



nVIDIA®

User Guide

FX Composer



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Chapter 1.

About the FX Composer

FX Composer empowers developers to create high performance shaders in an integrated development environment with real-time preview & optimization features available only from NVIDIA. FX Composer was designed with the goal of making shader development and optimization easier for programmers while providing an intuitive GUI for artists' customizing shaders for a particular scene

Using FX Composer supports all the standard features you would expect in an integrated development environment:

- ❑ Sophisticated text editing with intellisense and syntax highlighting
- ❑ Work directly with HLSL .FX files, creating multiple techniques & passes. Use the .FX files you create with FX Composer directly in your application
- ❑ Convenient, artist-friendly graphical editing of shader properties
- ❑ Supports Microsoft DirectX standard HLSL semantics & annotations
- ❑ DirectX 9.0
- ❑ Provides a plug-in architecture supporting import of custom scene data so you can view your shaders on your own models with lighting, animation, etc.

FX Composer also provides developers with debugging and advanced performance tuning features previously unavailable:

- ❑ Visible preview of intermediate (generated) textures
- ❑ Capture of pre-calculated functions to texture look-up table
- ❑ Interactive compiler shows where the problems are – jump directly to problems in your HLSL source code
- ❑ Simulated performance results for the entire family of NVIDIA GeForce FX GPUs
- ❑ Provides empirical performance metrics such as GPU instruction count, efficiency/utilization & FPS.
- ❑ Optimization hints – to avoid register stalls, XXX

FX Composer consists of several panels that can be docked in the main window, as shown in Figure 1 or taken out of the main window to a more convenient place.

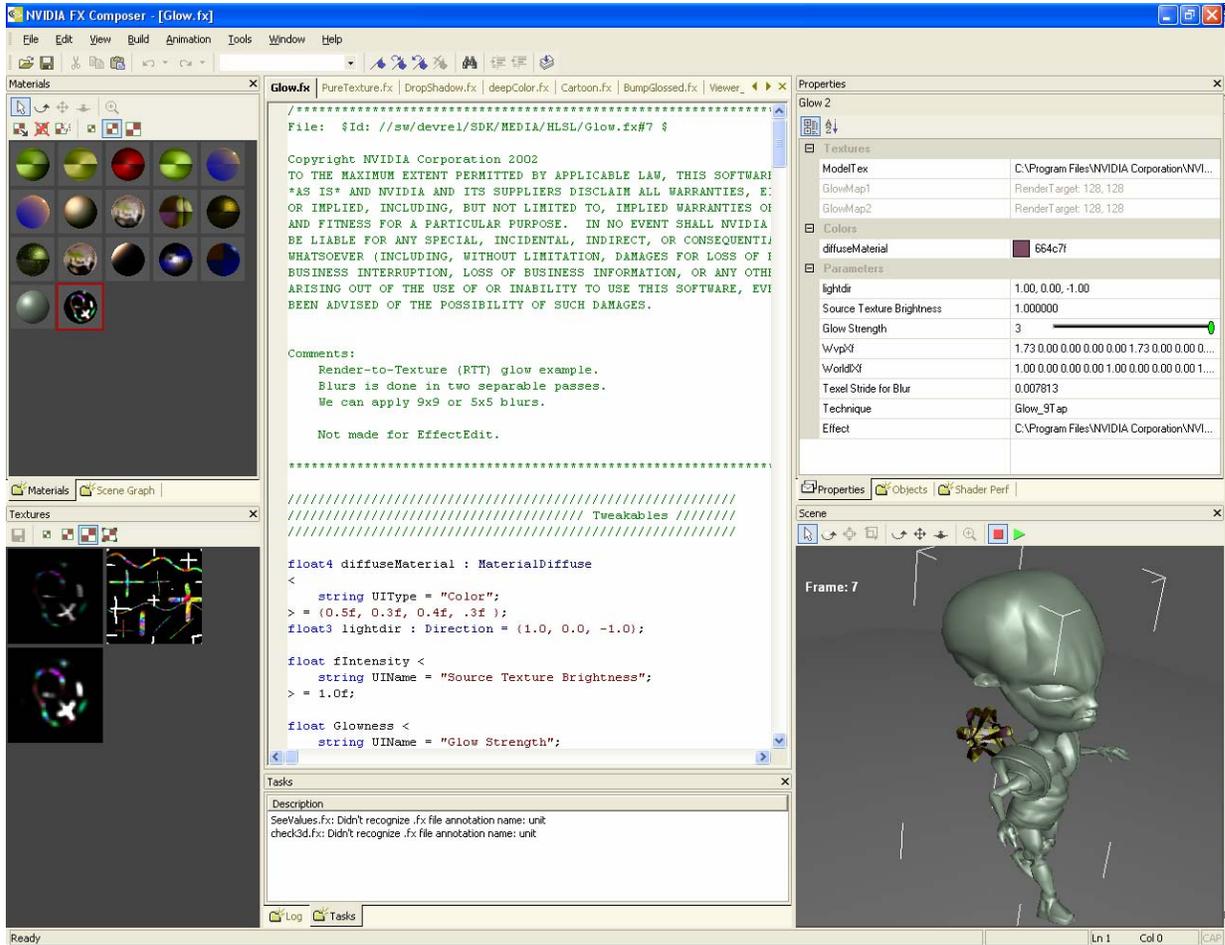


Figure 1. FX Composer Multi-panel Window

1.1. System Requirements

- ❑ NVIDIA GeForce FX series GPU or higher.
- ❑ Microsoft DirectX 9
- ❑ Windows 2000 or XP

1.2. References and Recommended Reading

- ❑ Microsoft DirectX 9 web site
- ❑ HLSL programming book

Chapter 2.

Using the FX Composer

FX Composer allows the user to configure their development environment in several ways. The Text Editor panel is always displayed in main window. Each optional element of the UI is displayed in a separate panel that can be displaced, hidden, resized, docked to the main window, or free float over the window. FX Composer supports systems with multiple displays, allowing free floating panels to be used on a second monitor. FX Composer can be configured to display any combination of the following panels:

- Log** panel
- Error** panel
- Properties** panel
- Object** panel
- Materials** panel
- Textures** panel
- Shader Perf** panel
- Scene Graph** panel
- Scene** panel

2.1. Panels

To display the various panels, use the **View → Toolbars** and select the panels to be displayed in your work area.

Each panel is adjustable and can be dragged away from its docked position to float freely above the main window. Several panels have buttons at the top associated with their major functions. Table 1 lists these buttons and provides a description of each. These buttons are only displayed in panels where they can be used.

Table 2 lists the icons and their function and Figure 2 shows the toolbar.

The FX Composer main window is shown in Figure 1.

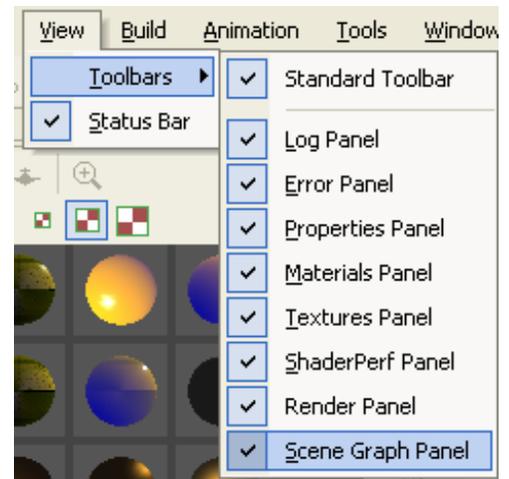
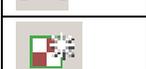
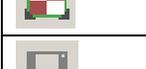


Table 1. Window Panel Tool Icons

| Tool Icon | Description |
|---|---|
|  | Where applicable, a toolbar is located at the top of each window panel. The toolbar contains only those icons that are relevant to the panel operation. |
|  | Select Object: Use this to select an object in the window. |
|  | Rotate Scene: Used to rotate a scene in the window. |
|  | Pan Scene: Used to pan over the scene in the window. |
|  | Dolly Scene: Use to resize an object from the center. |
|  | Zoom Extents: Use to zoon in on an object/scene. |
|  | Apply Material: Apply the selected material to the currently mesh selection. |
|  | Delete Material: Remove this material & close the corresponding .fx file. |
|  | New Material: Create new materials & corresponding .fx file |
|  | Small: Changes object size to a small representation. |
|  | Medium: Changes object size to a medium representation. |
|  | Large: Changes object size to a large representation. |
|  | Actual Size: Changes object representation to reflect its' actual size. |
|  | Save: Save current selection |
|  | Rotate Scene: Rotates all objects in the window in the direction you drag (CTRL + L-mouse) |
|  | Pan Scene: Move the camera up/down or left/right (SHIFT + L-mouse) |
|  | Zoon Scene: Move the camera closer or further away (CTRL + SHIFT + L-mouse) |
|  | Categorize: Show panel contents organized by category. |
|  | Alphabetize: Show panel contents organized alphabetically |
|  | Stop/Start Animation: Controls playback of scene animation. (CTRL+G=Start, CTRL+H=Stop) |

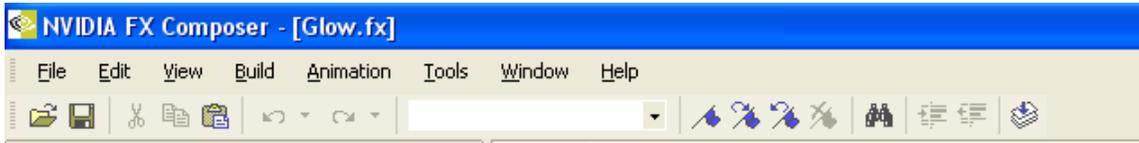
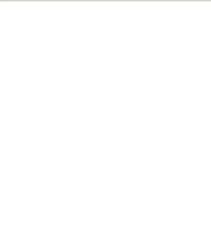


Figure 2. Application Toolbar

Table 2. Description of Application Toolbar Icons

| Tool Icon | Description |
|---|--|
|  | Open File: Used to open the browser to find a file. (CTRL+O) |
|  | Save: Used to save a file. (CTRL+S) |
|  | Cut: Use to delete or cut code from the .fx file. (Shift+Delete) |
|  | Copy: Used to copy highlighted text. (CTRL+C) |
|  | Paste: Used to paste the last copied text. (CTRL+V) |
|  | Undo: Undoes the last action. (ALT+Backspace) |
|  | Redo Used to redo the last action. (CTRL+Y) |
|  | Bookmarks: Used to flag lines of code and skip quickly between flags.  Toggle (apply/delete) Bookmark (CTRL+F2)  Go to Next Bookmark (F2)  Go to Previous Bookmark (Shift+F2)  Clear ALL Bookmarks |
|  | Find: Used to find specific words in a file. (CTRL+F) |
|  | Indent/Un-indent: Used to indent and un-indent lines of code. |
|  | Compile .fx: Used to compile the code displayed in the Text Editor panel. Note that the compiler stops at each instance of an error in the code and does not continue until the error is corrected. Click the Compile key again to continue compiling. (CTRL+F7) |

2.2. Materials Panel

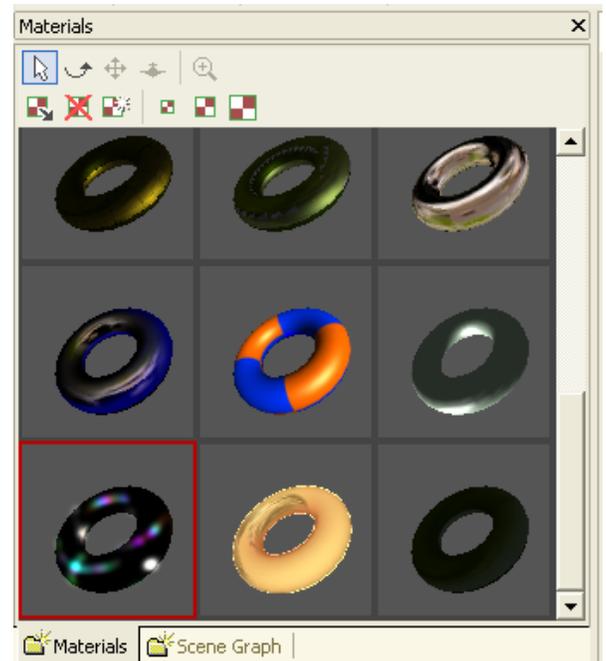
The **Materials** panel is a collection of 3D viewports, displaying a preview of each material currently loaded, applied to a simple shape. This allows you to visualize a material *and* see it applied in 3D.

To open materials, use the **File** → **Load Material...** and select the material to load. The materials will be displayed in this window. See Table 1 on page 5 for a description of the toolbar icons.

Use the **Apply** button  to apply the selected material to an object in a scene. Select the desired material, select an object in the scene and click the **Apply** icon. You can also **Right-click** on a material to access a list of actions and select **Apply To Selection**.

Use the **Rotate** button  to spin the materials around and see the different effects.

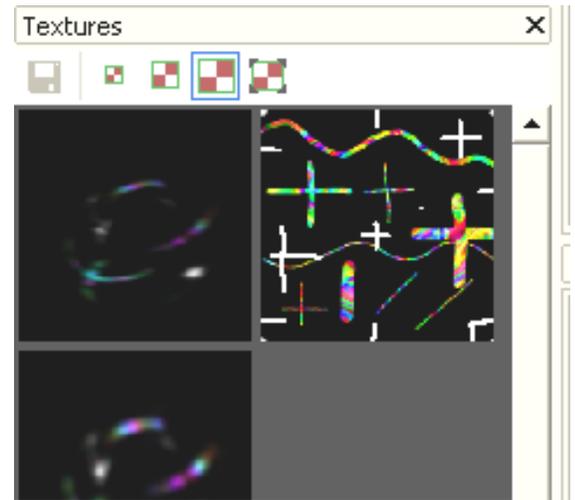
You can also **Right-click** on an object to access Materials panel display options in a context menu. The menu allows you to apply a material to the current selection in the Scene panel, create new materials, open or close existing materials, select the geometric primitive to which the materials should be applied, and set the display dimensions and rendermode.



2.3. Textures Panel

The **Textures** panel displays the current textures for the *selected* material as well as any procedurally-generated textures and render targets. The **Texture** panel also enables visualization of cubemaps and normal maps, etc., since it's really just the same window as the materials panel, and it is displaying the textures in an FX file.

The icons in the toolbar are described in Table 1 on page 5. You can also Right-click anywhere in the Texture panel to access a context menu with options to set the display dimensions and save the currently selected texture.



2.4. Text Edit Panel

The **Text Edit** panel contains the FX file code and is enabled with syntax highlighting (keywords in colors). It acts like the Microsoft Visual Studio. All Material files opened are listed as tabs across the top of the panel to allow you to switch between files easily. Use the scrollbars and bookmarks  to move through the file.

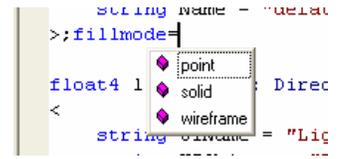
```
Viewer_Diffuse.fx | Glow.fx Rainbow.fx
*****
float4x4 worldIT : WorldInverseTranspose;
float4x4 wvp : WorldViewProjection;
float4x4 world : World;
float4x4 viewInvTrans : ViewInverseTranspose;
float4x4 view : View;

string Category = "Effects\\Crazy";

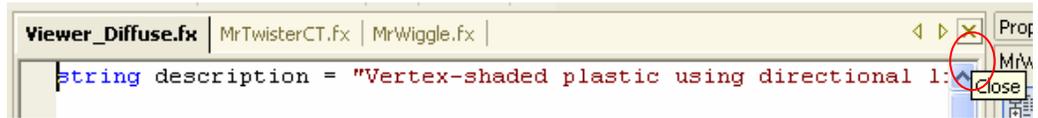
texture colors
<
    string Name = "colors2.dds";
    string type = "2D";
>;

texture swirl
```

The **Text Editor** panel uses syntax highlighting to automatically color HLSL keywords and comments. It also provides convenient intellisense completion, allowing you to select from a list of supported keywords appropriate in the current context. For example, you can type `fillmode=` and select from a list of options that are displayed.



Every time you open a project or a material, a tab is placed along the top of the **Text Editor** panel. Clicking on the tab displays the source code in the **Text Editor** panel and the objects properties in the **Properties** panel. To close a project or material, click on the tab and then click the **X**, Close.



2.5. Properties

The **Properties** panel is used to view and change object properties. It is primarily used for material properties; however it can be used to view/change shapes, textures, and other items in the scene graph such as light. Table 1 on page 5 lists the functions of the toolbar icons.

The options displayed in the **Properties** panel are created by parsing through the current FX file and evaluating the HLSL semantics and annotations used to describe each variable. For example, a specular exponent might be declared as shown in Figure 3, defining how the variable should be displayed in the **Properties** panel.

The screenshot shows the FX Composer interface with three main components:

- Source Code:** A window titled 'Viewer_Diffuse.fx' containing HLSL code. A red circle highlights the definition of `float4 lightDir1 : DIRECTION`. Below it, a `Parameter` block is shown with UIName 'Light', UIObject 'Dir', and Space 'World'. The default value is `> = { 1.0f, -0.5f, 1.0f, 0.0f }`.
- Properties Panel:** A window titled 'Viewer_Diffuse_2' showing material parameters. Under the 'Parameters' section, 'Light Direction 1' is set to `1.00, -0.50, 1.00, 0.00`. A red circle highlights these values, with an arrow pointing to the Parameter dialog box.
- Parameter Dialog:** A window titled 'Parameter' with a 'Scene Connection' dropdown set to 'Disconnected'. It shows the parameter 'lightDir1' with its current value `> = { 1.0f, -0.5f, 1.0f, 0.0f }`.

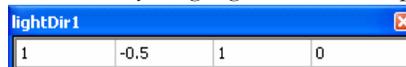
Important: Changing the values in the Parameter box or the properties panel does *not* change the default values specified in the source code. It does change the current values being used to render the scene.

If you click on the content of Light Direction1, the following pop-up window displays allowing you to change the values without having to scroll through the code.

The pop-up window 'lightDir1' shows a 1x4 grid of input fields with the following values: 1, -0.5, 1, 0.

Figure 3. Interconnection of Panels

Vectors and matrices also get special treatment in the **Properties** panel. When defined with the proper semantics and annotations as shown in Figure 3, a matrix editor tear-off panel provides users with a convenient way to experiment with different values. Note that clicking on the scene graph icon next to a **Light Direction 1** causes FX Composer to display the assembly language calculations performed for this light in a pop-up window.



FX Composer supports special color selection tear-off panels for editing color information (Figure 4). Semantics and annotations can be used to tell FX Composer that a variable is used to store color information and provide a descriptive name for the **Properties** panel.

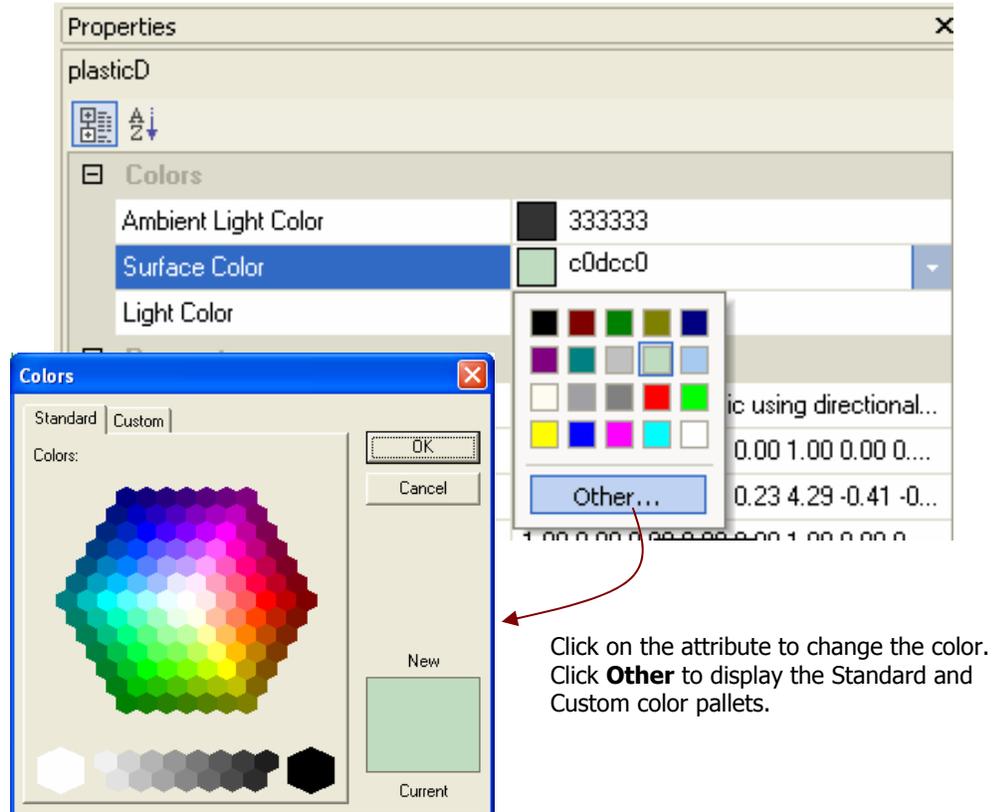


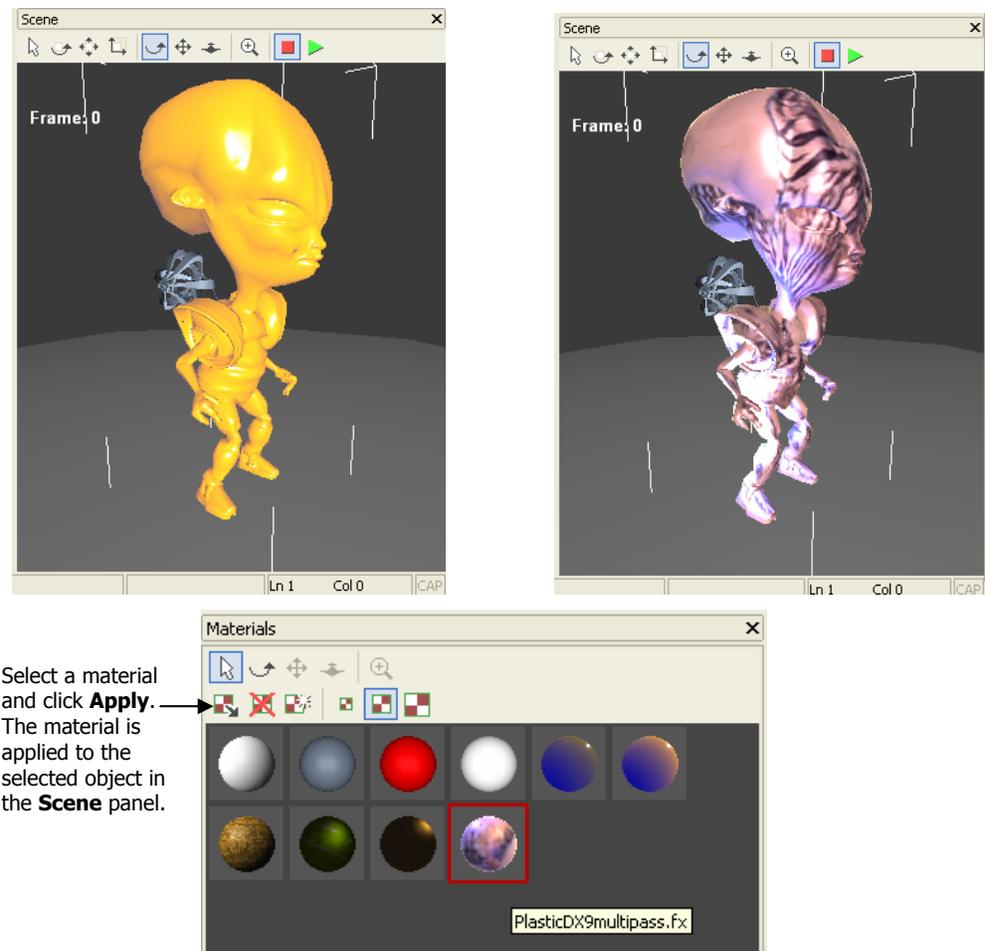
Figure 4. Color Selection Tear-off Panel

Vectors and matrices also get special treatment in the **Properties** panel. When defined with the proper semantics and annotations as shown in Figure 3, a matrix editor tear-off provides users with a convenient way to experiment with different values. Note that clicking on the scene graph icon next to a **lightPos** causes FX Composer to display the assembly language calculations performed for this light in a pop-up window.

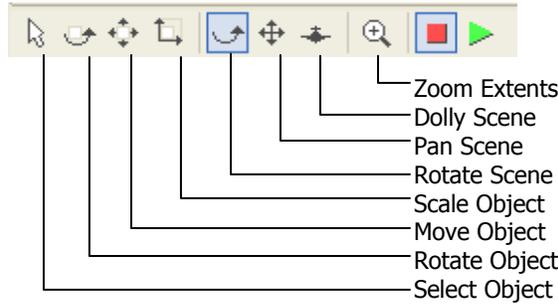
2.6. Scene

The **Scene** panel displays the current scene and has the usual controls for manipulating scenes. FX Composer includes GeoPipe plug-ins that support importing scenes stored in .nvb and .x files, both of which can contain skinning information. Use the **File → Import Scene...** command to load a scene.

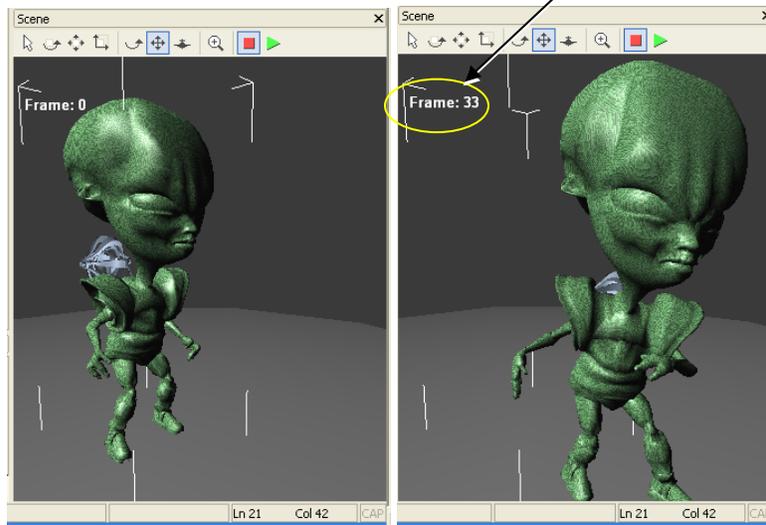
Select an object in the scene and apply a different material to it to change the appearance. Note that the light source remains the same, only the material of the surface changes.



Use the tool icons in the **Scene** panel to manipulate objects and scenes.



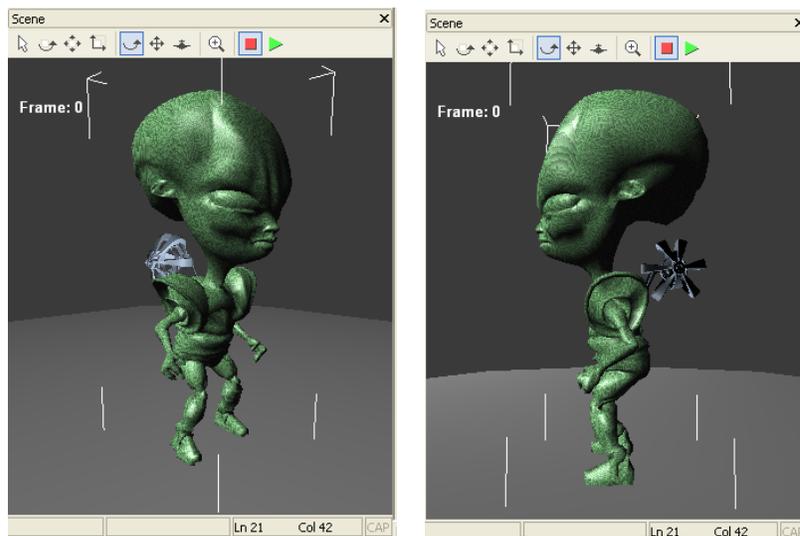
Use the animation controls in the toolbar   to run the frames and see the animation associated with your scene. Note that the frame displayed is shown in the upper left corner of the window.



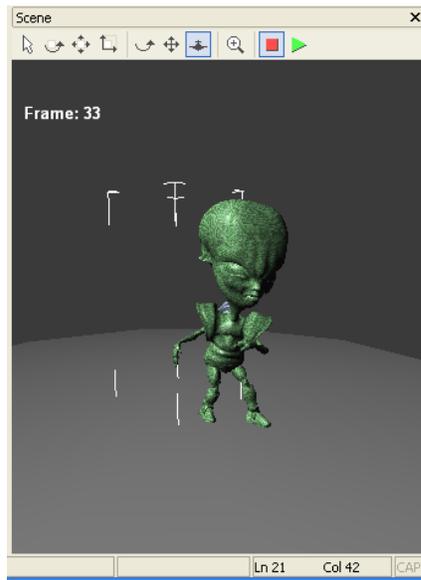
To move frame-by-frame, use **Animation** in the application toolbar or F10 for Next frame and F9 for Previous Frame.

| Animation | Tools | Window |
|--|--------|--------|
| Next Frame | F10 | |
| Previous Frame | F9 | |
| <input checked="" type="checkbox"/> Stop | Ctrl+H | |
| Run | Ctrl+G | |

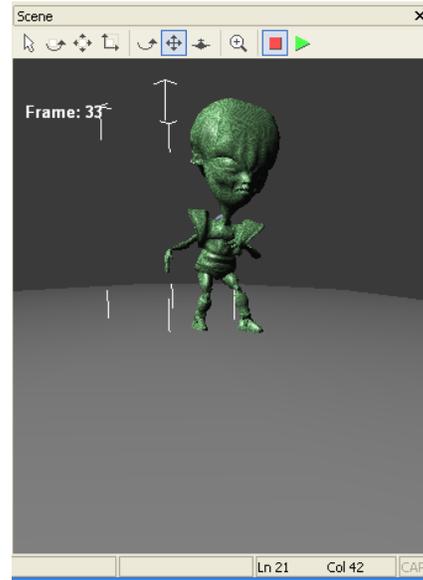
Rotated Scene



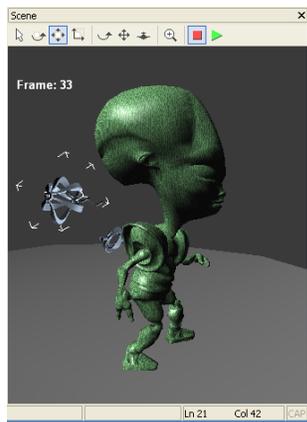
Dolly Scene



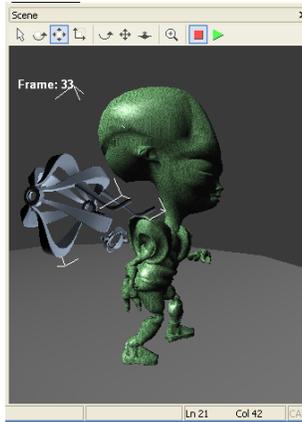
Pan Scene



Move an Object



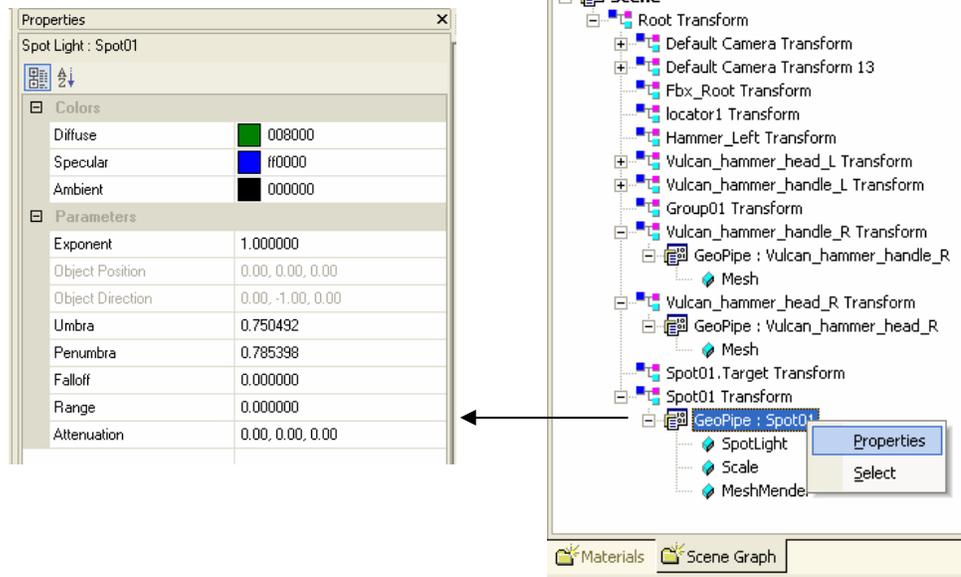
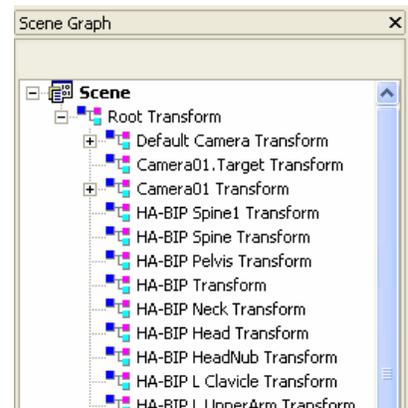
Scale an Object



2.7. Scene Graph Panel

The **Scene Graph** panel is used to browse through the current scene transform hierarchy and select objects. You can use it to select items that wouldn't easily be available in the UI, such as individual bone transforms, etc. It is also useful to see how a scene is built.

To use this window, you can, for example, select **GeoPipe : Spot01** and then Right-Click to display the GeoPipe properties in the **Properties** panel (if not already displayed).





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