In my last lecture, I shared with you the practical application of photography and how to obtain HDRIs using photographic techniques. This time I will be talking about the implementation of HDRI in a Maya scene and some tricks that I have learned. As with everything else, there are numerous ways of doing things, and what I plan on showing you is one way that worked for me. The Passes we will create using only an HDRI to light our scene are:
- Diffuse
- Specular
- Shadow
- Reflection

Ok, so you have an object that you want to use HDRI with. Let’s talk about how to go about doing so. First things first, let’s open our scene and get our object into view. (Yes that’s Woot you see on my screen).

![Figure 1](image-url)
I think the first and most important thing to do is to make sure that the default lighting is turned off in the render settings. You don’t want this mucking up your HDR lit scene. Also make sure that you’re using Mental Ray (Figure 1.1)

Ok moving on…. What’s next? Oh I know! Some HDR sweetness! That’s right! Let’s find the IBL settings, open the render settings(Figure 1.2.1). You see the Mental Ray Tab? In not change your renderer to Mental ray(Figure 1.2.2). Click that and then move down to the environment line at the very bottom and expand the line by clicking on the arrow. See the button next to Image Based Lighting called “Create”; click that (Figure 1.2.2). Guess what we get now? We get a shiny new environment sphere and a whole ton of new options in the Attribute editor for the IBL Node. Let’s talk about the next most important part, which is getting your image onto the sphere. Just click on the folder Icon next to the image name and load up your Light Map. Once your Light Map is loaded up it may or may not look weird. If it does look funny it’s most likely because the image you loaded up was that of a chrome ball. By default the Mental Ray IBL node is not set to handle this properly. It is set to handle a Lat/Long file which has a 2:1 aspect ratio and is basically a sphere unwrapped flat. To fix this simply change the Mapping at the top to angular. (Figure 1.2)
Figure 1.2.1

Figure 1.2.2
Ok now we have our light map plugged let’s talk about the render stats section. Since we are only going to use the IBL node to Emit light and nothing else, we need to turn off some stuff in here. First we need to: turn off Primary Visibility so that we don’t see our light map, turn off Visible as Environment so that it’s not visible in Primary Reflections, turn off Visible in Secondary Reflections and Refractions. Let’s leave visible in Final Gather even though we won’t be using it in this tutorial. Might be fun for you to experiment with! (Figure 1.3)
If you have pressed render at all up to this point and got only black don’t worry, that’s ok. Since presently we aren’t using final gather, we aren’t using reflections from our light map. Since we disabled default lighting we have eliminated any illumination or additive process in the scene. So, lets add some back! Go to the IBL node attributes which should still be open in your attribute editor and expand the Light Emission Part. Now I personally am not clear on what all the settings in here because quite frankly there isn’t a lot of documentation on the subject and what documentation there is, is lacking. I can guide you through the important stuff though. (Figure 1.4)
First, click the check box that says emit light and just like that we have turned on the complex process of emitting light from an image. It’s all downhill from here… no wait, uphill I mean. Finding those magic numbers can be frustrating. The first thing you are going to do is set your Quality U/V to the size of your Light Map. This just sets up “A control Texture for light emission. Every Pixel in that texture virtually represents a directional light.” –Maya Help Docs. These numbers can greatly increase or reduce your render times so treat them with care. Next we have the Samples, and I think the best explanation comes from the help doc’s again, “Sampling all “directional lights” represented by the control texture is often prohibitively expensive. Therefore the shader has a built-in importance mechanism that attempts to select the primary (key) lights.” –Maya Help Docs. Basically what I have found is that increasing these numbers increases your render time but also increases the quality of your shadows and light. Vary focus will offset the direction of all your “directional lights” randomly and improve quality. Last but not least, disable back lighting which should only be unchecked if you have something in your scene that is transparent like glass that greatly optimizes the sampling in your scene.

Whew, I think that covers most of the important stuff! I think everything else is pretty self explanatory, but the best way to learn is to just start clicking some stuff and get your hands dirty! See what comes of it!(Figure 1.4)
Ok, let’s get the last thing setup so that we can get into the render passes part. If you have noticed by now we have everything in our beauty pass except for reflections. Adding reflections requires you to create a polygon sphere. After creating the polygon sphere you will scale it to about the same size as the IBL Node, and apply a surface shader to the sphere. After applying the surface shader to the sphere you need to go to the out color of the surface shader and click the create render node button that looks like a checker box next to the attribute. (Figure 1.5)

At this point it’s important that your reflection map is a lat/long. If it isn’t, you can easily fix this with HDR shop by just looking up panoramic transformations. This is because the IBL is the only place that I have found that supports Angular mapping in Mental Ray. Anyway, once you get the “create render node” dialog box make sure you choose as projection and then click file. After that in the attribute editor for your shader, change the Projection type to Spherical. Next select your lat/long and now when you render you will have reflections. You might notice that you see your reflection map in the background; this is an easy fix. Select the polygon sphere and pull up the attribute editor and go to render stats. Turn off: Primary visibility, Cast Shadows, Receives Shadows, Double Sided and click opposite. Now you have a sphere that only contributes to Reflection and Refraction, nothing else.
Dang… That’s a lot just to get the HDRI lighting setup, so now we should break it down. My approach to this problem was, I think, relatively simple. If you think of using Emit light in the IBL node as the same thing as making a ton of spot lights then everything will make sense. (Figure 1.6)

Diffuse Pass-
For the diffuse pass, all we have to do is eliminate everything except for the diffuse rays. To do this we have to create a new render layer. Make sure that you create an empty layer (don’t use the add selected geometry to render layer… this button can be buggy). After which you can select everything that has diffuse in it and right click and add to that layer. Make sure that you don’t add the reflection sphere, not that it really matters, but it will help in keeping your scene clean. Next, right click on your render layer and go to the attributes of that layer. Turn the Override on for: Cast Shadows, Receives Shadows, Visible in Refractions and Reflections. Next go to the attributes for the IBL node and under Emit Light Uncheck: Emit Specular and Raytraced. You should have something like below.(Figure 1.7)
After that you should get a render that looks something like this with only diffuse information in the image. As you can see we have separated out the diffuse information. (Figure 1.8)
Specular-
This is pretty much the same stuff as before, so create a render layer and call it Specular. Once again add everything to this layer that has Specular information. Also we want to setup this layer the same as the diffuse pass. After that’s setup, go back into the attribute editor of the IBL node and uncheck Emit Diffuse and Check Emit Specular. (Figure 1.9)

![Figure 1.9](image1.png)

Now Press render and you should get something like below. (Figure 2)

![Figure 2](image2.png)

Shadow-
Now to the fun part, separating out the shadows. Once again create a new render layer and add everything to the scene that receives shadows. On the Attributes for this layer make sure that you leave
cast and receive shadow alone on, turn off reflections (this also might not matter, but better safe then sorry). Once you’ve done that go back to the Emit Light options in the IBL node and turn make sure that Emit diffuse. Next go to the Hypershade and create a “Use Background” Shader. In the use background shader set Specular color to black, Reflectivity to 0, and Reflection limit to 0. Leave shadow mask white. Lastly, while you have the shadow layer selected, right click on the “Use Background” Shader you just created and select “Assign Material Override.” Now every object in this layer will have this shader applied in this layer. (Figure 2.1)
After all of that hit render on and you should get an image that looks something like this in your alpha channel. (Figure 2.2)

![Figure 2.2](image.png)

Almost done just a little more. This next one should be interesting!

Reflections-
So initially I must say that there is a problem with my method of doing what we are going to do next. You may notice that the only kinds of reflections you will receive are global reflections or ones from the HDRI, but not from the geometry it’s self. I developed my own process for this, but it is highly impractical. I am going to try to avoid bringing this up and instead will show you another process that I found online from someone much smarter than myself. Since Reflectivity is an additive process we don’t need lights for the Shader to interact with HDR Environment map. So let’s set it up our reflections. Create a new render layer. For my teapot scene I only want reflections on the teapots themselves since the ground plain isn’t reflective. So, I have only added the teapots to my render layer. Next remember the reflection sphere we created earlier? Time to put it to use! Select the reflection sphere and add that to the reflection layer. Go to the attributes of the reflection layer and turn the Override On for Cast Shadow and Receive Shadow. Last but not least, go to the IBL Node settings and turn off Emit light. (Figure 2.3)
Now press render and you should get something like this. (Figure 2.4)

See the problem (Figure 2.4)? I do! How to fix this? Well there are 2 ways to go about this the first way I will try to explain as clearly as I can and the second way I will leave it up to you to go to another website for the tutorial.

The first way is to create a new render layer. In this layer you need to add everything just as if it was a beauty pass. Once you have done that you need to select the object that is going to receive reflections for this pass, and a assign a blinn material to it (this will be our reflection shader). Now open the
shader’s attributes set: Color to white, Diffuse to black, Ecentricity to 0, Reflection to 1 and Specularity to white (courtesy of Bridget Gaynor). Select everything else in the scene and turn off the primary visibility. This should give you a nice reflection but without self reflection (Figure 2.5). I did manage to conquer the problem of no self reflection on a previous project but in a crude way. If you where to duplicate the geometry that you have the reflection shader on, place the original shader back on it on it and just turn the primary visibility off on the duplication you will get yourself reflections.  (Figure 2.6)
The second way was done by someone more adept than me. By using some of the new production shaders, that are unsupported currently but can be unlocked, we can remedy the situation. I am not going to get into explaining how to do this in my tutorial but if you go to http://www.djx.com.au/blog/category/tutorials and get all the information you need from this amazing dude!

*Figure 2.7*
Well that about does it! Below is a final composite with all the render passes that we created here plus an Occlusion Pass. If you have any questions please feel free to contact me as with everything there is always more to cover. Hopefully this helped and you learned something new! Remember be creative when trying to come up with different render passes and keep thinking outside of the box. There is always an answer. (Figure 2.8)

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www.DMCscad.com