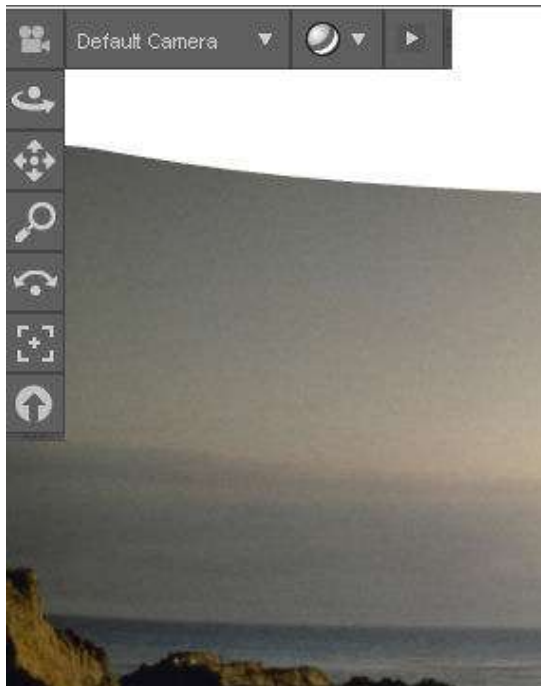


Cameras

Preface: This is the Portable Document Format (.pdf) version of the article appearing at: <http://artzone.daz3d.com/wiki/doku.php/pub/software/camera/start>.

There are several cameras and associated controls within DAZ Studio™. The most familiar controls are those used to view the 3D space you create. Most users know the basics of creating and moving the camera using the main camera controls.

Other cameras include orthogonal and perspective views applied to view ports in the workspace. Together these controls allow the 3D artist to look around the scene and aid in the placement of objects. For more details on these cameras, follow the link to the User Documentation and review the sections under Tab References titled Viewports and Cameras and Using the Camera Controls.



This article covers the other camera parameters allowing detailed control over the viewing area, focus points and depth of field control. These parameters affect the cameras used to view the scene and the resulting rendered images. These also allow the 3D artist to manipulate the image to emphasize specific details, draw the viewer's eyes to certain points in the image, and add a realistic handling of objects in the foreground and background. These controls replicate many aspects familiar to most photographers and duplicate these aspects in renders.

The basic documentation on DAZ|Studio™ can be found at the following link:

DAZ Studio User documentation (online version):
http://documentation.daz3d.com/studio/DAZ_Studio.htm

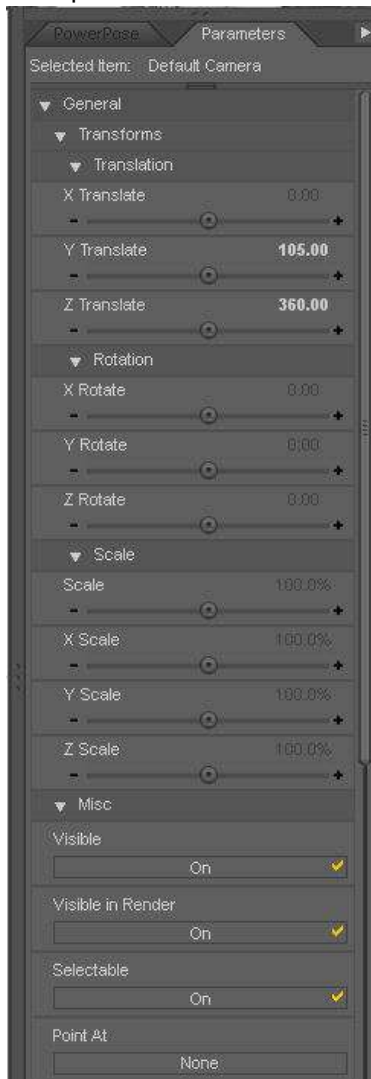
This document is set up following the areas

- Overview of Camera controls
- Camera lens terms and theory
- Focal Length Controls (brief explanation with link to existing article)
- Building an example scene for Depth of Field controls
- Depth of Field Controls
- Examples of DOF controls used

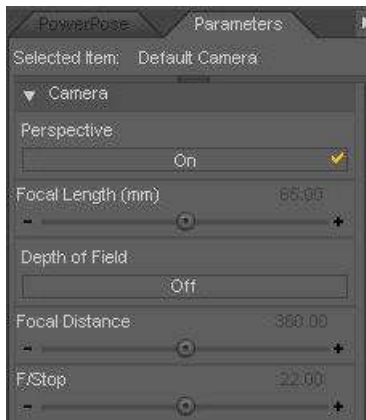
Overview of Camera controls

The controls discussed here show up when the user selects a camera (whether default or user created) from the Scene tab. The controls show up in the Parameters tab. You can view the information in 4 distinct areas:

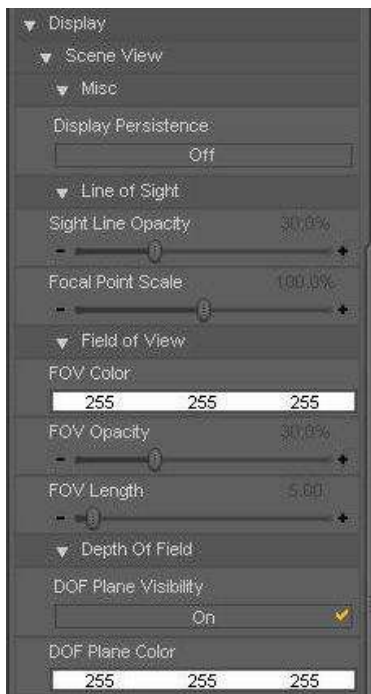
Positional and informational section that shows the orientation of the virtual cameras in the 3D workspace. The information is similar to any other object or model within the 3D workspace/area.



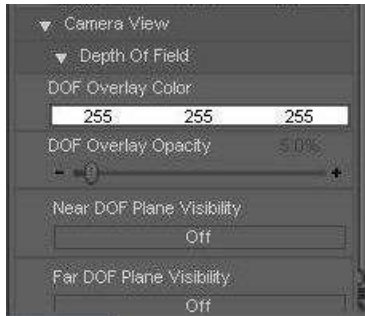
Camera controls covering specific lens controls. These will be covered in depth, particularly the controls for Depth of Field.



Display parameters which provides indicators on how much and which specific areas of the 3D scene are affected. These indicators are best viewed from other viewports and show up when the camera being adjusted is selected in the Scene tab.



View control area that indicates scene data when viewed from the viewport of the respective cameras. This area and the display area above overlaps and interact with each other.



Camera lens terms and theory

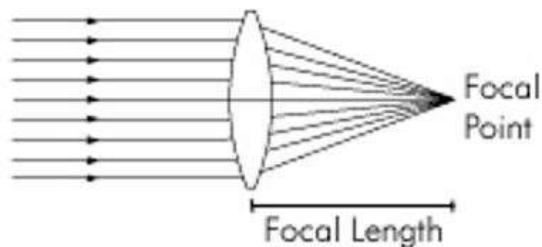
This section gives the user a working vocabulary of the terms regarding lenses in the real world and as related to the parameter items in Studio 3.

Perspective view: A toggle that turns the camera from a perspective view to orthogonal view.

Perspective is the 'normal' view that shows the respective size of objects over distance. Though items may be the same physical size, an item closer to the viewer appears larger than the same sized object located further away from the viewer.

Orthogonal view: Items in the scene are the same size regardless of distance from the viewer. The orthogonal view helps place objects in the virtual 3D space and is best used with the other view ports and cameras (such as the top and right view point cameras).

Focal length: The distance from the center of the lens to the focal point is the focal length of the lens. This means a 50mm lens (considered a normal lens for 35mm film cameras) is 50 mm long. A 200 mm lens is (you guessed it) 200 mm long. Mirrors, refraction properties of glass and modern technology change the real length of some lens, but this is the background to help understand how a lens is measured. In Studio 3, the default focal length is 65mm.

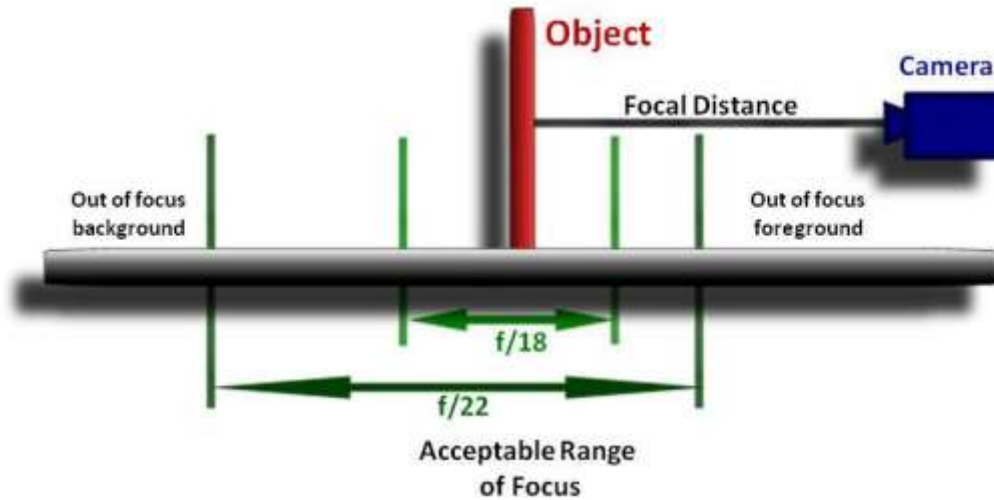


Focal Distance: The distance from an object or point you are focusing on through the lens to the film plane of a camera (or focal point). When you set a photographic lens' focus ring to infinity, the place behind the lens (inside the camera) where light rays converge to a point is the focal point. In DAZ Studio, you 'set' the distance from camera to subject when working in DAZ Studio. In real world terms, this equates to the focal point.

Depth of Field: All lenses have a depth of field where the subject and items in front of and behind the subject are all in what is called the 'range of acceptable focus'. This range of focus (where everything is in focus) falls 1/3 of the distance in front of the subject to 2/3 the distance behind the subject for any given F/Stop. This area is the Depth of Field (DOF). Anything outside of that Depth of Field becomes out of focus and appears fuzzy in photographs (and, we'll see, in your 3D renders).

F/Stop: In the real world, F/Stop is a ratio (which is why it is written with a slash) of the length of a lens over the size of the aperture letting the light through. A lens of 50mm length with an aperture opening of 25 mm is an F/2 setting. If the aperture is smaller, say 10mm, then the F/Stop is 50/10 or F/5. In general, the smaller this ratio, the greater the Depth of Field the lens produces. Most lenses have a substantial DOF with 'fractions' as low as f/32 or f/64 which means the aperture opening is very small (and the DOF is at maximum).

Putting this all together allows photographers and 3D artists to control how much of a scene is in focus.



In the above illustration, the camera is focused on a specific object or point and at a specific distance from the lens at some F/Stop setting. For any F/Stop setting there is an Acceptable Range of Focus. This area is basically the Depth of Field for specific settings used. As shown, a setting of $f/22$ has a greater depth of field (acceptable range of focus) than a setting of $f/18$.

When the DOF control is off, all objects in the scene are in perfect focus. However, the human eye focuses on specific points and the items within the peripheral seem out of focus. Using depth of field and lens controls allows you to mimic more realistic images.

Focal Length Controls

When you want to take a picture of your Cousin Ned, you would probably use a normal 50 mm lens (for a 35mm film camera) and be within a few feet of him when you take his picture. But in order to get the picture of the blue bird perched on the bird bath, you have to keep your distance (so you don't scare the subject away) and need a long lens (100 to 400 mm).

Both subjects will fill the image area to produce a normal size picture. But there are advantages of using different lenses.

In DAZ|Studio, you use the Focal Length Parameter to simulate changing lenses. The default setting is 65mm.



To see how this works in Studio, we'll set up a scene with a couple of objects.

Scene Set up

For this scene we'll use a couple of free models available from DAZ. Put these into a new scene.

Emotiguy: (http://www.daz3d.com/i/3d-models/free-3d-models/emotiguy?item=3101&cat=382&_m=d)

Scale him down to 50% so that he doesn't overpower the scene. Feel free to dress him up and pose as you see fit.

DM Garden Corner: (http://free.daz3d.com/free_weekly/detail.php?free_id=219)

Use the wall and floor tile for the Garden Corner. Look through the top view camera (zoom out until you see the complete grid) and adjust the X scale until the floor is just a bit wider than the Garden Corner (50% works well). Then adjust the Z-Scale until the now narrowed floor covers the grid (342.4% does the job).

Note: this article will suggest you look at your scene from the top view camera in the work space and then set various objects into scenes. Also, the suggestion will be that you do not look at the normal –Default – camera until told to do so. The reason is to let you see the view a bit more dramatically.

In the following set ups, the coordinates will be for the translational coordinates of X; Y; Z.

Using the top view, select the wall translate coordinates to 0, 0, -1874. Select Emotiguy and set him to the same translation coordinates.

Still in the top view, select the Default camera from Scene Tab and translate it along the Z-axis down to the bottom of the grid (translate factors 0; 105; 2001).

You might want to save this scene so that you have a 'playground' for further experimentation on your own with other settings and positions.

Let's get started

Let's use this scene to see the main aspect of the focal length parameter.

Use the Default Camera in the view port and look at the scene. The default focal length in Studio 3 is 65 mm

Emotiguy and the wall are a bit far away and should look a lot like this rendered scene:



Make sure the Default Camera is still selected and change the Focal Length (in mm) to 35mm. You are increasing the field of view (seeing more of the sides) which makes our character look further away from the camera.



Change the Focal Length to 600mm and you have 'zoomed in' on our friendly face.



Why not just move the camera?

Well, you could since Emotiguy isn't camera shy. But, there's another phenomena that occurs with telephoto (long) lenses.

It's called by some, foreshortening, others say compression. In essence, the foreground and the distance between the objects appear compressed. This comes from the fact that you reduce the field of view as the image is magnified.

To illustrate this, create a new scene.

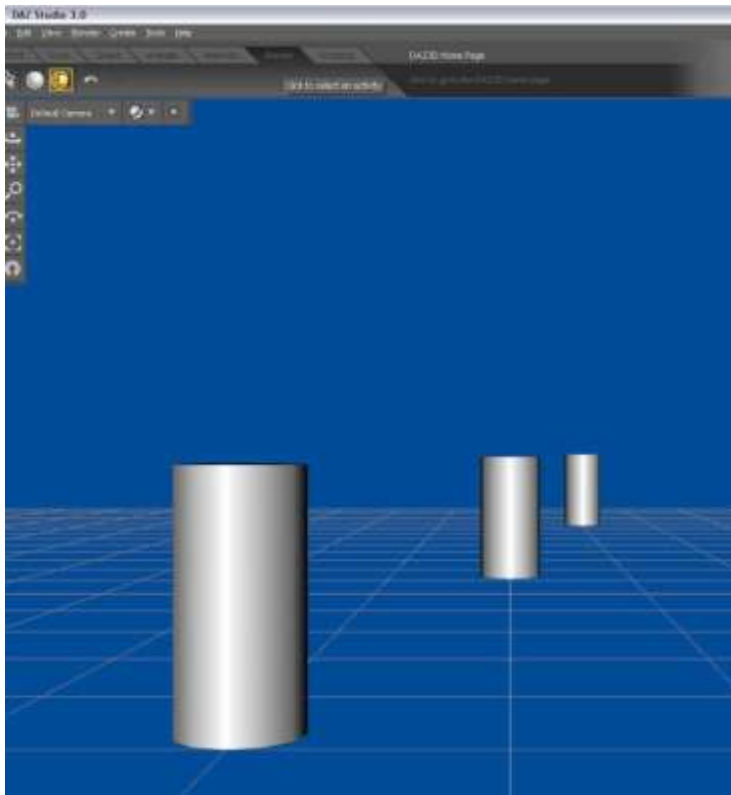
Use three primitives; cylinders will work well. Use Height= 1 m; Diameter= 0.5 m; Segments=1 Sides=12.

Locate the objects as follows:

- Object 1 at -100; 0; -125;
- Object 2 at 29; 0; -740;
- Object 3 at 102; 0; -1500.

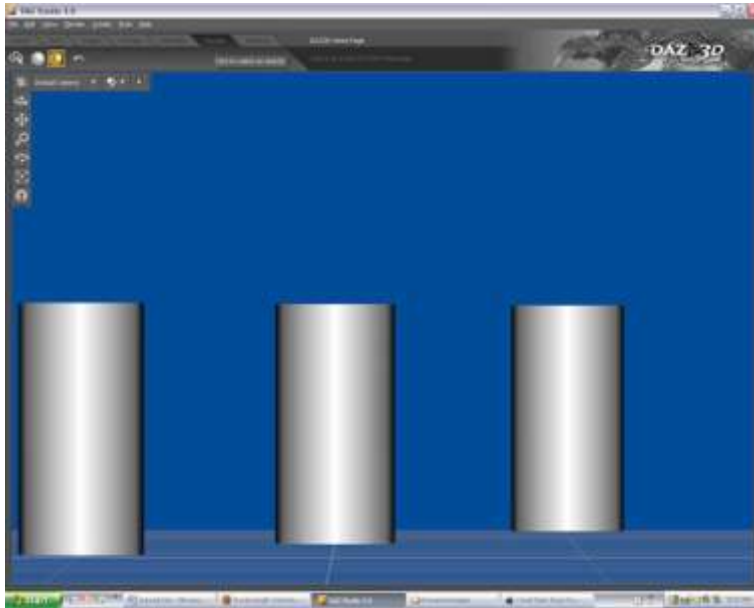
As before, you may want to save this scene as a different file. Then you can change various settings and move the camera around to experiment with different view points and focal lengths and return to your base scene.

When you look through the Default Camera lens at 65mm in its default position, you see a normal perspective view as in the screen-shot below.



Note the grid (only visible in your view port and not in a render) compresses as it disappears towards the horizon and the objects appear smaller as they recede into the background.

Now change the camera to the following coordinates: 20.00; 90.00; 11500.00. The objects suddenly appear far away. To change that perspective, change the Focal Length to 2000mm. Your scene should look like this screen-shot.



Notice that the grid is nearly non-existent because of the compression. Also see that the objects appear to be about the same size and the same distance apart. This is foreshortening though admittedly quite exaggerated. You have filled the view port with all your objects and changed the perspective for the person viewing the image.

So what?

The effect is called 'forced perspective' - a photographic technique where objects appear farther or closer, larger or smaller, than they really are. You've probably seen pictures of an adult standing in the palm of a child, or someone holding a monument in their hand. And as a side note, in many movies when you see the hero surrounded by flames, chances are he or she stands far away from the actual flames and a long lens is used to make the danger look real.

You can use this compression to your advantage and compose a scene without having to move the camera a lot and without having to rescale the objects. Since the objects are further apart in your virtual space, you can light each one separately.

Let's compose one more scene to illustrate that point. You might want to position the objects using the top view for this exercise...it's a bit more fun when you see the outcome.

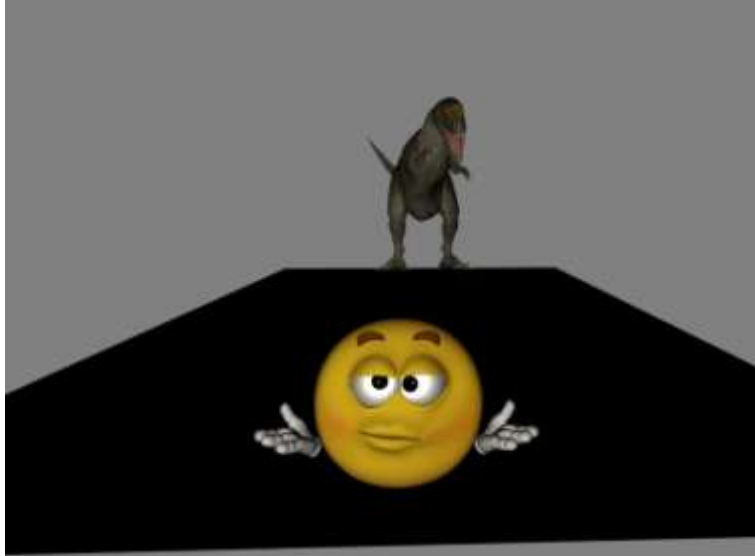
For this image we'll use Emotiguy placed at: 0; 0; 1980. (Leave him at 100% size this time).

Add a vicious, ferocious, large creature (I will use Allosaurus) at: 0; 0; -1997.

You may want to add a ground plane primitive to give the characters something to stand on.

Place the default camera at: 195; 160; 3150.

Look through the Default Camera view and you'll see that our little buddy has nothing to worry about; the bad old dinosaur is WAAAYYY back there.



Switch back to the top view and change the Default Camera's coordinates to: 350; 134; 16942. Use rotational settings of X=0.31; Y=1.04; and Z=0. Set the Focal Length parameter to 1200mm.

Now, look through the Default viewer and you'll see a completely different story.



Add dynamic posing and lighting to each element and you tell a story.

By moving the camera away from the scene and applying a long lens, you can foreshorten the distance between objects (forced perspective) and add a dramatic flair to your composition. The virtual distance also gives flexibility in lighting each object in the scene.

Building an example scene for Depth of Field controls

The section covering Depth of Field control will use a scene to illustrate the use of the tools and parameters. While not necessary to build this scene, it may prove useful for exploring in detail on your own.

The scene contains nine cylindrical primitives, a backdrop included in the default content, and a distant light. The default camera will be moved from its default location to take in all the objects.

One method to create this image would be to create the 9 cylinders, then from the Scene tab, select each one and manually input the individual coordinates in the Parameter pane. To create a primitive, go to the menu bar, click on Create, then New Primitive. Select cylinder and input the parameters as indicated.

Coloring the cylinders, while not necessary, provides differentiation between the cylinders. The color is set under the Materials tab. Set the diffuse setting of each and pick a color or type in the specific RGB codes. An example of the colors used are red (128, 0, 0) green (0, 128, 0) and blue (0, 0, 128). But any colors (or textures) can be used.

Cylinder settings:

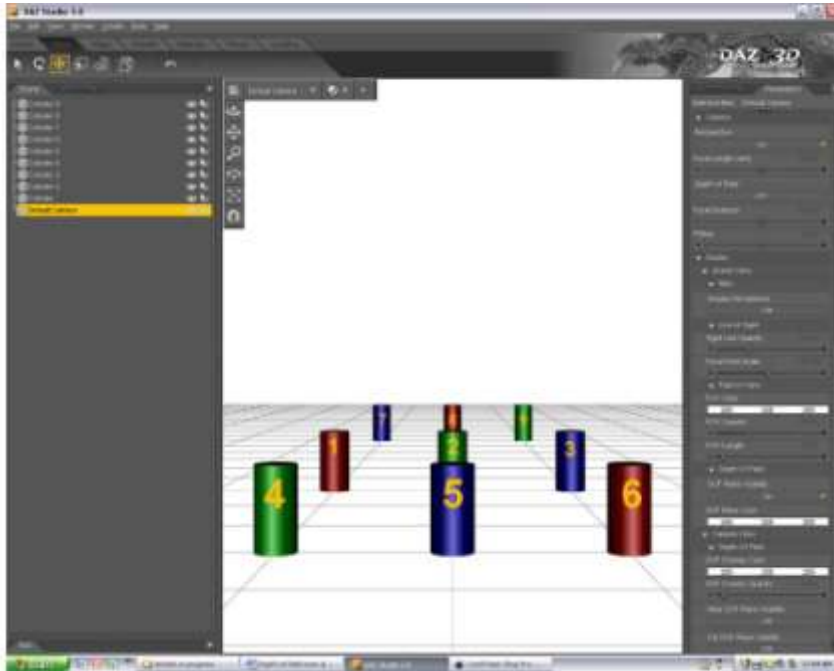
- Height = 0.5 m
- Diameter = 0.25 m
- Segments = 1(default)
- Sides = 12(default)

Cylinder Positions:

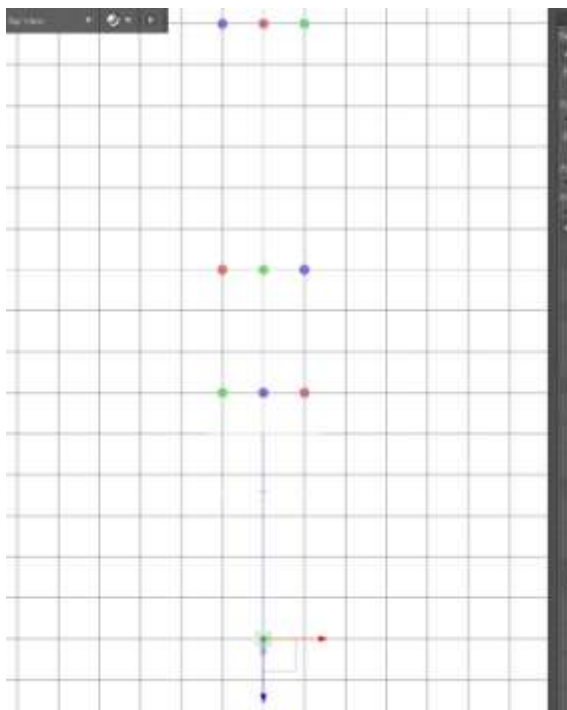
Item	X coord	Y coord	Z coord	Color
Cylinder	-100	0	0	Red
Cylinder 2	0	0	0	Green
Cylinder 3	+100	0	0	Blue
Cylinder 4	-100	0	+300	Green
Cylinder 5	0	0	+300	Blue
Cylinder 6	+100	0	+300	Red
Cylinder 7	-100	0	-600	Blue
Cylinder 8	0	0	-600	Red
Cylinder 9	+100	0	-600	Green

Set the parameters of the Default camera at the following X,Y,Z setting: 0; 105; 900. (Note the default position of the Default camera is 0, 105, 360. You are only moving the camera back along the Z-axis.) Once placed, you will not be moving that camera. You may want to consider locking the nodes for the Default camera. Again, not necessary, but it might prevent you from accidentally moving the camera.

When you have placed the cylinders, your view from the Default camera and top view will look like these screenshots (without the numbers, these were added those in post work for this illustration).



Using the top view camera you will see this view (you may need to zoom out on the Top View).

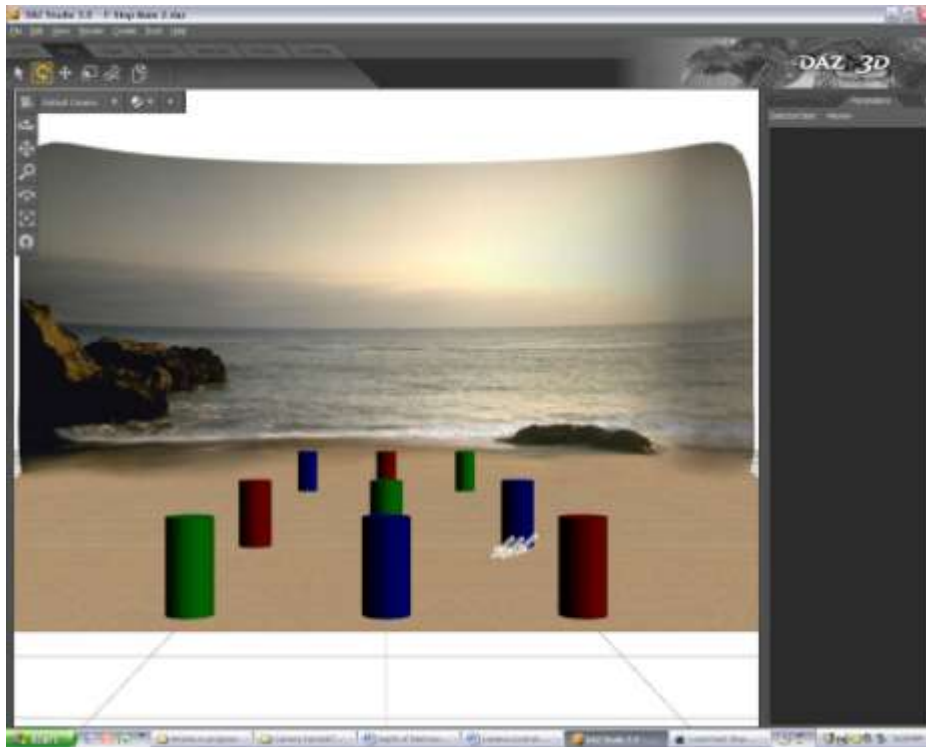


So that the cylinders illustrate our principles and don't "float" in space, add a background. The multiplane beach cyclorama included with the default content in D|S 3 works fine. When you load the beach scene backdrop, go to the Scene tab and click on the plus sign to the left of the beach scene. In the expanded

view showing the three planes, click on each of the 3 eye icons to hide the sand dunes (otherwise, a couple of the cylinders become buried a bit in the sand).

Finally, add a distant light. The exact position is not critical. Place it off to the viewer's right, pointed down. Set the shadow parameter to "Deep Shadow" for this light. This light will help see the effects of your camera adjustments.

Your scene should look like this more or less. Note the white arrows which indicate the distant light.



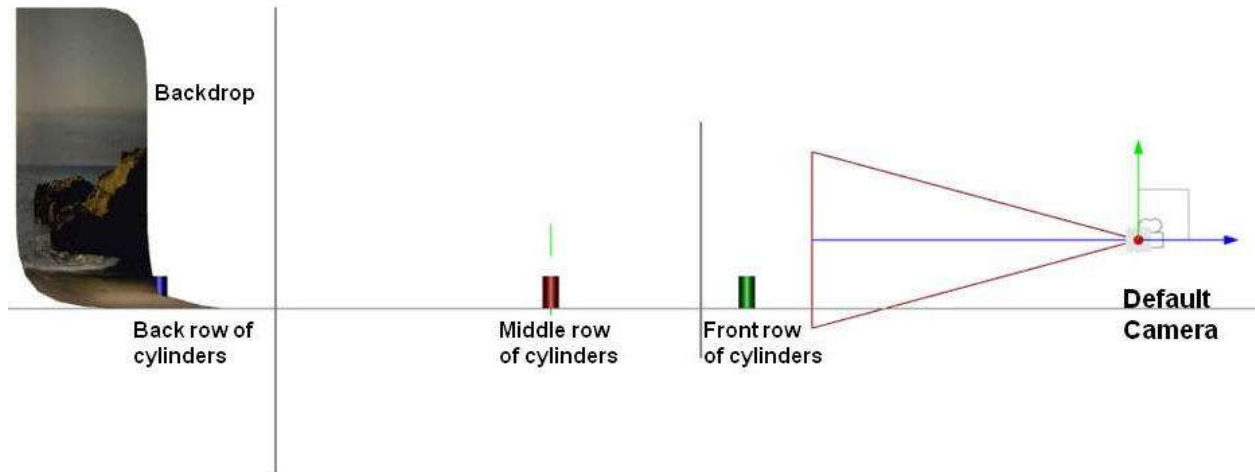
When you render the scene, it will look like this subject to differences in colors selected and exact placement of the distant light.



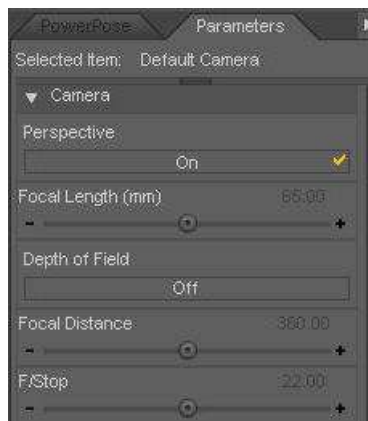
Depth of Field Controls

For this section, the scene described in the section 'Building an example scene for Depth of Field' will be used to illustrate various controls. The view will be from the right view orthogonal camera in the workspace. While in that view, you will have to zoom out to see the complete scene.

With the Default camera selected, the right view will look similar to this image. You will most likely not see all the lines shown here (the color of the lines are default at white and not seen against a white background). The use of each line will be explained in detail. The labels will give you points of reference in the scene.

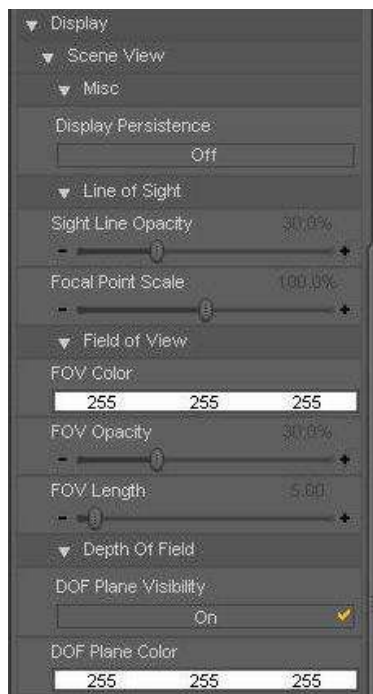


In order to control the depth of field (which area are in or out of focus through the depth of the image) you have to activate the camera parameters. The main control is the Depth of Field which is a toggle and the F/Stop adjustment. The Focal Distance and F/Stop controls the point the camera is 'focused' and the actual depth of field.



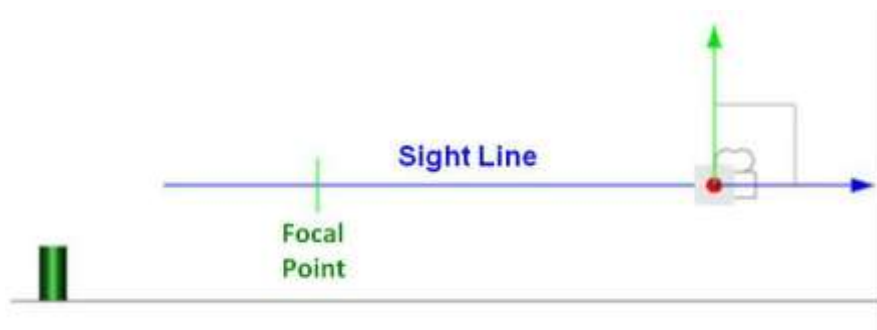
To aid in determining what areas of the render will be in focus (the actual Depth of Field), the user has several reference lines available. As stated, the best way to use these lines is to select the camera being used in the Scene tab and view the scene from a different view port such as the right view used here.

This is a view of the Display parameters:



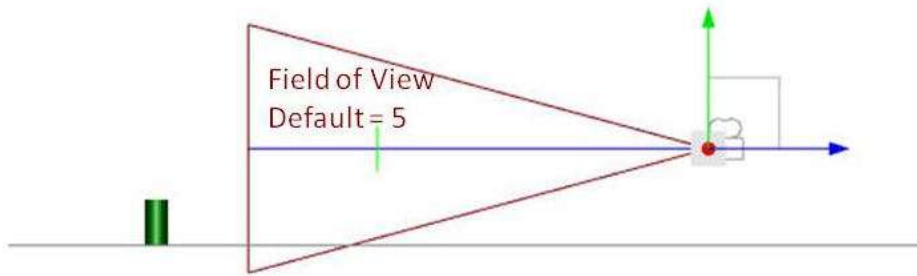
The above are default settings. Users may want to change the FOV color, DOF Plane Color and DOF Overlay colors, especially if you are using a white background. The actual colors are not important, though making each one a different color that contrasts the background color you use will make seeing the lines easier.

Looking at the basic lines first:

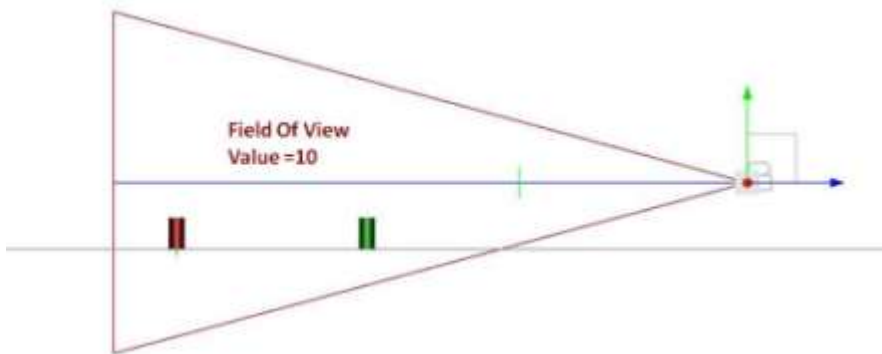


The parameter for the focal length, as you might suspect, sets the specific point the camera focuses on. The parameter for the Focal Point Scale, increases the length of the green line. To make it easier to see. The image above has set the value to maximum (200%) for this screen shot.

The next parameters are FOV (Field of View) Color, Opacity, and Length. Again, using a color other than white will allow the lines to show up on a white background. The item to look at is the Field of View, show below with the default setting of 5.

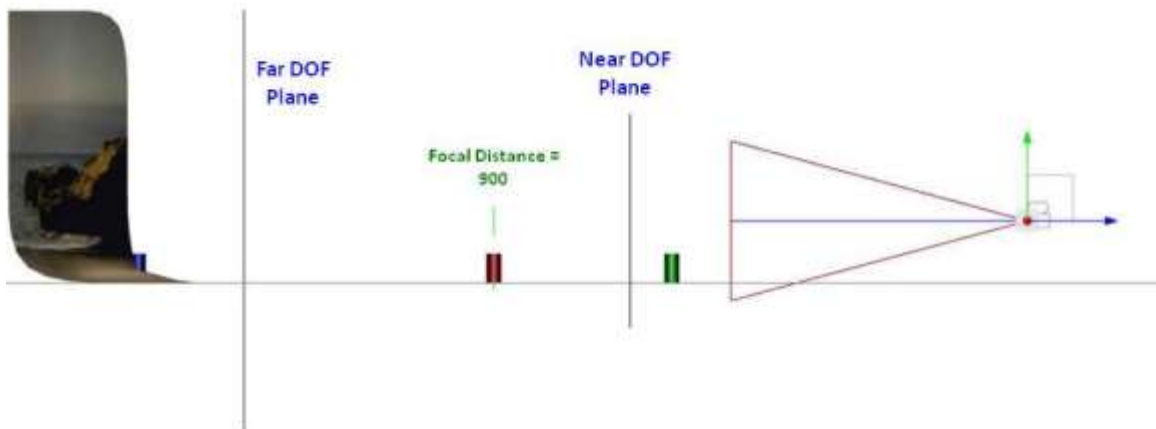


Changing the Length increases the size of the triangle in front of the camera. Using a value of 10 the image looks like this:



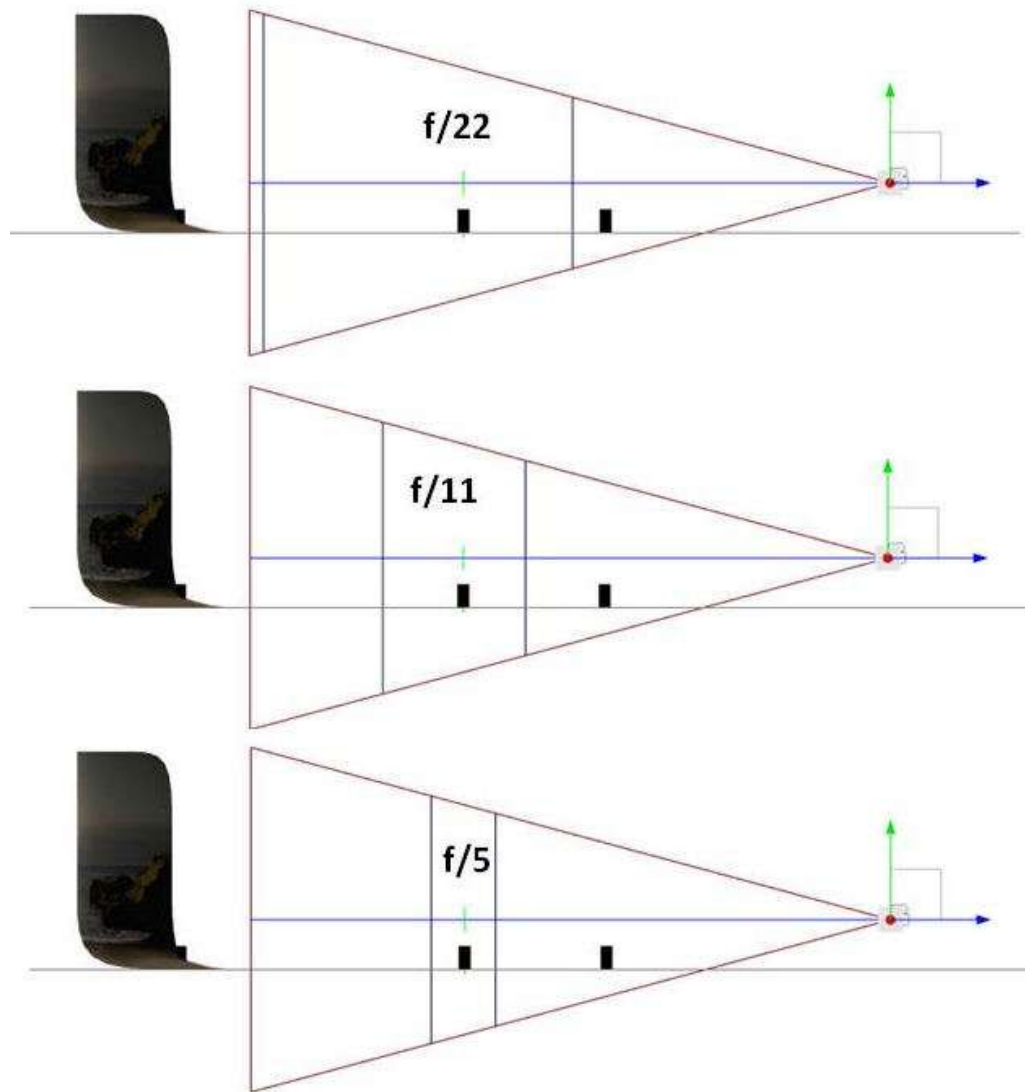
Viewing this in different lengths will help with seeing how the next controls fit into the scheme.

We next look at the DOF planes (using a different color again will help differentiate these lines).



If you review the discussion of F/Stop and depth of field in Camera lens terms and theory, this screen shot makes sense. Note that the focal point is set at 900 for this example. The area between the Near and Far planes covers the range of acceptable focus. Areas between the camera and Near plane and beyond the Far plane will be out of focus.

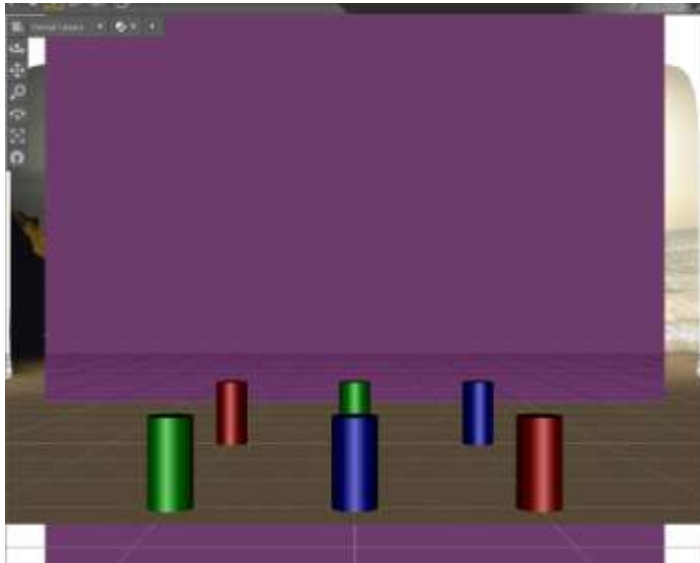
If it helps you to visualize what is going on, extend the Field of View by setting its value to 10. You will see that the DOF planes will fit inside the extended triangle. Shown below are the settings for F/22 (default), F/11 and F/5.



Again, the area between the DOF plane lines will be in focus.

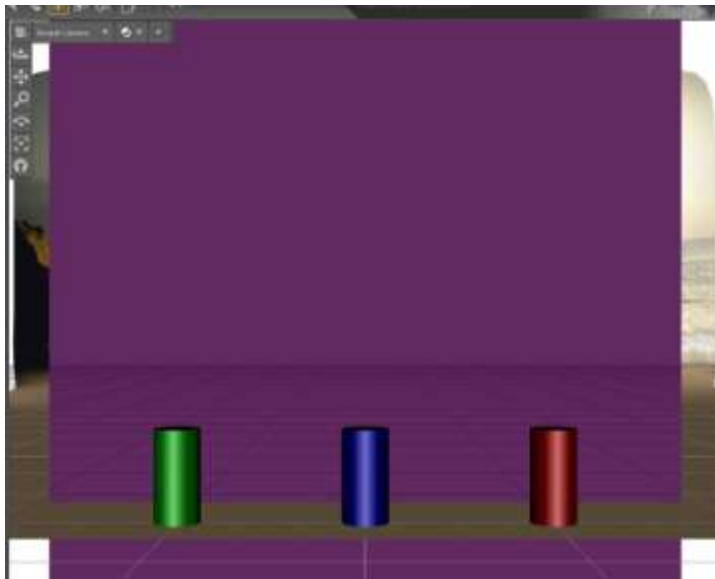
Before we look at renders, let's look at the Camera View parameters. When each of these are toggled on, a plane corresponding to the Near and Far planes becomes visible in the Camera View (the usual camera used for creating renders).

With the Far DOF Plane on:



Everything beyond (or behind) this plane - the back row of cylinders and the backdrop - will be out of focus.

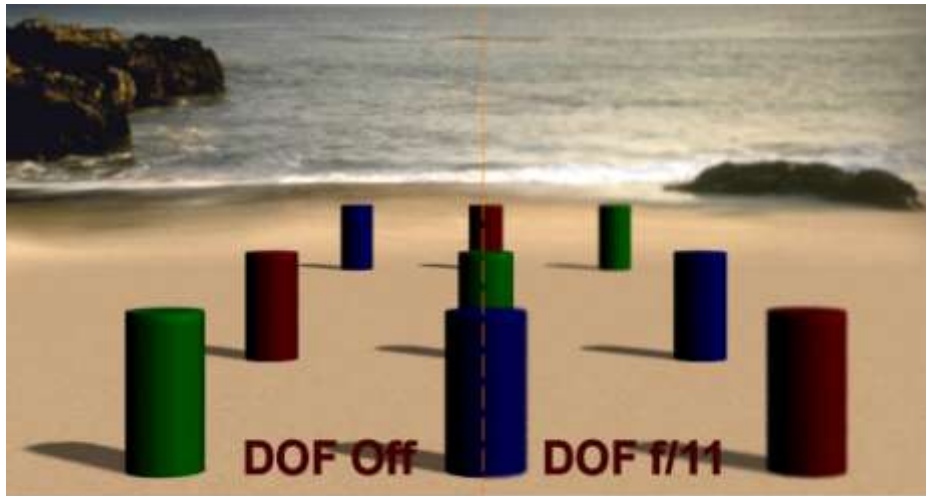
With the Near DOF Plane on...



...everything in front of this plane - the front row of cylinders - will be out of focus.

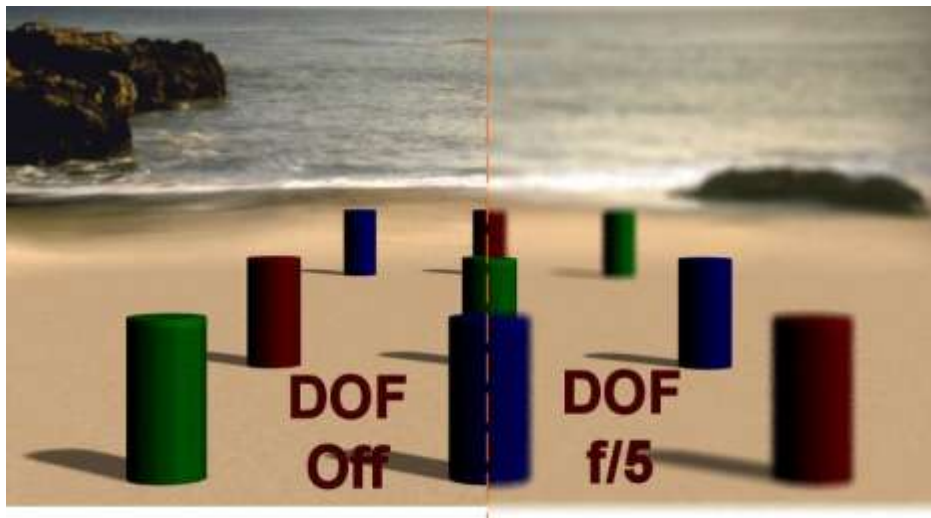
Putting this all together we'll compare renders at different settings. (If you didn't make a render of the default settings while setting up this scene, you may want to do so now for your own comparison by turning of the DOF toggle and making a render.

The image below compares the default (no DOF) with the F/11.



Notice that only the center row (the focal point of 900) remains sharply focused in both images. At f/11 the front row and back row (as well as the backdrop) are slightly out of focus.

Doing a render (to really exaggerate the effect) at f/5 produces:



Again, the center row stays in sharp focus and foreground/background more out of focus.

Experiment on your own with other settings for the focal point and F/Stop. You may find adding a null to your scene and setting the null at your focus point helps determine the exact spot.

Using all the controls (including the focal length of the lens) allows you to put emphasis on specific areas within your renders and gives a more realistic look to your images.

Examples of DOF controls used

The following compares the effects of Depth of Field (DOF) controls in rendered images.

Using these controls you can give a realistic view in the render with the foreground slightly out of focus as below:



Or by changing the focus point and F/Stop, bring the viewers attention to the foreground item.



Another example can add an air of mystery to the render by not identifying specific objects such as the person in the foreground.



In this image, the candle flames were simple conical primitives with a point light embedded. With DOF controls off, they do not look real. Also, note that the blue wall in the background is in focus.



Setting the focal point (in this case on a Null point at Vicky's nose) and adjusting the F/Stop softens the flames and the background putting emphasis on Vicky.



Without DOF, the sharp focus extends from Vicky's hand to the tip of her wings.



Focusing on a null point about halfway between Vicky and the dragon fly creates and setting a shallow depth of field a more real feel to the image.



One last example (a detail from another image) with a large depth of field shows that the main character (starting at the sword's hilt) is in focus but the tip is slightly out of focus to add a realistic depth to the image.



These are just a few examples of how to use Depth of Control controls. Many other possibilities exist and should be explored to add realism and focus to your images.