



Smoke is an effect that helps break up visible light when using Glow or Fog effects.

You can use it to simulate fog drift through a scene, or you can use it to create clouds in a sky, or smokey contrails from a rocket or spaceship.

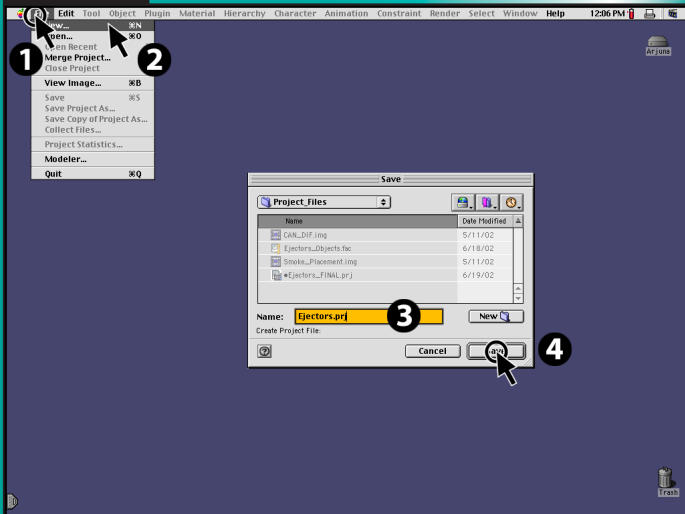
Another application is to use Smoke to create an effect we will call Ejectors... where we will simulate concentrated blasts of air or fuel from an object, like a propellant escaping a rocket engine.

In this exercise, instead of using particles, we will be using a light and a Smoker object to create an intermittent blast of smoke emitting from a canister.



2

Getting Started



Launch Universe Animator.

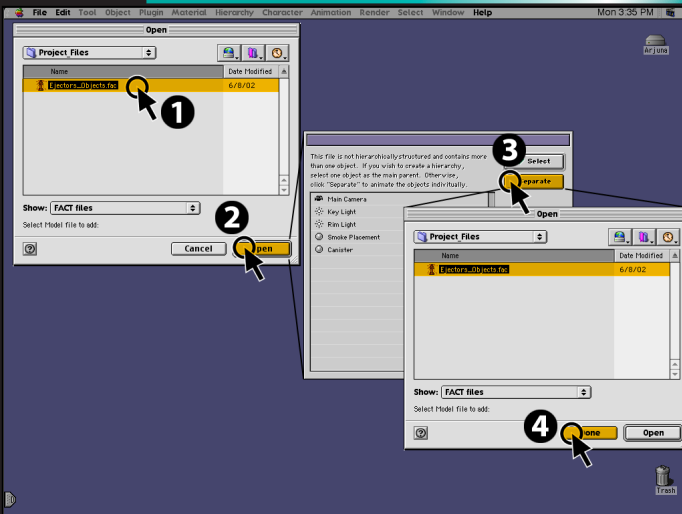
Press [**CMD/CTRL+N**] to start a new project.

When Animator prompts you to name and save this new project, name it "Ejectors.prj" file, then navigate to the Ejectors_Tutorial folder and save it in there.



3

Load the Scene



After saving, you will be prompted to load your FACT files into this new project.

Locate the Ejectors_Objects.fac file and **[CLK]** Open.

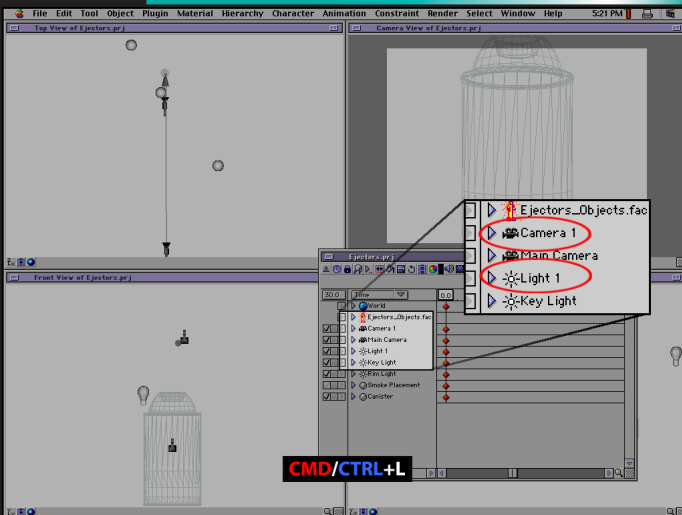
You will then be asked to create a hierarchy of the objects contained in this FACT file. Since we want them separate, **[CLK]** the Separate button.

If there were any more models to add, you could continue adding them into the project, but for this exercise, there aren't, so **[CLK]** the Done button.



4

Removing Unecessary Objects



Animator then generates the scene loosely based on the size of the FACT file we loaded.

Before we proceed, we need to remove two unwanted elements, a Camera and a Light.

Open the Project window by pressing **[CMD/CTRL+L]**.

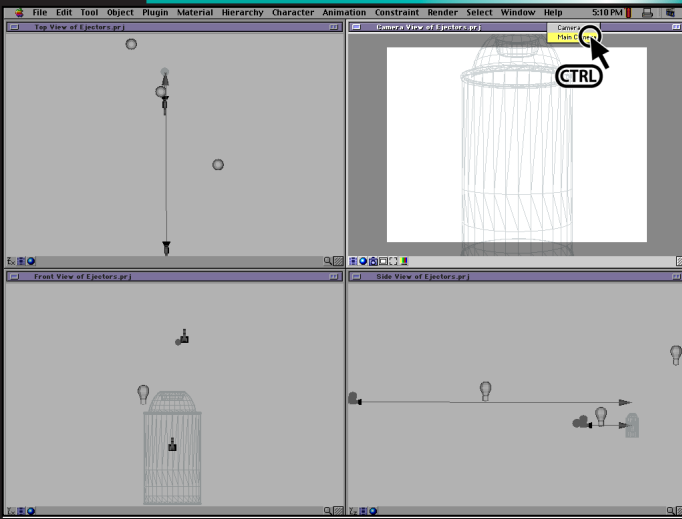
Animator defaults to adding a Light and a Camera into every new Project file. Since our FACT file contained a prebuilt Camera and Light, we do not need the default Camera and Light in our scene.

But before we delete the Camera, we need to switch our viewing angle from the default Camera to the Main Camera...



5

Switching the Camera View



In the Camera view window, **[CTRL/RIGHT+CLK]** on the Camera View window header bar.

In the pop-up menu, select Main Camera.

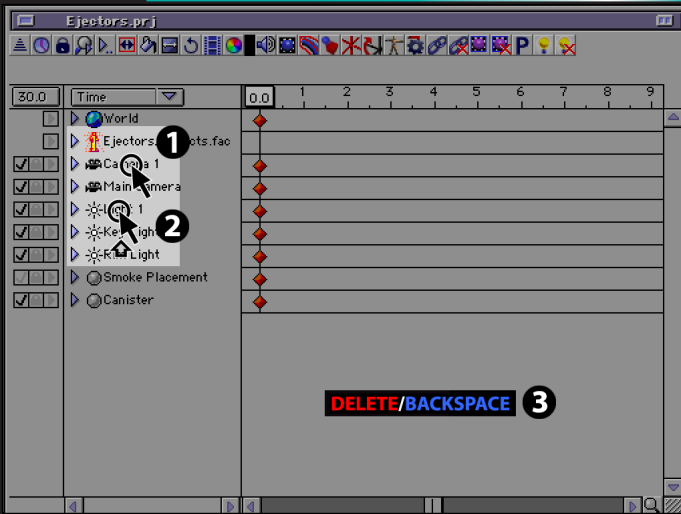
The Camera View window should now be looking at the can in the lower half of the screen, almost straight on.

Now we can delete the default Camera and Light....



6

Deleting the Default Camera and Light



So, in the Project window, **[CLK]** on Camera 1, **[SHIFT+CLK]** on Light 1, then press the **[DELETE/BACKSPACE]** button.

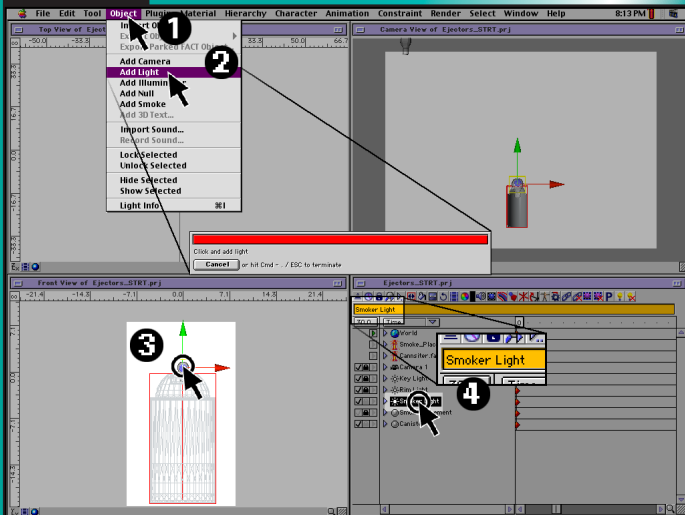
You should only see the following in the Project window : World, Ejectors_Object.fac, Main Camera, Key Light, Rim Light, Smoke Placement, and the Canister.

Now on to the exercise....



7

Adding a Light for the Ejector



In the menu bar, select Object > Add Light.

A prompt will open up asking you to place the light.

In the Front or Side View windows, **[CLK]** above the Canister to add the light. If need be, you may need to zoom up close to the canister for better placement.

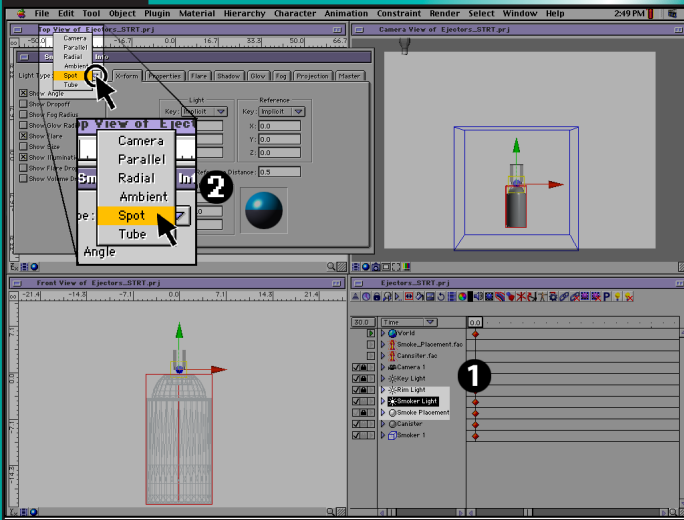
Open up the Project window **[CMD/CTRL+L]** and rename Light 3, the light we just added, to Smoker Light.

Leave the Project window open since we will be using it often. You may need to reposition it as necessary.



8

Changing the Light Type

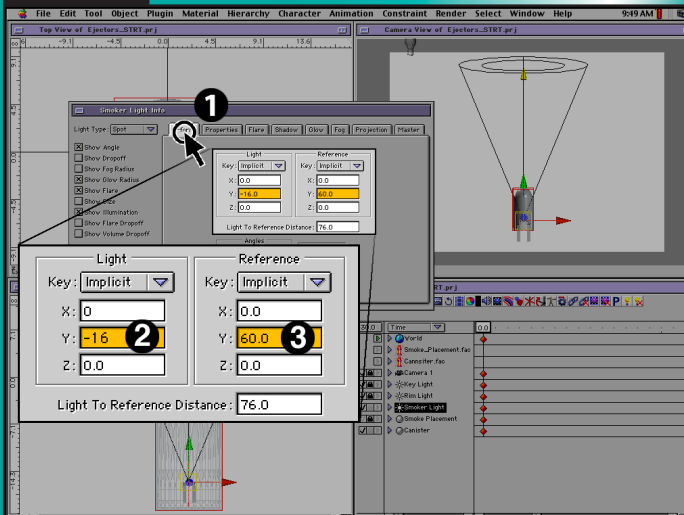


In the Project window, **[DBL+CLK]** on the Smoker Light to open up the light's Info window.

Use the Light Type pulldown menu to change the Light Type to Spot.

Note: Changing the light type to a spot provides adjustment options to the cone dimensions and direction of the light source, so we can create an animated jet-like blast with our smoke.





In the X-form tab, enter the following:

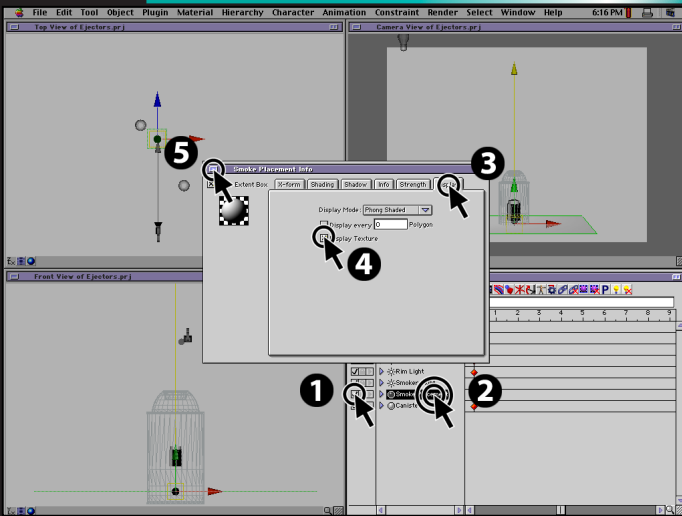
Light section:

Reference section:

X	0	0
Y	-16	60
Z	0	0

Note: You may have noticed, that our light source now resides near the base of the canister, and is now pointing straight up. The reason for this is the cone angle. We wanted to start off with a greater amount of visible smoke emitting from the can, so we wanted the cone angle of the light to intersect with the wide opening on top of the canister.





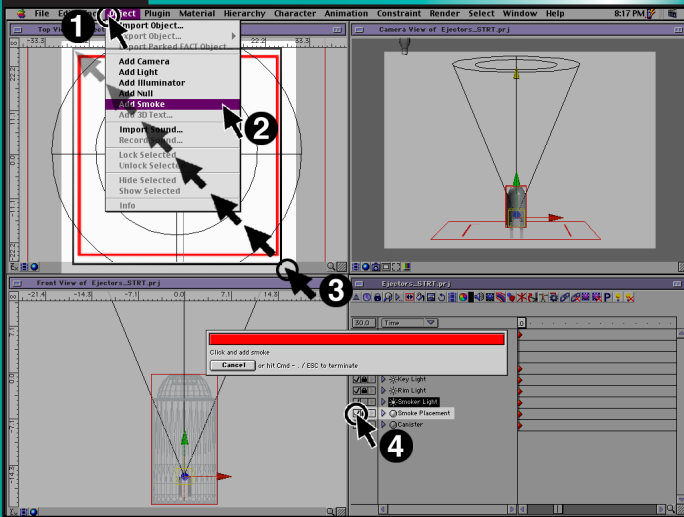
In the Project window, turn on the visibility of the Smoke Placement object (this is just a simple plane with a texture map applied, indicating where to draw our smoke).

[DBL+CLK] on the Smoke Placement object.

In the Smoke Placement Info window, **[CLK]** on the Display tab.

Enable the Display Texture feature. Now we should be able to see the smoke placement map. If you don't, make sure you have Gouraud or Phong shading turned on. Close this window.





In the Top View window, zoom in to see the canister and the Smoke Placement map.

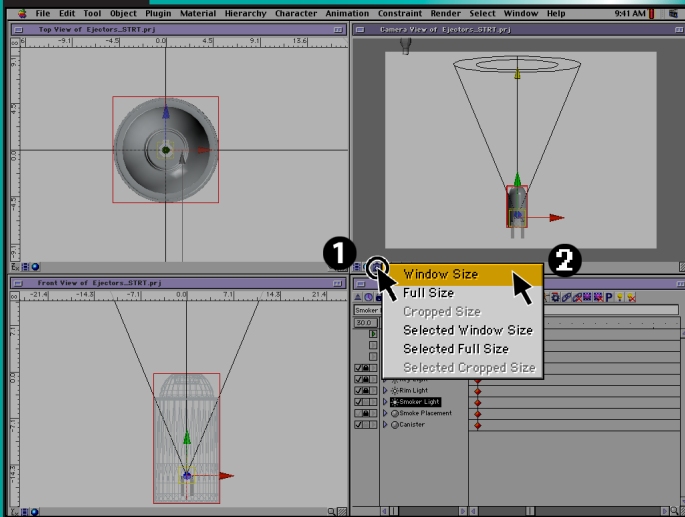
In the menu bar, select Object > Add Smoke.

In the Top View window, drag a marquis selection box around the thick red outline that surrounds the canister.

In the Project window, turn off the visibility of the Smoke Placement object.

Note: A smoker is just like a model object, a light, or a camera, in that everything you do to it can be animated.





Let's see what the default settings of the Smoker look like.

So render out a still from the Camera window.

Hmmmmmm.....





Well, we see our canister.

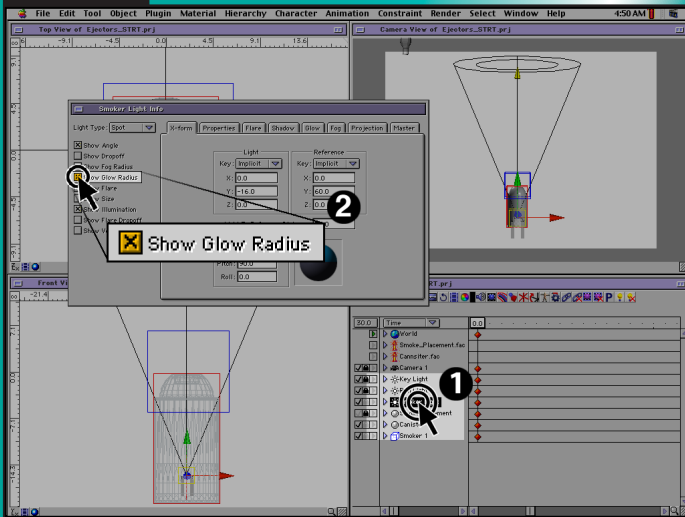
But no smoke.

Why?

That's because we still need to do one crucial step:

Apply the Smoker to the light source we created.





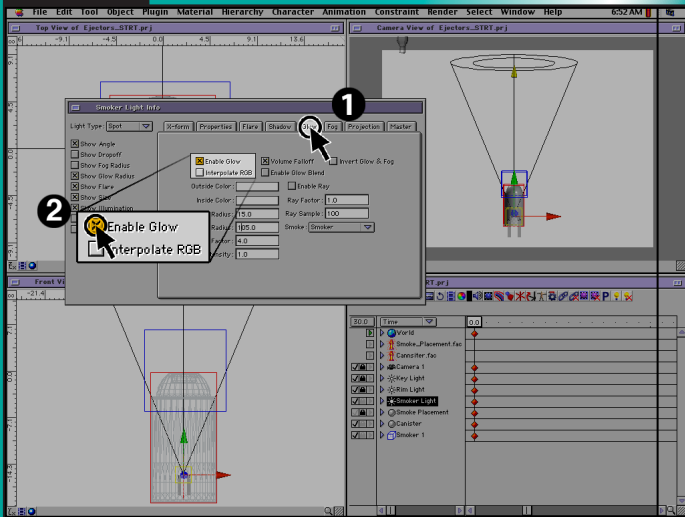
In the Project window, **[DBL+CLK]** the Smoker Light to open the Smoker Light Info window.

Note: In order to see our Smoke, we need to attach it to our light source. Smoke interacts with a light through the Glow and Fog tabs. In this tutorial, we are going to use the Glow tab, but you can use this same setup in the Fog tab, too.

Before we set up the Glow tab attributes, check the Show Glow Radius checkbox under Light Type.

The Show Glow Radius allows us to see the area that will be affected by the Glow attributes.





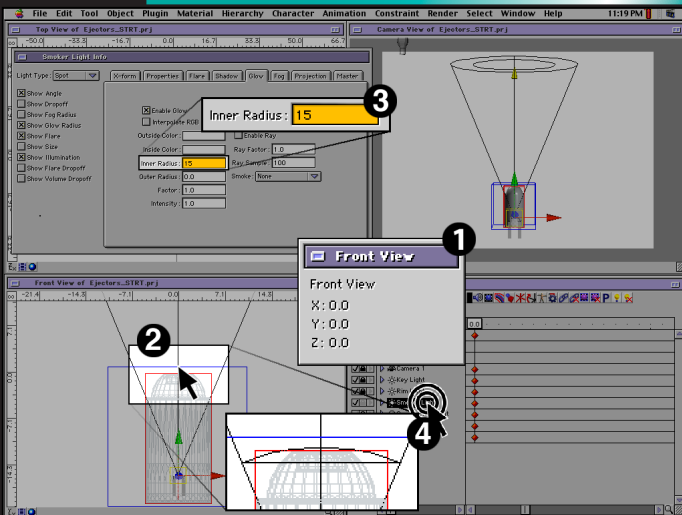
[CLK] on the Glow tab.

Check the Enable Glow option.

Checking this box activates the Light's Glow function.

But as you can see in the windows, nothing has happened.





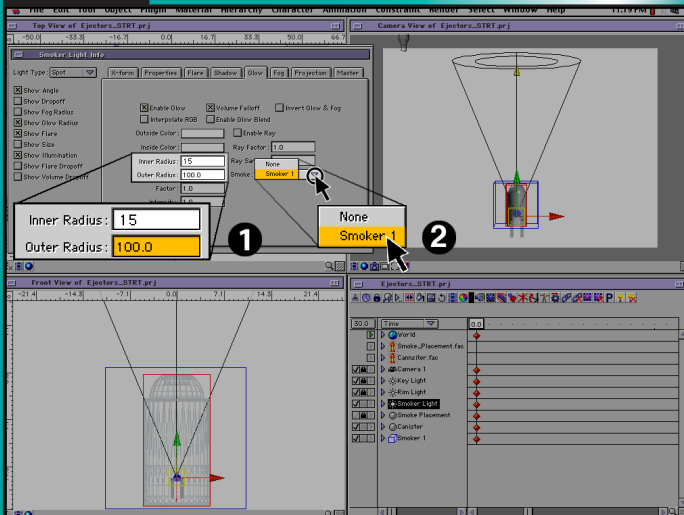
Right now the glow is set to only affect nothing. Both the Inner and Outer Radius, where the Glow begins and ends, are set to 0. We want the glow to start around the top of the can and continue on upward off of the screen.

Open up the Location Palette [**CMD/CTRL+Y**]. This palette gives you exact coordinates of where your cursor is in world space. Make sure that your rulers are on; if not, turn them on now [**CMD/CTRL+M**].

Hover the cursor around the top of the can. Roughly, the top of the can is at 5 units. But the Inner Radius is already set to 0. When we render we still see nothing. That's weird...

Well, not really. This number is related to the origin of the light, not the scene itself. Remember that our light resides 15 units below this or 10 units below the origin of world space. So knowing that, enter 15 for the Inner Radius. You should now see a concave-looking line appear in the cone angle of the Light.





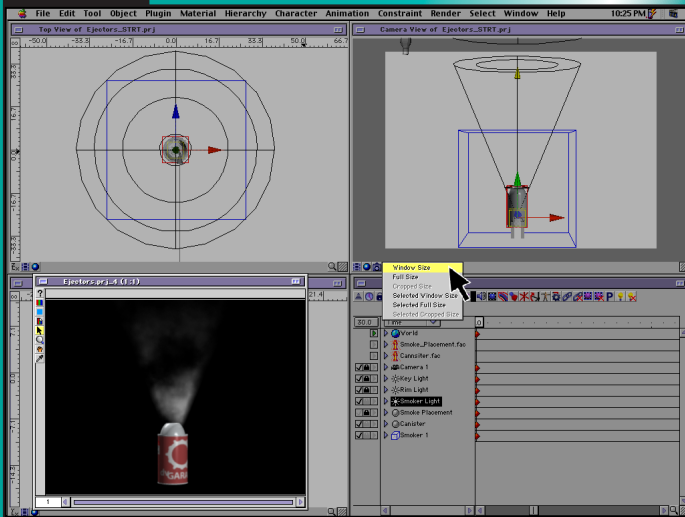
Since we want the Glow to continue offscreen, we need a larger value in the Outer Radius dialog box.

Enter 100 in the Outer Radius. For now, that should do it. We may need to adjust it later.

Last, but not least, we need to apply the smoker to the scene, **[CLK+HLD]** on the Smoke option pulldown and select Smoker 1.

Note: The Smoker Info box should have appeared after selecting the Smoker 1 object. Please close it for now.



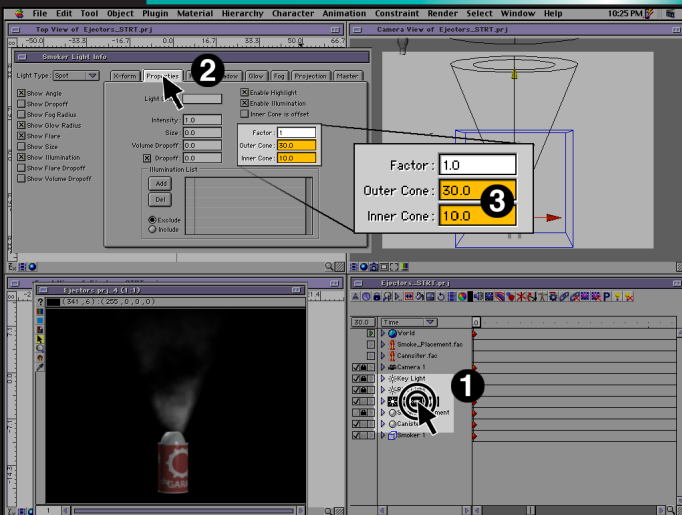


Render a test image of our scene.

As you can see, we have smoke. But it's a little too puffy for our tastes, and because we have not adjusted the cone angle on the Spot light itself, it seems that the smoke is coming from outside of the area we want it to come from.

Do not close this render. Position this window off to the side so that we can compare our progress with this image.





Open up the Smoker Light Info window and **[CLK]** on the Properties tab. We want to decrease the inner cone quite a bit and tuck in the outer cone just a hair.

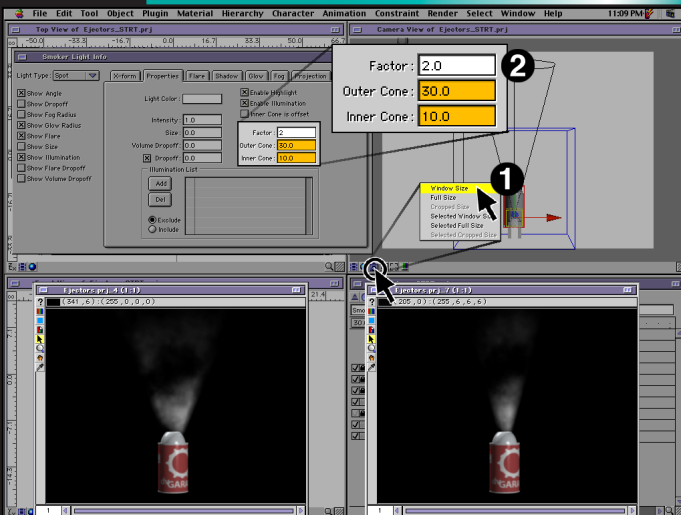
So enter the following values:

Outer Cone = 30

Inner Cone = 10

This concentrates the light to a narrower beam illuminating the smoke. Perform a test render to see the results and compare it to the last render we did.



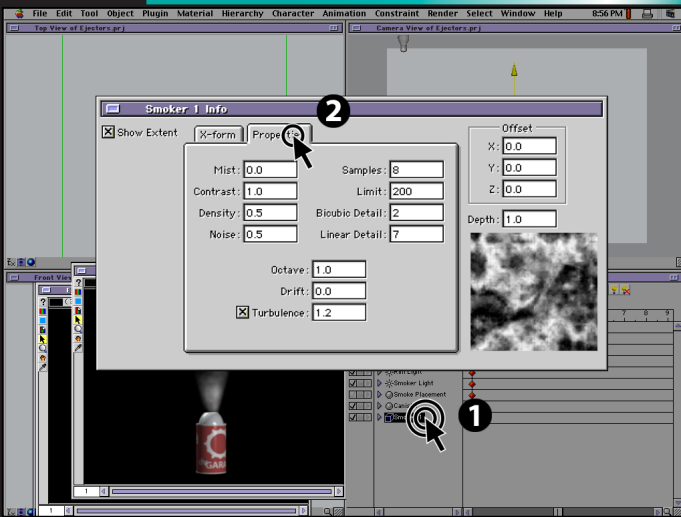


It's starting to come along, but the light still needs a little more focus.

We want the falloff, or the transition between the inner and outer cones to be a little more drastic than it is, so change the Factor setting to 2.

Render out a still to see the results. Compare this render to our previous ones. It's really starting to take shape now. But... we need to tinker a little bit more...



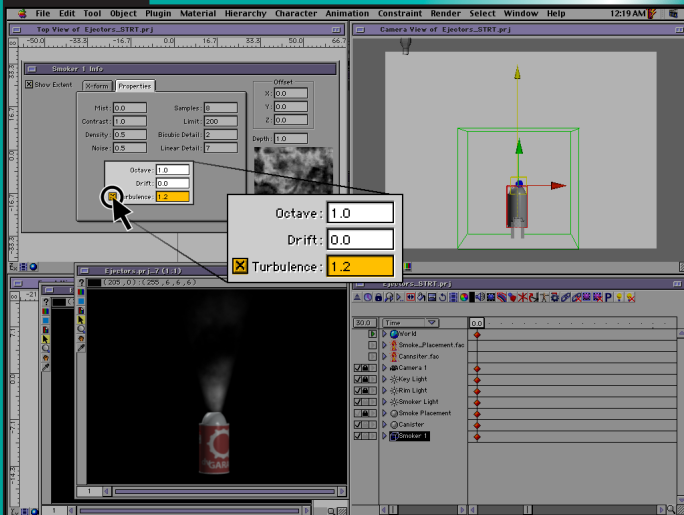


In the Project window, **[DBL+CLK]** the Smoker 1 object to bring up the Smoke Info dialog box.

[CLK] the Properties tab if it's not already selected.

As you can see, the Smoker has some similar traits to most other objects in Animator. We have the X-form tab, where we will be animating the position of our smoke to give it movement, and a Properties tab, where we will define the look of our smoke.



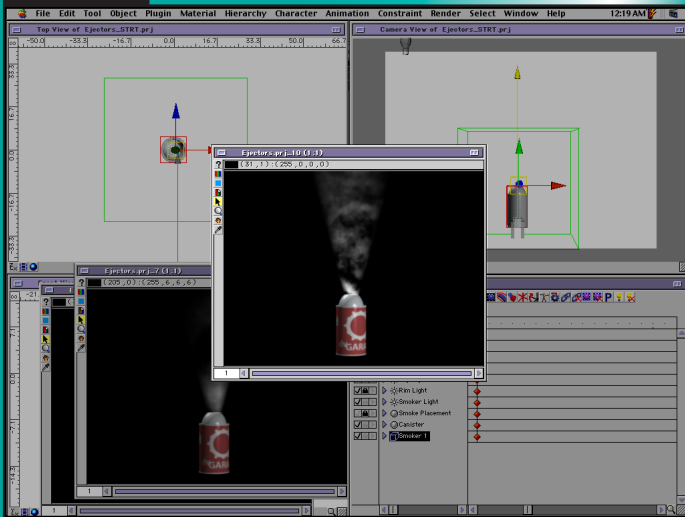


When you scrutinize the test renders a little further, you will realize that there is a gap between one puff of smoke and the next. While this is useful for clouds and some other smoky areas, we want a constant blast coming from our canister. To achieve this, we need more randomization in our Smoker object.

In the Properties tab of the Smoker 1, check the Turbulence checkbox and enter the value 1.2

This will allow the smoke layers to be blended together, allowing for more complex-looking smoke effects.



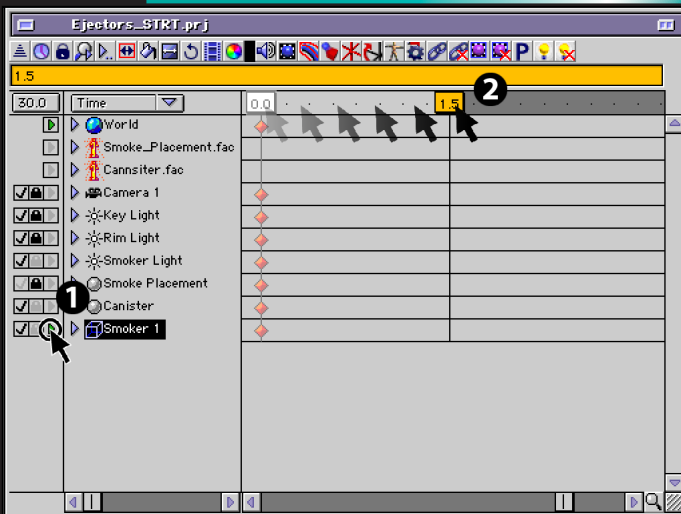


Render out a still image and compare what we have done with the previous results.

It's really starting to take shape now.

Now, instead of looking at a static image of it, let us animate our smoker to achieve our jet blast effect.



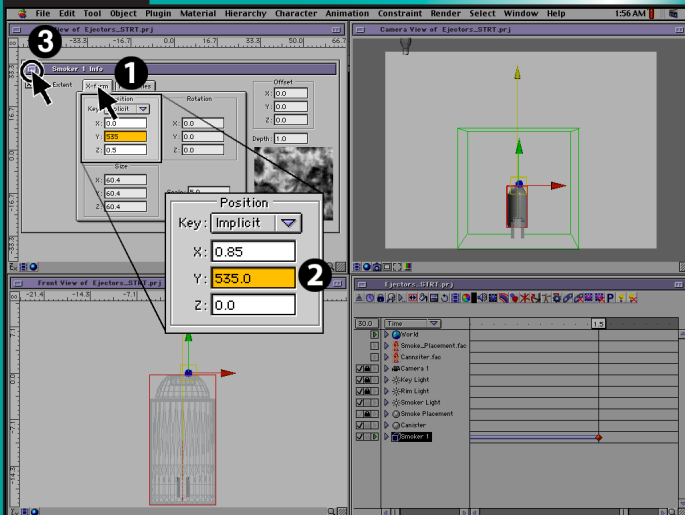


In the Project window, turn on the animation triangle next to the Smoker 1 object.

Drag the ending red arrow to the 1.5 second mark which will mark the end of the animation.

[**OPT/ALT+CLK**] on the Magnifying glass in the lower right of the Project window to fit the animation time to the window.





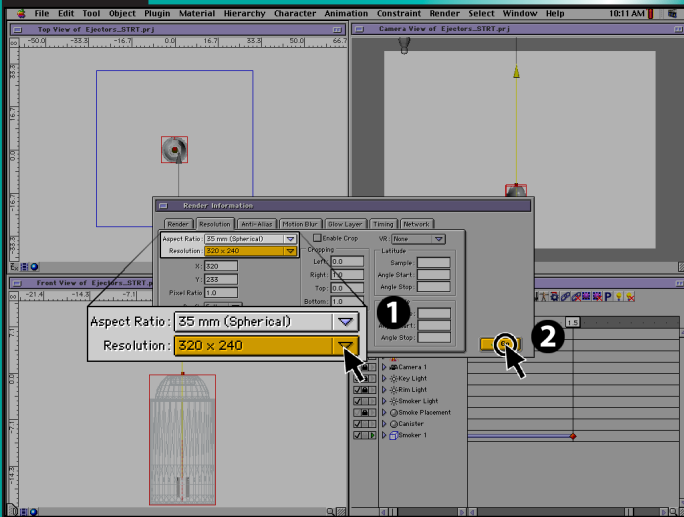
In the Smoker 1 Info window, **[CLK]** on the X-form tab.

In the Position section, enter 535 for the Y value.

Close the Smoker Info window.

So how did we come up with 535 for a value? We kept experimenting and adjusting the number until it looked good. Experiment with different values on your own and see what they do when rendered out.





Press **[CMD/CTRL+R]** to bring up the Render Information window.

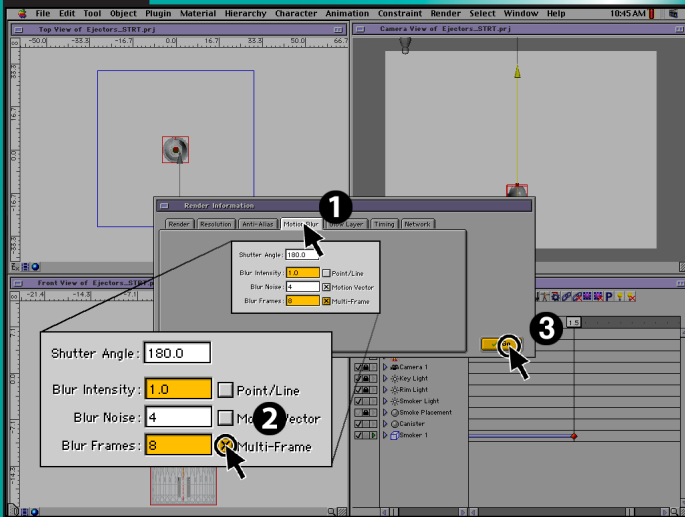
Adjust the settings to render out a 320x240 movie. Click on the Go button.

Once it's done rendering, view the animation.

Now it's looking like something. But you know what? It's lacking something. The smoke is a bit too crisp; if it's moving like that, it should have motion blur.

Stop the movie and re-open your project file.





Pull up the Render dialog box again [**CMD/CTRL+R**], and [**CLK**] on the Motion Blur tab.

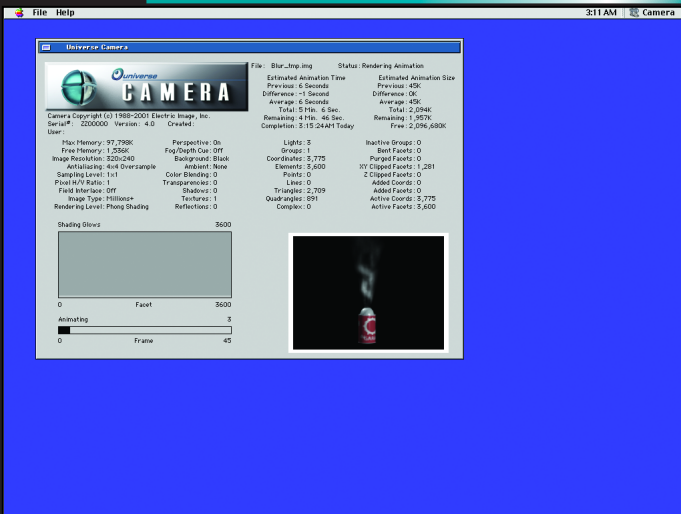
Enter 8 for Blur Frames. Enable the Multi-Frame option.

Set the Blur Intensity to 1.0

[**CLK**] Go. Save the animation and continue on to render the animation.

We just told Animator to apply a motion blur to each frame by taking 8 frames and averaging them together. Now this is not the de facto, all industry standard setting. We played around with the blur settings until we found one we liked, and we encourage you to do the same.



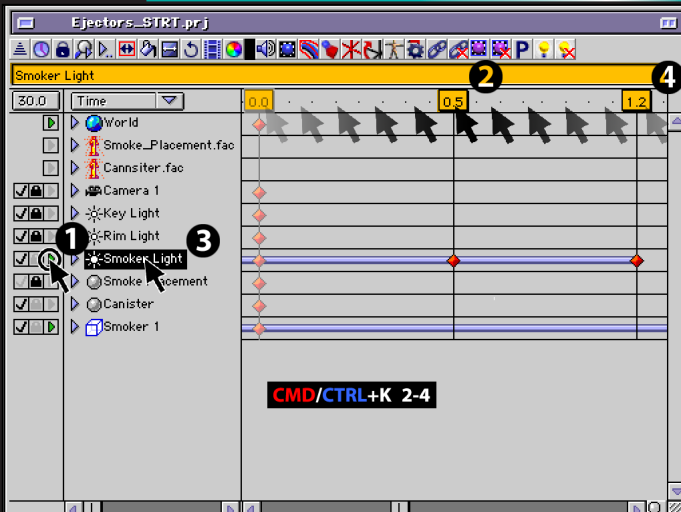


Render out the animation and view it when it is done.

While we could be satisfied with what we have done so far.... we're not. The smoke pattern is too even. It needs to contain some variations.

So let's re-open our project file and tinker a little more.





Turn on the green animation triangle for the Smoker Light.

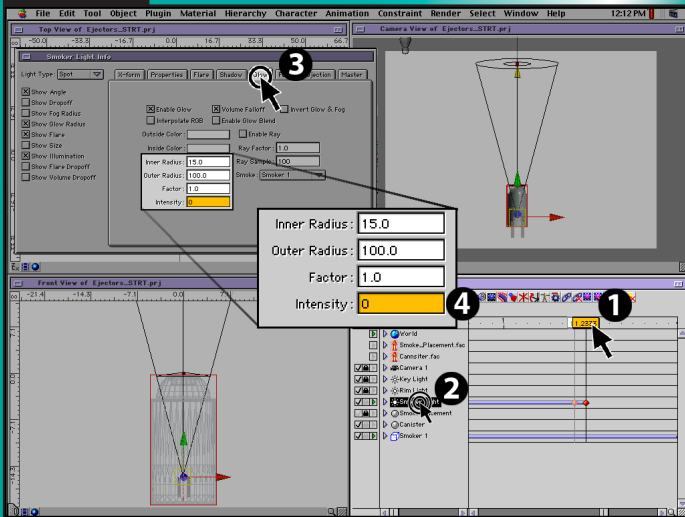
Move the Time Marker to 0.5 seconds.

Select the Smoker Light in the Project window, then press [**CMD/CTRL+K**] to add a keyframe here.

Move the Time Marker to 1.2 seconds and press [**CMD/CTRL+K**] to add a keyframe here.

Note: We are going to create an intermittent burst with our Smoker.





Move the Time Marker to the next frame after 1.2 (it should be 1.233).

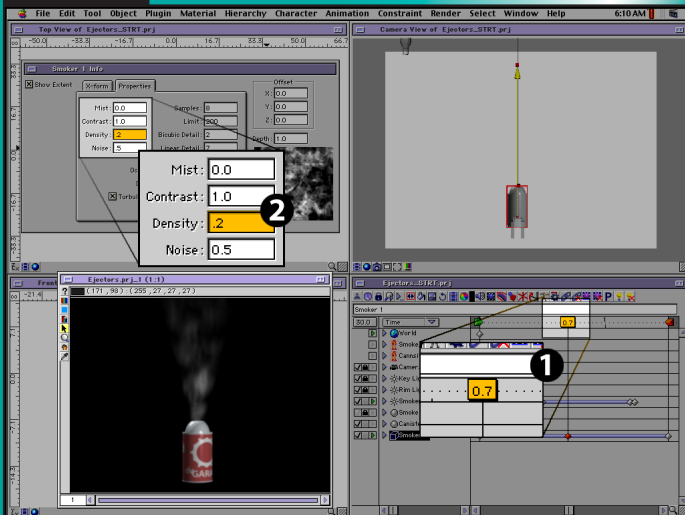
Open up the Smoker Light Info window and **[CLK]** on the Glow tab.

Change the Intensity of the Glow effect to 0. This shuts off the Glow effect, so the smoke is not illuminated anymore.

Move the Time Marker to one frame before 0.5 seconds (should be 0.4667). In the Glow tab, enter 0 for the Intensity.

Move the Time Marker to the beginning of the animation, at 0 seconds and again, enter 0 for the Intensity value of the Glow effect.





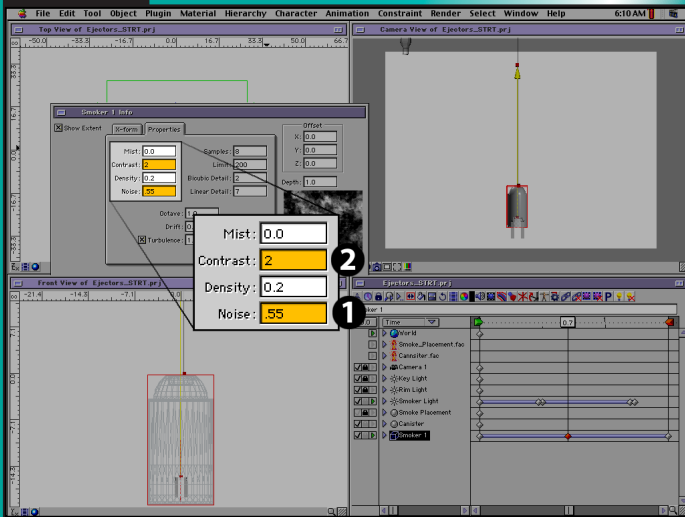
Now that we have made the Smoker blast intermittently, the Smoker itself needs a little finessing...

Move the time slider somewhere between 0.5 and 1.2 seconds. For our test, it was 0.7. Why here? This is where we earlier defined the visibility of the smoke within the light.

Let's lower the density of the Smoke. Enter 0.2 for the Density value. Render out a snapshot.

Density controls how much smoke is in the volume that we initially defined when we drew the smoke box.





Now that we've decreased the Density, which made it less prevalent, we need to add something back to it.

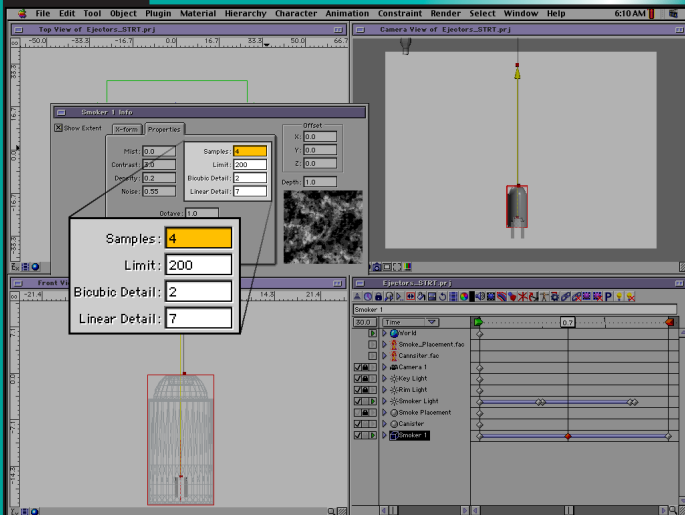
Let's add more detail to the smoke.

Enter 0.55 in the Noise value box to increase the detail of the smoke.

Let's also increase the Contrast to 2.0 to add some intensity to it, too.

Note: Noise and Contrast are not directly related to one another. If you alter one, you don't have to alter the other one.



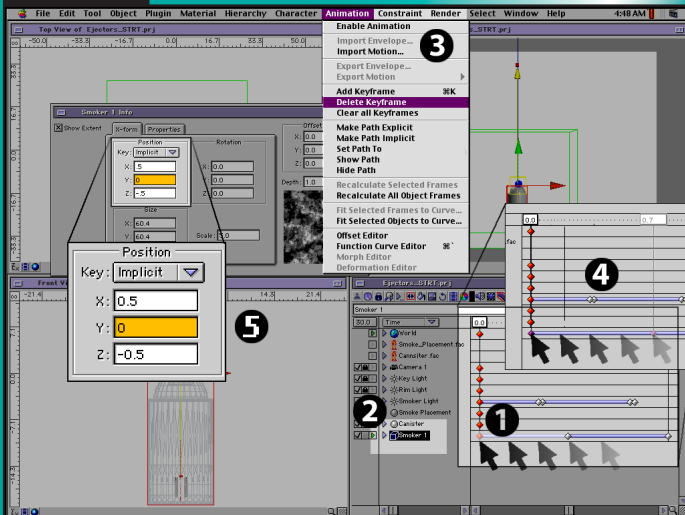


To save on rendering times, decrease the number of Samples to 4.

Samples indicate if the Smoker is either 2-dimensional, a value of 1 or less, or 3-dimensional, a value of 2 or greater.

In essence, Samples slice up the light source the number of times you tell it to, relative to the camera, and blend the planes together to achieve a volumetric look. This is especially useful when the camera is moving through a Smoker. Even though in our example the camera is not, we still want some perceived volume in our effect.



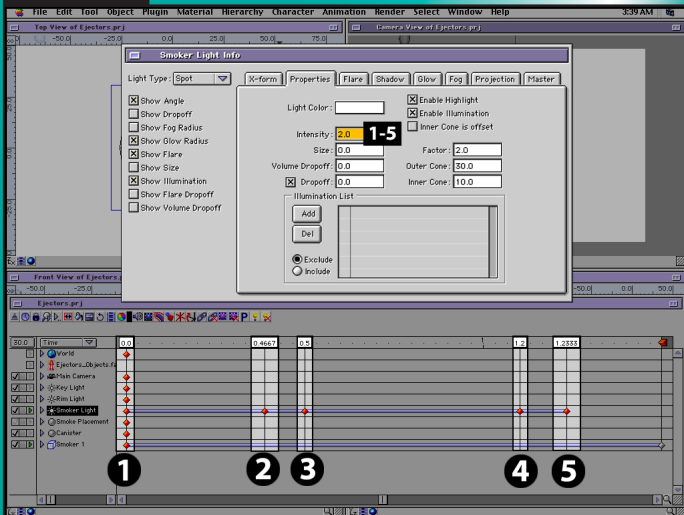


Since we want these changes to be constant throughout the entire animation, we need to adjust the keyframes. Entering the values in the previous steps, we created a keyframe where our Time Marker is located. Since this new keyframe has all of the parameters we want, it is easier to delete the old keyframe at the beginning of the animation and substitute it with this keyframe.

So move the Time Marker to the 0-second mark. Make sure that Smoker 1 is selected then select **Animation > Delete Keyframe** in the Main menu.

Now move the keyframe we created back to the 0 marker. In the X-form tab of the Smoker, change the Y value for Position back to 0.





One last thing that we will change is the main Light Intensity value.

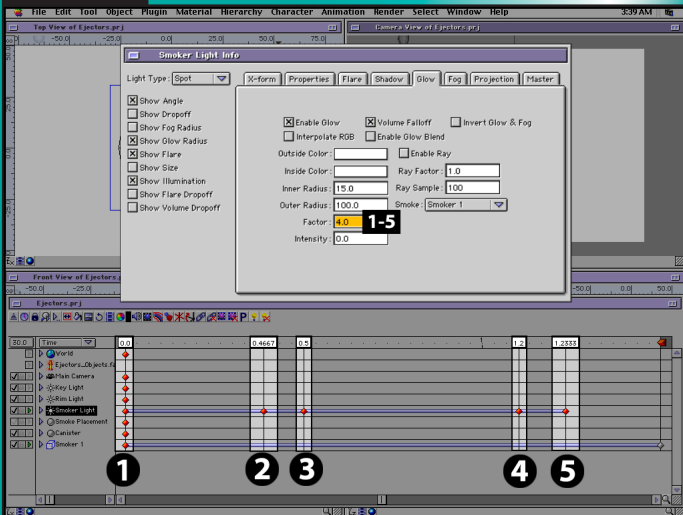
Move the Time Marker in the Project window to 0.

In the Light Info window for the Smoker Light, open up the Properties tab and change the Intensity to 2.

Advance the Time Marker to the next keyframe and change the Intensity setting to 2.

Do this for the rest of the keyframes.





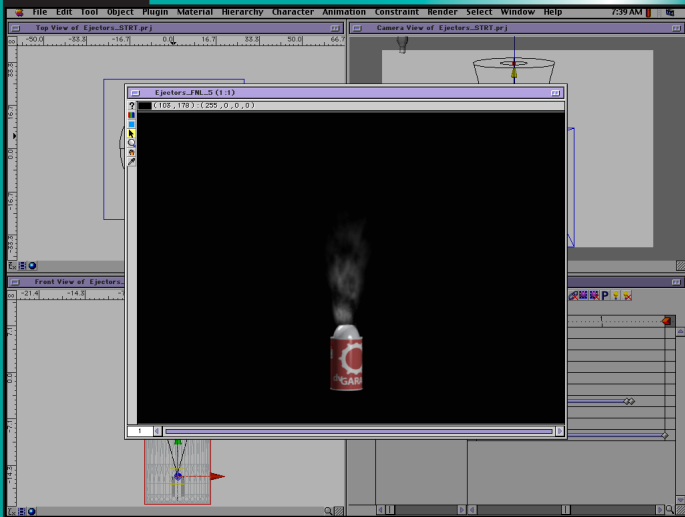
You could Render out the animation now and view it when it is done.

But, we want to adjust one more thing. This is the last one, I promise.

Smoke being ejected usually dissipates pretty fast, and if you were to render and view it now, you would see the smoke still moves off-frame.

To adjust this so it dissipates faster, go into the Glow tab of the Smoker Light and change the Factor setting to 4. You will have to adjust this value on all keyframes to make it stick (be sure to **[Enter]** your values too). Now, you can render.





Smoke has a variety of uses, and we just showed one of them in this tutorial.

This effect can come in very handy for stabilizing engines on spaceships, or for blasts of steam from steam engines or other locomotives. How about jet blasts, or landing stabilizers on rockets? One could even use this as a displacement map for other wild effects...

Anyhow, smoke is a really cool and powerful tool to know how to use. Have fun exploring and exploiting it.

