

# Hemispheric Lighting © Jonathan Koehn

Shadow map array tutorial and variations. (Hemispheric lighting like)

## 1. Light Setup

Lets start by making a new scene. In render settings have high quality, raycast, and raytraced and adaptive alias will work ok for these tests. Set world to meters and object to meters( totally up to you :) Lets make a clean lighting slate.

1.1 Initial shadows. We choose to go with a local light versus a spot mostly because a local can be used to light up objects behind the lights (covered more in (4.)). Spots will render faster though and we will use one of these latter in part (4). Set intensity to .3 and for shadows I chose Shadow Type (map), Shadowmap Size (High), Shadowmap Sharpness (Low), Shadow Quality (Med).

1.2 Positioning lights. This is just a simple matter of copy and positioning and a bit of adjustment. We'll use 8 locals (Id experiment here) copying the one we just made. Lets start on the bottom ring of 4 lights. I have a few positions here but basically its a ring. (World meters, Object meters) (I've used bit different marks in here I was getting confused :) (Tab works real good for apply and jumping through x,y,z and the arrow keys work good for jumping through the lighting array.)

Light 1 (X -5.090) (Y 2.330) (Z 2.719)

Light 2 <X -2.112> <Y -5.083> <Z 2.719>

Light 3 [X 2.358] [Y 5.349] [Z 2.719]

Light 4 {X 5.383} {Y -2.083} {Z 2.719}

Copy the last light and adjust its intensity to 0.4. This ring will be a bit smaller then the last.

Light 5 [X -4.378] [Y -1.558][Z 4.782]

Light 6 (X -1.692) (Y 4.571) (Z 4.782)

Light 7 {X 1.979} {Y -4.147} {Z 4.782}

Light 8 <X 4.880> <Y 2.500> <Z 4.782>

(Side note) This is an excellent area to experiment in. For ease of use I'm gonna glue the bottom ring together then select a top ring light then glue that ring together then glue the top ring to the bottom one. You've completed a hemispheric array! Here's a few screen grabs of a similar array. Fig. 1-a, 1-b, 1-c.



Figure 1-a



Figure 1-b

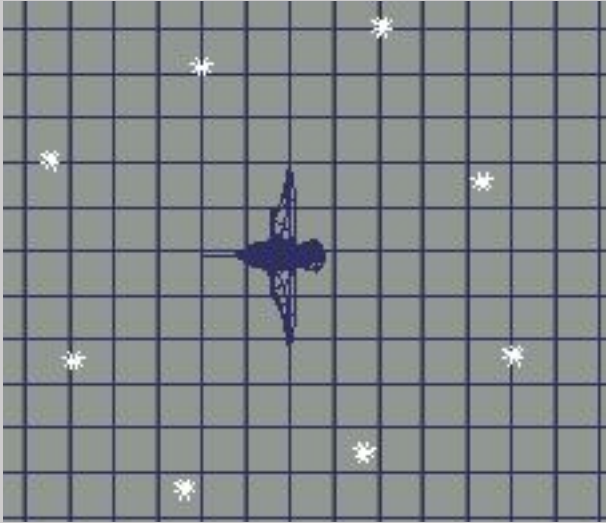


Figure 1-c

## 2. Test model setup

### 2.1 Models

Lets start by creating a cube and dividing z by 4 and timing x and y by 4. Then lower the top part of the cube to right at ground level(lets call this cube ground). Create a sphere and smooth quad divide it. (smoothing helps a bit with the shadowmaps)

### 2.2 Material

We'll go real basic in this. Smooth , Just color plain white, reflectant matte, transparency none, displacement none. Matte we adjust so we have no

ambiance but diffusion is all the way up. Then paint the sphere and ground with the material you just made. (Side notes) Now's a good time to go and test this out :) (also I saved the array as an object) Tested mine out here's the render. Fig. 2-a (this isn't how id like the shadows to blend together but this is tackled in part 3.)

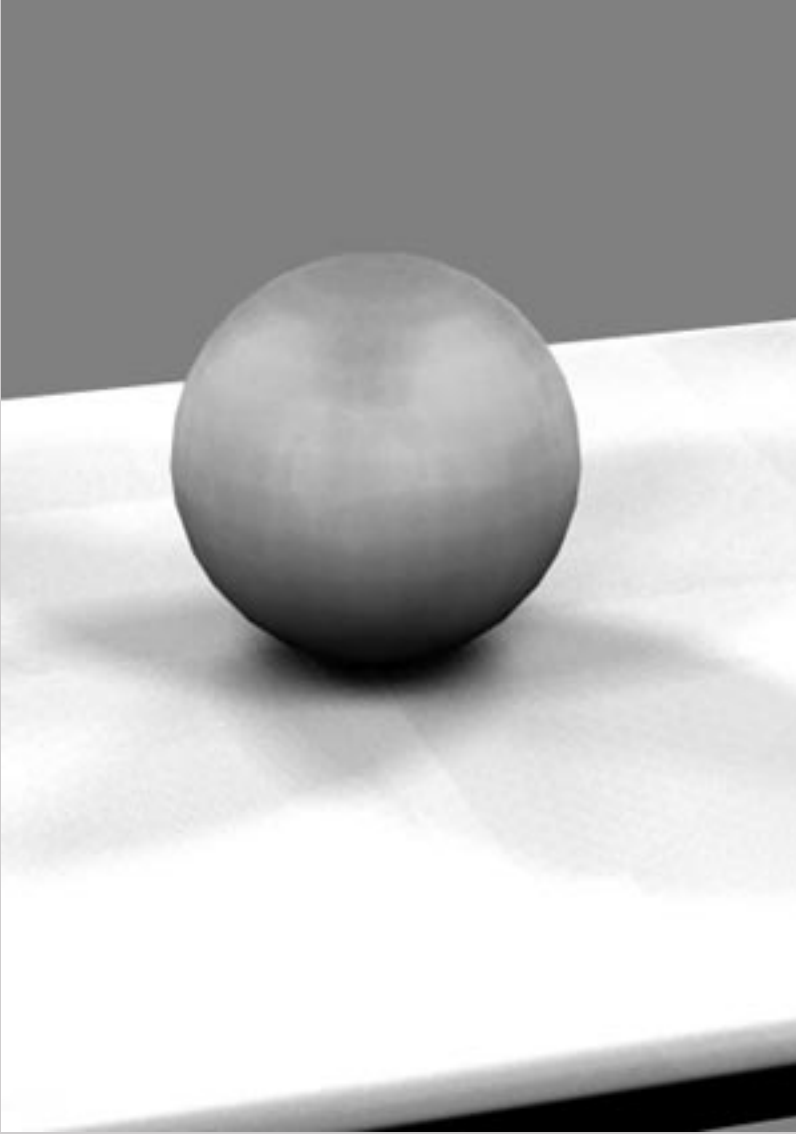
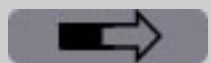


Figure 2-a



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## 3. Shadow adjustments

### 3.1 Shadow Artifacts

Lets see if we can get them artifacts removed the shadowmap banding. Our shadow map size is at 512 right? We'll try first by going to 1026 for just the bottom ring of lights. Higher adjustments appear to put a computational load on this 200 mhz but with a faster processor one can probably get much more desirable results. (This can also be removed by displacement, or easier a procedural or texture). But this is the best method of changing shadow map size if its got some banding and you don't like it experiment here :) Banding in shadow maps seems most noticeable on flat surfaces maybe upping the poly count might help as well.

### 3.2 Shadow number

If you still have like 4 shadows even after adjusting shadow size which also happened to help here then go to shadow sharpness and adjust it from 4 to 10 till you get the desired results. High setting in this area will produce a more crisp like shadow. (kinda like a raytraced shadow)

### 3.3 Shadow length

This is best adjusted in setting intensity. I noticed that it appears we have a squarish shadow on the bottom. I

brought the bottom rings intensity up to .4 for each light (we will cover more of this in part 4.)

(Side notes) Heres another good time to go ahead and test this. ( I noticed that we aren't seeing the outer shadows cast by the local so I timed the x and y size on the ground by 4.) While rendering this I noted that we have some real bad banding on the edges we could up the shadowmap size one would do this probably if the ground had to be a single color. But we will instead introduce a new material. Take and change the plain color on the ground to a procedural I chose marble with just the default settings. I reset the bottom ring to .3 intensity for the lights. I prefer the shadows and light highlights on the sphere overall with this setting. Here's a test render of the results Fig. 3-a.

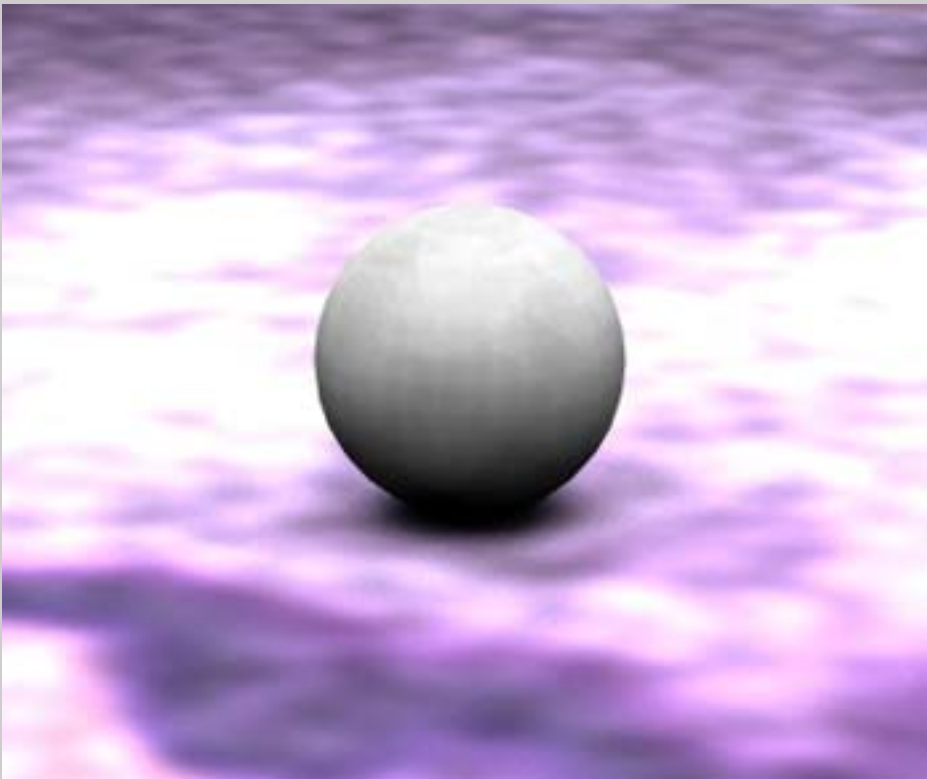


Figure 3-a

## 4. Hemispheric variations

## 4.1 Model lighting

Through steps 1 - 3 we've made a hemispheric array well suited to this.

(Side note) Have fun trying different models in this variation of a hemispheric array. A nice thing about this array is the model can face any direction. (I saved this one to modelhemispheric) Fig 4-a is a test showing this.



Figure 4-a

## 4.2 Sunset lighting

As one can image the light changes some color and the shadows change a bit in sharpness and length.

### 4.2a Color

Lets start by going to any light in the top ring and changing its color to a reddish orange. (Pink, purple or other sunset variations will work as well :)

## 4.2b Intensity

This light is where the sunlight will be coming from. Adjust this lights intensity to around .68 this will make its color out way the others as well as make a slightly longer shadow from this direction. For lots longer shadows more toward dusk set all the other lights down by like .1 or .2. Lets go ahead and do this bring all lights down by .1 except the sunset light. Then the light directly across from the sunlight plus the 2 lights right by it bring them down by another .1

## 4.2c Depth

Directly across from the sunlight on the top row set the white light to a darkish blue color (experiment time :) this will add depth to the shadows.

(Side note) Here's a test render of the results Fig. 4-b. In this array instead of using the top ring one could put the sunset on the bottom ring for more of a dusk approach and change the color to a deeper redish-purple then lower the intensity by .2 for all but the sunlight and across from the sunlight set that light to like dark purple-blue. (Moonlight could be used instead of sunlight but go for more of a whitish blue light.) and to offset it use dark purpleish-blue. The nice thing about this array is all you need to do is rotate the whole array to change where the sunlight is coming from. (I saved this one to sunsethemispheric)

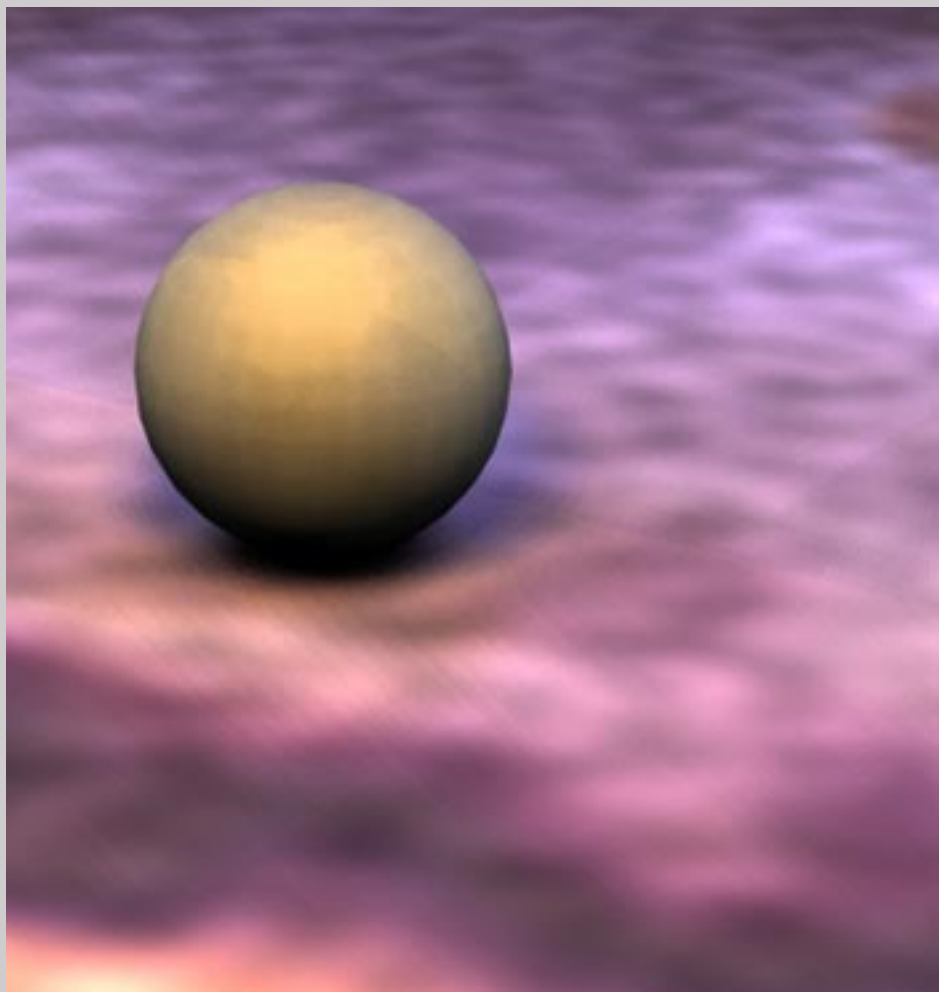
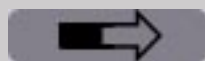


Figure 4-b



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## 4.3 High noon

Hopefully you saved the Model lighting one. Lets reload that back in.

### 4.3a Light

Lets go with another new local for the sun. We could use a spot but we still want it to cast light in multiple directions just like the sun. Kinda position the new light above the other lights in a tent like shape or (X 0.00) (Y 0.00) (Z 20.00) then glue it to the model array.

### 4.3b Color

Adjust the color of the sun to a whitish-yellow.

### 4.3c Intensity

This is one of the areas one should experiment in. For the sunlight set it like to .7 and adjust all the locals in the hemispheric array besides the sun down by .2.

4.3d Shadows Lets switch over to raytraced for the shadows on this one. Probably could use shadowmap with a high sharpness.

(Side note) Here's a render from the results (Fig. 4-c) but I decided to make it a bit past noon by moving the local light down in a curve sorta (X 0.00) (Y 5.00) (Z 15.00). Lets try changing the shadow to shadowmap settings all the same as the model lights on the top

ring but change the sharpness to the highest it can go. Shadowmap in this instance has a bit fuzzier edges while ray has sharper edge its your choice :) Here's another render with the results from the shadowmap one. Fig. 4-d (I saved this one to highnoonhemispheric)

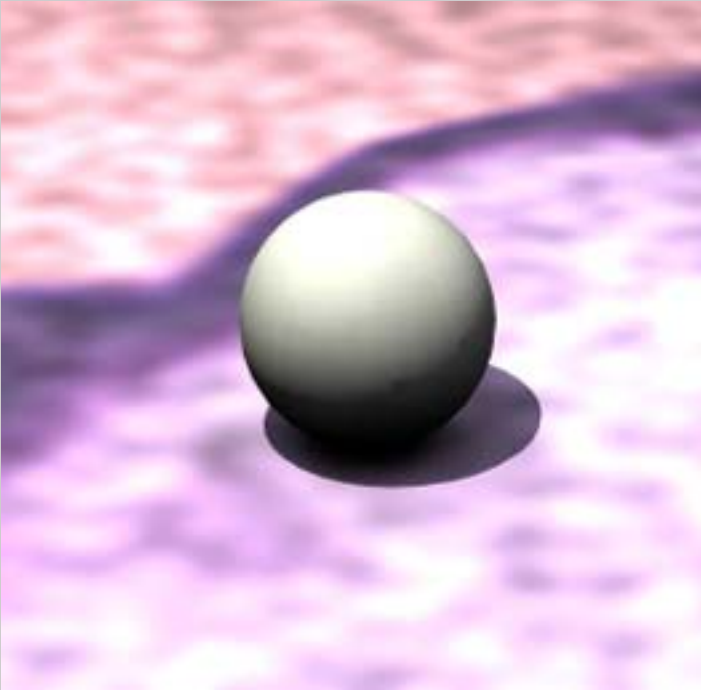


Figure 4-c

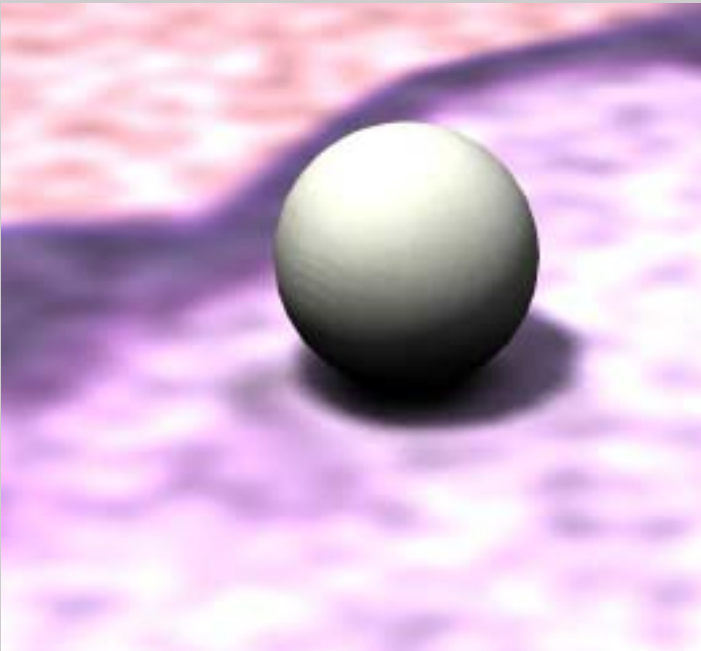


Figure 4-d

## 4.4 Clouds

### 4.4a Lights

Lets load the high noon array with ray shadow. This kinda strays a bit but we wont model clouds just the cloud shadow effect :)

### 4.4b Model

A simple sphere will do lets go with the default size. Move it up around the sunlight. (a flat plain or other primitive might work as well)

### 4.4c Shadows

To start lets see if we can find a good way of doing it hmm plain color (matte) will do or if one wants to get more creative go for light blue then apply erode transparency to it. (I tried default erode for starters went to dark looks like a clouds blocking the sunlight) Lets try a scale of .11, Coverage .54, and a fuzziness of .69.

(Side note) Fig 4-e Shows a render What should I have done to eliminate the 4 shadows? One could use a filter on a texture or wrapped mask, wrapped filter have fun experimenting in this area :) This shadow mask technique can also be used for faking caustic type of light like in a swimming pool. I tried filter made a procedural using Perlin noise but use any you like set one color to black and one to light blue then in filter move slider down into black then move the color over deep into blue. (I'd like to include more in this area but

it could get quite long so happy experimenting :)

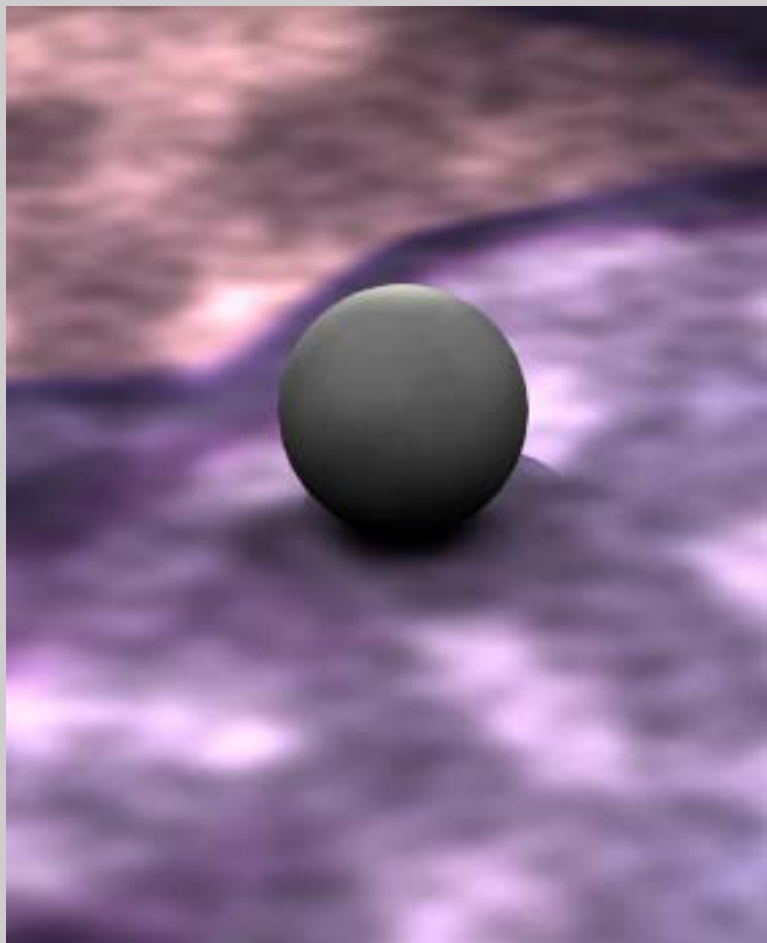
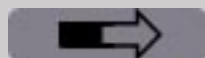


Figure 4-e



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## 4.5 Candle light

World coordinates meters, object meters.

### 4.5.1 Setting up

First off this array will use a new center local light and 8 outer lights. For this array lets test it inside a fairly large cube. Boolean the inside out by copying the cube you made and scaling it down a bit. Then subtract it. For this booleaned cube use matte material with full diffuse and no ambience. Create a sphere with the same materials and smooth it 2 times. Place this sphere at X 0.513 Y 0.000 Z 4.043 and times X by 1.5 and Y by 1.5. Create a camera and aim it at your test sphere and lets get them lights made :)

Ok lets go make 9 lights with these positions.

Center light X 0.131 Y 0.035 Z 2.540

#### Inner Ring

1. X -0.231 Y 0.012 Z 2.886
2. X 0.105 Y 0.339 Z 2.886
3. X 0.152 Y -0.336 Z 2.886
4. X 0.470 Y -0.012 Z 2.886

#### Outer Ring

1. X 0.796 Y -0.616 Z 2.175
2. X 0.796 Y 0.661 Z 2.175
3. X -0.534 Y -0.616 Z 2.175
4. X -0.534 Y 0.661 Z 2.175

## 4.5.2 Color

For the center light we want a brightish orange light.

Center light

Hue 47.5

Saturation 0.737

Intensity 0.5

This ring is slightly more orange.

Inner Ring lights

Hue 37.2

Saturation 0.839

Intensity 0.2

This ring is turning into red.

Outer Ring lights

Hue 34.8

Saturation 0.89

Intensity 0.2

(Side notes) Heres a good place to experiment, say we want a blue flame. Try changing saturation and hue to a medium light blue to dark blue color.

## 4.5.3 Shadows

Center light.

Shadow Type = Map

Shadowmap Size = High or 512

Shadowmap Sharpness = Med or 2.5

Shadow Quality = Med or 5

Inner Ring

Shadow Type = Map

Shadowmap Size = High or 512

This is the only one that changes.

(Shadowmap Sharpness = Low or 4)

Shadow Quality = Med or 5

Outer Ring

Shadow Type = Map

Shadowmap Size = 1026

Shadowmap Sharpness = Low or 4

Shadow Quality = Med or 5

#### 4.5.4 Falloff

In this array we will introduce something new, we will be using Linear falloff. That way our light is brightest at its source but falls off. Say this object lights the candle at .5 intensity, but at twice the size of the candle it is .25 intensity and at 5 times the size of the candle it is .05 intensity.

(Side notes) Experiment with the different falloffs.

There is some more information on them in the Truespace 4 Manual. Experiment with this in the other arrays as well. (Recommend reading up more on these at least in the Truespace 4 manual :)

#### 4.5.5 Effect

This is also new. But I originally tried creating a flame and do this if you like :) A deformed spheres works pretty good for this along with a macro swept poly.

But we'll do something a bit new. Go to the center local light and check lens. Now go to render file etc. and right click then left click ray and postprocess then right click postprocess then left click lens flares and once again right click Glows and lens flares.

Ok now it will render with the default lens flares try this if you like. But we want only a few rays and no ghost lens or hardly any halo. But a nice glow and pretty bright as well. Heres a run down of the settings that were gonna use please try some different ones :)

Lens shape = Circle

Intesity = 4

Glowfactor = 2

Glowradius = 4

Glowfocus = 0.09

Ghostcount = 0

Ghostfactor = 0

Rays type = Random

Rayscount = 10

Raysfactor = 0.78

Raysrange = 0.4

Halofactor = 0.2

Haloradius = 1

Halowidth = 1

(Side notes) Heres a tip I'd like to include if you dont want any halo reduce halo factor to 0. This is a fun area to Experiment in. Heres a image showing a bit of things that can be done with lens flares



Figure 4-f



Figure 4-g

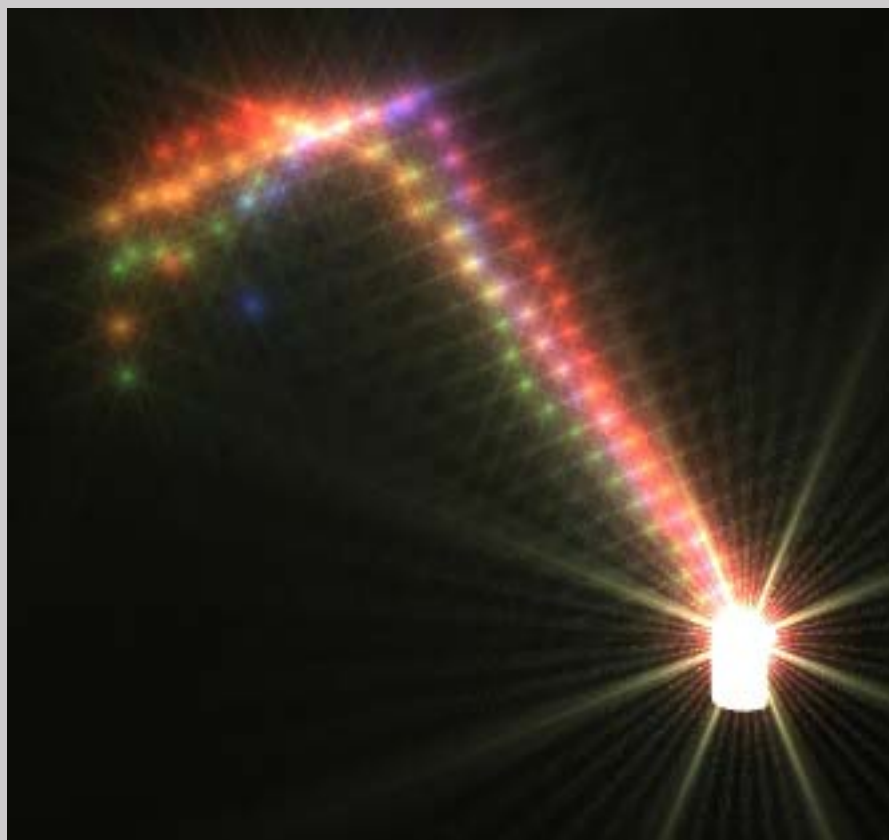


Figure 4-h

*Close*