



Creating textures in Photoshop is not just a case of painting strokes on a canvas, it's also about working with colour, blending details, creating customised brushes, working with photographic elements and using your eyes and brain!

This is a collection of tips that can help you to utilise Photoshop more efficiently and practically when working to create textures for your 3D models.

Layers are your Friends!

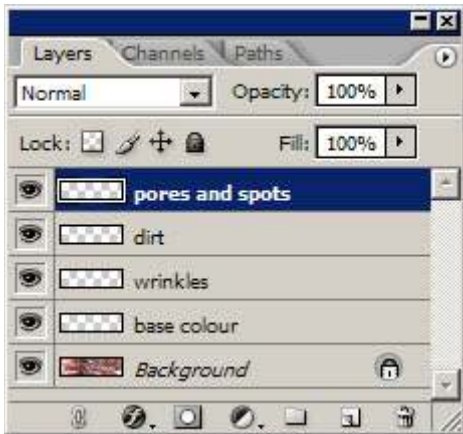
One of the first things that a good texturing artist needs to learn is how to properly use Photoshop's layer system for non-destructive texture creation. Using many layers also helps to ensure consistency throughout the different textures that you're creating for your surfaces by allowing easy copying of details from one map to another (discussed a little later on).

Working in a non-destructive manner means that you work in such a way as to separate and preserve the details that you paint, in case you need to modify or remove them at a later stage. The best way to handle this is to use lots of layers. While the drawback to using many layers is that your PSD file size is increased, which in turn uses more of your computers memory, the advantages of working non-destructively means that you'll have a more streamlined and efficient workflow.

Essentially, a good rule of thumb is to create all your various details on different layers. For example, if you're working on a skin texture for a creature, and you want to paint some wrinkles into it, rather create a new layer and paint your wrinkles onto this. Why do this? Well, because if you paint your wrinkles straight onto your texture that you've created so far, you could end up with an annoying task later on if you decide you want to change the wrinkles or remove them altogether. Simply deleting or erasing parts of the wrinkles would be much simpler if you have them on their own layer, than if you have to go and try and paint them out of the entire texture.

Using separate layers also allows you to utilise Photoshop's many blending modes, discussed


later on, to blend different details together on top of one another.



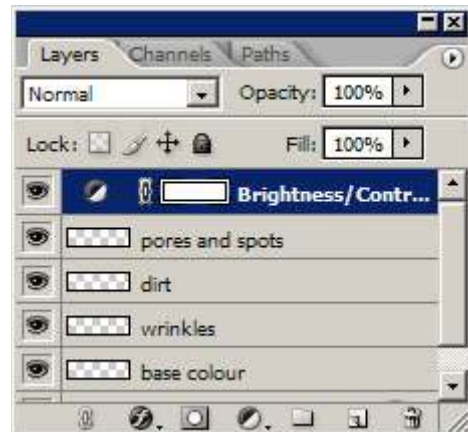
Production Tip: Always be sure to name your layers appropriately. When you're working in production, you may have to pass on your files to another artist at some point to work on. Naming your layers logically helps them to understand what you have been doing in the file, and also helps them (and you!) to easily navigate the file. There are few things worse than ending up with an image that has over 100 layers, none of which have any names! Save yourself, and others, the headache and get in the habit of naming your layers.

Adjustment Layers

Adjustment Layers are one of Photoshop's greatest, and yet often under-utilised, little treasures. They work in exactly the same way as Photoshop's Image> Adjustment commands (found under the top Image Menu), except that they actually layers that are added in your Layers palette, which affect all the layers beneath them, and can have different blending modes, layer masks and different opacity settings applied to them.

To create an Adjustment Layer, click on the  icon at the bottom of your Layers palette. You can then choose which adjustment function you want to create as a layer. Many of Photoshop's adjustment functions are available as Adjustment Layers.

This creates a new layer in your Layers palette that has the half tone icon alongside it, and automatically opens the adjustment dialog box so that you can make the desired adjustment.



To make changes to the layer later on, simply double-click on the halftone icon alongside the layer name. You can also alter the layers layer mask by clicking on the white box alongside its name. Painting or adding black or grey values into the layer mask will remove or lessen the layers effect in those areas, respectively. Remember that the Adjustment Layer affects all layers beneath it in the PSD file, or all layers beneath it in its own Layer Group (called Layer Sets

in Photoshop versions prior to CS2). Layer Groups are discussed next.

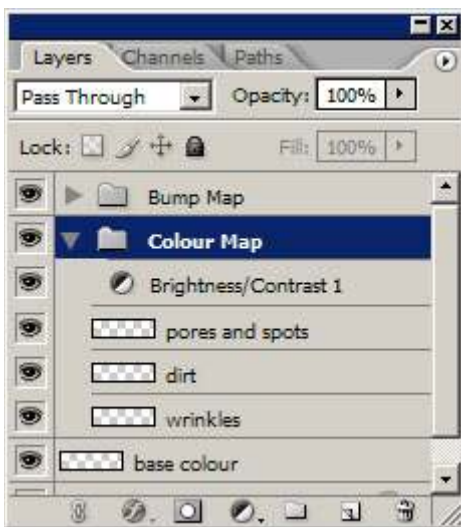
Remember that all Adjustment Layers can have their opacity changed, just like any regular layer, and can also be blended using different layer Blending Modes (discussed later) to create different effects. You can also change their position within the Layers palette by dragging them up or down the list.


Using Adjustment Layers is yet another way of working non-destructively. They are a great way to make adjustments to numerous layers at once without permanently altering the individual layers themselves.

They are particularly useful for making colour adjustments (Color Balance, Hue/Saturation) and tonal adjustments (Levels, Brightness/Contrast, Curves) to layers you have created but have then realised need some adjustment to them. This is particularly common once you've tested the textures on your models, when you often find that some things need to be altered slightly for a better effect. Perhaps your creature skin needs to be just a little more blueish, or maybe some of the details in your bump map need more contrast. Use Adjustment Layers to make these changes without potentially destroying your hard work.

Layer Groups

Layer Groups (called Layer Sets in previous versions of Photoshop) are basically like folders of layers within your Layers Palette. Use them to organise your layers within your PSD file.



Create Layer Groups by clicking on the  icon at the top right corner of your Layers palette and selecting either **New Group...** or **New Group from Layers...** (if you currently have multiple layers selected that you wish to group together). The latter option is not available in Photoshop versions prior to CS2.

Layer Groups are represented in the Layers palette by a small folder icon in the layer list. Each one's visibility can be switched on or off with its own eye icon, and can be expanded or contracted by clicking on the arrow alongside each folder icon.

Personally I like to create all the different maps for a single surface that I am texturing in a single PSD file. Using Layer Groups is a great way to organise and arrange the different layers for each surface attribute within the PSD file, by creating different groups for the Colour, Bump, Reflection, etc maps. This allows me to easily switch off the groups that I am not currently working on, and also makes the task of saving out the individual maps a bit simpler since you just have to switch on the Layer Group that you want to save while having the others switched off (the eye icon).

To add currently existing layers into a Layer Group, simply select them in the Layers palette and drag them onto the folder icon for the Layer Group into which you wish to add it. To remove a layer from a Layer Group, drag it onto the icon its group and it will be removed.

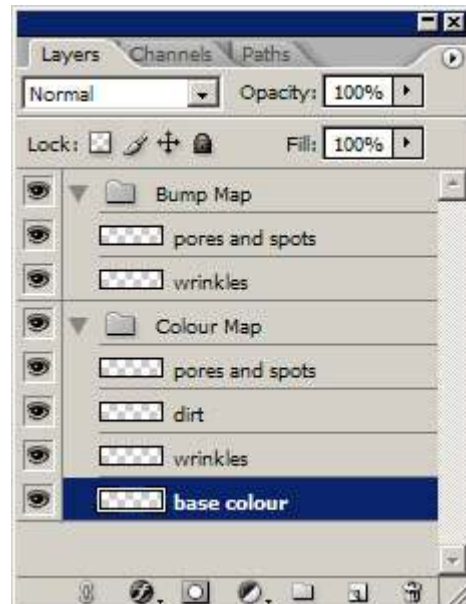
Layer Groups can also have layer masks and can have different blending modes applied to them as a whole.

Ensuring Consistency Between Surface Attributes

Working on your different details on different layers, as discussed previously, is also useful for ensuring easy integration of various details that you create into the various surface attribute maps that you're creating.

For example, if you create some wrinkles for your creature skin colour map, you'll also want to add them to your bump map and reflective/specular map, or vice versa. Keeping these on their own layers within their individual Layer Groups ensures that you can easily copy and drag them across into the various other Layer Groups for your other surface attributes.

You can then adjust them individually according to how they should affect each surface attribute. For example, your wrinkle layer, if a whitish colour in your colour map, can then be copied into your Bump map Layer Group, de-saturated and then inverted so that it behaves correctly for your bump map (if your 3D software interprets dark values in a bump map as being indented. Maya does this the opposite way around). When creating textures, it is safe to say that most of the time, most details will affect more than one, if not all, of your various textures for that surface. Organising and appropriately

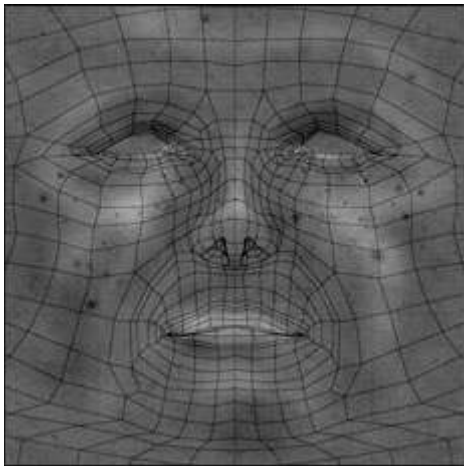


naming these layers, and keeping these details on separate layers as demonstrated, therefore helps to efficiently ensure consistency effectively throughout your entire 3D textured surface.

Greyscale Textures and the Dodge and Burn Tools



While scornfully disregarded by many “purist” artist types, Photoshop’s Dodge and Burn tools are extremely useful when creating greyscale textures for mapping surface attributes like Bump, Specular, Incandescence, etc. I also sometimes use them for making tonal adjustments to colour maps, but this can be tricky because they do alter the colour quite a lot.

Most 3D packages interpret greyscale images by making the lighter parts of the image increase the value of the attribute that you’re mapping, and having the darker parts decrease the value.



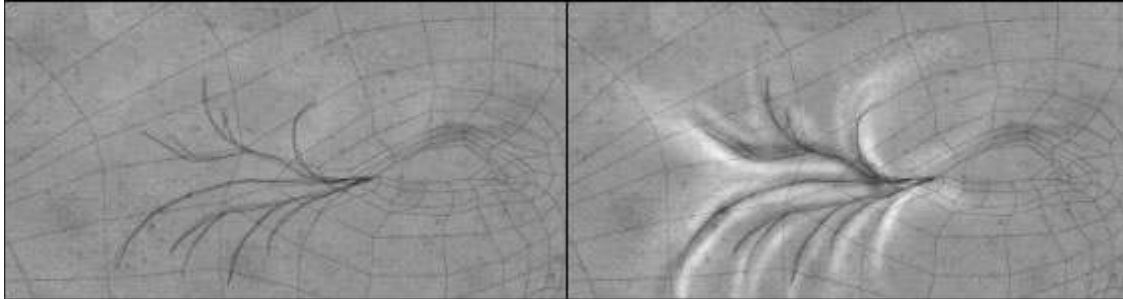
The image on the left, for example, shows a rough reflectivity/specular map for a character's face. The lighter areas are interpreted by the renderer as being *more reflective* while the darker areas are *less reflective*. So it can be generally understood that light greys increase the attribute while dark greys lessen it. There are some exceptions though, depending on the software.

So where do the Dodge and Burn tools come into this? Well, if they're great for adding some tonal changes to already existing layers. Now I know that I preached earlier about keeping things on separate layers, but sometimes it is safe to make permanent adjustments to layers, especially when working on things like reflection maps, bump maps, etc for making changes to the base layers.

The  Dodge (which makes things lighter) and  Burn (which makes things darker) tools are found in the Tools palette, above the Text tool. Hold down on the currently selected one to select the other. The tools are controlled by the **Exposure** value, which essentially determines the strength they have, and you can also select the tonal range that you wish to affect, whether it's the **Highlights**, **Shadows** or **Midtones** that you wish to work on. Generally Midtones (the default) generally suffices for most tasks, unless you specifically only wish to affect the light or dark areas of the image.

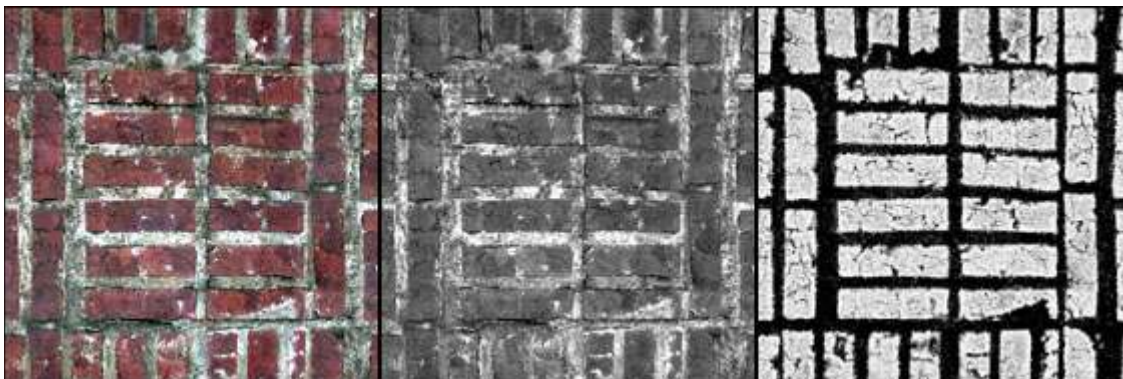
One particularly common usage of these tools for me is for softening details in my bump maps,

especially organic bump maps. The following two images show how a plain bump map for wrinkles, on the left, can be greatly improved by using the Dodge tool around the painted wrinkles (which are on a different layer!) to soften the transition around them, resulting in a more natural, organic effect on the right. Without this softening, the texture, once applied to the model, would likely result in a harsh, dug-in effect, as if the wrinkles were drawn in wet clay with wire.



Be sure to use low Exposure values when working with these tools, and rather build up the tones gradually. Using a stylus (such as a Wacom) really helps, as you have greater control over the pressure as well.

The Dodge and Burn tools are also useful for editing photographs that you are using as textures. Since you don't have the luxury of having the various details in the photo in separate layers, editing is often required to get the right effect from photographic textures. The following image shows a colour map from a photo on the left. The middle image shows the image de-saturated to grey, however this will not create the right effect for a bump map. The image on the right shows the photo which has now been edited with the Dodge and Burn tools to create the correct effect for the bump map.

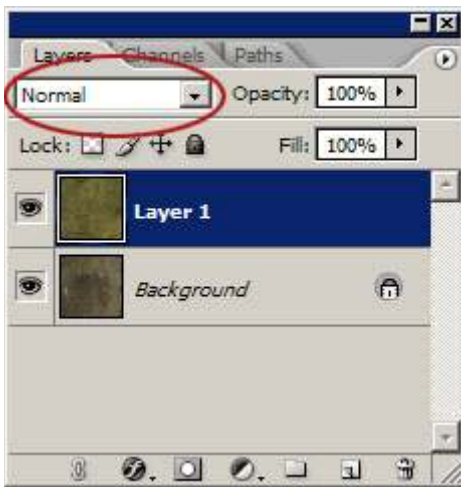


As mentioned previously though, do be careful when using these tools on colour images, as they can change the colours quite drastically, often creating harsh, undesirable results. Note that painting grey values on new layers using the Dodge or Burn painting modes with the Paintbrush

tool creates a similar effect, however I personally like the intuitive approach of building up new tones off existing tonal bases.

Blending Modes

Photoshop has many different ways of blending layers together. By default, all layers are opaque and do not blend together in any way. Changing the opacity value of a layer does blend the layer somewhat with underlying layers, but in a very linear fashion. Luckily there are numerous ways of blending modes together to create different effects.



You access the different blending modes at the top left corner of the Layers Palette. Although there are many to choose from, the ones I use most often myself are the Dodge, Burn, Overlay, Screen, Multiply, Soft Light and Hard Light modes. Each one of these modes, and the actual effect that they create, are explained in your Photoshop manual.

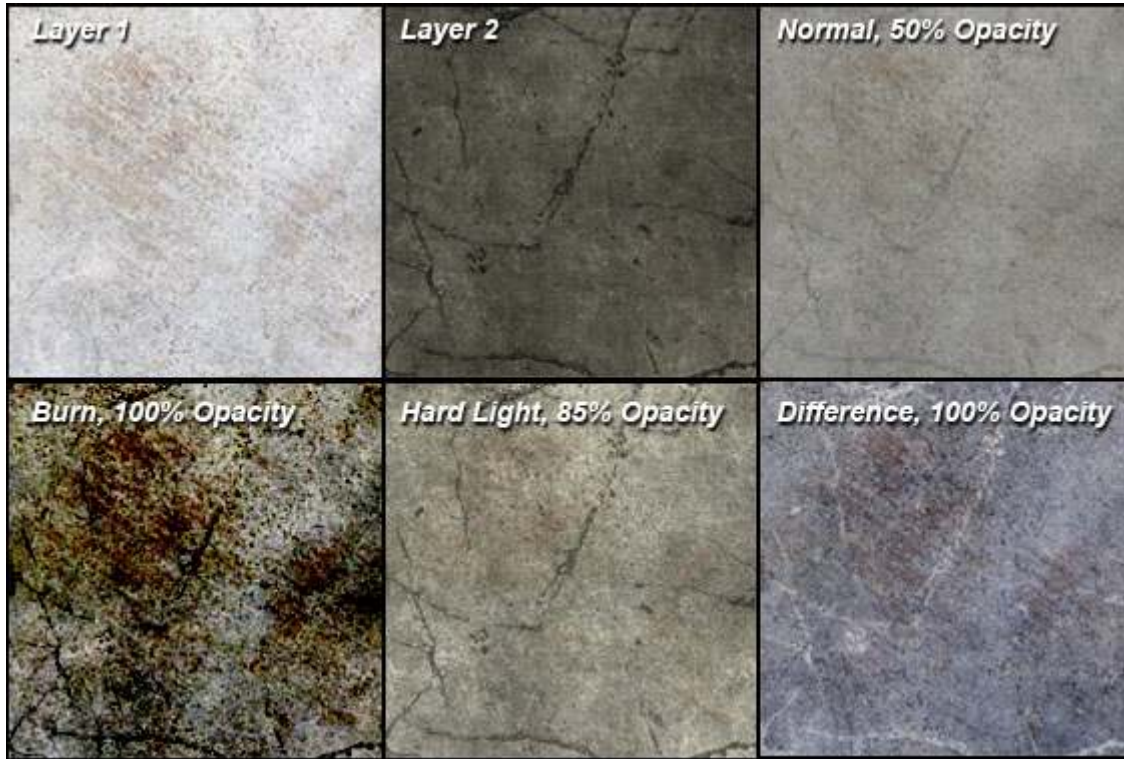
Blending layers together using these blending modes helps to create more depth to images and also creates more natural transitions and blends between different elements on different layers within a PSD file. Most of them tend to work more predictably with greyscale layers, but of course they're great for colour layers too. Some of them work very specifically with certain tonal values, such as the Screen mode which makes black areas transparent (and grey areas increasingly transparent the darker they get), and the Multiply mode which does the opposite of the Screen mode.

The great thing about a lot of these blending modes is that they create some really bold blending effects, mostly while retaining, or in some cases enhancing or even drastically altering, the way that the tones and colours affect one another, without simply losing clarity or becoming washed out, which is what tends to happen when you simply change the layers opacity.

The following image shows two layers - one plain concrete one, and another concrete image with cracks in it, placed above the aforementioned layer - blending together in different ways.

Notice how the different blending modes retain the richer tones of the details compared to the Normal blending mode with a lowered opacity, which tends to wash out the details and colours. No changes were made to each of the layers in these examples, other than changing the blending

mode, and in some cases changing the opacity of the second layer.



And these are only three of the many different blending modes! Experiment with different images and blending modes, using a variety of images, both colour and greyscale. Blending layers together is a great way to take elements from various sources (hand painted, photographic, etc) and have them affect one another in an organic and interesting way.

Photographic Textures

Photographs are a great help in texturing. Some artists feel that using photographs is “cheating”, which is silly, since working in CG requires a lot of trickery and cheating. And when you’re working on productions with big deadlines, you don’t really have a choice anyway - painting textures by hand can be very time-consuming, and frankly a lot of the time you can create the textures faster and more efficiently by using or incorporating photographic elements. The trick lies in finding suitable images.


By suitable images I mean photographs that have no lighting information in them - such as highlights or shadows, or light cast (colour bleed from lighting). Many commercial texture collections that are available for purchase on the web and such have shadows and highlights in their textures, which can cause problems because the lighting in the images can (and usually

does) clash with the lighting rig in the 3D scene. When you're using photographs for textures, rather try to find photos without their own lighting. If, however, you do find a perfect image but it has some lighting in it, there are ways to remove it. The two main options for removing lighting are either to paint them out (using paintbrushes, the Rubber Stamp clone tool, etc) or by converting your image to Lab colour and editing the Lightness channel.

Remember that colour maps should ideally contain only flat colour, as the shadows and highlights on the surface will be created by the surface shading, bump maps, displacement, etc and scene lighting, ambient occlusion, etc.

Firstly, let's look at manually painting the lighting out. Take a look at the image on the left. The top image shows a photograph of cut stones. While the lighting in it is, admittedly, rather subtle, it could cause a problem in a 3D scene, especially if viewed up close in a scene where the 3D lights are casting the objects shadow in a totally different direction. Ideally you should use displacement on the model itself to enable the different blocks to cast shadows, not the texture itself.



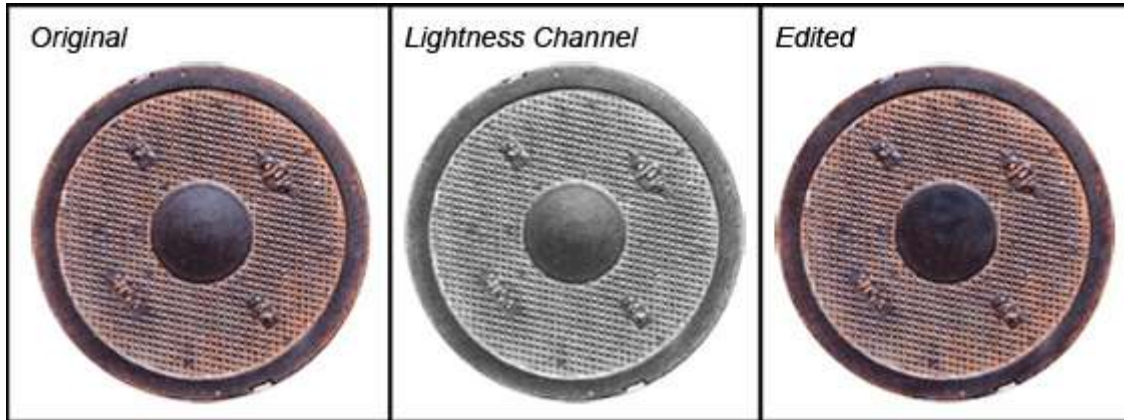
The bottom image shows the now-altered image. Using the clone tool (the Rubber Stamp  tool), I simply cloned surrounding areas to cover the shadow and highlight areas on the different blocks.

This flatter colour, used together with an appropriate displacement map (or geometry created to mimic the original details from the photo) would work better in a 3D scene since it would no longer clash with any local 3D light sources and shadows.

The second method, using Lab colour, is relatively simple as well. Unlike RGB images, which only have channels for Red, Green and Blue, Lab images have a Lightness channel that can be edited. To change an image to Lab colour, go to Image> Mode and select Lab Colour.

The following image shows a photograph on the right, then the Lightness channel in the middle. I then edited the Lightness channel carefully, using the Burn tool, and the result is shown on the

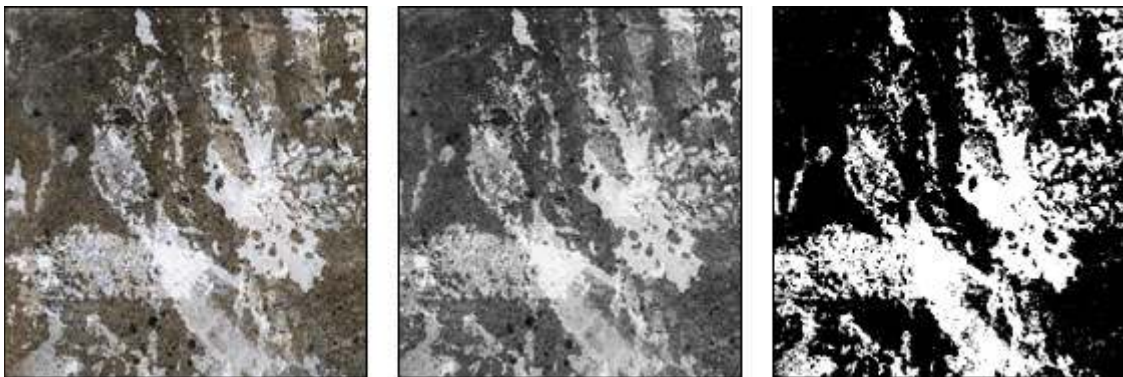
right. As you can see, the result is more appropriate for using as a texture as it no longer has the strong highlights, which were particularly noticeable in the middle part.



Customised Brushes

Every texturing artist needs customised brushes. Although there are brush packs that you can buy and download on the web, it is also very easy to create your own. A very popular type of brush used in texturing and painting is called a *grunge brush*, which is great for painting gritty details. These are very simple to create from photographs.

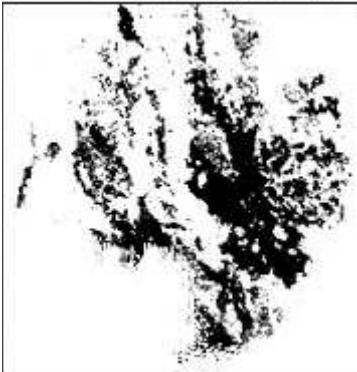
All you need to start off with is a nice, contrasted image with lots of nice details in it (shown below on the left). It's nice to have a variety of brushes with different types of details and different levels of complexity, so be sure to make quite a few from various sources. Once you have a suitable image, change it to grey (Image > Adjustment > Desaturate, or Ctrl+Shift+U), as shown in the middle below, and do a Brightness/Contrast adjustment on it to get a very highly contrasted result, as shown below on the right. For this last step you could also use Levels, Curves or even the Threshold command.





I decide that I want to make a brush of the white splatter part in the contrasted version of the image.

When making brushes in Photoshop, the black areas of the image selection become the opaque (solid) areas of the new brush, so I now invert the image (Image> Adjustments> Invert) so that the splatter pattern becomes black instead, as shown on the left.



The next thing I now do is work around the edges of the image a little bit, because I don't want a square shaped brush with sudden edges. So I take a white paintbrush, and just work around the edges a little until I am happy with the shape of the black details.

Now it is time to create the brush. The quickest way to select the black areas now is to simply go to **Select> Colour Range...** and using the Eyedropper tool in the Colour Range dialog box, I select the black and click Ok. With the black now selected, go to **Edit> Define Brush Preset**. This newly created brush is now added to your brush palette. To be safe, I usually like to save my brush presets whenever I create new brushes.

Of course, this is just a grunge brush, and you can make any kind of brush from any selection that you want. Any shades of grey within a brush will be semi-opaque, and having brushes like these can be really useful as well. Use these customised brushes to paint with, to clone with, to erase with, etc for more variation and detail in your work.

Grunge Mapping

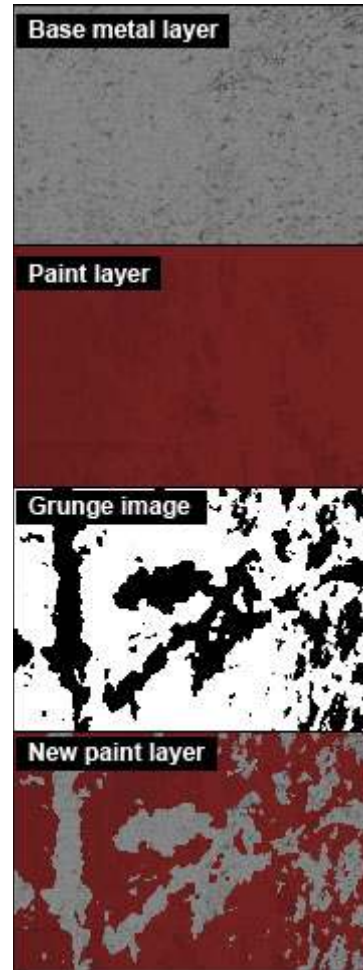
Grunge mapping is a similar technique to using grunge brushes, in that you use selections from contrasted images to create detailed grit and grime. However, in this technique you don't create actual brushes, but rather use the selections that you make within the image to cut out parts of layers or to create new, grungy layers from existing layers in your file.

The technique is really simple. Essentially all you do is create new grunge layers, and then make selections from them. With these selections, you can then either delete sections of layers, or you can create new layers from currently existing ones.

Let us say, for example, that you have a layer of relatively plain metal, and a layer of red paint. And you want to eat away parts of the layer of red paint so that it looks old and chipped. Simply find a suitable image, and using the technique described in the previous section, increase the contrast of the chosen grunge image until you have something that you can make a good selection from.

Once you're happy with the grungy details, select that layer and go to **Select > Colour Range...** and select whatever range of the image you want to use (whether the black areas, the white areas, or any grey areas that your grunge layer might have). In this example I chose to select the black areas of my highly contrasted grunge layer.

Once you have made the selection on this layer, you can now select any other layer that you want to affect, in this case the red paint layer. I then simply used that selection to delete that area of the paint layer, so that it shows the underlying metal one. This creates a good start for a chipped and scratched paint layer on top of the metal.



This technique is a very quick and very effective way of creating really great, realistically detailed grit that would otherwise be very time consuming to paint by hand.


Alpha Channels

Using alpha channels in images is the best method of isolating only certain areas of an image that you want to have showing on your 3D surface when you apply the texture to it. They're also a great way to blend multiple textures together on a 3D surface.

The way that alpha channels work is very simple - they simply create an additional channel in the image that acts as a matte. White areas of the alpha channel create opaque areas in the image, while black areas are totally transparent. Grey areas are partially transparent, with lighter greys being more opaque, and darker greys being more transparent.

To create an alpha channel, just go to the Channels palette (alongside the Layers one) and click



on the  icon at the top right corner and select **New Channel**.

A dialog box will pop up, and you can usually just accept those default settings and click OK. A new channel will now appear in the Channels palette, which you can edit simply by selecting it in the channels list.

Remember that in order to preserve the alpha channel in the image when saving it out as a texture, you have to save the image in a 32-bit image format, such as Targa, PNG or TIFF.

The images shown on the right show a cracked concrete image, followed by a quick alpha channel created simply with a paintbrush.

Fading the edges of the white areas in the alpha channel is a great method to use when you're wanting to seamlessly blend multiple images into one another on a surface. This is a popular method for hiding seams in textures, although it does require a bit of planning. This image is now saved out as a 32-bit Targa file.

As you can see in the third image, once the texture is applied to a 3D model in your 3D software, the software recognises that the image has an alpha channel, and makes all the dark areas of the alpha channel increasingly transparent, resulting in a smooth falloff in the texture, to reveal the underlying texture on the surface, which in this case is a checkerboard image.

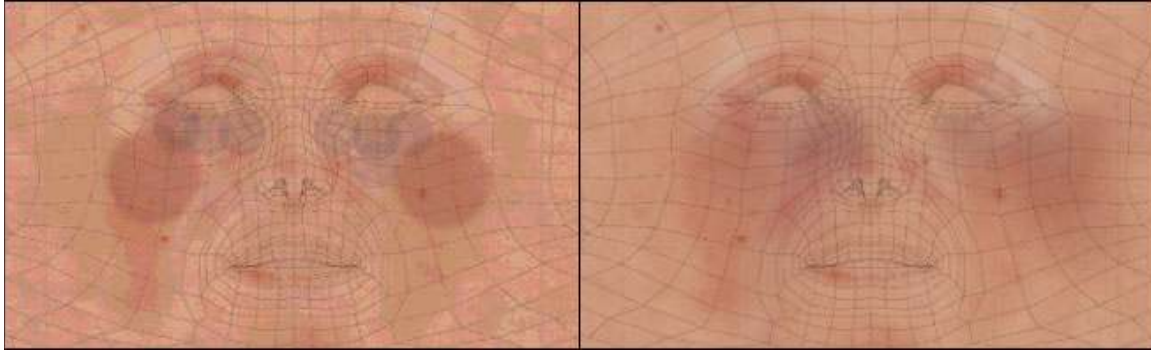


Soft Brushes

This one doesn't really need all that much explaining. When painting textures in Photoshop, especially organic textures, you should rely on soft-edged brushes instead of hard edged ones. You should also work on low opacity settings. This helps to create a far more organic look, as organic surfaces in real life very rarely have hard, bold splotches of colour on them.

Tones should always be gradually developed, with a great degree of delicacy, instead of simply splotching great big dabs of colour all over the place.

Consider the following two examples. The image on the left has details and tonal variations that are hard and unnatural, whereas the image on the right shows a far more organic, natural look created by soft edged, low opacity brushes.




When working on organic surfaces, I usually use opacity settings between 3%-8%, and gradually build up my various tones by slowly painting more and more layers of different, subtle washes of colour. Using a stylus, such as a Wacom, really helps with this process because it allows you a great level of pressure-sensitivity. Also regularly change the size of your brush while painting, to prevent noticeable patterns from occurring.

Useful keyboard shortcuts to know:

Shift+ [- decreases brush hardness / **Shift+]** - increases brush hardness

The two square brackets [] can be used to increase and decrease the size of your brush in increments of 10.

Using the Clone Tool

Everyone loves the Rubber Stamp  Tool, but you must learn to use it properly to avoid noticeable repetition all over the place.

As with painting, it is usually preferable to use soft edges, and also sometimes less than 100% opacity, when using the Rubber Stamp. This creates a more organic effect that allows you to clone parts of an image without making it too noticeable. Also be sure to frequently change the area that you are cloning from, by using the ALT key to define a new cloning point in the image.

Sometimes you will find yourself needing to use this tool with hard edges, but generally when working with organic textures, this isn't a good idea.

Creating Seamless Textures

You'll often find yourself having to create textures that are seamless in Photoshop. Seamless textures are useful for tiling across surfaces that don't need specific details, especially surfaces that are in the background, and are therefore not within the range of close scrutiny by the audience. Creating tiled textures is very common in the games industry as well.

Making images seamless in Photoshop is very easy - all you have to use is the Offset filter, found under **Filter > Other > Offset**. What the Offset filter does is shift the image over horizontally and/or vertically by a defined number of pixels. It shifts the image over by wrapping it in on itself, so if you shift it vertically by 50 pixels, those 50 pixels that now disappear on the right hand side will shift in on the left side. You can then use the clone tool to work over those seam areas that you can now clearly see, as demonstrated in the following image.

The image on the right shows the original, non-tileable image, followed by the image with the Offset filter applied (60pixels horizontal and vertical). The third image shows the reworked offset image, that will now be totally seamless and tileable.



Texture Scale

A common problem seen in texture work, especially from beginners, is an issue with the texture scale. By this I mean that an image, for example an image of a small piece of wood, is used to texture a massive wooden object in a 3D scene. When you do this, you mess up the sense of scale in the render, making the objects look as if they're miniature.

It is very important, when creating textures, to use your brain when deciding on how large the different elements in the texture are, especially when using photographs, or parts of photographs in your texture.

Have a look at the following two renders. The render on the left looks strange because the tread plate texture on the floor is unnaturally large. In reality we know that the indentations in tread plate are usually no larger than around 2cm in length each. At the scale that the texture currently is, it makes the floor look like it is, in reality, really small because our brains tell us that the piece of tread plate shown cannot be very large. The render on the right, however, looks more natural and believable because the texture has been scaled more appropriately for the scale of the actual buildings.



This same way of thinking should be applied to any kind of texture, whether it has patterns like the tread plate above or not. All kinds of textures, like concrete, sand, bricks, etc should all be carefully scaled within your texture so that they are correctly to scale.

When working with photographs, try to estimate or figure out what the actual scale of the photo is - in other words, try to figure out just how large, in reality, that piece of surface shown in the photograph is. Is it 30cm x 30cm? Is it 1m x 1m? Then simply ensure that when you use the photo as a texture in your scene, make sure that it does not exceed this scale when applied to your model. If your texture is roughly 50cm x 50cm, then apply it to a section on your model that is also 50cm x 50cm. Don't simply take some nice picture of a slab of concrete that you found, and then stretch it over the entire façade of a 10 storey building, because that will only end up looking strange.

When you're painting your own textures, use logic. If, for example, you're working on a texture for a wide courtyard, then don't paint tiles on the floor that would have been impractical in size to create in reality. Think about the logistics of building things in real life and try to work according to that. If you're unsure, simply do a search on the web for some reference images.

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About me: I am a CG artist, working in the feature film visual effects industry. I specialise in texturing, although I also do a lot of lighting and occasional modelling. I currently work for CafeFX (www.cafefx.com) in Santa Maria, California, USA. I've been using computer graphics software since the mid 1980's, and have been working in CG professionally since the end of 1999, specialising in texturing since 2001. I have had various articles on texturing published in numerous magazines, and also wrote *LightWave 3D 8: Texturing* for Wordware Publishing, and contributed to *LightWave 3D 8: 1001 Tips and Tricks*, both bestselling 3D titles on Amazon. I am currently writing a texturing book for Photoshop and Softimage|XSI (my main 3D application these days). I hope that you found this article informative and useful.

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