In this tutorial we will cover how to convert a scene that has been setup for use with the mental ray renderer to MtoA. We will cover how to use the Standard shader to create realistic materials such as glass and metal. We will also replace the existing scene's lighting with the Skydome light in combination with a Physical Sky shader to give us more control and a more realistic look. Lastly, we will add a background and render the scene.

The original Maya scene files for this series of tutorials can be downloaded from Autodesk's Hyperspace Madness production.

This tutorial will cover the following topics:

- Lighting
- Shading
Rendering

Our intergalactic hero ‘Sven’, whom we will be shading, lighting and rendering with MtoA

Lighting

- Create an Ai Skydome light
  - Arnold > Lights > Skydome Light.
- Connect a Physical Sky shader to the Color attribute of the Ai Skydome light.
- The lighting looks a little bit dark. Try increasing the Exposure of the Ai Skydome light to around 1 (f-stop).
When you are happy with the lighting and are ready for final rendering, increase the number of Samples to 3 in the Ai Skydome light to reduce any shadow noise. Otherwise keep it at 1 when test rendering with the IPR.

Shading

The scene contains various Blinn and Phong shaders. We want to convert these shaders to more physically accurate shaders within MtoA. Fortunately, we can use the shader Type menu in the Attribute Editor window to convert them. We will largely be using the multi-purpose Ai Standard shader.
Space Suit

Sven's space suit comprises of several Blinn shaders assigned to his arms, legs and torso.

- Select one of the shaders and change the shader ‘Type’ from Blinn to Ai Standard. Maya will automatically connect the file texture to the Diffuse Color, which is what we want.
- Increase the Specular Weight to 0.3. The Diffuse Weight is already at 0.7 and so a value more than 0.3 would exceed 1 which would not be physically accurate.
- Change the Microfacet Distribution to ggx. GGX is suitable for modeling light reflection from surfaces more realistically than Beckmann.
- Enable Fresnel. Fresnel has a large effect on almost all materials such as glass, water and smooth coated surfaces. Increasing the Reflectance at Normal value gives the material a more metallic-like specular reflection, so keep it to a low value such as 0.05.

More information about Specular Fresnel can be found [here](#).

Face

To get a realistic skin shading effect we could use the Ai Skin shader, however, our character is quite
stylized and so to keep it simple we will use the Standard shader. It has a realistic Sub-Surface Scattering attribute which suits our single color map well.

- Convert the Blinn shader that is assigned to the head to a Standard shader.
- Connect the color map **sven_diffuse_u1_v1.1k.jpg** to the **Sub-Surface Scattering Color** attribute.
- Decrease the **Diffuse Weight** to 0 and increase the **Sub-Surface Scattering Weight** to 1.

```
'sven_diffuse_u1_v1.1k.jpg' color texture map connected to Sub-Surface Scattering of Ai Standard shader
```

- Set the **Diffusion Profile** to **Empirical**. This uses a more physically accurate subsurface scattering profile, that, with a single layer, can capture both surface detail and deep scattering.

```
SSS Diffusion Profile set to Empirical
```

**Hair**

For the hair, we will create a simple plastic looking shader.
• Assign a Standard shader to Sven's hair and eye brows. Connect the file texture `sven_diffuse_u1_v4` to the Diffuse Color of the Standard shader.

• Increase the Specular Weight to 0.3. The Diffuse Weight is already at 0.7 and so a value more than 0.3 would exceed 1 which would not be physically accurate. Change the Microfacet Distribution to ggx. GGX is suitable for modeling light reflection from surfaces more realistically than Beckmann.

• Enable Fresnel. Fresnel has a large effect on almost all materials such as glass, water and smooth coated surfaces. Increasing the Reflectance at Normal value gives the material a more metallic-like specular reflection, so keep it to a low value such as 0.05.

Eyes

The eye geometry consists of two objects in this scene: Eyes and Corneas. The eye geometry sits inside the cornea geometry. Therefore the eye color should be assigned to the eyeball.

• Assign a Standard shader to the Eyes geometry as in the image below.
- The eyeballs have a texture **Sven_Eye_Color_1k.jpg**. Connect it to the **Diffuse Color** and also the **Sub-Surface Scattering Color** attributes.

![Sven_Eye_Color_1k.jpg texture connected to Diffuse Color of AI Standard shader](image)

- Increase the **Sub-Surface Scattering Weight** to no more than **0.3**. The Diffuse Weight is already at 0.7 and so a value more than 0.3 would exceed 1 which would not be physically accurate.

  More information about physical accuracy when using the Standard shader can be found [here](url).

Cornea
The cornea geometry needs a wet thin film shader to surround the eye ball geometry. Assign a Standard shader to it. Reduce the **Diffuse Weight** to 0. Increase the **Specular Weight** to 1 and increase the **Specular Roughness** to 0.1. This will give a larger glossy specular highlight on the eye.

Now we need to make the cornea shader transparent. Increase the **Refraction Weight** to 1. Change the **IOR** to that of water (1.33). Lastly, enable **Fresnel Use IOR**. This will give a realistic specular fresnel shading result based on the index of refraction that we have used (1.33).

As with all non-opaque geometry in MtoA, you should disable '**Opaque**' in the Arnold attributes for the geometry.

Your finished eyeball render should look like the image below.
Helmet

We will assign a glass material to the helmet. The helmet has been modeled with thickness and the normals are facing in the right direction. This is essential when rendering realistic glass surfaces with MtoA.

More information about rendering glass surfaces can be found [here](#).

- As with all non-opaque geometry in MtoA, you should disable 'Opaque' in the Arnold attributes for the geometry.
- Assign a Standard shader to the helmet and rename it to glass. Reduce the **Diffuse Weight** to 0. Increase the **Specular Weight** to 1 and reduce the **Specular Roughness** to 0. Enable Specular Fresnel.
- Increase the **Refraction Weight** to 1 so that the glass is fully transparent. Change the **IOR** (Index of Refraction) to that of glass (1.5). If you want to add a tint color to the glass, change the **Transmittance** to a light color. Lastly, enable 'Fresnel Use IOR'. This will give a realistic specular fresnel shading result based on the index of refraction that we have used (1.5).
Helmet glass shader

When we render the helmet glass we can see that the eye cornea (also a refractive material) appears black. This is because MtoA only traces two refractive rays by default. We must increase this value to allow more rays to penetrate the glass and the cornea shader. In the images below you can see the difference when increasing the **Refraction Ray Depth**.

![Refraction Ray Depth: 2 (eyes appear black)](image1)

![Refraction Ray Depth: 4 (eyes are visible through the glass)](image2)

**Helmet Collar**

Let's change the shaders on Sven's collar (and air tank) to have a more 'metallic' appearance.

- Change the Blinn shader that is assigned to the 'Helmet Collar' geometry to a Standard shader.
- Lower the **Diffuse Weight** to something like 0.4. We can increase the **Specular Weight** to 0.6 to make the shader appear more shiny.
• Change the **Microfacet Distribution** to **ggx**. GGX is suitable for modeling light reflection from surfaces more realistically than Beckmann.

• Enable **Fresnel**. Increasing the **Reflectance at Normal** value gives the material a more metallic-like specular reflection, so increase it to a large value such as **0.6**.

![Metallic Standard shader](image)

**TX Manager**

When you have completed shading and texturing of the scene, you are ready to use the **TX Manager** to convert the textures to **.tx** format. You should get into the habit of converting your file textures to the **.tx** format as they render faster and are more memory efficient than using other file formats such as **.png**, **.jpg**, **.tga** etc.

**Rendering**

**Background**

• Open the **Render Settings** window and go to **Environment**. Connect the **Physical Sky** we created earlier here by clicking and holding on the ![icon](image) icon to the right. It should appear in the drop down menu.
Sampling

Open up Sampling in the Render Settings Window. For test rendering Camera (AA) samples at 3 is fine. However, for final frame rendering you will want to increase it to at least 5.

A simple guide to sampling can be found here.

Arnold Log

When rendering scenes with MtoA it is a good idea to get familiar with the Arnold Log in the Diagnostics tab of the Render Settings window. This log file will show you any warnings and statistics which will help you diagnose your scene file.

A guide on how to read a render log can be found here.

Thats it. Congratulations, you have successfully converted a scene from mental ray to MtoA! Now go out there and explore new worlds of rendering!