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SHAG: HAIR was written by Ivan Kolev and Stanislav Evstatiev of Dimension Design Animation Group exclusively for Digimation, Inc.

The software protection scheme was written by Eugene Antonov exclusively for Digimation, Inc.

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PACKAGE CONTENTS

In this package, you should have received the following items:

- This manual
- A serialized registration card
- CD
- An authorization code fax form

Please take a moment to fill out and return the registration card to Digimation. By sending it in, your registration card entitles you to free technical support and information about new products and upgrades.

HARDWARE AND SOFTWARE REQUIREMENTS

The SHAG: HAIR package will work with 3D Studio Max 2.0 or later. A minimum of 64MB of RAM is recommended to run this software, but large scenes will benefit from more RAM (256MB recommended). Ensure that you have around 10MB free space on the target drive for installation. You should also be running at least Windows NT 3.51 or Windows 95. For NT 4.0, you need to have MAX 1.2. Upgrades from MAX 1.1 to 1.2 are available on the Discreet web site.

TECHNICAL SUPPORT

We at Digimation have tried to make this software and manual as easy to use and error-free as possible. However, if you do encounter a problem or have a question, feel free to contact us at the following telephone number.

SUPPORT NUMBER: (504) 468-3372

SUPPORT HOURS: 9am to 5pm, Mon-Fri CST

You can also send us e-mail and problem files via the Internet at any time.

INTERNET: techies@digimation.com

If you do want to send a file electronically, please be certain that it is compressed using Zip compression and no larger than **500K** in compressed mode. This will speed up transfer time on both ends. Thank you for your cooperation.

For frequently asked questions, tutorials and other useful guides, it is worthwhile checking Digimation's website at: <http://www.digimation.com>

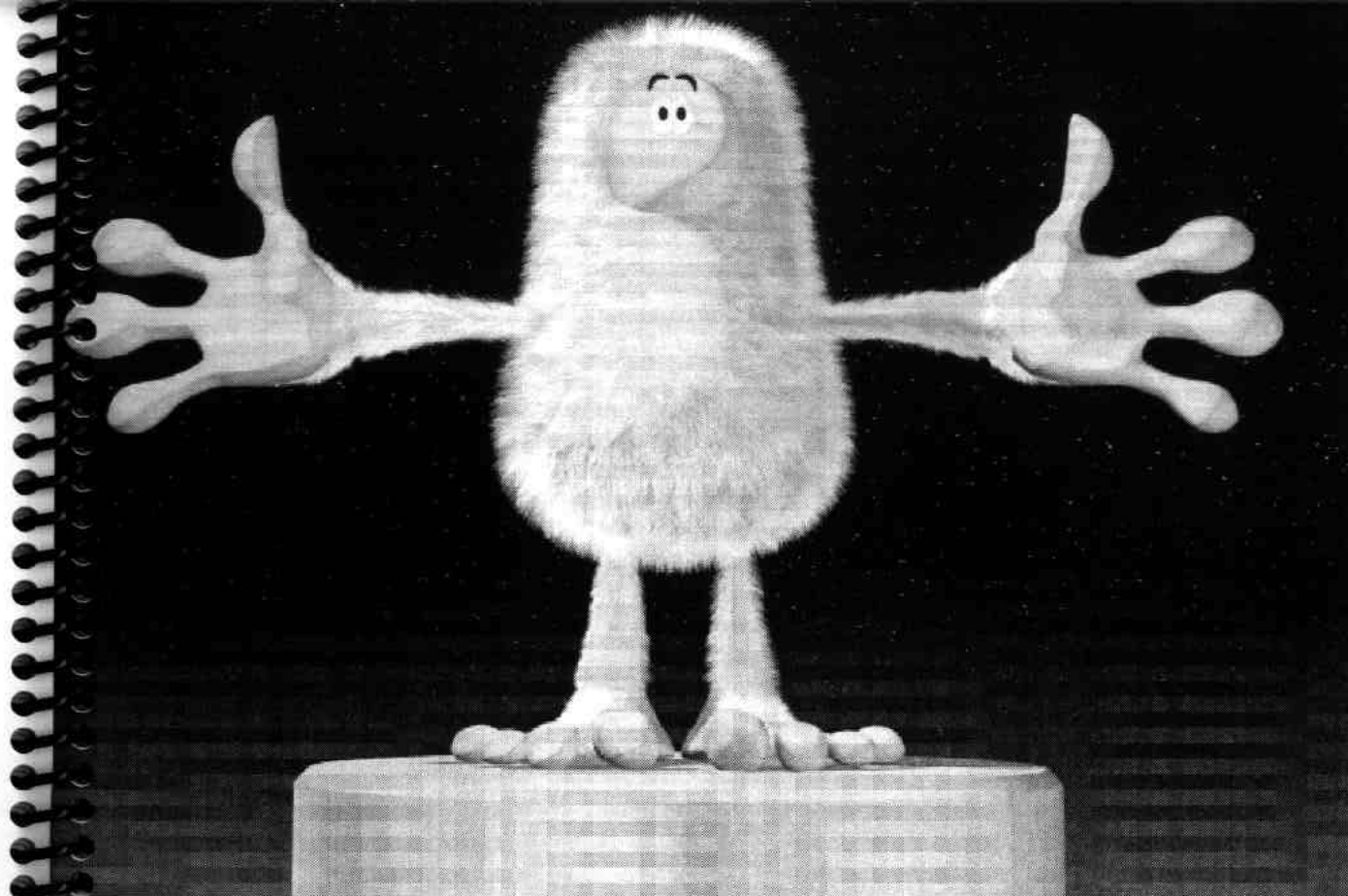
WHO IS DIGIMATION?

Digimation is the world's leading manufacturer and supplier of quality plug-ins and accessories for 3D Studio and 3D Studio MAX. Our plug-ins for MAX (we call them MAXimizers), represent the leading edge of 3D plug-in technology. Shag:Hair is an excellent example of this.

WHAT ARE MAXIMIZERS?

3D Studio MAX represents the finest 3D modeling and animation package on the market today. A major part of its design is its open architecture. This means that 3rd party developers outside of Discreet have access to 3D Studio's internal workings. Through the use of this open access, we are able to create additional features for MAX, above and beyond what it is normally capable of. This technology is commonly called Plug-In technology, and we call our plug-ins **MAXimizers**. **MAXimizers** represent the leading edge of plug-in development. Each one is specifically crafted to meet the rigorous demands of the film and video, game production and computer animation environments.





Installation Guide

Installation Guide

Installing and authorizing your new Shag: Hair package

Shag: Hair is very simple to install. Follow the steps below to copy the files from your installation diskettes to the appropriate subdirectories of your hard drive.

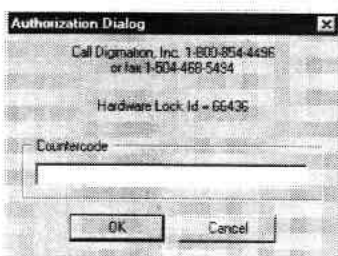
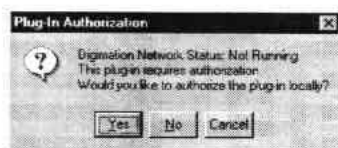
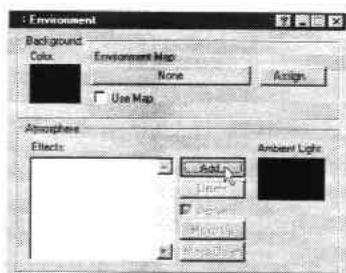
1. Insert the CD into your CD-ROM drive.
2. From the Windows NT pulldown menus, choose **File / Run**. From the new dialog that pops up, type in **d:\setup.exe** (this assumes that drive d: is the CD-ROM drive - if it is not, substitute the correct drive letter).

The installation routine for Shag: Hair will now prompt you for the following locations:

- The root directory that 3D Studio MAX resides in.
(Normally this will be C:\3DSMAX).
 - The subdirectory where it will copy all of the new plugin .dlls.
(This is normally C:\3DSMAX\PLUGINS).
 - A subdirectory to install the sample files, texture maps, etc.
3. Enter the correct paths for MAX and where you want your Shag: Hair files to reside, then hit **OK**. All of the correct files will be copied to your hard disk. This may take several minutes.

IMPORTANT NOTE:

There is one thing to keep in mind when installing Shag: Hair. Our software is protected via a software lock system that ties the routines to a specific 3D Studio MAX hardware lock. Be certain that the machine you install Shag: Hair on is the one you want the routine to permanently reside on. Once you've obtained an authorization code, you will not be allowed to authorize it for another lock without purchasing another copy of Shag: Hair.



Authorization Dialog

- Once installation is complete, launch MAX and go to the Tool Bar and Click on **Rendering/Environment**. After the **Environment** dialog window opens, under the **Atmosphere** group of controls, click on the **Add** button, then select **Shag: Hair** from the resulting selection menu.

The **Shag: Hair Authorization** popup menu will open.

- Now Click on the **Yes** button, which will display an authorization dialog.

You now need to get an authorization code to activate your plugin. Beyond the 5-digit lock ID you will need to provide, you will also be asked for your package serial number, so have it available. Without it, you will not be allowed to authorize your routines.

Keep your counter code number in a safe place. If you accidentally delete the routine, this number will be valid to re-install it.

There are 3 methods for getting an authorization code:

- Call Digimation at (504) 468-7898 Mon. thru Fri. 9am to 5pm.
- Fax Digimation at (504) 468-5494. Use the enclosed form.
- e-mail us at authorize@digimation.com

If you choose to electronically authorize your plugins, please be sure to include all of the information required on the included fax form. Incomplete requests will not be processed.

Network Setup and Considerations

RENDERING ONLY

Shag: Hair is fully capable of running across your network for rendering all of your animations. There are two steps you must do in order for it to work correctly. First, copy the authorized **ShagHair.dlr** routine to a shared network drive. Second, from your \3DSMAX root directory, copy the **digipclt.dll** to the MAX root directory of all of the machines you want Shag: Hair to render on. At this point, any machine that points to the shared directory and is rendering a Shag: Hair animation will now render correctly.

MULTI-USER ACCESS

All of the Digimation routines for 3D Studio MAX have the added capability to be authorized on a local machine, yet be accessible to any MAX system on a local network.

It is able to accomplish this through the use of a Plugin Manager routine that is automatically installed to your local hard drive when you first install Shag: Hair.

This manager is called **digipsrv.exe**.

In order to run a routine across a network, you must perform the tasks listed above for network rendering first. This means copying your already authorized **ShagHair.dlr** plugin to a shared network plugin directory and copying the **digipclt.dll** to the MAX root directory of any machine you want to network edit with.

Next, make sure that you have already installed **RPC Services** to your Network through the Control Panel of Windows NT or Windows95. Check your NT or 95 documentation on how to do this.

Now on the machine that you originally installed Shag: Hair, open up a Console Window (DOS Prompt), go to your 3D Studio MAX root directory and type **DIGIPSRV**. The management software will begin tracking all of the installed routines.

NOTE:

*The RPC Service protocols that are the basis of our network management software can only be initiated from a Windows NT machine. Due to limitations in the way that RPC is set up for '95 machines, they can only log on to an NT machine running DIGIPSRV as a client. If you try to initiate the **digipsrv.exe** from a Win '95 machine, it will not function properly.*

On your other network machines, the first time you try to access the shared plugin, it will prompt you with a message saying "RPC Server not found" and then ask you to identify the other server. Type in the System name of the NT computer running Digipsrv.exe. The license server should now connect you.

SEVERAL THINGS TO KEEP IN MIND

1. The manager software will be tracking how many authorized copies of a routine you have, and only that many users can access the program at the same time. So if you have 1 copy and put it on the network, only the first person will be allowed to work with the plugin. Any other user that tries to simultaneously use the program will get a message that they have been denied access and to try again later.
2. The digipsrv.exe must be run from the computer that **originally** authorized the package. Otherwise, multi-user access will not function properly.
3. If the machine that is running digipsrv.exe is under Windows NT 4.0, there is one hairther setup that needs to be done in order for Multi-User Access to function correctly.

In order to share the resources across the network (including the Digimation license database) the machine that is running digipsrv.exe must set up a User for each machine that needs access. Then you **MUST** log in ONCE as that User (with their password).

What this means is that if you have 5 machines, with one acting as the digipsrv.exe server, you will have to set up that machine with the User names and passwords of the other 4 machines and log in as each one once. Ask your System Administrator about setting up the necessary accounts. Be aware that the users on each of the 4 slave machines can have the same Username and password.

SHAG:HAIR

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Introduction

Introduction

Shag:Hair is a powerful set of plugins designed to enable you to create a wide variety of hair effects in your scenes. You can create effects ranging from thick curly hair to straight plain hair to even grass and weeds. Best of all, you can now make use of dynamics to force the hair to behave in a realistic manner, including effects such as collision, gravity, and wind.

Shag:Hair is a combination of plugins that you can make use of to create the hair effects in your scene. It includes the following plugins: Shag:Hair 1.0, Shag:Fur 2.0 (an upgraded version of the original Shag:Fur product), Hair Enabled Lights, a Hair Helper object, a model hair modifier, a Hair G-Buffer Video Post routine, a Hair Standard Material, and a Hair rendering engine.

Shag:Hair represents an upgrade to the Fur 1.0 products as well as introducing the Hair portion of the system. Fur is generally used for creating short furry hair such as that found on a short hair dog. Hair, on the other hand, is designed to make use of long hair strands and create realistic looking hair for almost all situations where you would need such an effect.

Hair and Fur are advanced rendering systems that supports the following features:

- You can model your own hairs as Splines or NURBS curves. The splines or NURBS Curves must have a Model Hair modifier applied to them before use in the Hair system.
- You can use Dynamics to simulate real world movement of the hair strands in the model.
- Implemented as an environmental shader, the hair can cast shadows and can now properly interact with other environmental shaders such as Fog. This is a feature unique to Shag:Hair.
- You now have the ability to choose whether to have Hair generate true 3d geometry or create the hairs at render time. With true geometry, you will get slightly better anti-aliasing and motion blur, but at the cost of higher RAM and system resources needed to handle the scene.
- New modeling cutter and restricting objects enable you to trim and cut the hair strands as you like by using another object to perform the cutting with.
- A new thick renderer is now available for rendering hair strands that are

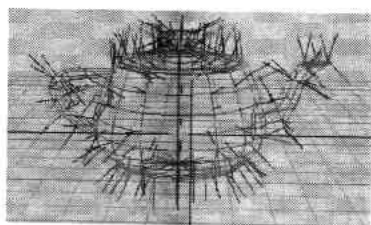
thicker than 1 pixel. This new renderer can render thick hairs quicker and better than the original Fur 1.0 rendering engine.

- Hair strands can now have variable thickness along their length enabling you to create a wide variety of effects.
- Hair now supports clumping. This gives you the ability to clump groups of hairs together making them appear to be wet.
- You now also have the option of using round strands for hairs or flat strands for grasses or other such effects.
- Many of the Hair settings can now make use of Curve Controls which enable you to use a graph to control the value over the length of the hair strand. Examples include the thickness of the hair, and the curliness of the hair strands.

UNDERSTANDING HAIR CONCEPTS

Before getting into the reference guide and tutorial sections of the manual, you need to understand some basic concepts about the Hair system along with some terminology. These concepts will directly influence how you use the commands listed in the reference guide.

The individual hairs in a Shag:Hair system are called strands. There are two types of strands: Vertex Strands and Middle Strands. Vertex strands are the objects that appear in the viewport when you assigned an object as an emitter for the hair system. The following figure shows you an example of these types of hairs.



Vertex strands are the first level of hair and are generated every time the shape of the hair changes. Vertex strands, as you might guess, are always placed on the vertices of the emitter object. These strands are used when you want to use model hair cutters, restricting cutters, and to give you visual feedback in the viewports. Many of the commands in Shag:Hair and/or Shag:Fur operate only on vertex strands.

The next level of hair in the system is the middle strand. These are the strands that are actually rendered. They do not appear in the viewport and are not located on the vertices of the object. But, they are based on the nearest vertex strands. So, any changes to the vertex strands are immediately transmitted to the middle strands at render time. As with vertex

SHAG:HAIR

strands, some of the hair and fur commands will only affect the middle strands.

When using Shag:Hair, you must use a "model hair" as the shape for your hair. A model hair is simply defined as a spline or NURBS curve that has had the Model Hair modifier applied to it. Once the modifier is applied, it can be used as the hair instead of straight lines. This gives you a true sense of flexibility in how you can create your hair. The hair routines, as a matter of fact, require the use of at least one model hair before any hair will be rendered.

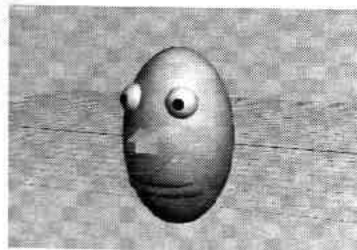
Since model hairs are based on splines, you are probably already familiar with terms like vertices and segments. Hair uses the term knot. A knot is similar to the vertex of a spline that is using a Bezier Spline corner type. The more knots you have in a model hair, the more accurate the motion of that hair will be, but also the longer it will take to calculate dynamics on the hair strands. Hair also uses the term bezier steps, which is simply the number of straight line segments between knots. The more steps you have the smoother the hair will appear, but the longer it will take to render and calculate dynamics.

Now that you have a grasp of some of the basic terminology associated with the Shag:Hair system, you are ready to dive into the quick start tutorial.

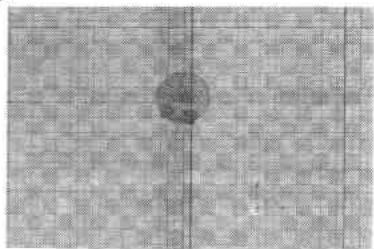
Quick Start Tutorial

In the following tutorial, you will create a simple hair system for a basic head.

1. Load the file HAIREX1.MAX from your SCENES directory. This file should have been placed there during installation. This scene contains a simple cartoonish head that you will apply hair to. This same head is used for most exercises in this manual. The following figure shows you the scene at this point.
2. First, let's start by creating a light. Shag:Hair uses special lights that are necessary to render the hair. Switch to a Top View and zoom out so you can see more of the scene.
3. In the Create Command panel, click on the lights button. Then choose Hair-Enabled Lights from the drop down list. Select a Hair Omni light.

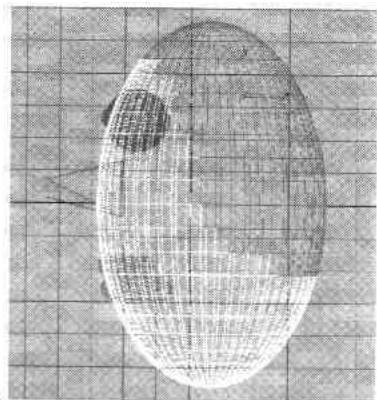


SHAG:HAIR

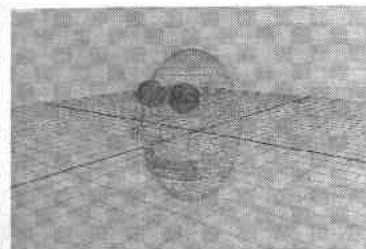


4. In the Top viewport, click down and to the right from the head to create the light, approximately where shown in the following figure.
5. Move the light approximately 120 units vertically in the Z axis to position it above the head. Use the Transform Type in if that is easier for you.
6. Once the light is created, go to the Modify command panel and set the following:

Color	237,237,237
Cast Shadows	On
Shadow Size	512
7. Now, it's time to create the hair for use on the head. In the Create command panel, go to Shapes and select the Line command.
8. In the top viewport, create a line that is approximately 20 units long. Create the line with only two vertices, a start and an end.
9. With the Hair still selected, go to the Modify command panel. Select the More... button, then click on the Model Hair modifier and choose OK. This assigns the Model Hair modifier to the spline.
10. Go to the Modify command panel. Expand the Coordinate Systems rollout. Enable the (Curve Base, Tangent) system. This places the Hair coordinate system at the base of the hair strand and will correctly orient the hair on the surface of the head.
11. Now, it's time to setup the head for working with the hair strand. The location of the hair strands can be controlled by changing the Material ID of the faces in the head. So, let's get that accomplished now.
12. Switch to a Right View. Select the head and go to the Modify Command Panel. Enable Face Sub-Object mode.
13. Using a Window selection, select approximately the faces shown in the following figure.
14. Scroll down in the modify command panel to the Edit Surface rollout. Change the Material ID spinner to 4. Turn off Sub-Object mode.
15. At this point, it's probably a good idea to save the file.
16. Now, we are almost ready to add the hair to the head, but one more task remains. Hair requires either a Camera view or a Perspective view to render correctly, so create a camera in the scene that produces a



SHAG:HAIR

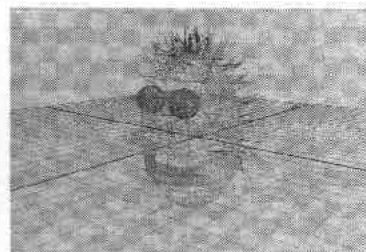


- view similar to the following figure.
17. Now, let's setup the actual hair system. From the pulldown menus, select Rendering, Environment. This launches the Environment dialog box.
 18. Click on the Add... button. In the list that appears, select Shag:Hair and choose OK.
 19. Repeat step 18, but this time add a Shag:Render entry. Both shaders must be present for Shag:Hair to render properly.
 20. Click on the Shag:Hair entry. You will immediately see the Hair rollout appear. In the Objects, Copy/Paste, Load/Save rollout, click on the Pick button under Emitters. Then click on the head itself. You will see the name of the head (Sphere01) appear in the drop down list.
 21. Click on the Face Level button. This launches the Face Level Assignment dialog box where you can assign which faces the hair strands will emit from. In this dialog box, enable By Sub-Material and set the spinner to 4 to match the ID you assigned earlier. Choose OK to close the dialog box.
 22. Under Model Hairs, choose the Pick button and select the Spline that you created earlier. After selecting the spline, you will immediately see the ShagView object appear in the viewport. This shows you the Vertex strands of the hair and roughly how large it will be. The following figure shows you what you should see.
 23. Now, let's setup the parameters for the hair. In the parameters rollout, set the following settings:

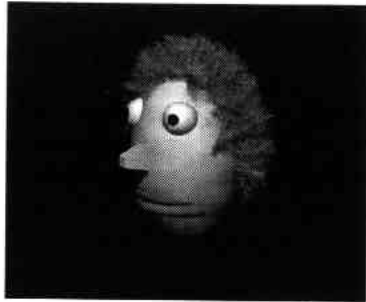
Under Density	Per Area	1.0 (Increases the number of Hairs)
Under Thickness	Maximum	0.1 (Makes hair thinner)
Under Thickness	Random Factor	0.52 (Randomizes the thickness)
Under Curliness	Enabled	On (Turns on curling of the hair)
Under Curliness	Turns	4.0 (Number of turns in the curly hair)
Under Random	Middle Strands	1.0 (Randomizes the middle strands)
Under Random	Vertex Strands	1.0 (Randomizes the vertex strands)

24. Under the Shading, Geometry, Quality rollout, set the following:

Under Shading	Shade Bezier Segments	On
Under Shading	Shade Middle Strands	On



SHAG:HAIR



25. Scroll back up to the top of the Environment dialog box and select the Shag:Render option.
26. Set the Quality and Memory spinner to 10.0. This is the highest quality setting.
27. Set the Render Stripe size to 480 and turn on the Render Progress Bar checkbox. Now, you are ready to render the scene.
28. Close the Environment dialog box. Then, render the Camera viewport at 640x480. Note that it may take a few minutes to render this scene. The result should be similar to the following figure:
29. Save the file.

At this point, you are done with the introductory exercise. You may opt to go back now and play with some of the settings and see how they effect the final rendering. Alternatively, you might return to this exercise after completing the manual and add more color to the hair besides a standard grey.



Reference Guide

Reference Guide

Shag:Hair is broken down into 6 different plugins that work together with each other to produce the hair effects in your scenes. Each plugin is listed separately in this guide along with descriptions of each of the commands associated with that plugin.

SHAG:HAIR MODEL HAIR MODIFIER

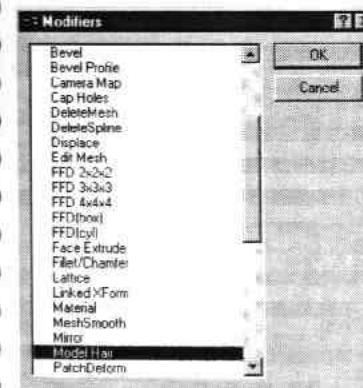
The Model Hair modifier is used anytime you want to use a custom spline or NURBS curve as a hair strand instead of your standard straight hair. If you plan to use the Shag:Hair module, you must create at least one spline that uses this modifier for the hair to render.

The model hair modifier is used to define how the hair is attached and oriented to the emitter object in the hair system. Model hairs are interpreted as vertex strands in the hair system. The main purpose of this modifier is to define the model hair coordinate system (called the HCSys), which defines the attachment point on the hair as well as the orientation of the spline or NURBS curve. Each vertex strand in the model is then created by interpreting the HCSys into a vertex coordinate systems (Vcsys) at the vertex where the strand is placed. Then the coordinate systems are blended together. This is pretty much handled automatically by the Model Hair modifier.

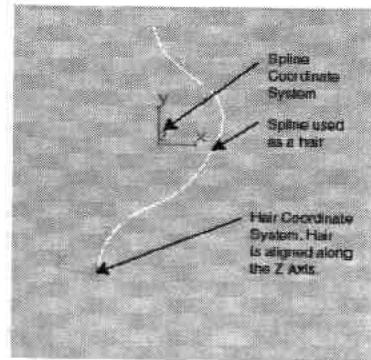
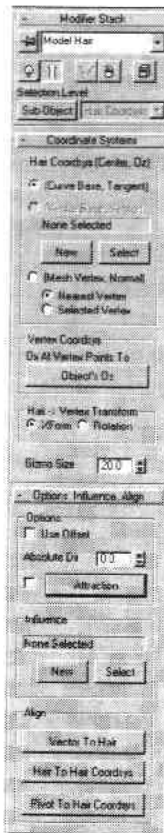
Note:

If the shape you apply the modifier to consists of multiple curves, each curve is treated as a separate hair. By attaching several curves into one shape you can apply the same model hair parameters to several curves with a single hair modifier. You can also do the same by copying or instancing the modifier itself. As a result, you cannot use different spline shapes to define your hair segments.

This plugin is implemented as a standard modifier, as shown in the following figure, and may be applied to any spline or NURBS curve.



SHAG:HAIR



Once you have applied the modifier to the hair, you will see the rollout shown in the following figure appear in the Modify command panel.

Each of the commands listed in the Coordinate systems rollout are listed below and briefly described:

(Mesh Vertex, Normal). When this option is selected, Hair basically will go into an interactive mode where you position the hair and it will interpolate the coordinate systems. To use this option, first create your emitter object or surface. Then create the hair strand and apply the model hair modifier with this option active. Then, add the Shag:Hair atmospheric to the scene. Once you have done this, if you move the original hair spline, you will see the position of all the vertex strands update.

This option has two methods it uses for calculations: Nearest Vertex and Selected Vertex. Say for example you choose nearest vertex. When you move the hair spline around, the hair coordinate system will be calculated based on the position and orientation of the base point of the spline in relation to the nearest vertex of the emitter object. In other words, as you move and orient the spline, you are moving and orienting the vertex strands. You may also orient the strands based on a selected vertex as well.

(Curve Base, Tangent). When this option is selected, the Hair coordinate system is generated at the base of the selected spline curve. In other words, the first vertex of the spline becomes the base point or attachment point of the hair to the emitter surface. When this option is selected, the HCSys gizmo will appear at the base point of the spline, as shown in the following figure. The Z axis of the HCSys (sometimes called the Oz axis) is oriented along a path that is tangent to the spline or curve. This z-axis is then aligned with the normal that is associated with the vertex on the emitter object. This options forces the hair to always grow perpendicular to the emitter surface.

The only way to change the orientation of the hair relative to the emitter surface is to change the X axis of the vertex coordinate system or to use the Absolute Direction option discussed later in this section.

Vector Base, Vector. This option places and orients the Hair Coordinate system at the location of a Hair Helper object (generically referred to as a vector helper). You must either select a Hair Helper (by clicking on the Select button) or create a new Hair Helper (by clicking on the New button) before this option becomes available. Choosing New will create a helper object at the base point of the spline. The Hair coordinate system gizmo will be aligned to the local coordinate system of the vector helper.

Tip:

When using this option, it is a good idea to link the hair to the vector helper object as their orientation relationship is fairly important.

Object's Oz. As mentioned earlier, you don't have too many options that enable you to change the orientation of the hair strand. This is the only option. When you select this button, you will be prompted to select a vector helper object through a select by name dialog box. Once you select the helper object, the X-axis of the hair strand will point towards that helper. This option only works if your Hair->Vertex transform is set to Xform and not rotational.

Hair -> Vertex Transform. These two radio buttons enable you to define how the hair coordinate system is transformed into the vertex coordinate system for use on the emitter object. The first method is Xform. This method uses a standard matrix transform where the X-axis of the hair system goes to the X-axis of the vertex system and so on. The second option is the Rotational option. This option rotates the Z axis of the hair coordinate system to match the Z axis of the vertex coordinate system using the shortest angle. In this case, only the Z axis of each system are aligned.

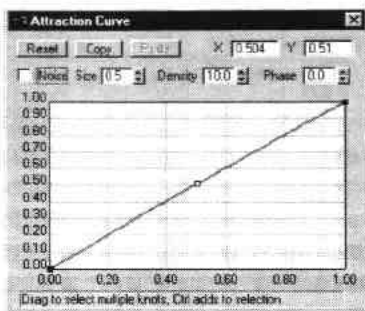
Note:

Since the rotational transform uses the actual orientation of the model hair, the model hair should be close to and linked to the emitter.

Gizmo Size. This spinner defines the size of the HCSys gizmo in terms of MAX units.

The commands found in the Options, Influence, Align rollout are listed below and briefly described:

Use Offset. This option enables you to offset the hair strand from it's hair coordinate system center. In other words, you can move the hair strand so it exists above the emitter surface. This option cannot be used with the (Curve Base, Tangent) option.



Absolute Dir. This option rotates the hairs in the scene to match the orientation of the original hair strand. A value of 1.0 represents absolute alignment with the original hair strand. A value of 0.0 represents the alignment of the hairs with the vertex normals. This option is useful to getting the hairs to grow in one direction.

Attraction. This option is a curve control which defines how much the vertex strands are attracted to the model hair. To use this option you should place the model hair near the emitter's surface, among the strands that it influences. Attraction works on hair knots, so you should use more knots if you want more accurate attraction.

Attraction is one of several curve controls available in Shag:Hair. When an option is a curve control, it has an associated function curve that defines how the option works. The following figure shows you an example of such a function curve and the dialog box in which it appears.

Each of the controls found in the Attraction Curve dialog box are listed below and briefly described:

Reset. Resets the curve to its default settings.

Copy. Saves a copy of the current curve into memory, where you can paste it into another curve either in the current Hair system or another Hair system in the same scene.

Paste. Enables you to paste copied curve data into the current curve.

X. This is the X position of the currently selected (white) knot on the curve.

Y. This is the Y position of the currently selected (white) knot on the curve.

Noise. This checkbox enables noise to be used on the curve to make it more random and natural looking.

Size. This spinner defines the overall size of the noise.

Density. This spinner defines the density of the noise.

Phase. This spinner defines the phase of the noise, much like the phase of noise in the Noise Map found in MAX 2.0.

Points can be added to the curve simply by clicking on the curve (green line) itself. You can click on individual points to select them or drag a window around a group of points to select them. Once selected, you have several mouse options available to you. Holding the SHIFT key down and dragging the points with the mouse restricts the movement to the horizontal axis. CTRL works on the Vertical axis.

If you right click on the select spline knot, a small pop up menu appears enabling you to define the knot further. You can set the knot to be either a smooth or a corner knot, just like you can define the same values for vertices in a spline. You can also opt to delete the knot through this menu.

The ranges of the curve control for attraction are as follows: horizontal 0 = model hair root, 1 = model hair tip; vertical 0 to 1, giving the amount of attraction. The attraction parameter is useful for making plaits and locks, or large clumps of hair.

Influence. Model hairs' can be given an influence when two or more model hairs are used to shape the strands of hair. In such a situation, the influence settings enable you to define how the model hairs are blended together to create a new hair shape. For example, if you start with an S shape and a helix, you can actually animate from one to the other by using the influence.

Influence has two options: Auto and Vector. When Auto influence is selected, Hair automatically handles the mixing of hair strands depending upon their distances to each other in the model. Vector enables you to use a Hair vector helper object to define the influence. When you select the Vector radio button, the Select and New button also become active. Clicking on New will create a new vector at the base of the hair, assign it as an influence, and link it to the hair. The Select button enables you to select an existing vector helper to use as the influence.

When using vectors in the influence settings, the direction of the vector is unimportant. Only the influence settings are used. In addition, vector helper objects also have option for face level influence, which enable you to more precisely control the model hair's placement over the surface of the emitter.

Note: Negative values of the vector's influence are ignored and treated as zero.

Tip: The Slice modifier in MAX 2.5 can be used to make linear boundaries between the faces. Then by selecting different sub-material id's on both sides of the slicing plane (or using named selection sets) you can have two patches of hair growing from the same emitter in completely independent directions. The same can be done of course by splitting the emitter into two different objects and assigning different Shag entries to each one

Vector to Hair. Aligns a selected Hair vector helper with the current hair's base and tangent vectors.

Hair to Hair Coordsys. Places the base of the hair at the hair coordinate system (the gizmo) center and points it along the object's Z axis

Pivot to Hair Coordsys. Aligns the hair's pivot with the hair coordinate system (the gizmo).

Hair Coordsys Sub-Object mode. There is one sub-object level of selection in the modifier, however it does not work the usual for MAX way. You can't modify the HCSys manually. The sub-object level is used just to let the modifier draw a gizmo of the HCSys in the viewports. The only way to modify it is by adjusting the controls in the HCSys group of the rollout.

SHAG:HAIR LIGHTS

Shag:Hair lights are located in the Create command panel under the Lights options. Once there, you can click on the Lights drop down list, shown in the following figure to access the Shag:Hair lights.

Once you select the Hair Enabled Lights, you will see the rollout shown in the following figure. This rollout lists the different types of Shag:Hair lights you can create.

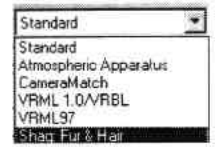
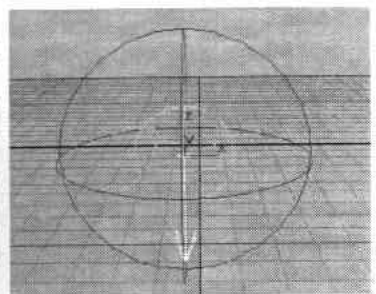
Shag:Hair lights work in the same way as their MAX counterparts. The only difference is that they are aware of the Shag:Hair environment so the strands will properly cast shadows. You can also convert regular MAX lights to Hair enabled lights and vice versa through the Shag:Render environmental control.



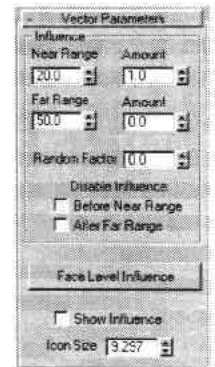
Note: Even though Hair enabled lights are specific to Shag:Hair, they will illuminate the rest of the scene, just like a regular MAX light will. So, be careful placing your lights so you don't add too much to your scene.

SHAG:HAIR HELPER

The Shag:Hair Helper object, shown in the following figure, is accessed through the Create command panel under the Helpers button.



When you get to the Helpers panel, you will find the helpers drop down list. If you click on this, you will see the list shown in the following figure. Select Shag:Fur and Hair to access the helper creation controls.



Once you have accessed the helper controls, you will see a Vector button in the command panel rollout. Click on this button, then click and drag in any viewport to create the helper object shown earlier in this section. Once you have created the helper, you will get the rollout shown in the following figure.

Each of the commands found in the Vector Parameters rollout are listed below and briefly described:

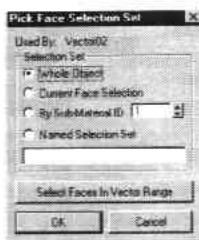
Near Range. Defines the near range for the influence of the vector. This spinner may be set up to 100,000 units.

Amount. Defines the amount of influence for the near range. This spinner may be set from -1.0 to 1.0.

Far Range. Defines the far range for the influence of the vector. This spinner may be set from 1 to 100,000 units.

Amount. Defines the amount of influence for the far range. This spinner may be set from -1.0 to 1.0.

Random Factor. This spinner enables you to adds some randomness to the near and far ranges.



Disable Influence. When this option is checked, the influence before the near range or after the far range is set to 0.

Face Level Influence. This button launches the dialog box shown in the following figure. The face level influence is used to restrict the influence settings to a certain selection of faces on the emitter surface.

Each of the commands found in the Pick Face Selection Set dialog box are listed below and briefly described:

Whole Object. Uses the whole object as the selection set.

Current Face Selection. Uses the faces that are currently selected by a Mesh Select or Edit Mesh modifier sitting on the emitter object stack.

By Sub-Material. Creates the selection set by Material ID numbers, which can be defined in an Editable Mesh.

Named Selection Set. Sets the selection set to a named set of faces. The text area is where you type in the name of the selection set, which must be predefined. In general, this option only works on objects that have a Mesh Select modifier applied to it to create the selection set with.

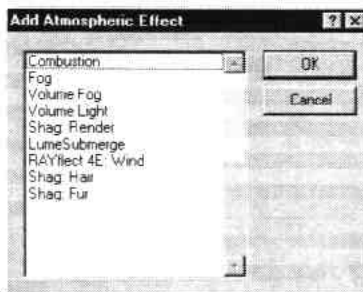
Select Faces in Vector's Influence. This button launches a Select by Name dialog box where you can select different object's in the scene. The only objects in the scene that you will be able to select must have a Mesh Select modifier applied to them and either be inside or intersect the volume of the Helper object. If so, all faces within the spherical range of the helper will be selected.

Show Influence. When this checkbox is active, the spheres representing the influence of the vector are visible regardless of whether the vector helper has been selected or not. When disabled, the spheres are only visible when the vector is selected.

Icon Size. This is the size of the current vector icon in MAX units.

SHAG:HAIR AND FUR COMMON CONTROLS

Both Shag:Hair and Shag:Fur are implemented as atmospheric shaders. To add them to the scene, choose Render, Environment from the MAX pulldown menus. Then choose Add under the Atmosphere rollout. A dialog box,



shown in the following figure will pop up showing you the Atmosphere plugins that are available.

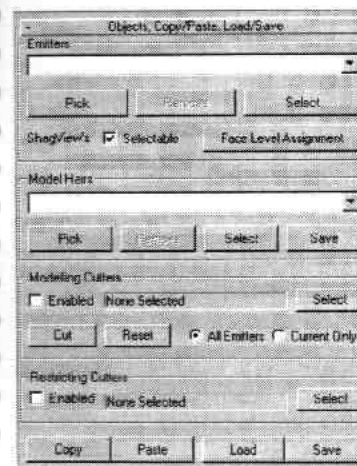
You will notice that there are three Shag entries. For Shag to work and render correctly, you must have the Shag: Render atmosphere applied as well as either the Shag:Hair or the Shag:Fur atmospheric plugin. Fortunately, many of the commands between the Shag:Hair and Shag:Fur atmospheric shaders are the same. As a matter of fact, Shag:Fur contains all of Shag:Hair's controls plus a few specific controls. So, the common controls are covered in this section and the Fur specific controls are covered in the next section.

Once you have added either the Fur or Hair atmospheric shader, you will get a set of 4 rollouts in the environment dialog box. Each rollout is covered individually in the following pages.

THE OBJECTS, COPY/PASTE, LOAD/SAVE ROLLOUT

This rollout, shown in the following figure, contains all the controls necessary to define which objects in the scene are emitters, model hairs, cutting objects, and restricting cutters.

Each of the commands found in this rollout are listed below and briefly described:



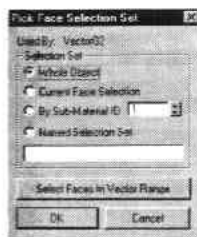
Emitters Drop Down List. This drop down list contains all the objects in the scene that are being treated as hair emitters for the current hair system.

Emitters Pick. Enables you to select objects in the scene for use as hair emitters.

Emitters Remove. Removes the emitter that is currently displayed in the Emitters drop down list from the hair system.

Emitters Select. This button enables you to select emitters through a select by name dialog box.

Emitters Select Arrow. This button enables you to select the current



emitter in the scene.

Emitters Select Double Arrow. This button enables you to select all the emitters listed in the drop down list in the scene.

Face Level. This button pops up the face level assignment dialog box, shown in the following figure, where you can modify the selection of faces for the current emitter object.

Each of the commands found in the Pick Face Selection Set dialog box are listed below and briefly described:

Whole Object. Uses the whole object as the selection set.

Current Face Selection. Uses the faces that are currently selected by a Mesh Select or Edit Mesh modifier sitting on the emitter object stack.

By Sub-Material. Creates the selection set by Material ID numbers, which can be defined in an Editable Mesh.

Named Selection Set. Sets the selection set to a named set of faces. The text area is where you type in the name of the selection set, which must be predefined.

ShagViews. This area lists the current ShagView object associated with the current emitter object. The ShagView object is the object that displays the vertex strands in the scene.

Sync Names. Synchronizes the names of ShagView objects with the Emitter objects. This is very helpful when you have multiple hair emitters for the same Shag:Hair entry.

ShagView Select. Selects the current ShagView object in the scene.

ShagView Select All. Selects all ShagView objects in the scene that are associated with the current Shag:Hair shader.

Model Hairs Drop Down List. This drop down list displays all of the currently selected splines that are to be used as model hairs on the current emitter surfaces. You may select more than one model hair if you wish.

Note:

Model Hairs are not available for the FUR rollout. Shag:Fur does not use splines as it automatically generates short straight hair.

Model Hairs Pick. Enables you to select splines that have the Model Hair

modifier applied to them from the scene.

Model Hairs Remove. Removes the model hair that is currently displayed in the model hairs drop down list from the hair system.

Model Hairs Select. This button enables you to select the model hairs through a select by name dialog box.

Model Hairs Select Arrow. This button enables you to select the current model hair shown in the drop down list.

Model Hairs Select Double Arrow. This button enables you to select all Model Hairs listed in the drop down list.

Model Hairs Save. Enables you to save the model hairs as a separate MAX file. This enables you to export hair strands from one scene to another.

Auto Influence Mixing. If the Model Hairs used in the scene have the Auto Mixing option turned on, this spinner defines how much mixing occurs between the strands of hair. The spinner may be set from 0 to 1 with a default of 0.5. At 0, no mixing occurs, while at 1, every hair strand is mixed.

Modeling Cutters Enable/Disable. This checkbox enables or disables the use of Modeling Cutters. Modeling cutters are any MAX objects that can be converted to a tri-mesh. Hair cutters work on the vertex strands of the model.

Modeling Cutters Select. This button enables you to select modeling cutter objects through a select by name dialog box.

Cut. When you select this button, all modeling cutters are activated and cut the hair strands. This can take a few minutes if you have a lot of hair strands. Cuts are cumulative on the hair. So, for example, if you cut the hair, then decide you want it a little shorter, you can move the modeling cutter objects, the cut again. To make hair longer, you will need to reset the hair to it's original state, then cut again.

Reset. Resets the hair strands to the original state before cutting. You can undo this option if necessary.

Scale/Cut Flyout. This flyout contains two buttons that enable you to define how the hairs are cut by the Modeling cutters. You can elect to outright cut the hairs or to have the hair strands scaled down to match. Simply select the appropriate button to enable this option.

All Emitters. When this radio button is active, all emitters in the hair system can have their hair strands cut by the modeling cutters.

Current Only. When this radio button is active, only the current emitter, as displayed in the emitters drop down list, can have its hair strands cut by the modeling cutters.

Restricting Cutters Enabled/Disabled. This checkbox enables or disables the use of restricting cutters in the hair system. Restricting cutters are used to cut the hair back to an object such as a hat. Unlike modeling cutters, restricting cutters work on the middle strands only at render time. It should be noted that the restricting cutters only work on the side of the face where the normal appears. 2 sided objects will not work correctly.

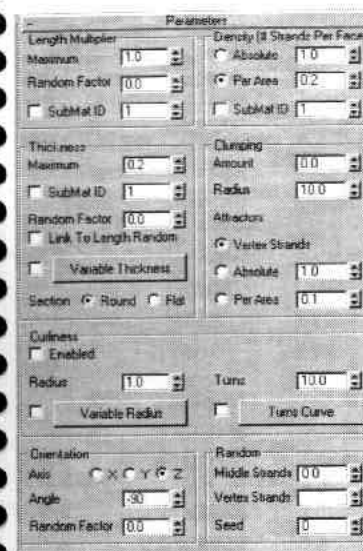
Restricting Cutters Select. This button enables you to select objects in the scene for use as a restricting cutter through a select by name dialog box.

Copy. Enables you to copy all of the Hair parameters from one hair system to another. The same applies for Fur systems, but you cannot copy hair into fur or vice versa.

Paste. Enables you to paste any copied Hair parameters into the current system.

Load. Enables you to load hair or fur parameters from a saved file on disk. Make sure you only load Hair files into hair systems and Fur files into fur systems.

Save. Enables you to save Hair or Fur settings to a file. Hair files have a *.HR extension while Fur files have a *.FUR extension.



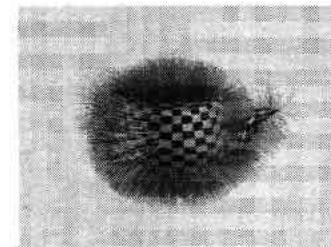
THE PARAMETERS ROLLOUT

The commands found in this rollout, shown in the following figure, are used to define the position, number, density, size, and shape of the hairs in the hair system.

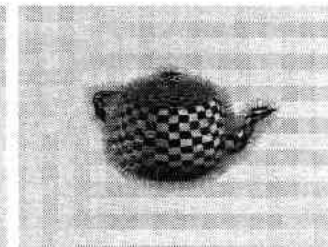
Each command found in the Parameters rollout is listed below and briefly described:

Length Multiplier. These controls enable you to define the length of the hair or fur strands. Each control is listed below and briefly described:

Maximum. This spinner defines the overall length of the hair strand as a ratio of the model hair length. A value of 1.0 uses the entire strand. A value of 0.5 uses 50% of the strand from the base upward to define the length. This spinner may be set from 0 to 1.0. (Note: For Fur, the spinner is given in MAX units and can be set from 0-1000 world space units.) The following two figures show you a teapot with a length multiplier of .75 and 0.3 respectively.



Length Factor 0.75



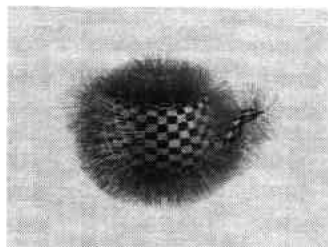
Length Factor 0.3

Random Factor. This spinner, which may be set from 0 to 1, enables you to add randomness to the length of the hair strands. A value of 0 indicates no randomization.

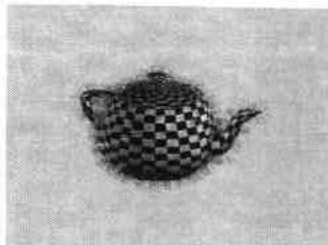
Sub-Mat ID. This checkbox and spinner are used to tie the length of the hair strands to a sub-material ID on the object. The Maximum value is multiplied by the value of a sub-material at the root of each middle strand. In such a case, the procedural map or bitmap is converted to grayscale. Any white areas of the map are treated as 1 and black as 0. So, where white appears in the map, the strands are full length. Where they are black, no hair appears. The following two figures show you a teapot with a checker map. The first figure doesn't use Sub-Material ID's, while the second does. Notice how the black areas do not have any hair growing from them.

Note:

To make use of this parameters, the emitter object must have mapping coordinates from a UVW mapping modifiers. Default mapping is not supported.



Sub-Mat ID Disabled



Sub-Mat ID Enabled

Density (# Strands Per Face). These controls enable you to define the density or number of hairs per face of the emitter object. Each control is listed below and briefly described:

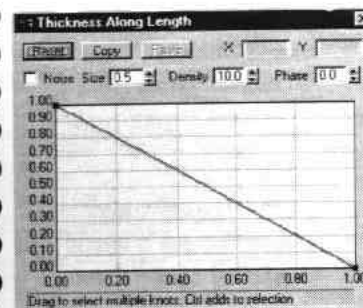
Absolute. This spinner defines the absolute number of hair strands per face on the emitter object. For example, if you have an emitter with 5,000 faces and you set this spinner to 30, you will receive a total of 15,000 hair strands. If you set this spinner to a decimal number such as 10.5, you will get slightly different results. In this situation, half of the faces will grow 10 hairs, the rest will grow eleven.

Per Area. This spinner defines the number of strands to be based on the area of the emitter object. In this case, the area of each triangle is calculated, then multiplied by the value in this spinner. The result is the number of hairs that appear on that face. This method produces very even distributions of strands on the object emitter, regardless of face shape or size.

Sub-Mat ID. This checkbox and spinner allow you to use the Diffuse map from the material assigned to the object to determine the overall number of hairs that are created. Here, the bitmap or procedural map is converted to grayscale and the values are multiplied by either the Absolute or Per Area spinners, depending upon which is active. The white areas of the map represent a value of 1 and black 0.

Note:

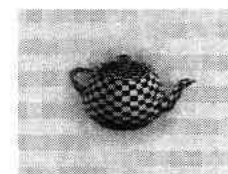
The material map is sampled at the center of each face. If you have large faces, the strand density won't change across the area of the face, even if your map changes.



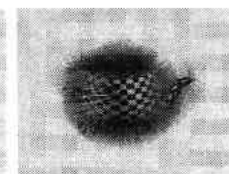
Thickness. These controls enable you to define how thick the individual strands of hair are when rendered. Each control is listed below and briefly described:

Maximum. This spinner defines the maximum diameter of the middle strands, in terms of world space units. The button with the straight line next to the Maximum spinner launches another curve control dialog box where you can control the thickness of the strands. (See the Attraction Controls in the Model Hair modifier for more info on Curve controls)

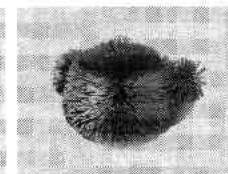
With this curve control, the horizontal values are linked to the length of the hair strand with 0 representing the base and 1 representing the tip of the hair strand. The vertical values are linked to the thickness. The vertical value is multiplied times the maximum thickness value to get the resulting thickness of the strand. The following three figures show you thickness' of 0.02, 0.2, and 0.5 respectively.



Thickness 0.02



Thickness 0.2



Thickness 0.5

Sub-Mat ID. This checkbox and spinner allow you to use the Diffuse map from the material assigned to the object to determine the overall thickness of hairs that are created. Here, the bitmap or procedural map is converted to grayscale and the values are multiplied by the Maximum spinner. The white areas of the map represent a value of 1 and black 0.

Note:

The emitter object must have mapping coordinates applied to it through a UVW mapping modifier. Default mapping is not supported.

Random Factor. This spinner enables you to add randomness to the thickness of the strands. A value of 0 indicates no randomization. A value of 1 means that the thickness can range from 0 to the maximum spinner across the hair system.

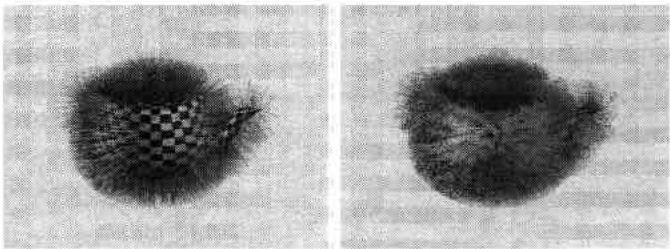
Link to Length Random. When this checkbox is active, the thickness random factor is ignored and the length random factor is used instead. This ensures that a hair strand is randomly scaled downward, so is it's thickness.

Cross Section. These two radio buttons are used to define the shape of the cross section of the hair. You may select either round or flat. Flat is most commonly used for hair like strands such as grass.

Curliness. These controls enable you to define how curly the hair strands are, regardless of their initial shape. This process makes use of the bezier steps in the middle strands. Hence, you should increase the number of bezier steps in your strands before using this option. These controls are listed below and briefly described:

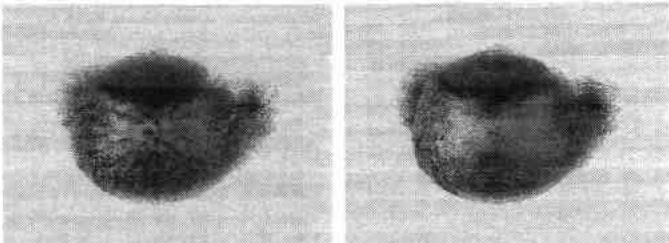
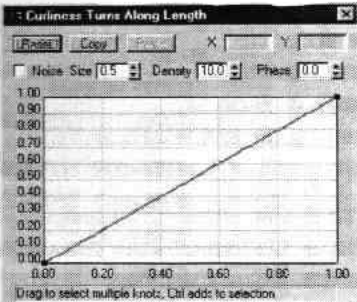
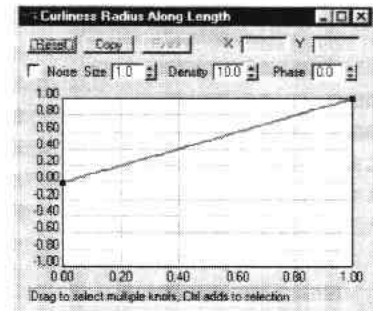
Enabled. Enables or disables the curliness option. This option also has another curve control option enabling you to use a graph to control the radius of the curves. (Curve controls are discussed fully under the Attraction Curve settings in the Model Hair section of the reference guide)

In this case, the horizontal values of the graph represent the strand length from 0 at the base to 1.0 at the tip of the strand. The vertical values represent a radius multiplier which is multiplied times the value in the Radius spinner to define the radius of the curve at that point on the strand. The following two figures show you the difference between having curliness enabled or disabled and using the default settings.



Curliness 0 Curliness 1.0

Radius. This spinner defines the radius of the curled strand. The following two figures show you the difference between a radius of 1.0 and 2.0 respectively.



Radius 1.0 Radius 2.0

SubMat ID. The radius value is derived from the submaterial assigned to the emitter object. This enables you to use materials to define areas of larger or smaller curls in the hair strands based on the grayscale colors of the underlying map.

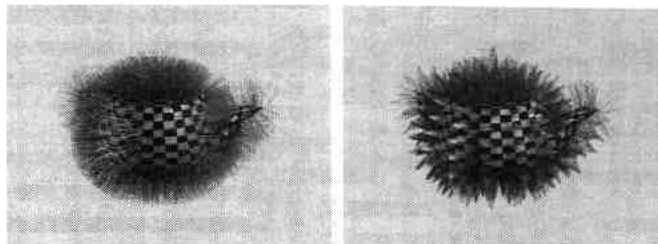
Turns. This spinner defines the number of turns the curled strand will make. When the Turns Curve parameter is not used, this command works like the Helix Shape command. You may set this spinner from 0 to 10000. The button next to the spinner provides access to another Curve Control that enables you to define the number of turns in the spline through the graph shown below.

In this graph, the horizontal values represent the length of the strand going from 0 at the base to 1.0 at the tip. The vertical values are a multiplier that is multiplied times the Turns spinner times 2 Pi. Horizontal parts of the graph represent areas where you will have straight hair segments. Sloped parts of the spline represent areas of the hair strand where you will have curliness.

SubMat ID. Enables you to derive the number of turns in the hair from the underlying material assigned to the emitter object. This enables you to use materials to define areas of more or less curly hair.

Clumping. These controls enable you to define how the hair clumps together to make the hair appear dirty. Clumping works on the middle strands of the hair. For each face in the emitter, a few hair strands are chosen as attractors. Each middle strand then leans toward the attractor that is closest to the root of the strand. Clumping effects are localized to each face, so high density mesh emitter objects will not clump well. Each control is listed below and briefly described:

Amount. This spinner defines how much the middle strands lean towards the attractors. This spinner may be set from 0 to 1.0. At 1.0, the tip of each strand touches the tip of the attractor strand. The following two figures show you the difference between clumping at 0 and 1.0.



Clumping 0.0

Clumping 1.0

SubMat ID. This enables you to define the amount of clumping based on the materials assigned to the emitter object. With this, you can use materials to define where the hair is more or less clumpy. This is based on the grayscale values of the underlying maps in the material.

Radius. This spinner defines a radius, in world space units, within which strands are effected by the clumping values. The radius is centered around each attractor hair strand. Any strands outside this radius are ignored.

SubMat ID. This enables you to define the radius of the clumping based on the materials assigned to the emitter object. With this, you can use materials to define where you have larger and smaller clumps of hair. This is based on the grayscale values of the underlying maps in the material.

Vertex Strands. This radio button defines the vertex strands to be the attractors.

Absolute. This radio button and spinner defines a set number of attractor strands per face in the emitter.

Per Area. This radio button and spinner defines a variable number of attractor strands based on the overall area of each face. The area of each face is calculated and multiplied by this spinner to define the number of attractors.

Note:

The clumping parameters correspond closely to the density controls. You should strive to have about 5 to 20% of your strands as attractors.

Growth Style. These controls enable you to define how hair can be grown over time. Each control is listed below and briefly described:

Grow at Each Frame. With this option, the hair or fur is recalculated from the modelers at each frame.

Fix to Emitter. When this option is selected, the hair or fur is recalculated only at specific frames. For all other frames, it disregards the modelers and makes the hair follow the animation of the emitter's skin. This option is used most commonly with skeletal deformation packages such as Physique or BonesPro, or even the Bend modifier.

Reference Frame. This spinner defines the frame number where the Fix to Emitter option is calculated.

Note:

When using Fix to Emitter, there are several things you cannot do. First, you cannot animate any parameters associated with defining the fur/hair shape. This includes leaning and bending options in Fur. Second, you cannot apply this option to emitter objects whose vertex count changes over time, such as a sphere with an animated number of segments.

Orientation. These controls enable you to define the orientation of the hairs as they are emitted from the emitter surface. These controls affect only the middle strands of the hair system. These commands are most commonly used in hair systems such as grass fields where the orientation of the grass blades is important. Each control is listed below and briefly described:

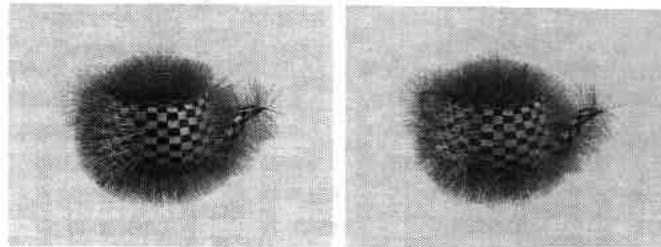
Axis. These radio boxes define the axis along which the orientation is adjusted. The default is Z which is along the hair axis.

Angle. This spinner defines how much rotation is placed in the hair along the selected axis. You may set this value from -180 to 180. The rotation is relative to the emitter surface.

Random Factor. This spinner enables you to add randomness to the rotation of the strands. A value of 0 indicates no rotation. A value of 1 means that the rotation can range from -180 to 180 across the hair system.

Random. These controls are used to add additional randomness to the hair system. Each control is listed below and briefly described:

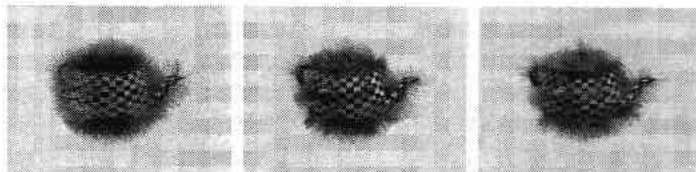
Middle Strands. Randomizes the direction in which middle strands grow. Can be set from 0 to 1.0. The following two figures show an example of using this option with Middle Strands set to 0 and 1.0 respectively.



Middle Strands 0

Middle Strands 1.0

Vertex Strands. Randomizes the direction in which vertex strands grow. Can be set from 0 to 1.0. The following three figures show you Vertex strands at 0, 1.0, and both vertex and middle strands at 1.0.

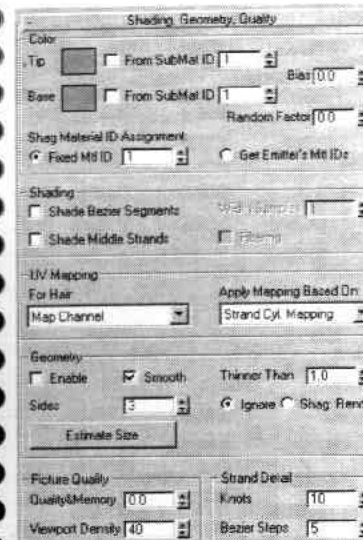


Vertex Strands 0

Vertex Strands 1.0

Vertex & Middle 1.0

Seed. This spinner sets the seed value for all randomization factors in the current Hair system. By setting different seed values, you can create different hair patterns for the same hair settings.



THE SHADING, GEOMETRY, QUALITY ROLLOUT

The commands found in this rollout, shown in the following figure, are used to control the materials and shading of the hair strands, whether or not geometry is created and the quality of the overall rendering.

Each command found in this rollout is listed below and briefly described:

Color. These controls are used to control the colors and materials used on the individual hair strands in the hair system. Each control is listed below and briefly described:

Tip:

Clicking on this color swatch launches the MAX color selector where you can pick the color that the hair strands will use at their tip. This color is blended along the length of the strand from the Base to the tip of the strand.

Base. Clicking on this color swatch launches the MAX color selector where you can pick the color that the hair strands will use at their base. This color is blended along the length of the strand to the Tip color.

Note:

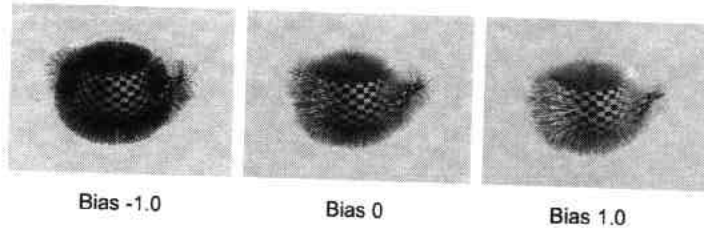
You can apply any MAX material to Shag:Hair systems by applying the material directly to the Shag:Hair ShagView object. The ShagView object is the strands of hair that appear in the MAX viewports. This enables you to apply any material, but does not enable you to have changing hair color across the surface of the emitter.

Sub-Mat ID. This spinner is used to derive the color of the hair strands in the viewports from the sub-material ID of the emitter object. In other words, the color of the strands is derived from any maps that are applied to the emitter object.

Note:

You must use Shade Middle Strands if you want the underlying color of the strands to be derived at each middle strand. Otherwise, the colors are derived only at the vertex strands. In addition, the emitter object must have UVW mapping coordinates for this option to work. Default mapping is not supported.

Bias. Moves the base color closer to or farther away from the tip color. This spinner ranges from -1.0 to 1.0 with -1.0 being completely the base color. The following three figures show you the effect of using the bias at -1.0, 0, and 1.0 respectively when the base color is black and the tip color is white.



Random Factor. This spinner enables you to add randomness to the colors of the strands. A value of 0 indicates no color variation. A value of 1 means that the strands can have any color across the hair system.

Fixed Mtl ID. This enables you to assign a fixed material ID to the strands in the Hair system.

Get Emitter's Material ID's. When selected, each hair strand derives its material ID from the face it is emitted from. When deselected, the hairs all use a Material ID of 0.

Shading. These controls are used to define which hairs in the hair system are shaded. Each control is listed below and briefly described:

Shade Bezier Segments. When this option is enabled, each bezier step of the hair strand is shaded individually. Otherwise, hair strands are shaded only at the knots of the hair.

Shade Middle Strands. By default, Shag:Render shades only the vertex strands and interpolates the colors across the middle strands. This option enables you to shade each middle strand. This is useful when you are using the Sub-Mat ID options to derive the color from a material map.

Width Samples. When Shade Middle Strands is enabled, Shag:Render has the ability to shade the strands in more than one points across their width. This is useful only when rendering thick strands with the thick strand renderer. This is the only way to make thick round strands appear actually round in the image. The optimal value for this

parameter is the visible screen width of the strands. That is, if you see that your strands have generally screen width of 5 pixels, you should set this parameter to 4, 5 or 6. Using lower values produces aliasing, while increasing it slows down the rendering and again may produce aliasing. However, for larger values you can enable the Filtering option which will counter aliasing to some extent.

Filtering. This option is useful in the cases when you have variable strand thickness and have set the number of Width Samples to the largest strand screen width. In this case you'll get aliasing in the thinner parts of the strands. Turning Filtering on will fix this. This slows down the rendering, so first check if enabling this option really produces a better result.

UV Mapping. These controls are used to define how mapping is applied to the hair objects when you assign materials with maps directly to the ShagView object. Each control is listed below and briefly described:

UV Mapping for Hair. This drop down list enables you to which UVW mapping channel you are going to apply the mapping to. You may select the Map channel or the Vertex Color channel.

Apply Mapping Based On. This drop down list enables you to select which types of mapping are applied to either the Map Channel or Vertex Color channel of the hair strands. Each type of mapping is listed below and briefly described:

No Mapping. No mapping coordinates are applied to the selected mapping channel.

Strand Cyl MappedBased. This is the internal mapping of Shag:Hair and is very close to a cylindrical mapping. U mapping wraps around the hair and V goes along the length.

Strand Color. This is the internal Shag Color of the hair and is by default assigned to channel 2 for use in the Vertex color channel, which makes it accessible for the Vertex Color Map.

Emit Map Channel. When selected, the mapping coordinates are read from the emitter objects Map Channel.

Emit Vert Color Channel. When selected, the mapping coordinates are read from the emitter object's Vertex Color Channel.

Geometry. These controls enable you to convert the hair strands over to true geometry. Each control is listed below and briefly described:

Enable. Enables or disables the creation of the hair system as true geometry in 3D Studio MAX. Once created as true geometry, the hair system can be rendered directly by the 3D Studio MAX rendering engine. This provides better anti-aliasing and motion blur, but is very resource intensive.

Smooth. When this option is enabled, the resulting geometry is automatically smoothed by Shag:Hair.

Thinner Than. When generating geometry, strands thinner than this spinner will be treated differently. This option has two radio buttons that further qualify how it works:

Ignore. All strands smaller than the spinner value are ignored by the geometry generation engine.

Shag Render. When enabled, no geometry is generated for strands thinner than the spinner value. But, those strands are still rendered by the Shag rendering engine instead of the 3D Studio MAX rendering engine.

Sides. This spinner defines the number of sides for the hair geometry, just like the number of sides for a cylinder. This is ignored for flat strands.

Estimate Size. When you select this button, an estimate of the number of vertices and faces that will be created is displayed.

Picture Quality. These controls enable you to control the quality of the final rendering. Each control is listed below and briefly described:

Quality/Memory. This spinner limits the amount of memory available to Shag:Render for this Shag entry only. The Shag:Render environment plugin also has a Quality/Memory that is used globally. When this value is set to 0 (the default), the global value is used, otherwise this value is used. Higher values result in more memory usage and longer rendering times, but much higher quality renderings. The maximum value is 10.0.

Viewport Density. This spinner defines the percentage of vertex strands that will be drawn in the MAX viewports.

Knots. This spinner defines the number of knots that are used in the hair strands at render time. Higher values are used when you have large amounts of curliness or you are using the dynamics system. You should try to keep this value as low as possible to conserve memory.

Bezier Steps. This is the number of steps between knots. This is similar to the number of steps between vertices on a spline. Higher values result in smoother curves and better looking hair at the expense of longer rendering times and higher memory usage.

THE DYNAMICS ROLLOUT

The commands found in this rollout, shown in the following figure, are used to simulate real world forces on the hair system. These controls enable you to have hair that bounces and sways with the wind, gravity, and/or motion of the emitter object.

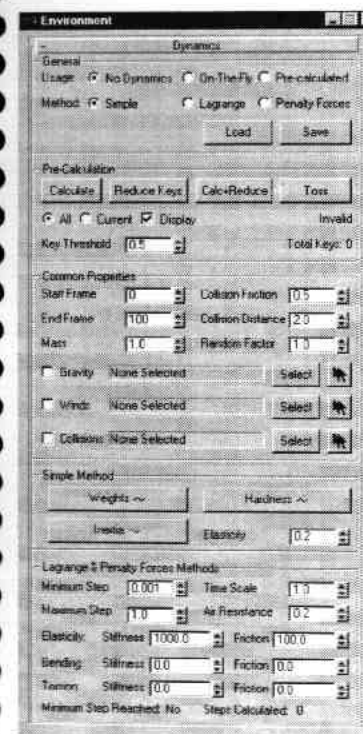
Each of the commands found in the Dynamics rollout are listed below and briefly described:

General. These controls enable you to define the type of dynamics system to use and how to use it.. Each control is listed below and briefly described:

Usage. Enables you to select one of 3 different ways for using dynamics. These methods include: No Dynamics, On-The-Fly, and Pre-Calculated. The default is No Dynamics, which disables the dynamics interface. On-the-fly calculates the dynamics during each frame at render time. Pre-Calculated enables you to save time by calculating all of the dynamics up front. In general, if you are going to use dynamics, try to use Pre-Calculated as it is the most stable method. You should not use on-the-fly dynamics if you are going to render from video post with Scene Motion Blur enabled. This will crash 3D Studio MAX.

Method. Sets the dynamics calculation method. You may select one of 3 different methods. Each is listed below and briefly described:

Simple. This is a basic method for calculating forces that fairly closely simulates real world situations. It is most commonly used on long stiff hair strands or when you need a quick solution. This option uses the least amount of memory and the least amount of calculation time.



Lagrange. This method is generally the best method. It does not allow elasticity of the strands. That is, the hair knots keep always at the same distance from each other.

Penalty Forces. This method allows elasticity, but is generally slower and more unstable. Elasticity looks especially good when you use the curliness feature.

Load. This button enables you to load the dynamics parameters from a Shag:Hair or a Shag:Fur file.

Save. This button enables you to save the dynamics parameters to a Shag:Hair or a Shag:Fur file. Hair files have a *.HR extension while fur files have a *.FUR extension.

Pre-Calculation. These controls enable you to control how dynamics are pre-calculated.. Each control is listed below and briefly described:

Calc. Starts the calculation of pre-calculated dynamics. When activated, the system will calculate the dynamic forces for the entire range of the animation. These forces will then be stored as keyframes for the individual strands. This command can generated hundreds of thousands of keys.

Reduce Keys. Starts a key reduction algorithm to reduce the number of keys generated by the Calc command. This should only be used after the Calc command. The number of keys reduced is controlled by the Key Threshold spinner.

Calc+Reduce. This is a combination command that calculates the dynamics and immediately reduces the keys that are produces.

Toss. Enables you to delete the currently saved pre-calculated dynamics solution.

Display. Enables you to see the calculation of the dynamics in the viewports as they occur. In general, this gives you a good sense of how the dynamics will look, but also slows down the processing.

All/Current. These two radio buttons enable you to define which emitters in the scene for which the dynamics will be calculated. You may select All or Current.

Key Reduction Threshold. As the dynamics are calculated, Shag:Hair

creates keyframes for each frames. This results in a lot of keys and a large MAX file. By default, after the dynamics are calculated, Shag:Hair goes through a key reduction process to remove as many animation keys as possible while still maintaining the correct animation. This spinner enables you to control how many keys are left over after key reduction. Higher values result in less keys and a slightly less accurate simulation, but a smaller file.

Common Properties. This section of the dialog box enables you to define properties that are common to all methods of dynamics simulation.

Start Frame. This spinner defines the frame number where the dynamics simulation starts.

End Frame. This spinner defines the frame number where the dynamics simulation ends.

Mass. This spinner defines the mass of the hair in the system. This provides the hair with a certain amount of inertia or weight. You may set this value from 0.0001 to 1,000,000.

Collision Friction. This spinner defines how much the hair movement decreases when a strand collides with a surfaces. Larger values result in stickier surfaces.

Note:

Shag:Hair provides you with the ability to control the collision friction on an object by object basis. To do this, right click on the object and choose the Properties option. In the properties dialog box, click on User Defined Properties and add a value in the following format:

ShagCollisionFriction=value

Where value is the collision friction value you want to use.

Collision Distance. Enables you to define a distance between the hair strands and the collision objects that must always be maintained. When used with a large random factor, this will keep hairs at random distances from the surface of the collision object, simulate inter hair collisions.

Note:

Shag:Hair provides you with the ability to control the collision distance on an object by object basis. To do this, right click on the object and choose the Properties option. In the properties dialog box, click on User Defined Properties and add a value in the following format:

ShagCollisionDistance=value

Where value is the collision friction value you want to use.

Random Factor. Enables you to randomize the collision distance.

Note:

Shag:Hair provides you with the ability to control the collision distance random factor on an object by object basis. To do this, right click on the object and choose the Properties option. In the properties dialog box, click on User Defined Properties and add a value in the following format:

ShagCollisionDistanceRandomFactor=value

Where value is the collision friction value you want to use.

Gravity's. When this checkbox is enabled, you can use gravity space warps to influence the hair system. Choose the select button to select any space warps that exist in the scene.

Note:

When using simple dynamics, the Mass of the hair is not taken into account, so it doesn't matter if you use either gravity or wind to achieve certain dynamic effects. Both will have the same result.

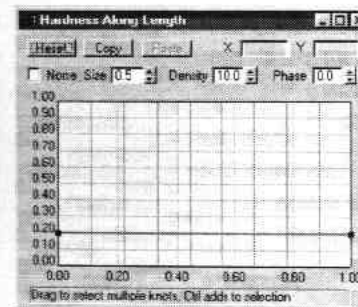
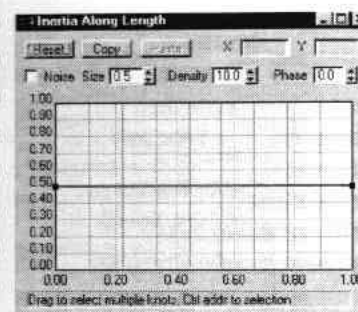
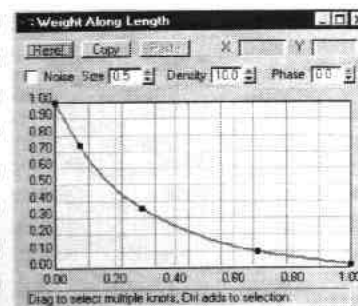
Winds. When this checkbox is enabled, you can use wind space warps to influence the hair system. Choose the select button to select any space warps that exist in the scene.

Collisions. When this checkbox is enabled, you can use other objects in the scene to influence the hair system. Once an object is selected, Hair calculate when strands collide with the surface of the objects and change the motion of the hair strand accordingly. Choose the select button to select any objects that exist in the scene.

Note:

Collision objects work much quicker when they are collapsed editable meshes without any modifiers applied to them.

Simple Methods. This section of the dialog box enables you to define parameters associated with the Simple Method way of calculating dynamics.



Weights. Enables you to define where the weight of the hair resides. This is implemented as a curve control, shown in the following figure. The default graph shows most of the weight of the hair at the root.

Inertia. Enables you to define how much inertia, or the ability to resist movement that a hair has. This is also implemented as a curve control, as shown in the following figure. Higher inertia values will create hairs that act like they are heavier and have some sort of resistance to them.

Hardness. Enables you to define the stiffness of the hair strands. This is also implemented as a curve control, shown in the following figure. By adjusting the hardness, you can create bristly hair or very soft, relaxed hair.

Elasticity. This spinner enables you to define the elasticity of the hair. This defines how much a hair strand can bend. Higher values result in more elastic and less stiff hair.

Lagrange and Penalty Forces Methods. This section of the dialog box enables you to define parameters used by the Lagrange and Penalty Forces methods of dynamics simulation.

Minimum Step. This is the minimum time step that dynamics will use in its calculations. This value is always smaller than a single frame.

Decreasing this value is necessary when the dynamics system becomes unstable. This results in longer calculation times, but may improve the solution.

Maximum Step. This is the maximum time step that the dynamics system will use for its calculations. It is always smaller than a single frame.

Time Scale. This spinner enables you to scale the dynamics simulation. Values larger than 1.0 will result in the simulation moving faster than the environment. Lower values will slow the simulation down.

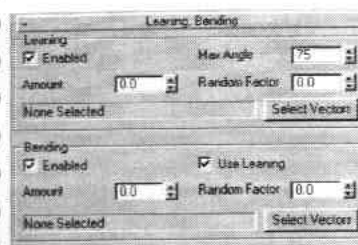
Air Resistance. This spinner defines the density of the air around the hair system. Higher values resulting in more resistance to the movement of the hair. You can set this value from 0 to 1,000,000.

Elasticity. This spinner controls how much the segments that link the knots can change in length. This parameter is available only for the Penalty Forces calculation method. This option is useful when using the curliness feature.

Bending. This spinner controls how much hair strands can bend at each knot. That is, how much can the initial angles between the segments change.

Torsion. This spinner controls how much can hair strands twist at each knot.

Elasticity, Bending, and Torsion Stiffness and Friction spinners. The Stiffness spinner controls the accuracy of a constraint. The higher the value, the more accurate the constraint, and the higher the chance for instability. The Friction spinner decreases oscillation around the point where a constraint is met. Without friction, hair will never stop moving. Generally, set this value to be 2-10 times smaller than the Stiffness.



SHAG:FUR SPECIFIC CONTROLS

The Shag:Fur specific controls come in the form of a single rollout, shown in the following figure, that appears below the Dynamics rollouts. The controls found in this rollout are used to control the leaning and bending of Shag:Fur hair strands.

Each of the commands found in the Leaning, Bending rollout are listed below and briefly described:

Leaning Enabled. Enables or disables leaning of fur strands.

Max Angle. This spinner defines the maximum extent to which the fur strands can lean. If the Max Angle is set to 180 and the amount is set to 1, all fur strands will point in the given direction, instead of the surface normal.

Leaning Amount. This spinner determines how much the fur strand should lean. When the value is more than 0, the fur strand will lean in the direction specified by the direction vector(s), but not exceeding the value specified by the Max Angle parameter (in degrees). The influence of the vector helpers is also taken into account. Their influence is calculated at each mesh vertex from which a vertex strand grows.

Leaning Random Factor. This spinner enables you to add randomness to the leaning of the strands. A value of 0 indicates no lean variation. A value of 1 means that the strands can lean in any direction across the hair system.

Leaning Select Vectors. This button launches a select by name dialog box where you can select Hair Helper objects to use as leaning vectors.

Leaning Select Double Arrow. This button enables you to select all leaning vectors associated with the current Shag:Fur entry.

Bending Enabled. Enables or disables bending of fur strands.

Use Leaning. Activating this check box tells the fur strand to bend from the normal to the lean direction. As such, the surface normal is always tangent to the strand at its root and the tip of the strand lies in the plane of the selected lean direction. In this case the bend vectors and bending amount spinner are not used.

Bending Amount. This spinner defines the amount of bending present

in the fur strands. You may set this value from -1.0 to 1.0. When the value is greater than 0, the fur strand will bend in the direction specified by any directional vectors used in the system.

Bending Random Factor. This spinner enables you to add randomness to the bending of the strands. A value of 0 indicates no bending variation. A value of 1 means that the strands can bend in any direction across the hair system.

Bending Select Vectors. This button launches a select by name dialog box where you can select Hair Helper objects to use as bending vectors.

Bending Select Double Arrow. Enables you to select all bending vectors associated with the current Shag:Fur entry.

SHAG: RENDER

The Shag: Render atmospheric shader is the plugin that does most of the work in Shag:Hair. This atmospheric shader, shown in the following figure enables you to define the quality and methods for which the hair strands will be rendered. Shag:Hair will not render without this shader.

Each of the commands found in the Shag:Render rollout are listed below and briefly described:

Quality/Memory. Globally limits the amount of memory used by the renderer for all Shag entries. This parameter can be specified separately for each set of Shag parameters. The higher the value the higher the quality of the picture. The tradeoff is that at higher settings, the more memory (and possible swap space) is used. As a general rule of thumb, use lower values for test renders, and then change to higher values for your final rendering. Anything below 7 is generally of lower output quality and good for test renders. The effect of this parameter does not change linearly with the change of the parameter. What this means is that qualities around 9 are usually good enough for production, but the memory usage is much lower than at qualities above 9.8.

Note:

This value is only used when 0 is set in the individual Shag entry and is ignored otherwise.

Cast Shadows. This option enables or disables shadow casting for all hair entries in your scene.

Render Stripe Size. This spinner enables you to define the number of pixels rendered vertically. For example, if you render a scene 640x480 and have a Render stripe Size of 240, Shag:Render must make two passes to render the first and final stripes of the scene, equalling a total of 480 pixels vertically. This saves memory, but takes more time.

Progress Indicator. Enables or disables the use of the progress indicator during rendering. This is useful for display the current progress of the Shag:Render engine.

Apply Disabled Atmospherics. One of the more difficult things to do in MAX is render different atmospherics so they appear correctly in the scene, not rendered over the top of each other. This option allows Shag:Hair to process any other atmospherics in the scene that are DISABLED. Shag:Render then properly integrates the resulting atmospherics. This makes it possible to have fog mixed in with your hair and other such effects. To make use of this, you must disable the other atmospherics in the scene by turning off the Active checkbox in the Environment dialog box for each entry. When this option is enabled, all atmospherics will still be rendered.

Use Thick Renderer. This enables the thick strand renderer. If not enabled, Shag: Render will draw only thin anti-aliased strands of about 1 screen pixel, no matter how thick these strands should actually be. Enabling the thick renderer will render thick strands correctly. This rendering method produces slightly better results even for strands of sub-pixel width. However, it is about 3-4 times slower than the thin strand renderer. That's why you can choose the strand width boundary above which the thick renderer to be used.

For Strands Thicker Than. Limits the thick strand renderer to strands of screen width larger than the specified value. The default and normal setting is 1 pixel. When this value is set to 0, all strands will be rendered by the thick strand renderer.

Make Hair Enabled Lights. When this button is selected, all the standard MAX lights in your scene are converted to hair enabled lights.

Back to Normal Lights. Takes any selected Shag:Hair lights in the scene and converts them back to normal MAX lights.

Copy. When this button is selected, all selected splines in the scene will have the Model Hair modifier applied to them.

Instance. When this button is selected, all selected splines in the scene will have the Model Hair modifier applied to them, but as an instance, not a copy. Thus, making changes to one copy of the Model Hair will affect all that have instances applied to them.

Copy From: Default. Selects an existing model hair from the scene whose Model Hair modifier will be copied by the Apply Model Hair Modifier tool. The name of the object is displayed in the label of the button. When no object is selected, the default settings will be used.

Statistics. This section lists the statistics from the last completed rendering of the scene. These statistics are specific to the Shag:Hair rendering engine and report values such as rendering time, number of strands generated, etc. These values are separate from the MAX rendering engine.

THE HAIR STANDARD MATERIAL

When loading older Shag:Fur 1.0 scenes into Shag:Fur 2.0, they will probably not render the same due to changes in the Fur 2.0 rendering engine. As such, this material is available for you to use on the Fur 1.0 strands to make the simulation closer to the original settings that you had. It's worth noting that you will not be able to exactly duplicate 1.0 scenes in 2.0, but only come close to duplicating them through the use of this material. It is automatically assigned to objects imported from Shag:Fur 1.0.

THE SHAG:HAIR G-BUFFER VIDEO POST FILTER

The hair rendered by Shag: Render is treated by MAX as an atmospheric effect. A common problem to all atmospheric effects in MAX 2.x is that they are not available to image filters in Video Post, except of course in the basic image channels - color and alpha. Most image filters however work with other image channels too, like Z-buffer, material effects, object effects, etc.

The Shag Fur/Hair G-buffer Output filter is a simple image filter which you can use to put the hair rendered by Shag: Render in the G-buffer. This way the other image filters will recognize atmospheric hair as a geometry object. Note that this filter is needed only for hair rendered by Shag:

Render - the hair which generated geometry is treated as a standard geometry object by MAX and is available in the G-buffer without any special care.

Use the filter by adding it after the scene event in Video Post, or at least before any image filters that you want to work with hair. The filter will add the atmospheric hair in the scene to the following image channels:

- Z-buffer.
- Material effects (the ID assigned to materials via the Material Editor).
- Object effects (the G-buffer ID assigned to objects in their Properties dialog box).
- Render node ID (the unique IDs assigned by the renderer to all nodes).

To use the material effects channel, assign a material to the ShagView representing the hair, then assign some non-zero material ID to that material. To use the object effects channel, select the ShagView object and set the Object Channel ID in its properties dialog.

The G-buffer output filter works by rendering the atmospheric hair once again, which may take time. However, the rendering method is optimized for G-buffer output and is much faster and takes much less memory than Shag: Render.



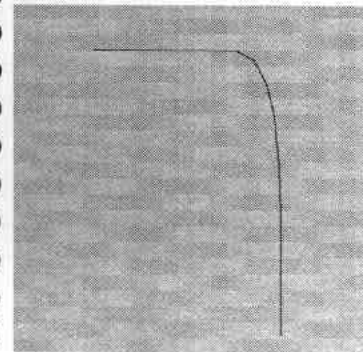
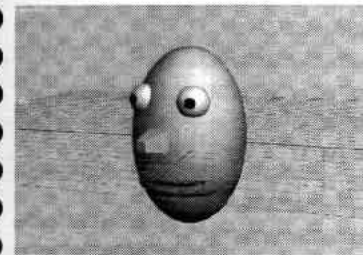
Tutorials

Tutorials

In the following tutorials, you will learn how to use the various aspects of Shag:Hair to create realistic hair or hair-like effects in your scenes.

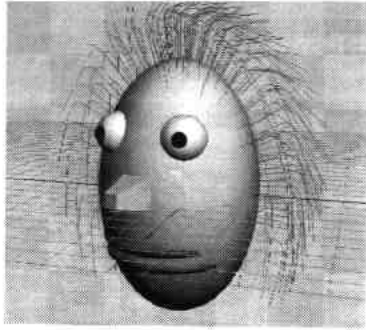
TUTORIAL #1 CREATING DIRTY BLOND HAIR WITH SOME CURL

In the following tutorial, you will take the head from the Quick Start exercise and apply some hair to make the figure look like a woman. Then, you will control the color to make the hair appear to have dark roots and light blond hair.



1. Load the file HairEx2.MAX from your SCENES directory. This file should have been placed there during installation. This file contains the head scene, with Hair enabled lights, cameras, and the Material ID's already assigned from the quick start exercise, so all you have to do is create the hair strand and apply it immediately. The following figure shows you the scene at this point.
2. Switch to a Right view. In the Create command panel, click on the Shapes button, then select line. Create a 3 vertex line that looks similar to the following figure. Make sure the first vertex is at the top left of the line.
3. Go to the Modify command panel and apply a Model Hair modifier to the strand.
4. In the Model Hair rollout, expand the Coordinates rollout and switch the coordinate system type to (Curve, Base Tangent)
5. Switch back to the Camera view.
6. In the pulldown menu, select Rendering, Environments. This launches the environmental dialog box.
7. Click on Add... Add a Shag:Hair shader and choose OK. Repeat and add a Shag:Render shader to the scene.
8. Select the Shag:Hair shader and the rollouts will appear.
9. In the Objects, Copy/Past, Load/Save rollout, click on the Pick button

under Emitters. Select the head. Click on Face Level and set the Selection Set to By Sub-Material ID with an ID of 4, then choose OK.



10. In the Model Hairs section, click on Pick and select the Model Hair you just created. You will immediately see the ShagView object appear, as shown in the following figure.

11. Scroll down to the Parameters Rollout and set the following settings:

Density	Per Area	1.5
Thickness	Maximum	0.1
Curliness	Enabled	On
Curliness	Radius	1.0
Curliness	Turns	4.0

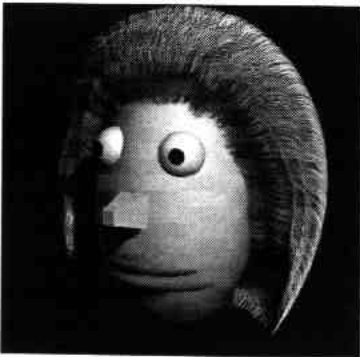
12. Scroll down to the Shading, Geometry, Quality rollout and set the following parameters:

Tip Color	255,251,226
Base Color	52,34,2
Bias	0.17
Random Factor	0.08
Shade Bezier Segments	On
Shade Middle Strands	On

13. Scroll back up and select the Shag:Render entry and set the following parameters:

Quality&Memory	10.0
Stripe Size	480
Progress Indicator	On

14. Render the scene at 640x480. You should see a result similar to the following figure:

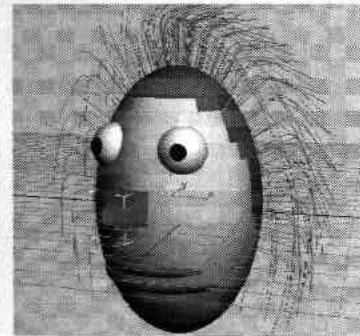


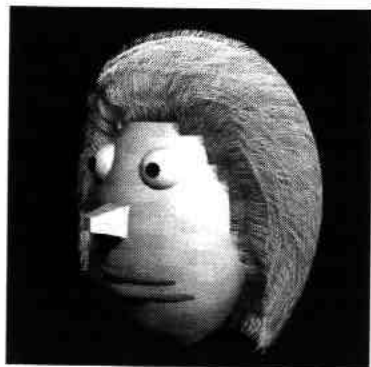
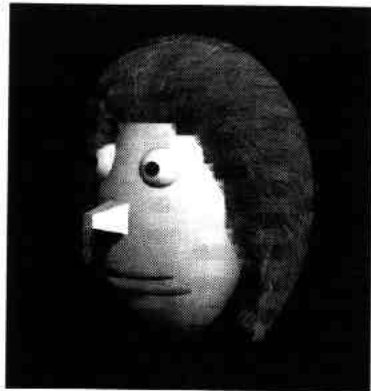
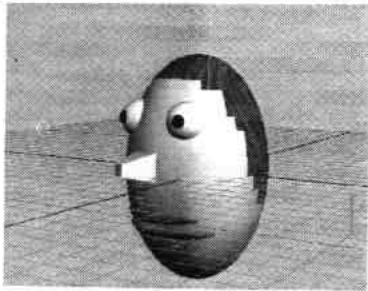
15. Save the file. You will continue with this file in the next exercise.

TUTORIAL #2 EXPLORING MATERIALS IN HAIR

In the following tutorial, you will take the file from the previous tutorial and create both a dark brown hair using sub-material ID's and create a silver-haired woman by applying a material directly to the ShagView object.

1. Load the file HairEX3.MAX from your SCENES directory. This file should have been placed there during installation. This is the same file from the end of the last tutorial. Now, you will use two additional methods to color the hair beyond the Tip and Base colors. First up, let's use a SubMaterial ID. To begin, we need a new material for the head, so open up the Material Editor.
2. There, you will find a beige skin colored material. Select that material preview window if it isn't already selected.
3. Click on the Material Type button. This launches the Material/Map browser.
4. Select a Multi/Sub-object material and choose OK.
5. When prompted, select Keep Old material as Sub-Material and choose OK. This places the beige material in the Material ID slot #1. Copy that material to slot #2 as well. When you do, if you have a shaded camera view, you will see the area where the hair is emitting turn gray as shown in the following figure.
6. Click on the Material located in slot #4. This takes you to the Standard Material rollout for that sub-material.
7. Click on the blank button next to diffuse to apply a map. This launches the Material/Map browser. Select Bitmap and choose OK.
8. When the Bitmap rollout appears, click on the blank button. This launches a file selection dialog box. Select the file Beige033.JPG from your MAPS directory. This file should have been placed there during installation.
9. Once you have selected the Map, turn on Show Map in Viewport.
10. Choose Go to Parent twice, then assign the material to the Head object. Now, the map doesn't appear yet because we need to have mapping coordinates.





11. So, select the head and go to the Modify command panel. Apply a UVW mapping modifier. Set the mapping type to box with a size of 70 in the X,Y, and Z directions. You should now see the map on the head, as shown in the following figure.
12. Now, let's setup the hair. Go to the Environment dialog box. You should see the Shag:Hair and Shag:Render entries from the last exercise. Click on Shag:Hair.
13. Scroll down to the Shading, Geometry, Quality rollout. For the Tip color, enable the Sub-Mat ID spinner and set the spinner to 4. Repeat for the Base color as well.
14. Close the Environment dialog box and render the scene. You should see a result similar to the following:
15. Now, let's create the silver hair. Open the Material Editor and select an empty material slot.
16. Set both the Diffuse and Ambient colors to pure white 255,255,255.
17. In the scene, select the ShagView object (the character's hair). Assign the material you just created to this object.
18. Re-render the scene. You should see a result similar to the following figure.

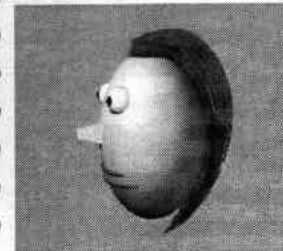
TUTORIAL #3 CREATING A MOHAWK HAIRDO

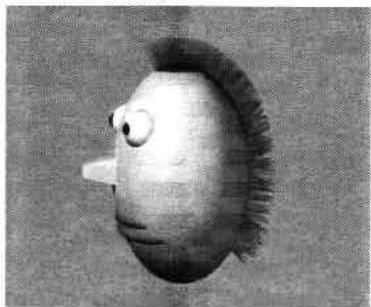
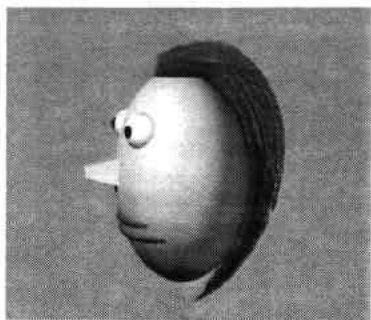
In the following tutorial, you will make use of both curliness and clumping to create an interesting Mohawk effect.

1. Load the file HairEX4.Max from your SCENES directory. This file should have been placed there during installation. This file contains a simple head, hair enabled lights, and a camera, and a spline to use as a hair. The head has already had the face level material ID assignments made and has a multi-sub-object material applied to it.
2. Open the Environment dialog box and add both a Shag:Hair and a Shag:Render entry. Click on the Shag:Hair entry to expand its rollouts.
3. Assign the Head as the Emitter with a face level assignment set to ID 4.
4. Assign the spline as the Model Hair. You should end up with a scene that looks similar to the following figure:
5. In the Hair rollout, scroll down to the parameters rollout and set the following:

Density	Per Area	1.5
Thickness	Maximum	0.1
Curliness	Enabled	On
Curliness	Turns	4
Clumping	Amount	1.0
Clumping	Radius	20
Attractors	Per Area	0.05
6. Scroll down to the Shading, Geometry, Quality rollout and set the following:

Tip Color	SubMat ID	On and set to 4
Base Color	SubMat ID	On and set to 4
Color	Bias	0.17
Color	Random Factor	0.08
Shading	Shade Middle Strands	On
Shading	Shade Bezier Segments	On
7. Scroll back up to the top and select Shag:Render.





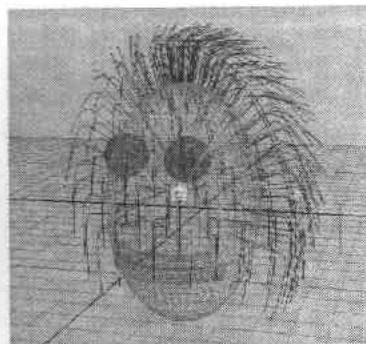
8. Set the following parameters for Shag:Render

Quality&Memory	10
Render Stripe Size	480
Render Progress Indicator	On
9. At this point, render the scene and you should have a result similar to the following figure.
10. As you can see from the last rendering, a nice punkish mohawk has been achieved that even has what appears to be braids. Now, what if you wanted to produce a more standard bristle Mohawk? Well, thanks to the flexibility of Shag:Hair, it's easily achieved.
11. Select the Model Hair and go to the Modify Command Panel.
12. In the Stack go back to the original Line object.
13. Turn on Vertex Sub-Object mode and delete the last vertex in the spline. When you do, you will immediately see the ShagView object reflect the changes. This feature gives you the ability to practically sculpt the hair strands. The following figure shows you the scene at this point.
14. Return to the Environment dialog box and select the Shag:Hair entry.
15. In the Parameters rollout, change the Maximum thickness spinner to 0.05 to make the hair thinner. Change the Per Area density to 2.0.
16. Disable the curliness.
17. Now, re-render the scene to see the results shown in the following figure:

As you can see from the last image, leaving the clumpiness enabled helped to give the Mohawk the appearance of having a styling gel applied to it, or being slightly wet.

TUTORIAL #4 WORKING WITH DYNAMICS

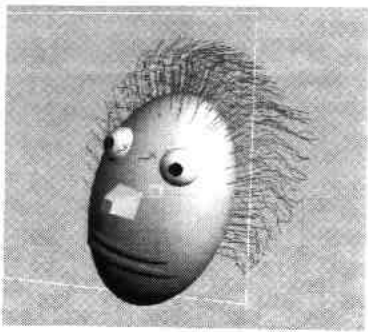
In the following tutorial, you will make use of the dynamics system in Shag:Hair to create hair blowing in the wind.



1. Load the file HairEX3.MAX from your SCENES directory. This file should have been placed there during installation. This file contains a complete hair scene minus the dynamics that you will apply in this exercise. The following figure shows you the scene at this point.
2. The first thing to do is setup a space warp to use in the dynamic simulation. In this case, a Wind space warp. Switch to a Back view.
3. In the Create command panel, click on the Space Warps button. Then select Particles And Dynamics from the drop down list.
4. In the rollout that appears, select the Wind button. Then, click and drag in the front viewport to create the wind. The size of the icon is unimportant.
5. Once you have created the Wind icon, set the following parameters under the modify panel:

Strength	8.0
Turbulence	2.0
Frequency	5.0
Scale	2.0
6. Now, you are ready to setup the dynamics. Open the Environment dialog box and select the Shag:Hair entry that exists there.
7. Scroll down to the bottom and expand the Dynamics rollout.
8. Under Common Properties, enable the Winds space warps. Then, click on the Select button and select the Wind01 object from the Select by Name list. This assigns the wind as a dynamic force.
9. Enable Collisions. Click on the Select button again. Select all the Sphere and Torus objects. This forces the hair to detect collisions with the Head itself.
10. Under Simple Method, set the Elasticity to 1.0. This makes the hair very elastic and easily blown in the wind.
11. Scroll back up in the Dynamics rollout and click on the Calc + Reduce keys. At this point, the dynamic simulation will be pre-calculated. This

is the safest and quickest method of using dynamics. This downside is that this step takes from 10 to 15 minutes or more depending upon the speed of your machine.

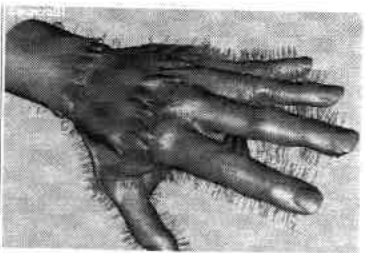
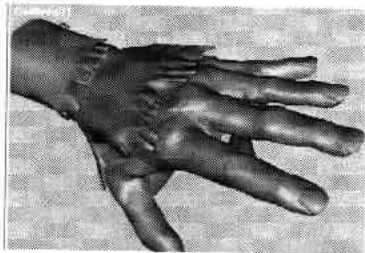


12. Once the simulation is calculated and the keys are reduced, playback the animation to see the results in the ShagView object. Then, render the animation off to a 320x240 animation to see the results. The following figure shows you the scene at some point during the animation.

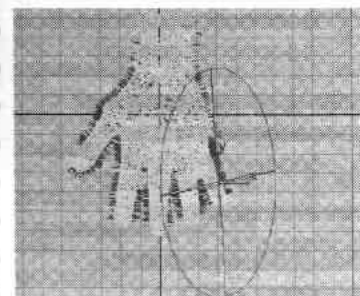
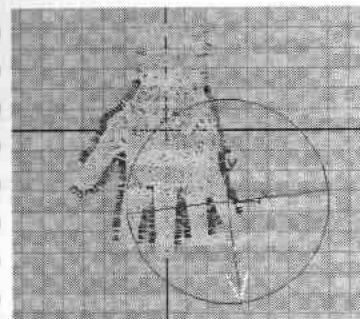
At this point, you are done with the dynamics simulation unless you want to change it, in which case it must be recalculated. On your own, you might try this simulation running the Lagrange or Penalty Methods or to explore the other Simple Method options.

TUTORIAL #5 APPLYING VECTORS TO A FUR OBJECT

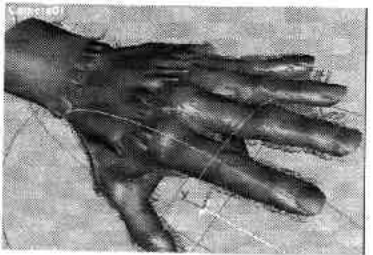
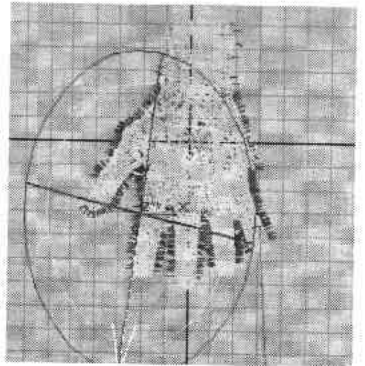
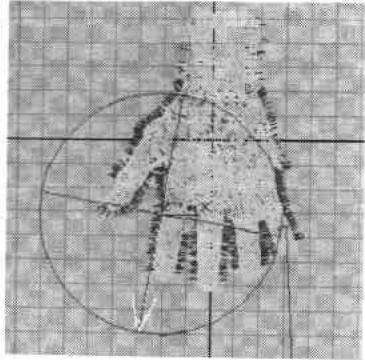
In the following tutorial, you will use vectors to control the orientation of Fur strands on a hand.



1. Load the file HairEX5.MAX from your SCENES directory. This file should have been placed there during installation. The file contains a mesh of a hand that you will use Shag:Fur to add hair to. The following figure shows you the hand at this point.
2. First, let's set up the fur. Open the Environment dialog box.
3. Add a Shag:Render and a Shag:Fur entry. Then click on the Shag:Fur entry to access its rollouts.
4. In the Objects, Copy/Paste, Load/Save rollout, click on the Pick button under Emitters. Select the hand in the scene.
5. Click on the Face Level button and set the Selection Set to By SubMaterial Id with the ID set to 1. This removes the Fur strands from the Fingernails. The following figure shows you the scene at this point.
6. Scroll down to the Parameters rollout. Set the Maximum spinner to 4.0 and the Random Factor spinner to 0.8. Activate SubMat ID and set the spinner to 2.0. The Hand has a black to white linear gradient applied to its Material ID 2 so the fur won't have a sudden length cutoff at the fingertips.

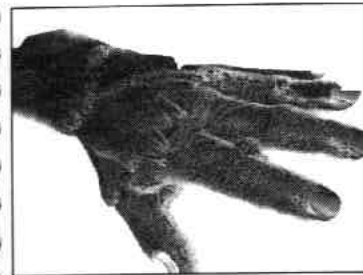


7. Set the Maximum Thickness spinner to 0.3.
8. Under Density, set the Per Area spinner to 4.0
9. Scroll down to the Shading, Geometry, Quality rollout. Set the Base color to black and the Tip color to 122,57,0
10. Render the Camera Viewport at this point. The following figure shows you the result.
11. At this point, you have a descent furry hand, but it's not very natural looking. Hair on most creature usually points in one direction or another, but hardly every straight up. So, let's correct that. Go to the Create command panel. Click on the Helpers object, then Select Shag Fur & Hair from the drop down list.
12. Click on the ShagVector button. In the top viewport, click and drag out a vector icon of about 10 units in size. Then orient the vector so it covers the pinky and ring finger as shown in the following figure.
13. Go to the Modify command panel, with the vector selected. Set the Near spinner to a value of 25 and the Amount spinner to 1.0. This forces the strands within the near sphere to be totally under the control of the direction vector.
14. Set the Far spinner to 30 and leave the amount at 0.0.
15. Now, select Non-Uniform scale from the Main toolbar and scale the vector on the Y axis in the Top viewport. Scale the vector until the far range covers the area where the palm meets the wrist, as shown in the following figure.



16. Now, let's create another vector for the other side of the hand. Return to the Create command panel and create another vector in the top viewport. This time, place it over the Thumb, index, and middle finger. Orient the vector so it is pointing in the same general direction as the middle finger. The following figure shows you this vector.
17. Set the Near Range to 40 and the Far Range to 50.

18. Again, non-uniformly scale the vector along the Y axis until it covers the area where the palm meets the wrist. The following figure shows you the proper scaling.
19. Now, let's return to the Environment dialog box and add these vectors to the Fur.
20. Select the Shag:Fur entry and scroll down to the last rollout, which is the Leaning, Bending rollout.
21. Under Leaning, click on the Select button and select both vector objects.
22. Set the Amount spinner to 1.0 and the MAX Angle spinner to 180. When you do, the ShagView hairs display the leaning as shown in the following figure.
23. In the Bending section, make sure Bending is enabled and Along leaning is turned on. This forces the Fur strands to bend along the direction of the leaning strands.
24. Scroll up and click on the Shag:Render entry. Set the Quality & Memory setting to 10.0 and turn on the Render Progress Indicator.



25. Render the scene at 320x240 to see the results, shown in the following figure.

At this point, you have a good sense of how to use vectors in conjunction with Fur. As you can see from these tutorials, Shag:Hair and Shag:Fur are somewhat complex plugins that are not difficult to use. Explore the options and you will find yourself constantly discovering new ways and methods to create the hair effects you need.