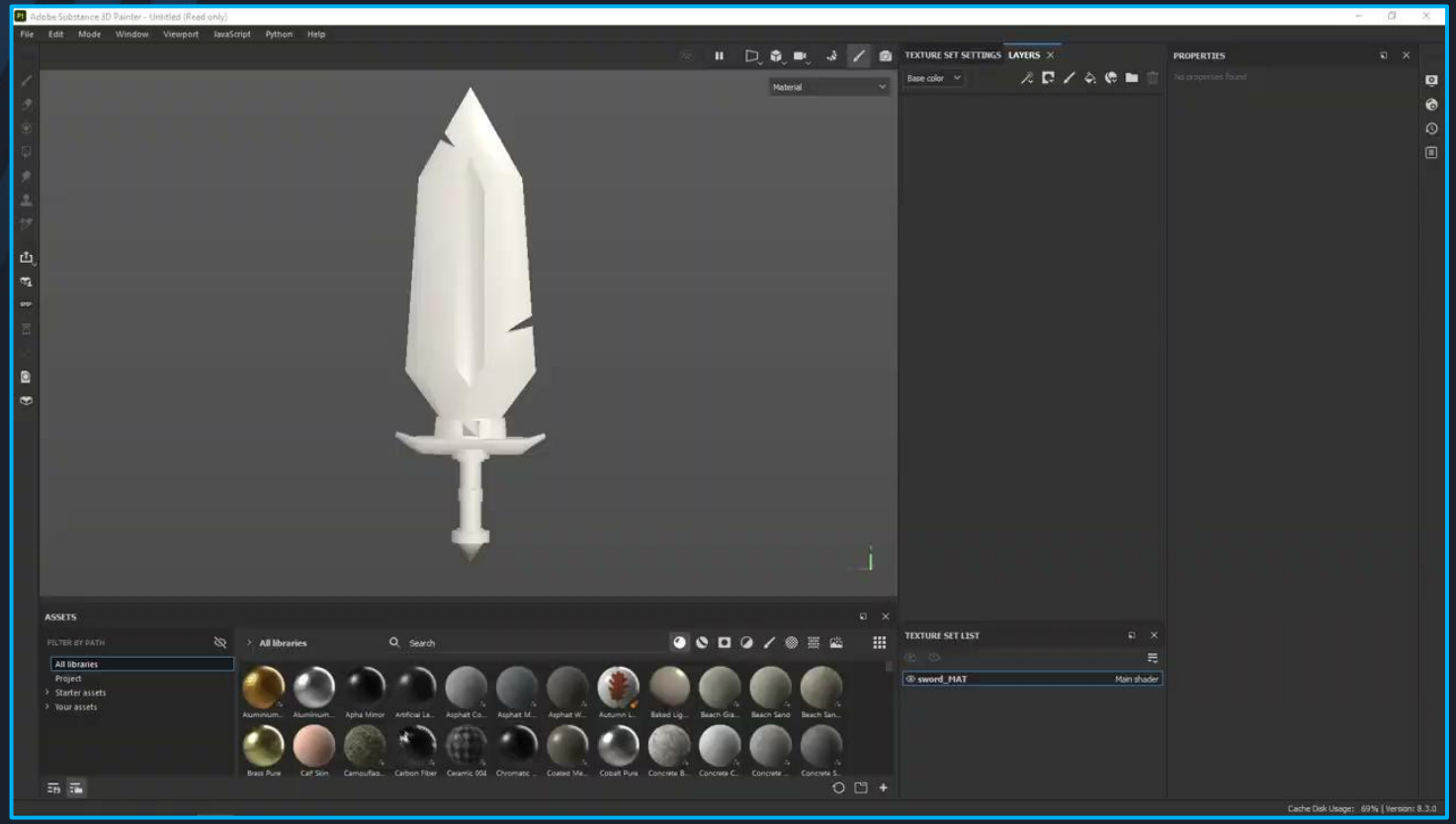


- Paint Layers allow you to paint on the mesh using your Brush settings setup within your **Properties – Paint** window.
- Paint layers are a destructive approach to texturing in Substance Painter and don't allow for easy adjustments down the line.

aie

Fill Layers

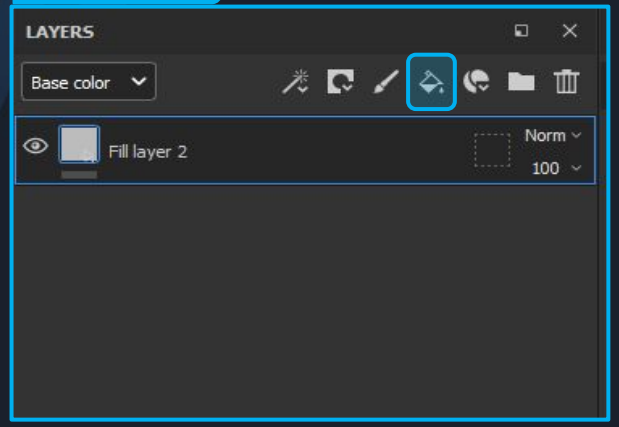
Substance Painter | Fill Layers



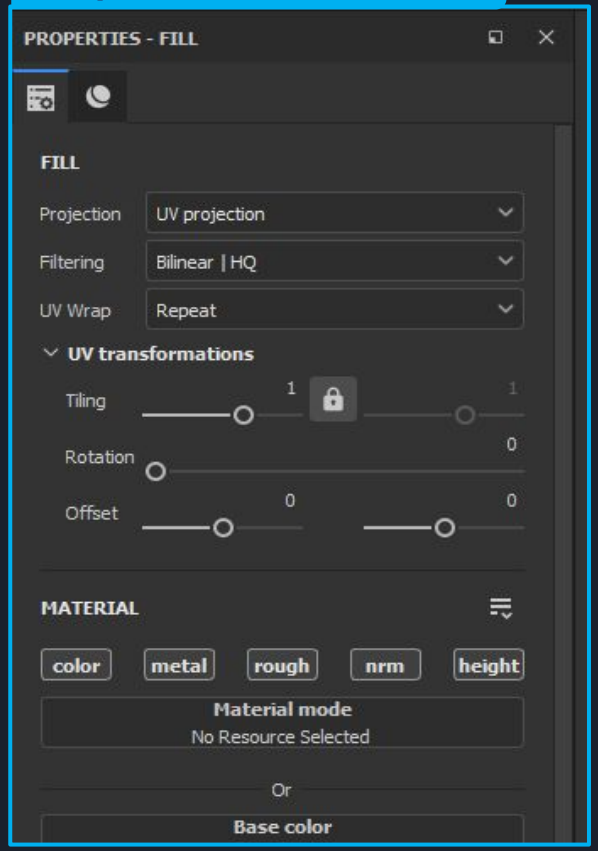
- Fill layers are the primary method for texturing in Substance Painter.
- They are non-destructive, allowing for easy adjustments throughout the texturing process.
- You can stack layers and mask between them like you would in Photoshop.
- You can dynamically and selectively edit the texture channels of a fill layer.

Substance Painter | Fill Layers Properties

Fill Layer



Properties

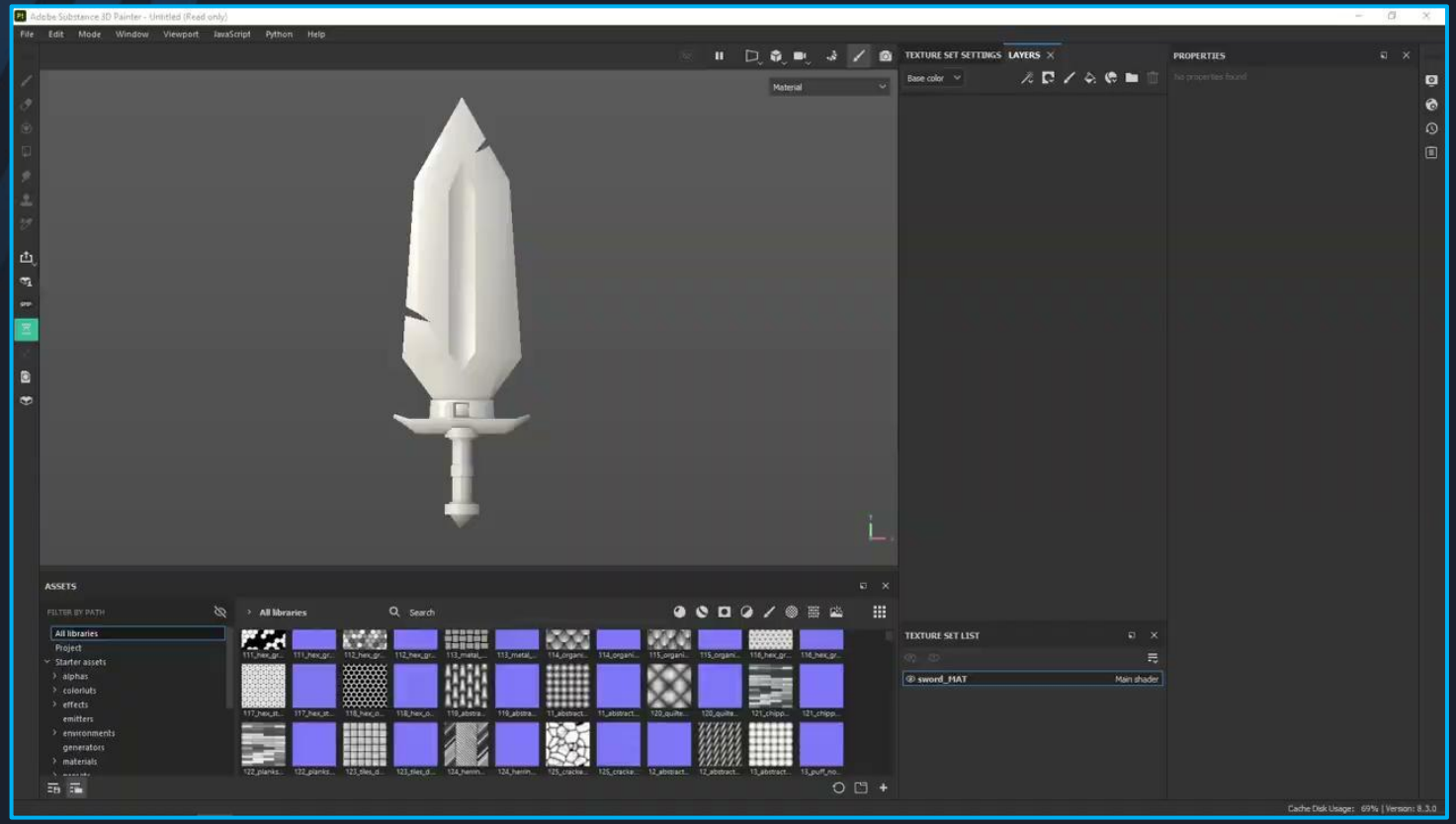


Fill layer properties will be displayed in the properties panel when a Fill layer is selected

1. **Projection**: How the layer's textures are projected onto the mesh
2. **UV Wrap**: Whether or not the layer's textures tile or not
3. **Tiling**: The amount of Tiling applied
4. **Rotation**: For rotating the layer's textures
5. **Offset**: For repositioning the layer's textures

aie

Substance Painter | Fill Layers Channels

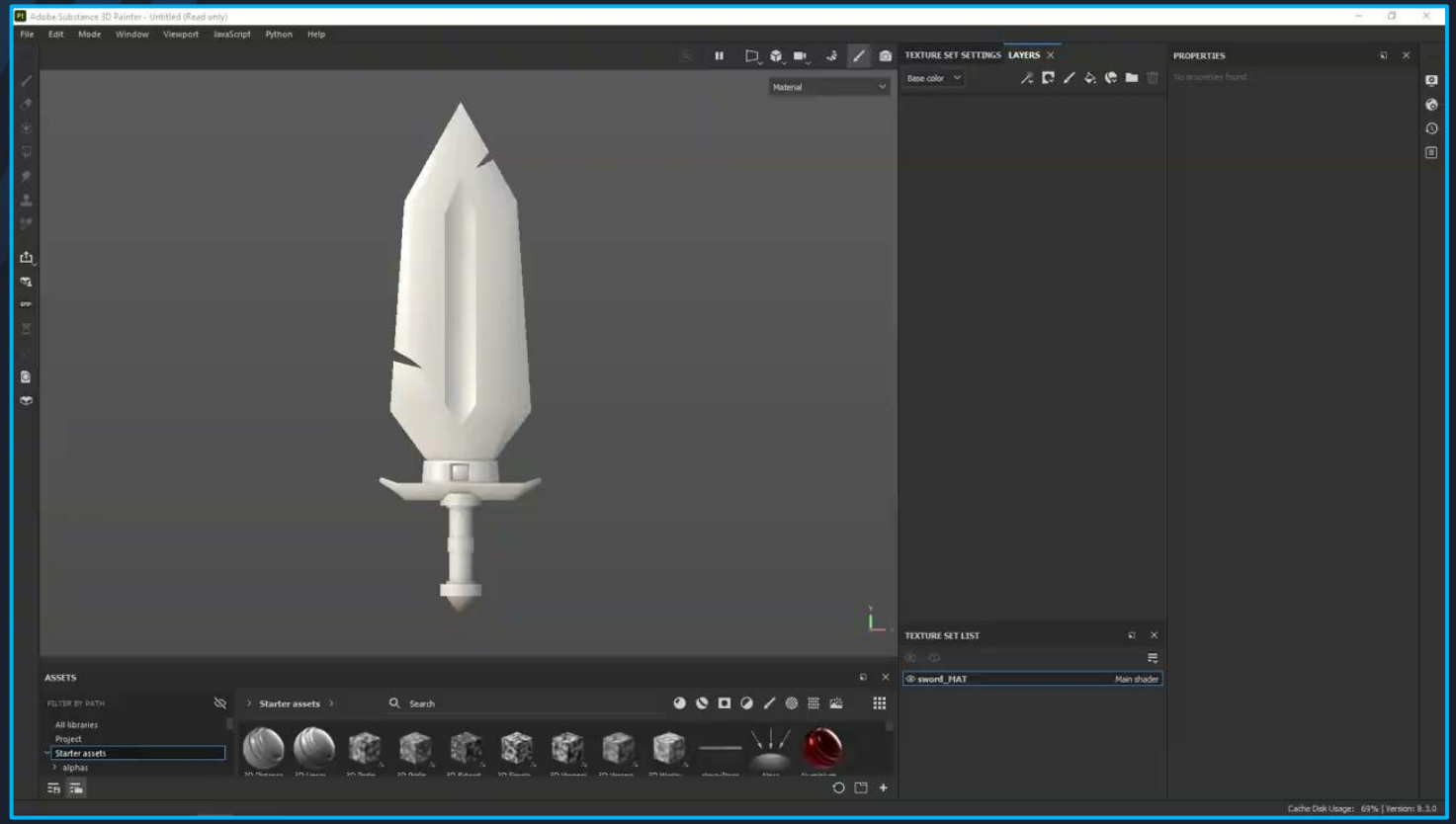


You can edit each one of the texture channels on a Fill or Paint individually. The default PBR shader has:

-**Colour**
-**Metal**
-**Roughness**
-**Normal**
-**Height**

You can edit the parameters of each with global sliders or selecting an image to input.

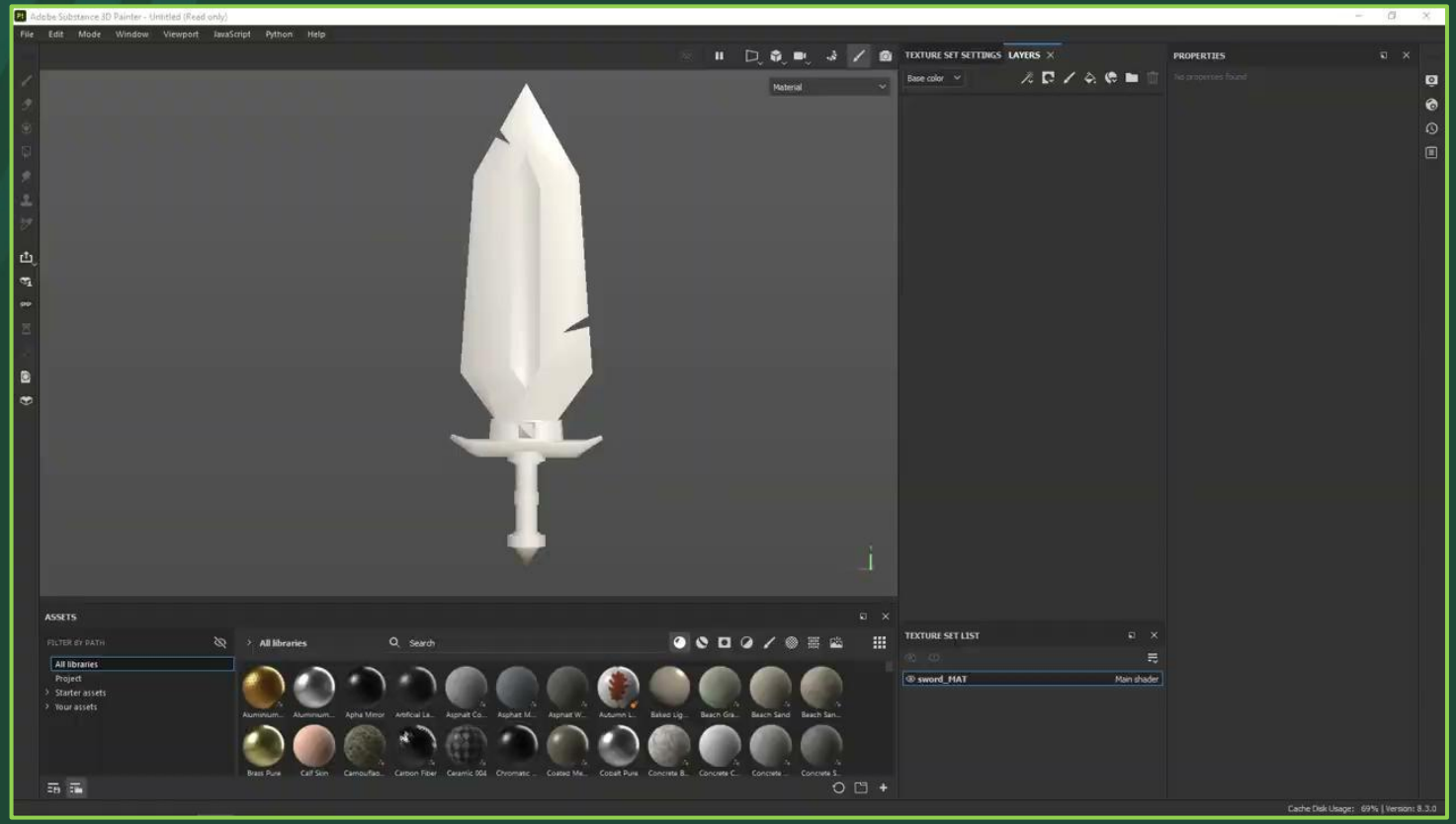
Substance Painter | Fill Layers Channels



The channels on a fill layer can be enabled and disabled by clicking the channels name in the Properties.

Masks

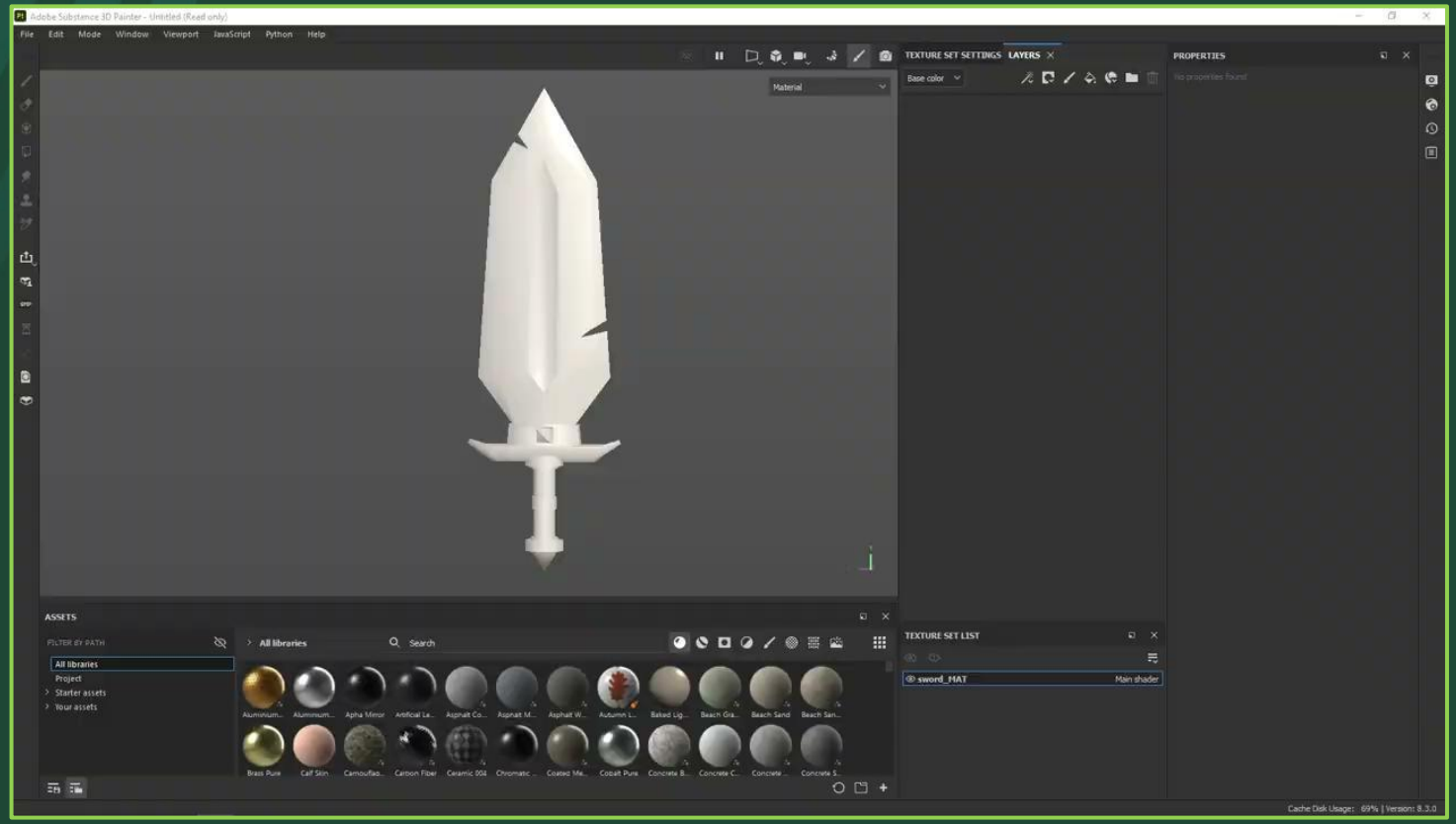
Substance Painter|Painting Masks



In order to control where the Fill Layer affects the mesh we need to utilise our Masks.

1. Create a Fill Layer.
2. Right click on the new layer and select Add Black Mask.
3. With the mask selected in your layer stack you can now start painting between Black & White to hide or reveal the Fill Layer *(Use **X** to quickly switch your brush between black and white)*.
4. **Alt+LMB click** the mask to show it within your viewport.
5. Click the layer thumbnail (not the mask) to go back to your layer view, Or hit (m) to go back to material view.
6. Shift+LMB click the mask to disable it

Substance Painter|Masks Using A Texture

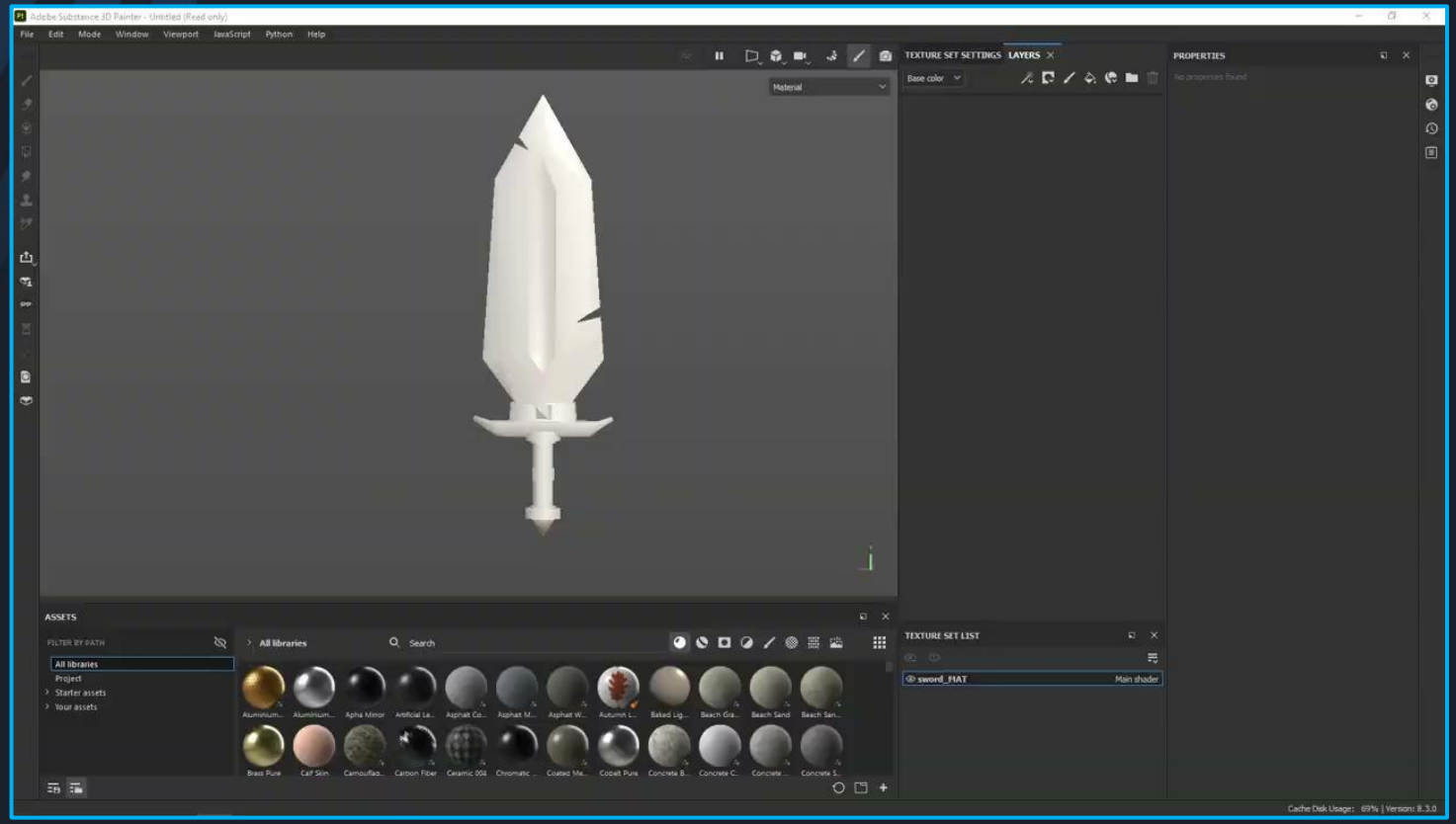


1. Create x2 Fill Layers and add a Black or White mask to the top layer.
2. Right Click the mask and select ‘Add Fill’.
3. Select the new Fill added and navigate to the Properties.
4. Click the grayscale button to add a texture as a mask. (You can also right click on the layer and “add bitmap mask” which sets this up for us.

Note: Smart masks and generators are commonly used in substance painter. However to use these the full set of baked textures are required. Baking and smart masks and generators will be covered in the next subject.

Paint Layers Vs Fill Layers

Substance Painter | Paint Layer Vs Fill Layer



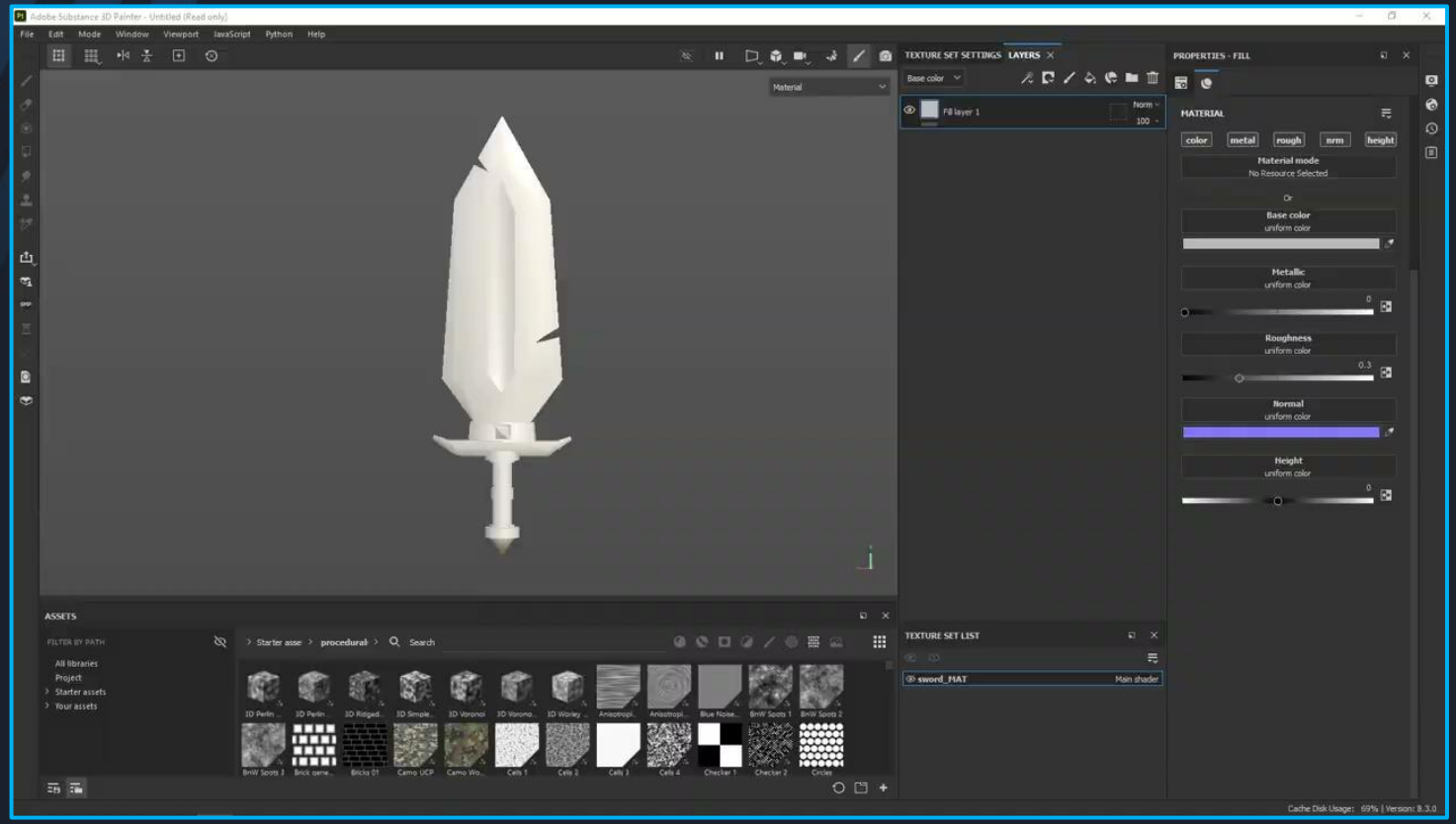
- Paint layers are destructive vs Fill Layers which are non-destructive and allow for dynamic editing of the painted material.
- It's rare that you'd choose a paint layer over a fill layer as you can do almost any layer editing you'd need with fill layers and masks.
- Another way to think of this is being able to control your paint stroke after you've painted it rather than committing to the stroke each time.

The eyedropper Tool (**P**) can sample pixels directly from your model. Ensure to press "c" first to toggle to your base colour channel to get the accurate colour without lighting and shading information.

Alternatively there's an Eye dropper next to each channel in the Properties you can use.

Procedurals

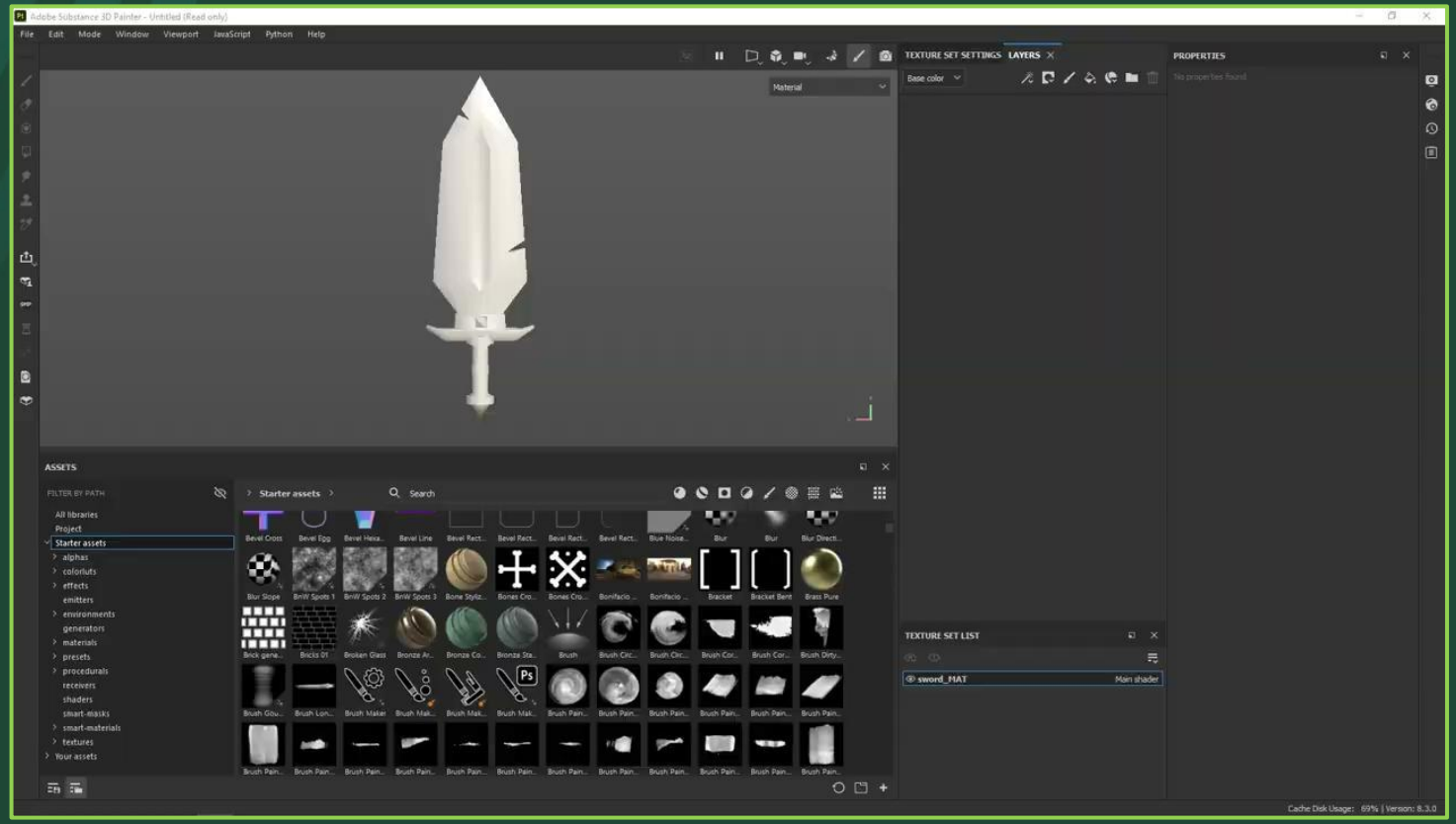
Substance Painter | Procedurals



- Substance Painter contains a range of various textures and alphas that have been setup to work procedurally within the software with various parameters exposed. This makes for quick easy editing and adjustments.
- Procedurals are created within Substance Designer.

Materials

Substance Painter | Smart Materials



1. Drag and drop materials and smart materials onto the layer panel.

- Materials will be made up of a fill layer.
- Smart materials are a number of layers and layer adjustments and filters inside a folder. The smart material layers can be adjusted to suit your object.

Note: A lot of the Smart Materials rely on having the Mesh Maps baked out in order to work correctly.

aie

Substance Painter | Single Channel Display

1. Click the **C** key to cycle through single **Channels** in the viewport.

   This is particularly helpful for visualizing what each map looks like.

2. Click the **B** key to cycle through each of the **Baked maps** in the viewport (If you've baked the maps out).

   This is particularly helpful for checking for any baking issues and checking what each map looks like.

3. Click the **M key to return to Material mode.**

Note: There is also a dropdown in the Top Right of your Viewport Window to switch between all of these view modes.

Polygon Fill

Substance Painter|Polygon Fill

You can use the **Polygon fill** tool within your masks to quickly mask between different fill layers.

This can be done based on:

- Triangle – Masks by triangular polygons
- Polygon - Masks by quad polygons
- Mesh – Masks based on contiguous meshes
- UV Shell – Masks based on contiguous UV shells

1. Add a mask to the layer.
2. Go to the toolbar and select the **Polygon Fill** tool. (**4 Hotkey**).
3. From the Tool Settings, select the fill mode you want to use.
4. Click each component of your model you want to fill, Or click and drag over a selection of your model (In either the 3d or UV window).

Note: X to switch between Black and White.

Folders

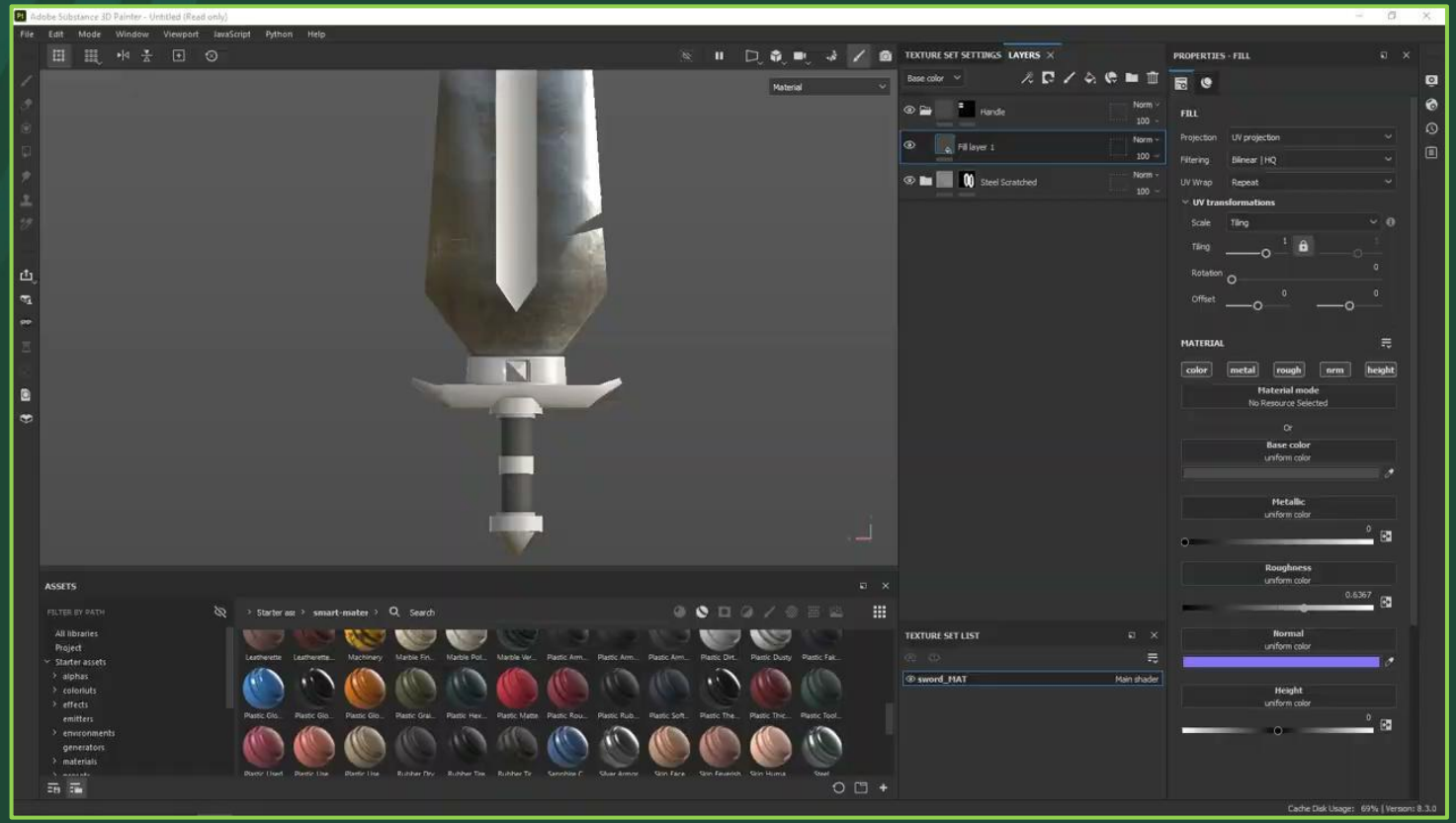
Substance Painter|Folders

For scene organisations it can be helpful to separate different layers within named folder groups. Folders can also be masked like layers and it can be better to mask a folder containing multiple layers within it.

1. Create Fill layers and drag each into it's own Folder group.
2. Add Masks to each Group and use the Polygon Fill tool to setup your Masks.
3. Go back to any of the fill layers and adjust the Colour, Roughness, Metalness to accurately represent the material type needed.
4. Add more Layers within each group as needed.

Projection Types

Substance Painter|Projection Types



The commonly used layer projection types are UV and Tri-Planar projection.

UV projection will project the texture as a plane onto the UVs setup. ***Note*** *within the UV window you can easily position, rotate and scale images here.*

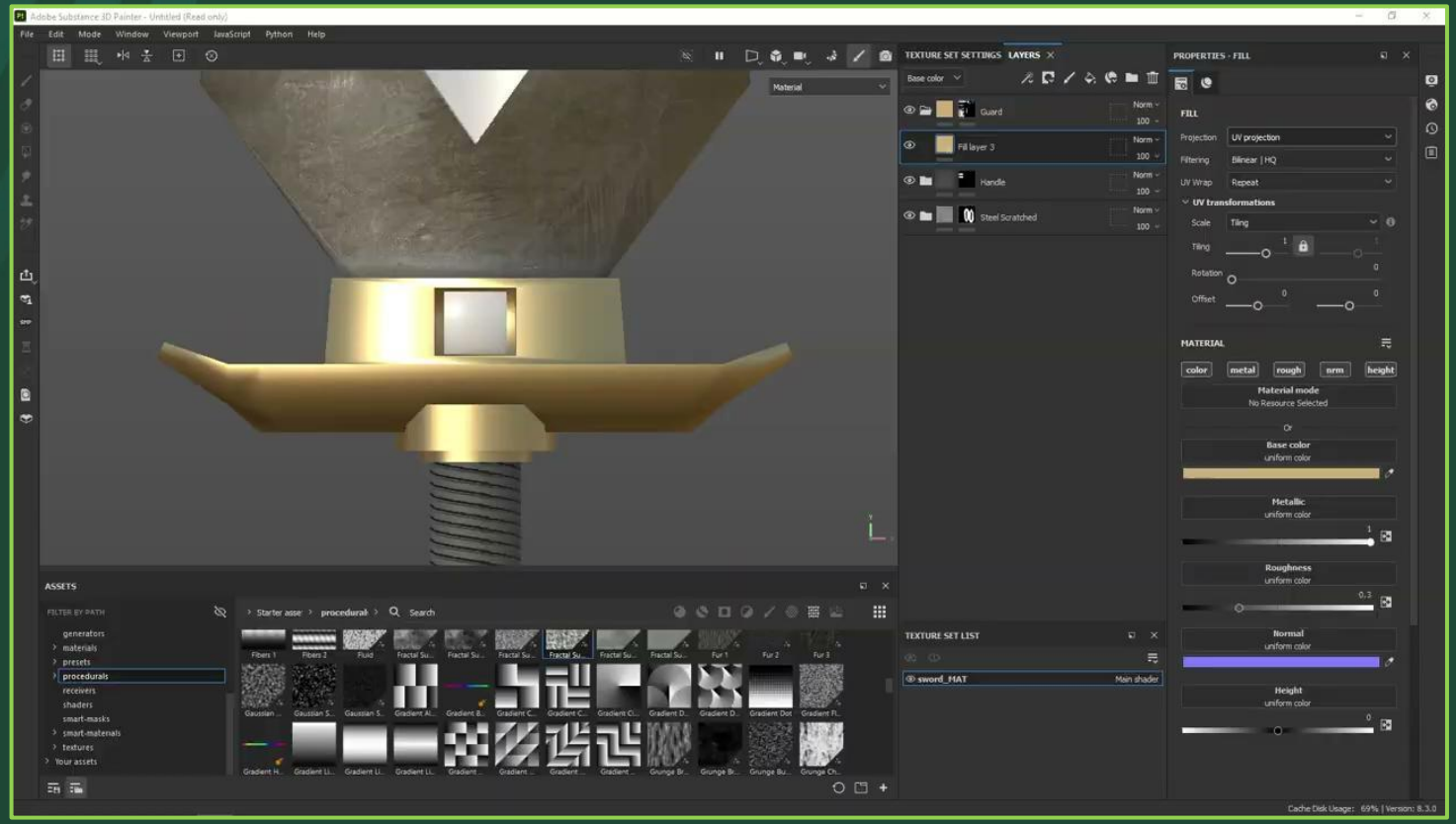
Tri planar projection will project the textures onto your model from every axis in the 3D view. This can be useful when UV seams show up in your textures ***Note*** *within the 3D window you can easily position, rotate and scale it here.*

1. Create a Fill and add texture into one of the channel inputs.
2. In the fill properties of the layer, next to projection click the drop down and change the projection type.
3. Move the projection gizmo in the UV and 3d viewport.

NOTE: UV Projected Textures will automatically tile across your UVs. You can change this within the 'UV Wrap' mode and set to 'None'

Editing Layers

Substance Painter | Blending Modes



Layers work a bit differently to Photoshop, since each layer controls multiple channels at once (Colour, Rough, Metallic etc).

You can adjust the opacity and blending modes of each layer's channels separately based on the drop down selected in your layer menu. This also applied to the Masks of layers.

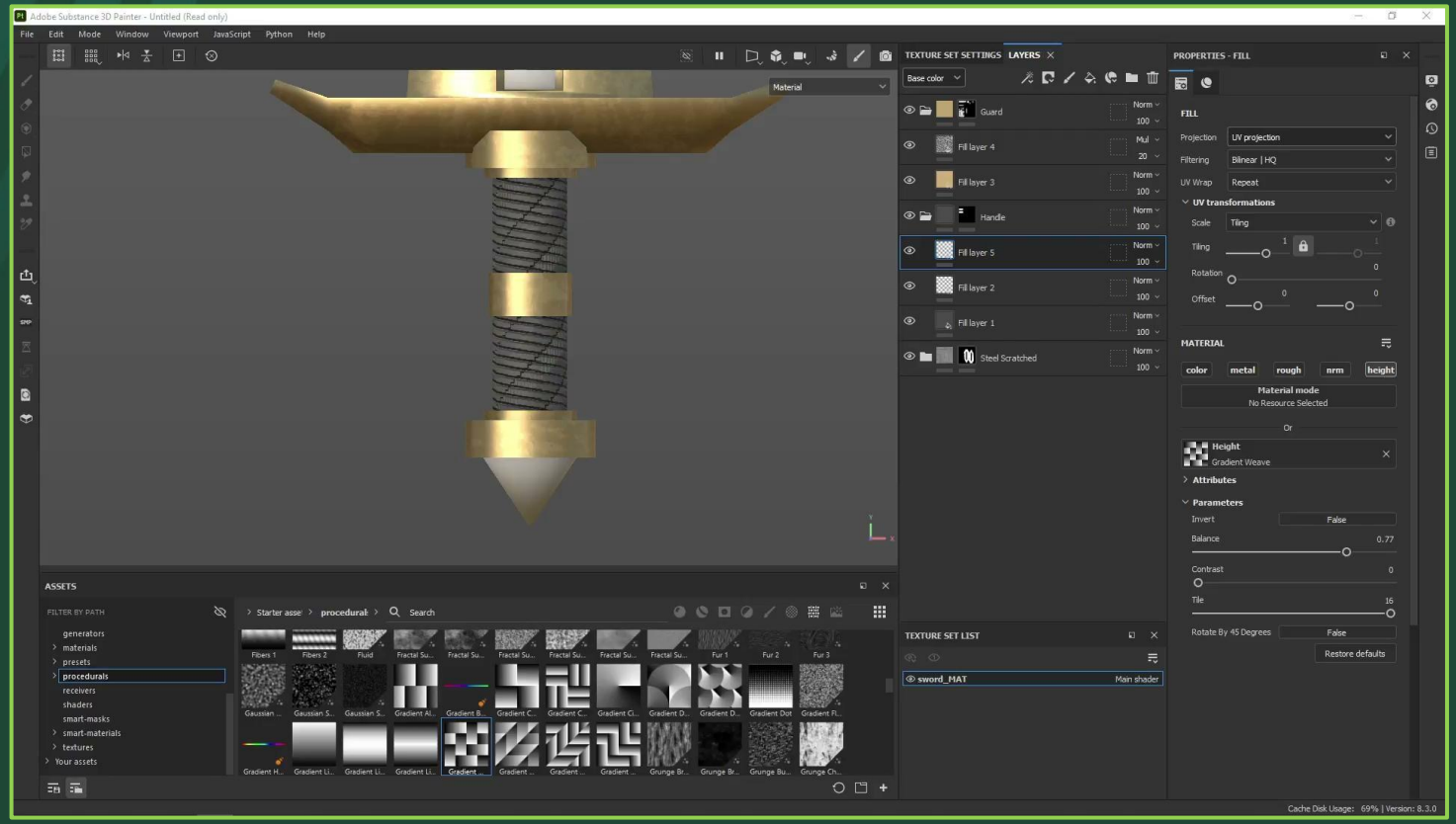
Common Blend modes:

- **Normal**: Simple Cross-blend, Top layer over the top
- **Multiply**: Blends **Blacks**
- **Ldodge** or **Screen**: Blends **Whites**
- **Passthrough**: Used to merge the layers below into a single layer

Height and Normal channels automatically combine details with layers below unless you change the blending mode of the layer.

Switch the layer from **Ldodge** (Height) **Normal Combine** (Normal) to the **Normal** blend mode in order to change from Combine to Replacing for these layers.

Substance Painter|Filters



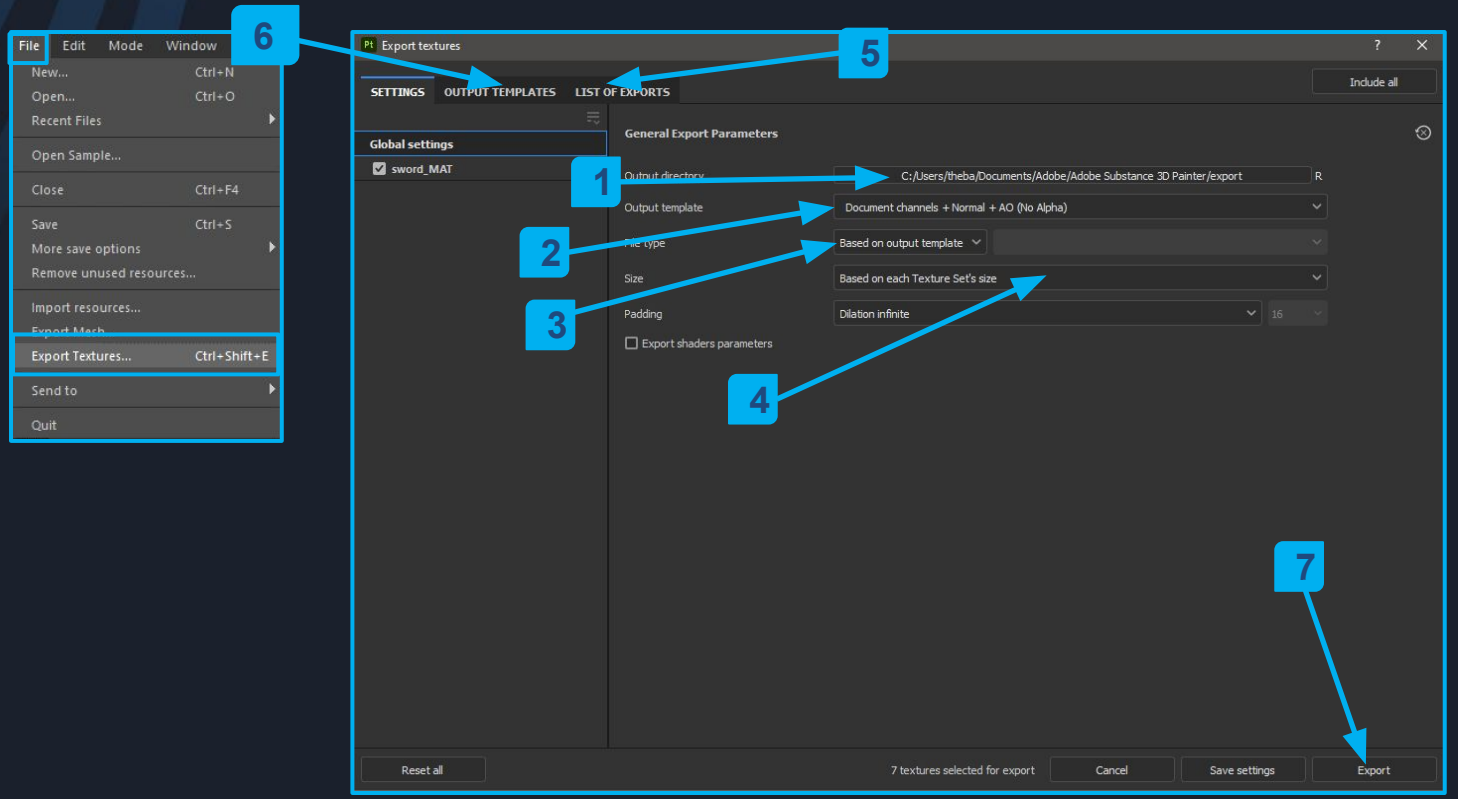
- Both Layers and Masks can be edited using **Filters.**
- 1 Right Click a Layer or Mask and select Add Filter.
- Click ‘No Filter Selected’ button and choose the filter you require.

Common Filters:

- Levels
- Blur
- Sharpen
- HSL (Hue Saturation Lightness)
- Colour Balance
- Colour Correction

Exporting Textures

Substance Painter | Exporting Textures

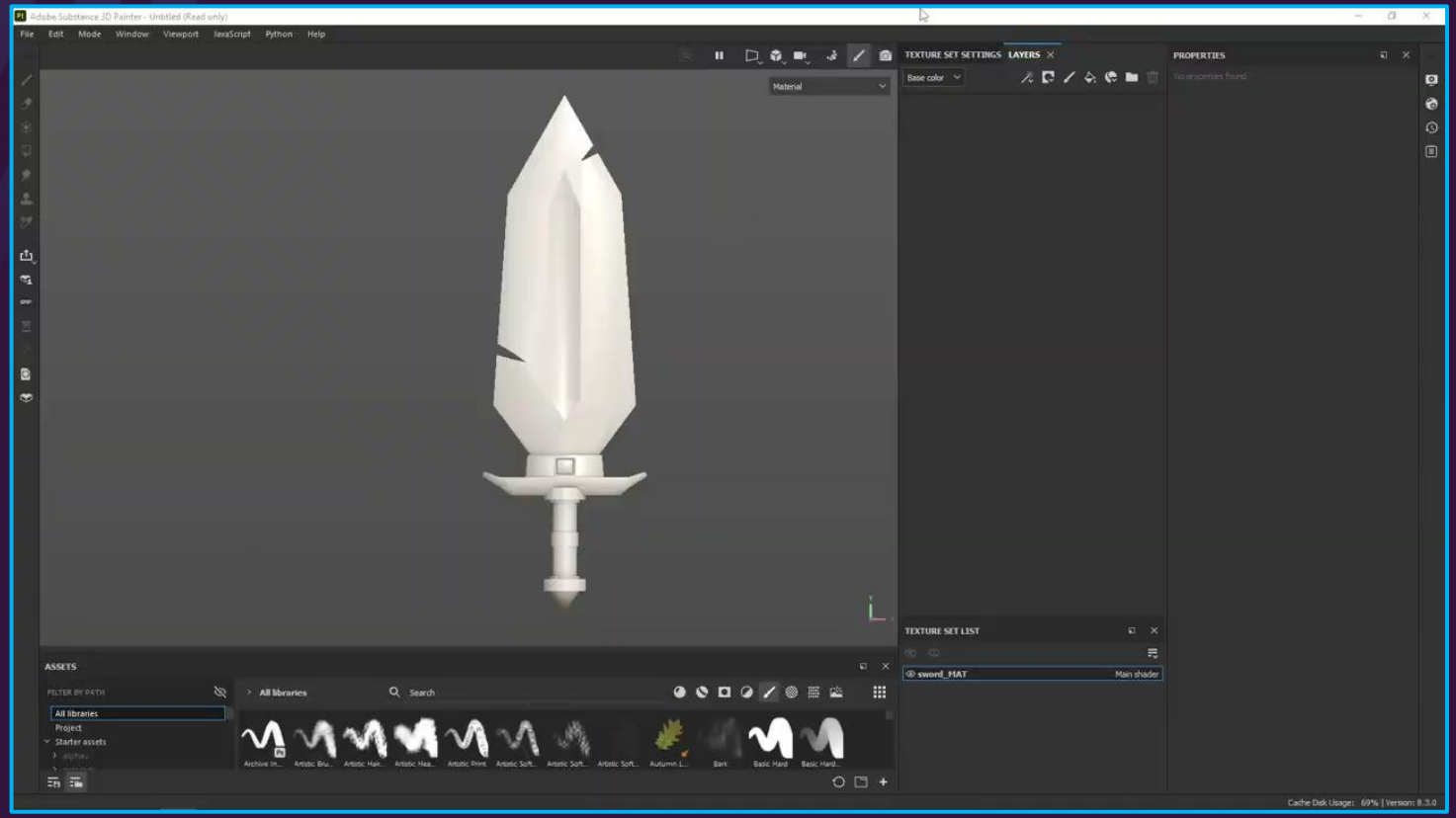


There are configurations to export your textures for your target platform.

File>Export Textures (Ctrl+Shift+E)

1. Export path
2. Output Template: Defines how the texture are named and formatted.
3. File Type: Texture format (will use Output Template if not defined here).
4. Texture Resolution (Will use Project Settings if not defined).
5. List of textures exported
6. Templates Details
7. Click to Export

Exercise|Texture the Sword



Practice what you've learned:

Create a textures for the sword.

Consider the following:

- Order your layers on the model as they would be in real life.
- Use fill layers and masks
- Utilise folders to organise your materials

You have 60 mins.

Painter - Intro | Summary

Today we have learned the basics of Substance Painter.

- Complete: You've imported a low polygon models into Substance Painter, learned how to use layers and mask.
- Usability: Substance Painter makes realistic texturing fast and flexible. Great for texturing everything from props to characters.
- What's next: Painter has many more features to allow you to texture a variety of assets. You will learn advanced techniques, baking, smart masks, and generators in the next subjects lessons.