What is the Deal with Color?

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There are so many aspects of using color in Mandelbulb 3D that it is naturally confusing to many new users. In this tutorial we will discuss many different aspects of adding, changing or enhancing to color you apply to your image. We will reference the image below throughout the tutorial so parameters have been included.
In order to keep the image quick to render we will keep the size at 800 x 500 for most of the tutorial.

Mandelbulb3Dv18

{Titel: Tut}
Once you have loaded the parameters above and rendered the image we can begin.

**Beginning from the beginning**

Let’s take a look at Mandelbulb 3D now and talk about where and how color can be changed. We will have to bounce around the GUI a little but the bulk of our conversation will be about the lighting tab and the many different things we can do to affect change in image color.

There is a tab on the main window called coloring, however these radio buttons are beyond the scope of this tutorial. Suffice it to say, for now, that they have nominal effects of adding color to our image above. The are useful, just not for the basic color addition we want to speak to here.

Since the lighting tab is where all the controls for color really live let’s first talk about preset color palettes, how to use them plus how to create your own. Look at the area below the red line. You should notice a series of five preset colors to choose from. Each of them will change your image.
color palette. But hold on! What if you pick the first preset and you want to go back to the original image? That is what the arrow circling to the left is for.

As with most of Mandelbulb 3D if you hover over a radio button or any raised / colored command buttons and even some sliders, a pop up text box will appear to help you understand what function that item performs.
This is the case with everything below the red line. Some of these tips will be very helpful and some may seem to be more confusing than helpful. It is important that you investigate and read them however, as over time some of the ones you found confusing will make more sense.

Our First Moves

For the sake of simplicity the lighting tab has been moved over the main window in the image below so we can concentrate on the lighting tab and the effects it has on color! Notice that the first preset color button has been selected and the image color changed to the preset <sand> color.

It would be redundant to apply each of the five presets and supply a visual image for you to see the different colors, so instead we will move on to talk to the other settings below the red line. The M will allow you to save a color palette to a custom button, if you think you will use that particular
color frequently and want quick access to it without having to use a drop down to find it or have to create it from scratch again. Many artist do create color palettes from scratch and then save them to a collection where they can access them on demand. They also share these collections with others with no expectations of getting any credit for them if they are used by other artist. Check the file section of the FaceBook group Mandelbulb Maniacs for collections both large and small.

Below the M button is the Keep lights radio button. This refers to the positional lights you may have added to the image. When the checkbox is ticked, the positional light will not be affected if you change the image color. We will talk more about positional lights and how to use them later.

The open folder icon will allow you to search your system for a full light or color parameter not stored in the mandelbulb ini file. For example, you may have downloaded a single light file and want to use it. By using the open folder you will be allowed to import that single file into the program. If you elect to save it for use later, the save icon next to the open folder icon will allow you to do so, with it’s current name or you can rename it before saving. This is one method of building your own collection. If you download multiple color parameters you can unzip the file and extract it to your M3L folder and then the program will refresh by itself when you close and reopen it. That brings us to the drop down arrow. When you click the arrow, a list of all the color parameters in your M3L folder will be presented for you to select from. This is incredibly useful and powerful. You should get very familiar with this feature!
Diffuse Object Colors

If you want to create your own unique color for an image you have a way to do so, by selecting the color box next to the title Diff (shown below).

![Diffuse Object Colors](image)

This section is so powerful and daunting to many users that we will spend a lot of time here talking about the many facets of very useful tool. When you first click on the color box mentioned above the Color adjustment panel will appear. This color selection is the default color for this particular
image. It is not the default colors you would see when you first start the program. However for our purposes it will work just fine. The top grey bar is the specular color and the bottom is the diffuse color. This section will cover the diffuse color and how to adjust it. The diffuse color palette will have the most impact on your image and once you understand how to change it you will also know how to change the specular color as the process is the same. Notice to the right of the color adjustment window you see two buttons labeled Random. The top is specular and the bottom is diffuse. When you click on the bottom Random button the entire color bar on the color adjustment panel as well as the color on your image will change instantly. You can cycle through many color combinations until you find something you like. However, there may be that one color you just don’t want, or want more of to enhance your image. That is where all those little boxes come into play. Each box can be changed and or moved which will affect the entire color palette. Let’s look at the last box on the right, the one with orange color on the bottom. These boxes are all divided into three equal section and each section can have a different color assigned to it! The diffuse color is always the bottom box so that is what we need to concentrate on.

First, right click on the orange color and change it to black.

Caution: Read the following paragraph thoroughly before making any changes. See how the black affects the same area the orange did, but is
graduated by the grey color the farther it goes to the right. That is because there are several boxes of grey stacked on top of each other to the far right that limit the amount of black that is being used. If you attempted to move any of the boxes from the assigned positions they currently hold you would not be allowed to do so. In order to be able to move the box you must first untick the Glue sliders button. Do this now and move some of the boxes around just for fun. As you move the boxes the shades and colors will automatically affect your image. There is not reset back to where you began inside this popup so just remember that when moving your boxes around.

[You can use “That little arrow circling to the left to go back to where you began, but you may need to click it multiple times depending on how many changes you made].

If you want to play around moving boxes and changing colors without it affecting your image you need to uncheck the Auto update image button before making any changes!

So now you have changed the color of your image to something you really like, it’s time to save it. Go to the bottom of the lighting tab and click on the save icon, name your new color palette and click ok. Now whenever you open the program your new color parameters will be there waiting for you to apply them to another image. Not so hard is it?
Specular Lighting

A **specular** highlight is the bright spot of **light** that appears on shiny objects when illuminated (for example, see image at below). **Specular** highlights are important in 3D computer graphics, as they provide a strong visual cue for the shape of an object and its location with respect to **light** sources in the scene. Source [Wikipedia](https://en.wikipedia.org).

![Specular Highlights](image)

What this means for us is that the color assigned as the specular light will affect our images as the light coming from an outside source like the sun. For example you may need the source light to be blue instead of grey or yellow. That is when you would change the specular settings. For the most part you probably will not change this very often however.

Transparency

The very top box in the trio is for transparency. When you right click on this box you are not greeted with a popup color wheel. Instead you see a box with numbers inside. There is also a slider to the right of the box if you prefer to use it instead! The higher the number the more effect will have on
that portion of your color palette. For instance if the box has a diffuse color of blue and you do not want that color effected by transparency you would change the value to zero. All other colors would have some effect on them.

**Paint on Image**

If you have a Wacom style tablet you can click on the Paint on Image radio button on the far lower left and then paint on a specific portion of the image. This is very difficult to do with just a mouse or mouse pad. It is not impossible, but for the best results a tablet with pen is recommended!

**Those sliders and things**

We saved our color parameters and now we can fine tune them. The Diff slider will allow you to change the darkness of the colors you applied and the specular slider will add or decrease the highlights for the image. But there should be more that we can do to change the color palette and creatively change the overall image. Fortunately there is! We will start with Col cycling, 2. Choice and no ipol. If you uncheck the Col cycling box right now the image will turn green. Play around with these three in combination with each other and you will see that they can affect change in the color of the image. Before you throw up your hands and think you just have any control let's look at the most powerful tool in your color arsenal, the Color start and Color end sliders. Push the Color start slider all the way to the right, move slowly so you can see how it changes the image. Now move the Color end to the
middle and stop. What a dramatic difference. This would not be your final image as the colors still need some minor adjustments to really compliment the image and be pleasing to the eye of the creator as well as the public.

Diffuse and Light Maps

What would your image look like if you could use a picture of your dog as a texture? Diffuse maps and light maps are essentially the same image used to different ways. The images stored in the M3Maps folder are used to create these diffuse and light maps. There is a catch however. You can name your dog's picture dog.jpg but it will not work. Each image in the folder must be given a number for a name and they must be either jpg's or png's. If you have duplicate numbers with one image being a jpg and the other a png, the software will only see and use one of the two images. You can use all kinds of images a maps, including heightmaps. This is not a tutorial on heightmaps so we will not discuss them other than to say, that they too have to have a number for a name. Now that your dog's image
has been named 1.jpg if you click on the “[use a map for the diffuse color box” you will be allowed to pick any image properly named inside you M3Maps folder.

Let’s begin with Diffuse maps. By default the first image displayed is number one of course but you can have an unlimited number of maps in your folder. The texture is applied to the image instantly and can be adjusted using the sliders and radio buttons displayed below the drop down selector. We will discuss these in length, you will understand the sliders and radio buttons very quickly by just playing around with them to see how they affect the image. Note that diffuse maps override lightmaps. In other words if you are using rover as a diffuse map and the empire state building as a light map at the same time you will see both images effecting the color and texture of the image but the diffuse map will be more prominent. The scale slider should not be overlooked as it will increase the pattern of the map which can be useful in certain situations.
So how do you add a light map you may be thinking, since you now understand diffuse maps. Simply look for the lightmap tab at the top of the lighting tab and click on it.
There are several things we need to discuss here. First notice we have an active diffuse map and that now we have an active lightmap also. The lightmap is number two just for demonstration purposes in order to show the different colors.

The L1 tab at the top of the lighting tab itself indicates we still have five other tab lighting tabs we can assign lighting parameters to. We can use global lights, positional lights and lightmaps to all six tabs. In addition to these six tabs, all with independent lighting settings, we can also employ diffuse maps to our image. As with the diffuse maps, lightmaps can be adjusted using the sliders to the left. If we turn on the Combine map Y with diffuse color switch will add the Diff colors to the image in addition to diffuse map being used. The Gamma slider will add some shadows or brighten
the image where the L2 radio button softens the light and is independent of the gamma slider.

**Global light**

If you click on the L2 tab at the top you can see that it is already active and has been assigned a global light setting! You have several options on all of these tabs regardless of the type of light you choose to employ. You can change the color of the light simply by clicking on the brown color in this instance, you can increase the intensity of the light by changing the intensity values up or down. You can turn the light on and off by clicking the on button. The Diff: dropdown has four setting but if you are going to use hard shadows it is recommended that you only use the Cos and Cos^ settings. The Spec: dropdown has settings from 2 to 256 with 2 being the strongest. This affects the specular power and is helpful when lowering the brightness of a positional light used to imply a light through a window for example.

**Positional light**

There are some really tutorials out there about this topic so we won’t go into it in great detail. We will discuss how to deploy a positional light, how to adjust it and when to make it visible. Here the positional light color has been change to teal the number below the word visible has been increased to 4, so you can see where we place the light. You don’t need to have this set to four but until you do a couple of them it will be helpful. The image switch has also been activated so that the cursor will now appear as a crosshair inside the main image which will allow you to select the placement of the light.
The white circle surrounds the teal light. This was done so you could identify the location of the positional light before we increase the value and make a huge change in the image itself.
The Visible switch was turned back to zero and the Diff: and Spec: values were changed. However one thing about positional lighting is that it does increase the noise the image and can get out of control quickly. You will notice that the HS switch is highlighted in the example above. HS is for Hard Shadow. This switch enables the hard shadow, if calculated. If the HS wasn’t calculated, the ambient shadow decreases the light if enabled. Each tab has a HS switch so you can selectively apply it to as many tabs as you want.
Having all these options available to you in addition to hard shadows, ambient shadows, reflections and transparency gives you complete control over the way your final image will appear! So dig into the lighting tab and have fun applying the many different color choices the software offers you.

If you find any incorrect information in this tutorial, please contact me right away so it can be corrected. Happy Fractally!

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