

Swivel 3D™

Three-Dimensional Drawing/Modeling for the Macintosh®

*Addendum
version 1.1*

P A R A C O M P

Swivel 3DTM

Three-Dimensional Drawing/Modeling for the Macintosh®

*Addendum
version 1.1*

P A R A C O M P

The Software

Swivel 3D 1.1 was written and designed by Young Harvill and is copyrighted ©1987, 1988, 1989 by Young Harvill/ VPL Research, Inc.

The software was written in MacForth, which is copyrighted ©1986, 1987, 1988, 1989 by Creative Solutions, Inc.

Trademarks

Swivel, Swivel 3D and Swivel 3D 1.1 and Body Electric are registered trademarks of VPL Research, Inc.

Macintosh, Macintosh Plus, Macintosh SE and Macintosh II are registered trademarks of Apple Computer, Inc.

Hypercard is a registered trademark of Apple Computer, Inc.

MacPaint and MacDraw are registered trademarks of Claris Corp.

Excel is a registered trademark of MicroSoft Inc.

Adobe Illustrator and Illustrator 88 are registered trademarks of Adobe Systems, Inc.

Studio/8 is a registered trademark of Electronic Arts, Inc.

PixelPaint is a registered trademark of SuperMac Software.

User's Guide Addendum

Written by Ann Lasko-Harvill

Copyright © 1989 Ann Lasko-Harvill, VPL Research, Inc.

Edited by Sean McKenna

Table of Contents

Introduction	1
Addendum	1
User Interface Description	1
Rendering Changes	2
Effects Options	2
Anti-Alias	2
Project Object Image	3
To use this rendering effect	3
Tips for successful image mapping	4
Mapping Pictures on the Background	6
Types of Pictures that can be Mapped	6
Fast Cubes	6
New Color Features	7
The Intermediate Palette	7
Color Palette Options Dialog Box	7
Object Colors	8
Shade Effects	8
Color Range%	9
Object Contrast%	9
Shadow%	9
Remap Color	9
Printing	10
Black and White Printing	11
Rotation	11
Resolution	11
Color	11
Printer Compatibility	11
Precision Model Making:	
Working with Accurate Measurements	13
Rulers	13
To adjust the Ruler	13
Units	14
Scale	14
Divisions	14
Show Rulers in Design Object View	14
Finer Angular resolution	14

Animation - Changes in the Tween Panel	15
Using Keyframes	15
Tween Options	16
Write Export File	17
Write to PICS	17
Write to Scrapbook	17
Smooth Keyframe	17
Ease in and Ease out %	17
Tweening w/o the Tween Panel	17
Changes in Object Creation and Design	18
Skin Tree Objects	18
Creating a Skin Tree object	18
Extruded Object Creation	19
Lathe-type Object	19
Extruded-type Object	19
New Features in Object Design	20
Moving Between the World and Design Object Views	20
Adding and Deleting Points	20
More Possible Points in Swivel L	20
Templates in the Side and Top Sections	20
Scaling Section Views	21
Scrolling Section Views	21
Rulers	21
Object Info...	22
New Object Database	22
Swivel 3D 1.1 Compatibility	24
Compatibility with Swivel 3D 1.00	24
Compatibility with MultiFinder	24
Compatibility with the Scrapbook	24
Output to the Scrapbook	24
Compatibility with Other Applications	25
Output to other applications	25
Adobe Illustrator	25
Excel	26

Input from Other Applications	26
Input in the Design Object View	26
Templates	26
Mapping on Objects	26
Input for Backgrounds	26
Command File Input	26
Input from Body Electric™	26
 Drawing Speed Improvements	26
 User Interface Description	27
Swivel 3D Documents	27
The Menus	28
Apple Menu	28
About Swivel	28
The File Menu	29
New	29
Open	29
Open Command File	29
Close	29
Save	30
Save As	30
Export File	30
PNTG for MacPaint	30
PICT for MacDraw	30
PICT for Studio/8 or Pixel Paint:	30
EPS for Adobe illustrator	31
TEXT for Excel	31
Revert to Saved	31
Halftone...	31
Page Setup...	31
Print...	32
Quit	32
 The Edit Menu	32
Undo	32
Cut	32
Copy	33
Paste	33
Clear	33
Duplicate	33
Duplicate Link	33
Paste Command	34

Paste Background	34
Clear Background	34
Find...	34
Inherit...	35
Output Style	36
The World Menu	36
World Position	36
World Attitude	37
World View	38
View Angle	38
Normal Size	38
Reduce	38
Enlarge	38
Size to Fit	38
World Grid	38
Object Menu	39
ReDesign Object	39
Return to World	39
Create Skin Object	39
Position	40
Attitude...	41
Align Object...	42
Object's View	42
Rulers...	42
Scale	43
Units	43
Divisions	43
Set all Objects	43
Attitude Grid	43
Object Form...	44
Mirror Object	44
Mirror Horizontal Cross Section	44
Mirror Vertical Cross Section	45
Mirror Horizontal Top and Side Sections	45
Mirror Vertical Top Section	45
Mirror Vertical Side Section	45
Render Form	45
Triangle Facets	45
Front Cap and Back Cap:	46
Draw Back Faces	46

Use Draw Grid	46
Use Polar Grid	46
Use World Grid	46
 Render Menu	
Resize Workspace	47
Render Separately:	48
Orthographic	48
Fast Cubes	48
Wireframe	48
Hidden Line	48
Outline Shade	48
Shade	48
Contour	49
 Effects Menu	
Open Tween Panel	49
Count	50
Frames	50
Last Key or UpArrow	50
Next Key or DownArrow	50
KeyFrameKey Total	50
Set Key	50
Add Key	50
Clear Key	50
Loop	50
Options	50
Write Export File	51
Write to PICS	51
Write to Scrapbook	51
From Object's View	51
Smooth Keyframe	51
Ease In	51
Ease Out	51
Preview	51
Tween	51
Open Light Panel	52
Effects...	52
Shadow:	52
Anti-Alias	52
Project Scrap Image	53
Project Object Image	53
Object Edge	53

Depth Edge	53
Effects Render	53
Remap Color	53
Select Color	53
The View Tools	54
World View	54
Tools	54
XY Arrow	54
XZ Arrow	54
Yaw Arrow	54
Pitch Arrow	54
Roll Arrow	54
Scale Tool	54
Lathe Object	54
Extruded object	54
Free Link	55
Lock Link	55
Ball Joint Link	55
UnLink Tool	55
Zoom In Tool	55
Zoom Out Tool	55
Palette Tool	55
Reflectance	55
The Intermediate Palette	56
Color Palette Options Dialog Box	56
Object Colors	57
Shade Effects	58
Flat Color	58
Cool Penumbra	58
Cool Shadow	58
Color Range%	58
Object Contrast%	58
Shadow%	58
Design Object View	59
Tools in the Design Object View	59
Double Arrow Tool	59
Single Arrow Tool	60
Free Poly Tool	60
N-gon Tool	60
Rectangle Tool	60

Introduction

This update to the User's Guide to Swivel 3D™ is divided into two parts. The first section, the **Addendum** describes the changes between Swivel 1.0 and 1.1. The second section is a new **User Interface Description**, an update of the chapter in the User's Guide.

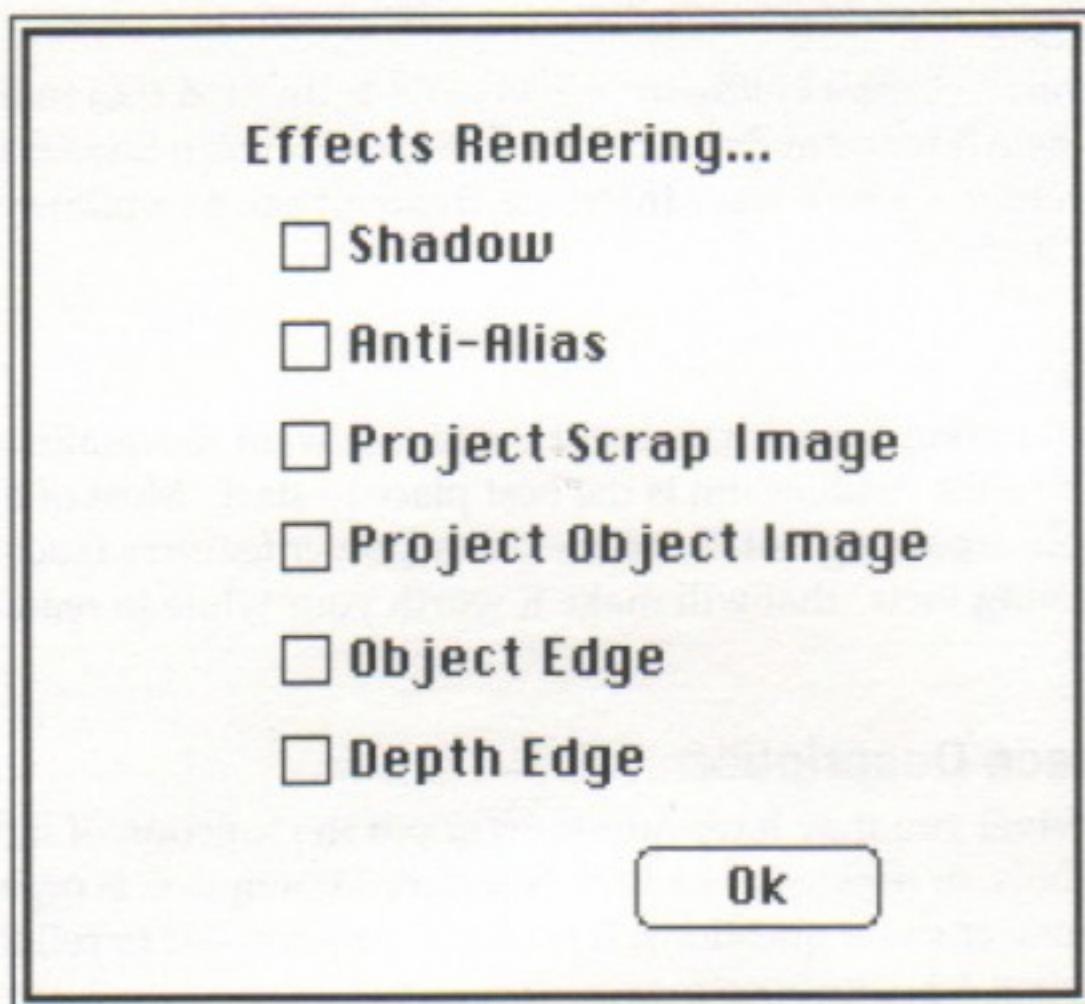
Addendum

If you are already familiar with Swivel 1.0 and just want to acquaint yourself with the new features, the Addendum is the best place to start. Most of the new features are self-explaining but there are many power features (such as zoom in the object drawing view) that will make it worth your while to read the Addendum carefully.

User Interface Description

As you use Swivel you may have questions about the function of individual menu items, tools, or dialogs. The User Interface Description is organized as a reference to answer those questions. It is completely revised to reflect the changes in Swivel 1.1.

Rendering Changes



Effects Options

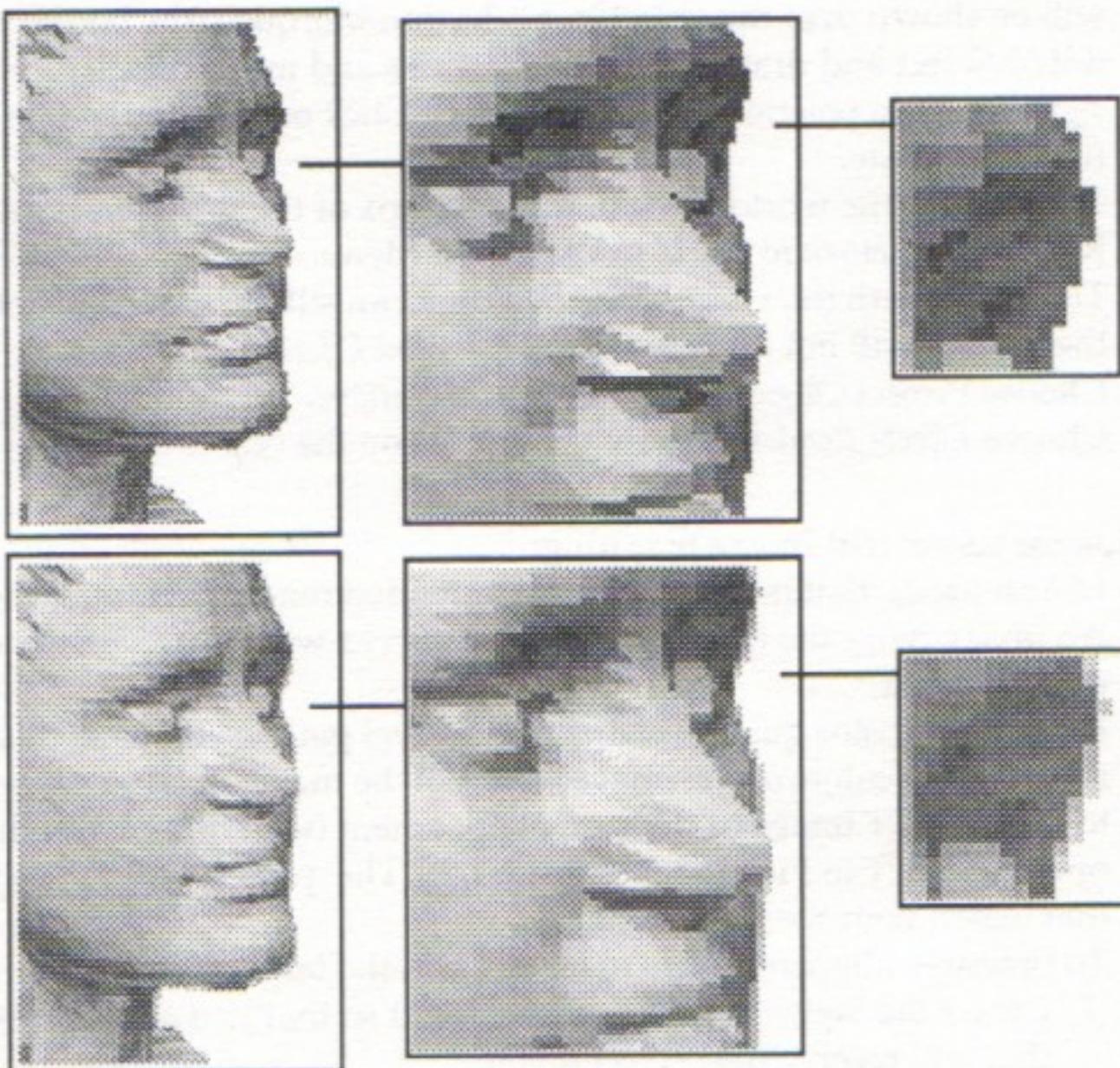
In addition to the rendering effects available in Swivel 1.0, there are two new effects in Swivel 1.1: Anti-Alias and Project Object Image. The effects selected in the *Effects Rendering...* dialog box are used for both rendering and tweening.

Anti-Alias

Anti-aliasing smooths object intersections and “the jaggies”. To produce an anti-aliased image, each object is drawn four times, with each rendering slightly offset from the previous one. These four images are averaged together to produce the anti-aliased image. Anti-aliasing therefore takes four times longer to render than normal rendering. Anti-Alias works in all rendering modes, including Wireframe, Shadow and Project Object Image.

- Choose Anti-Alias in the *Effects Rendering...* dialog. The world will be rendered with Anti-aliasing every time *Effects Render* is selected.

Note: Selecting the **Fine** in the **Workspace Size** dialog box will improve the resolution and rendering quality of intersecting planes.



Project Object Image

Swivel 1.1 now maps pictures directly onto objects, so that you can add texture, detail, or text to each object individually. Choosing this option in the *Effects Rendering...* panel tells Swivel to render images mapped onto objects during effects rendering.

To use this rendering effect:

- Create the picture in a graphics program and paste it into the Scrapbook. Quit the art program and run Swivel. If you already have a Swivel object on which to map the picture, open this world. Otherwise, create a new object.
- Position the Swivel object in the World View so that the side you wish to map the picture on faces you. When the picture is mapped, it projects onto the object from your view, so be sure that the orientation of the object matches that of the picture.
- Enter Object Design Mode by double-clicking on the object.
- Expand the Object View by clicking in the Object View Sidebar.
- Copy the picture from the Scrapbook.
- Paste the picture over your object using the *Paste* command. The picture

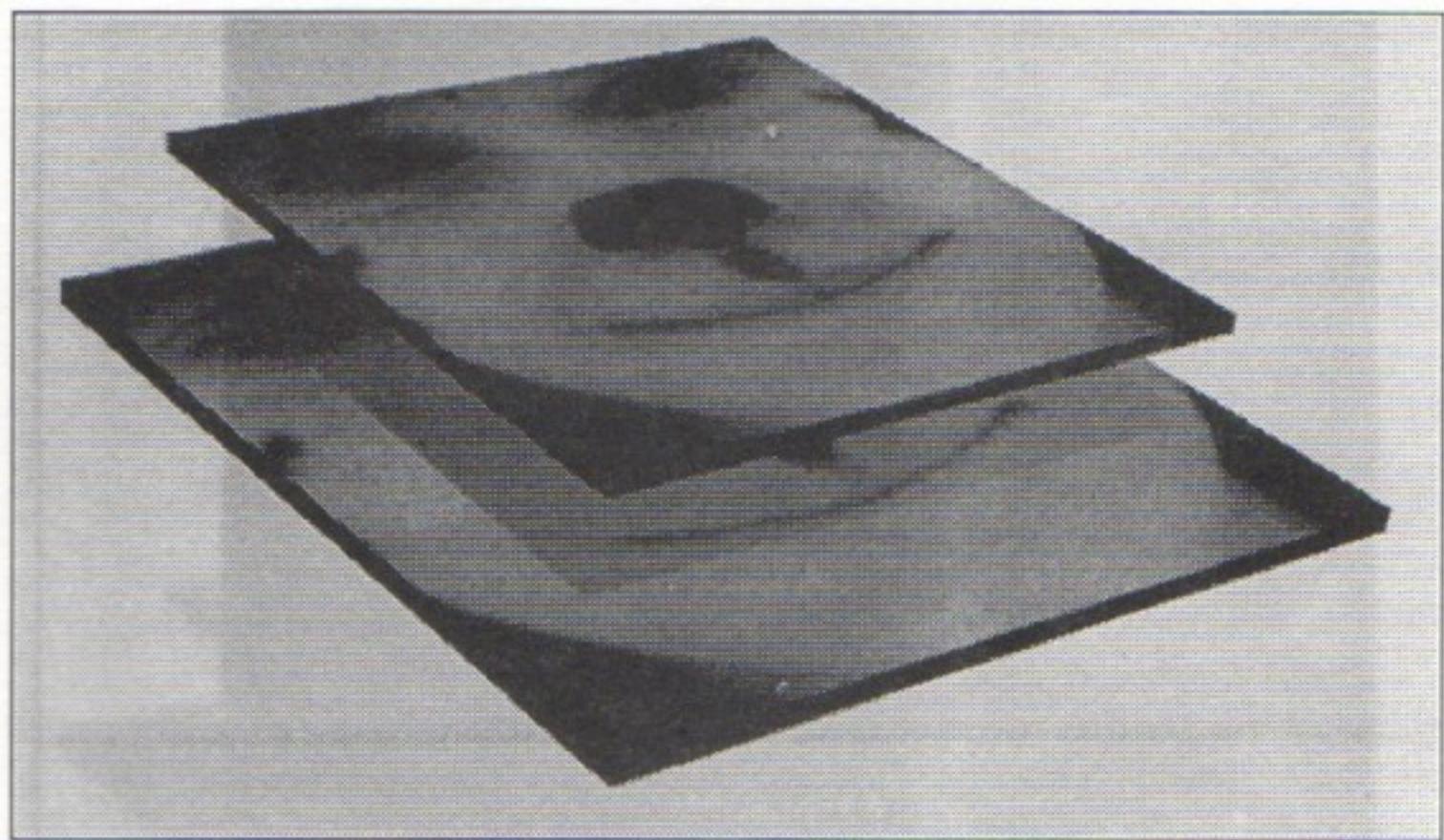
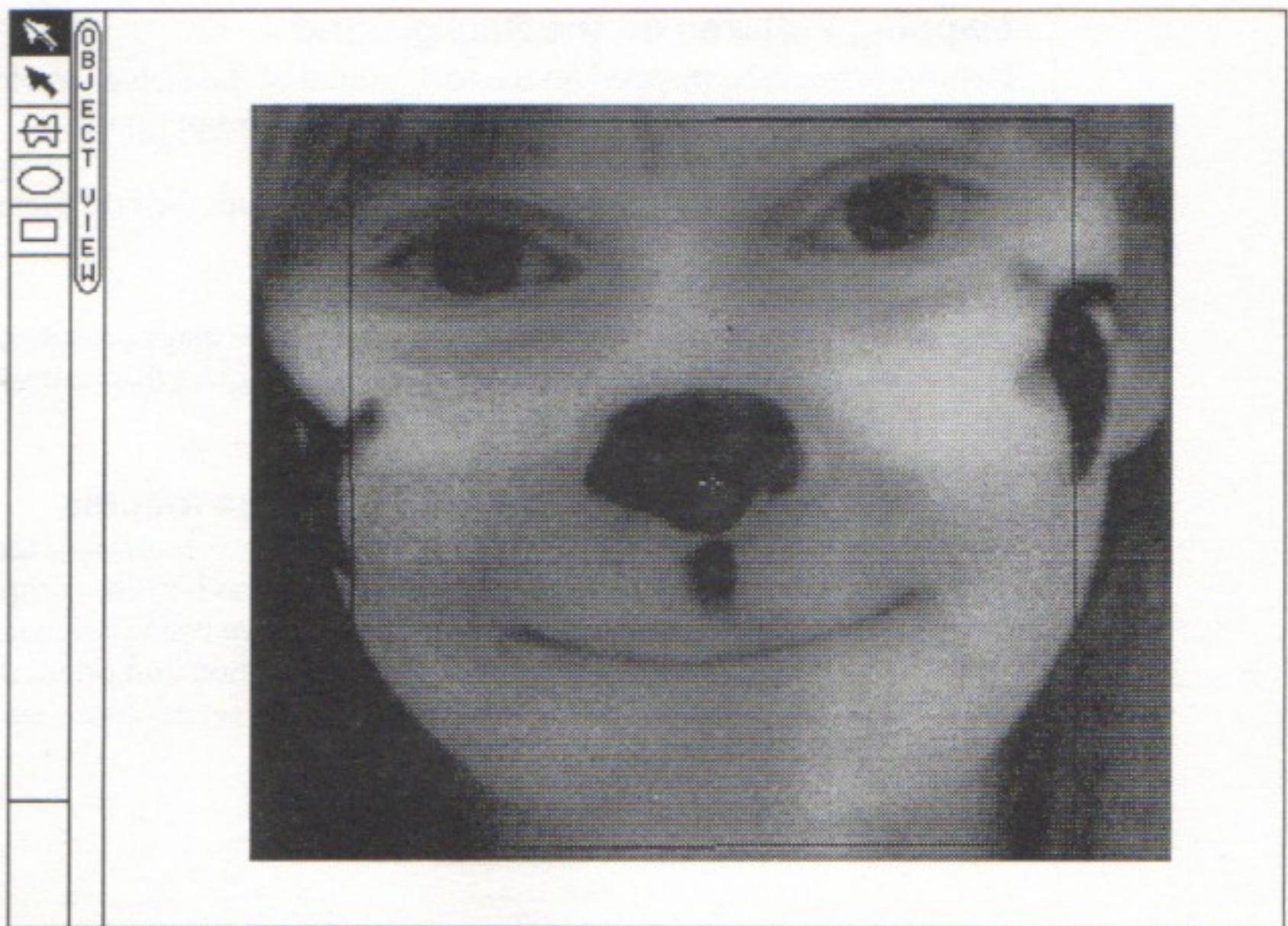
will be shown over the object in a selection Marquee (the border of moving dots). Select and drag within the Marquee and move the picture up, down, right or left to position it over the object. Click outside of the Marquee to finish the paste.

- To return to the world, click in the close box of the window, type Command-R, or select *Return to World* in the Object Menu.
- The object with the picture mapped on it can still be moved or rotated, but the picture will not be drawn until the next *Effects Render*.
- Choose Project Object Picture in *Effects Options*.
- Choose *Effects Render* to draw the picture on the object.

Tips for successful image mapping:

- Use an image that is larger than the intended rendering size of the object. An image twice the final rendered size works well, especially when you are mapping text.
- For the best color quality, choose the Swivel palette you wish to use carefully to includes the colors of the images that will be mapped. An easy way to do this is to save a PICT image of the Swivel document (which includes the palette) and open the PICT in PixelPaint or Studio/8. The palette will now contain colors that match your Swivel palette.
- To precisely align an image to features on the target object:
 1. Create the Swivel object and position it so that you are facing the side that will receive the project image.
 2. Double-click on the object to enter the design views.
 3. Click the mouse in the Object View sidebar. Copy the wireframe image of the object and paste it into the Scrapbook.
 4. Quit Swivel and open a graphics program to draw the projected image. Use your Swivel world's palette for the best color results. The method for using the palette is explained above.
 5. Paste the wireframe image from the Scrapbook into the graphics program. You can use this wireframe image as a template. Design your artwork so that features of your project image will match the position of features on the wireframe.
 6. When you have finished drawing the image, copy it in the Scrapbook and follow the steps described above to place it on the object and render it.

Note: If you switch between applications often, for example, between Swivel and a color paint program, Multifinder can greatly improve your productivity. See the *Macintosh System Software User's Guide* that came with your Macintosh for information on installing and using Multifinder.



Mapping Pictures on the Background

Pictures can also be mapped on the background of the Swivel World.

- Copy the picture from the Scrapbook or a graphics program
- Select *Paste Background* from the Edit Menu.
- To remove the picture, select *Clear Background* from the Edit Menu.

Types of Pictures that can be Mapped

Any PICT in the Scrapbook or the Clipboard may be mapped onto objects.

PICTs can be created in drawing programs, like MacDraw, or painting programs such as MacPaint and PixelPaint.

Fast Cubes - quick rendering for complex models

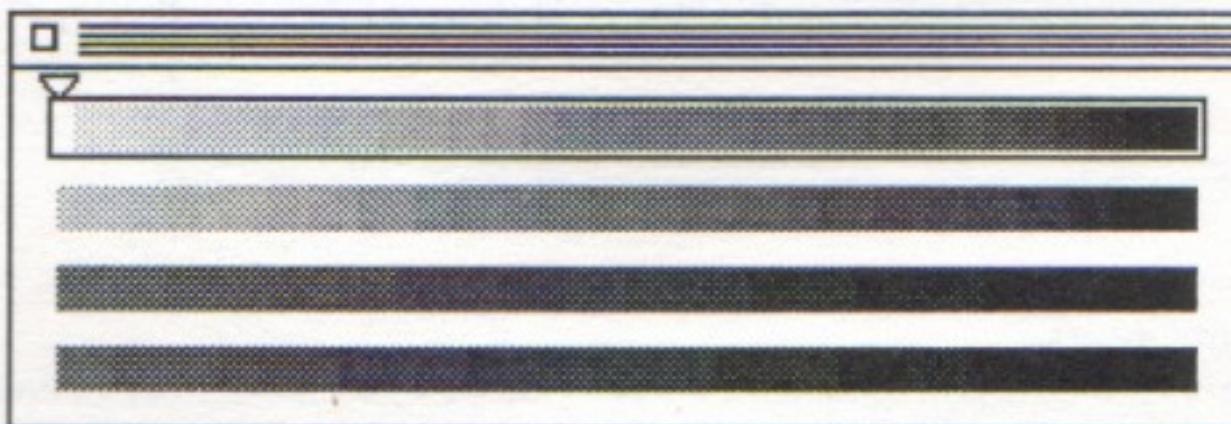
Fast cubes renders all objects as blocks the size of their bounding rectangular solids, which can help enormously when a model has become complex enough for rendering to slow down work. After objects have been designed and linked, select Fast Cubes from the Render Menu. Any position and orientation changes can be made swiftly, and Tweening keyframes can set up, and then Fast Cubes can be unselected.

New Color Features

The Intermediate Palette

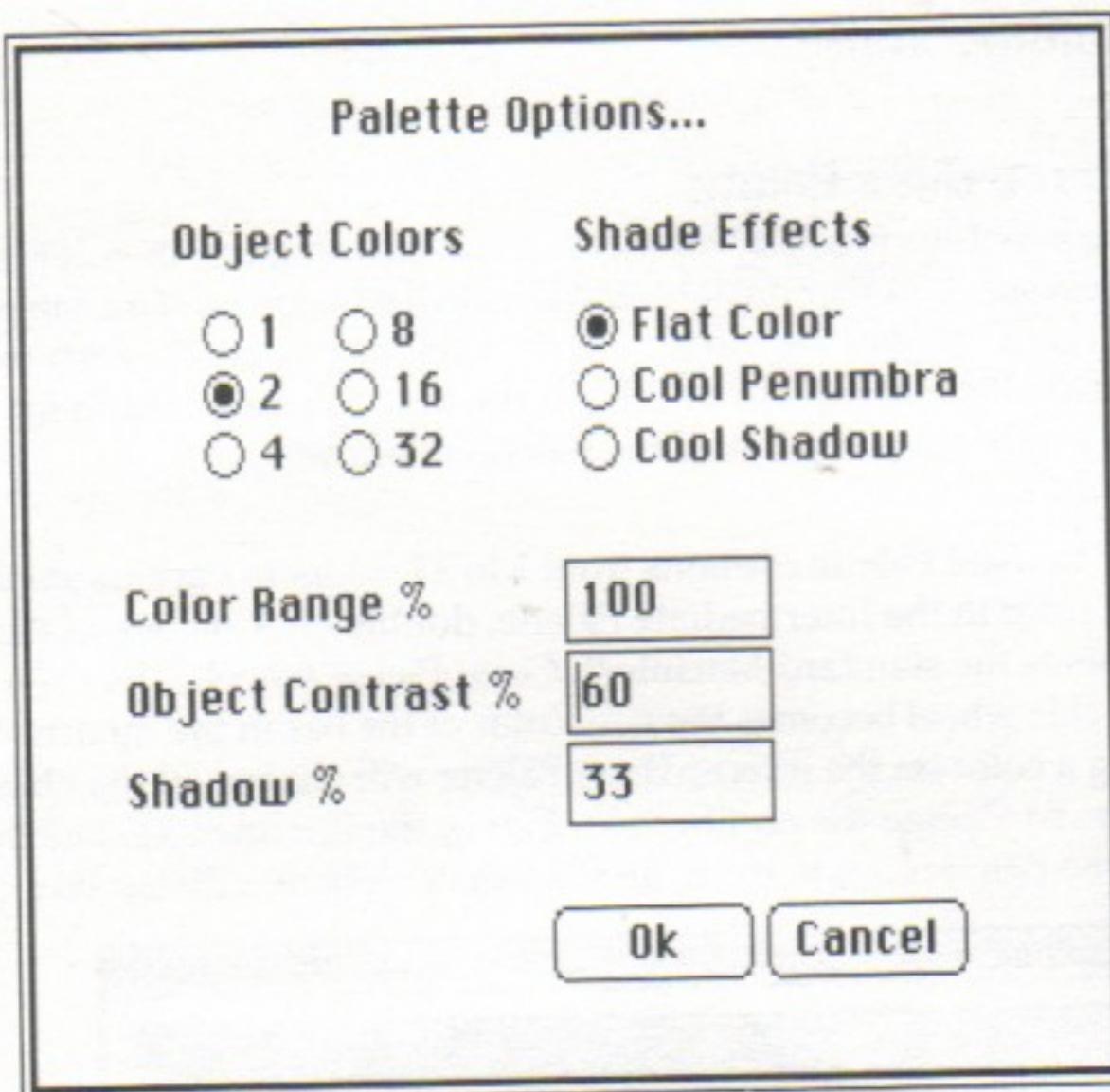
Using the new Intermediate Palette, you can customize your color palette to make the best use of the Macintosh's 256 available colors. To change an object's color, select the palette tool, and then click on the object you wish to change. The Intermediate Palette will appear. Select the new color and shade for your object, and click on the go-away box of the palette window.

The Intermediate Palette contains from 1 to 32 colors in various shades. To change a color in the Intermediate Palette, double-click on one of the color bars. This presents the standard Macintosh Color Picker wheel. The color that you select on this wheel becomes the new color of the bar in the Intermediate palette. Changing a color on the Intermediate Palette will change all the objects that have that color. To change the number of colors in the Intermediate Palette, double-click on the palette icon to bring up the *Palette Options...* dialog box.



Color Palette Options Dialog Box

Double-clicking on the palette tool *icon* opens a dialog box where you can re-configure the Intermediate Palette. You can choose the number of colors that are displayed on the palette (from 1 to 32), choose range of color tones, and adjust the contrast and shadow intensity of the colors. These changes affect the entire Swivel world.



Object Colors

The number that you choose in Object Colors sets the number of colors that appear in the Intermediate Palette. As the number of colors increases, the number of shades for each color decreases.

Shade Effects

Swivel's shading effects enhance the "painterly feel" of finished images by subtly changing the way that an image reflects light. The three shade effects (Flat Color, Cool Penumbra, and Cool Shadow) each handle the color shade choices differently for different qualities of light.

Flat Color: Keeps the colors the same, shading objects by changing the level of grey in the color. This is the default setting.

Cool Penumbra: Uses cooler (bluer) tones for the shadow between light and dark. This quality is especially effective for flesh tones.

Cool Shadow: Makes the shadow tones bluer than the lighted facets of the objects.

Color Range%

Color Range% sets the range of shades between the lightest and darkest shades of the selected color. At the default setting of 100%, the color ranges from the chosen color to black. Setting the color range to 60% creates a pastel effect.

Object Contrast%

Sets the range of tone the *object* will be rendered in from light to dark (out of the available range for the given color). The default is 60%.

Note: The Color Range% and Object Contrast% settings work together. The reason for setting the range for the palette separately from the objects is to allow pasted pictures to work with a full range of color, while the contrast of the objects can still be limited.

Shadow%

The darkness of the shadow cast when Shadow in *Effect Render* is selected can be adjusted by entering a different value in the Shadow% field. With a value of 100%, the shadow is very dark and at 0%, no shadow is projected. The default setting is 33%.

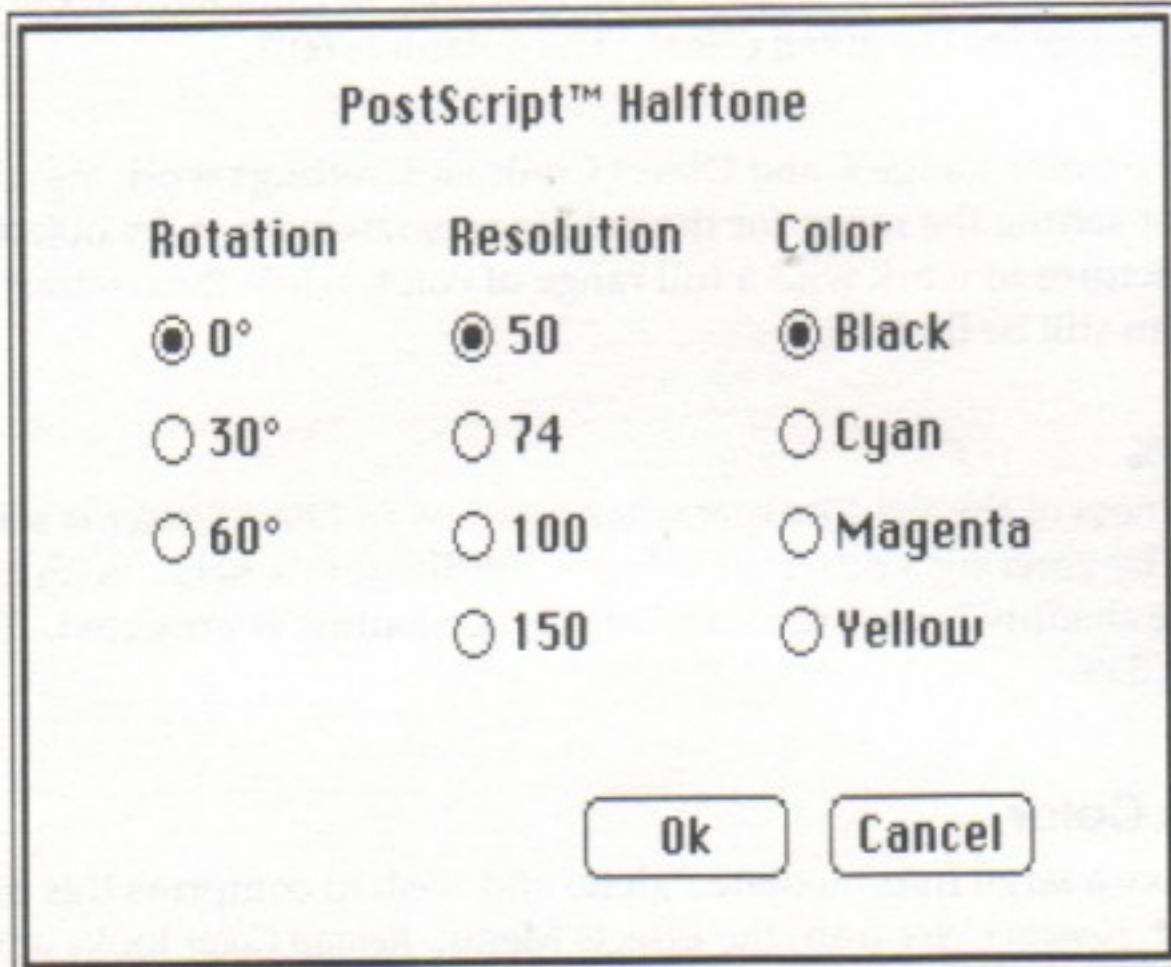
Remap Color

If you have a large Intermediate Palette and wish to compress this palette, you can select *Remap Color* from the Effects Menu. *Remap Color* looks at the colors of all of the objects in the world and makes up a new palette based on these colors. In the process, unused colors are discarded and duplicate colors are combined into one bar. The new Intermediate Palette contains as few colors as possible.

You can also use *Remap Color* to optimize the palette for objects pasted in from another Swivel file with a different palette. By remapping the colors, the new object's colors are added to the intermediate palette.

Printing

Swivel prints images that were created in color or in 256 black and white mode in PostScript™ halftones. To reset the rotation or resolution of the halftone screen or to select a color to make a separation printer select *Halftone...* from the File Menu.



Halftone...

Opens a dialog box where you can configure the printing halftone and color separation.

Color Printing

Color selection is used to prepare images for printing as color separations: Black, Cyan, Magenta and Yellow printers are produced one at a time. The halftone should be rotated for successive printers. Rotations of dot pattern of 0°, 30° and 60° may be selected.

In monochrome mode, (selecting 1 color in the *Palette Options...* panel) Cyan, Magenta or Yellow will render and print shading appropriate for that printer. Note that color resolution is higher for separations in monochrome, as each printer has 256 shades. However, projected object images will not map color properly in this mode.

Black and White Printing

In Black and White, 2 color mode, with the Output Style set to Paint Type, Swivel will print a Quickdraw Bitmap image.

In any color mode with the Output Style set to Draw Type, Swivel will print a PostScript Image using the current *Halftone* settings. Projected Images, Shadowing, and object Intersections will not be shown.

In 256 color mode, with the Output Style set to Paint Type,
To do single color printing, use *Black* color setting without rotation. To preview
the halftone value, use monochrome mode in *Palette Options...*

Rotation

Changes the orientation of the halftone screen for making color separations.

Resolution

The available resolutions correspond to halftone screens with 50, 74, 100 or 150 dots per inch. Note that increasing the spatial resolution of the halftone will decrease the tonal resolution.

Color

Interprets the object color for printing in a colored ink. If a monochrome palette is chosen for display, the objects' gray level is based on the color ink selected. The proper coloration of projected images and backgrounds pictures is not assured with monochrome palettes.

If Draw-Type printing is selected in the *Output Style* dialog, Swivel uses custom PostScript output in which lines are set to a finer width and the tone quality of objects is improved.

Printer Compatibility

Swivel 1.1 features improved compatibility with the Mirus Film Printer and other printers that require their own printing port be used.

the first time in the history of the world, the people of the United States have been called upon to make a choice between two distinct and opposite systems of government.

The one system is based upon the principles of freedom and equality,

the other upon the principles of slavery and oppression.

The one system is based upon the principles of justice and right,

the other upon the principles of wrong and injustice.

The one system is based upon the principles of progress and development,

the other upon the principles of stagnation and decay.

The one system is based upon the principles of individual liberty and responsibility,

the other upon the principles of centralized power and control.

The one system is based upon the principles of democracy and popular government,

the other upon the principles of oligarchy and aristocracy.

The one system is based upon the principles of internationalism and world citizenship,

the other upon the principles of nationalism and狭隘的民族主义。

The one system is based upon the principles of social justice and equality,

the other upon the principles of social inequality and discrimination.

The one system is based upon the principles of peace and good will,

the other upon the principles of war and conquest.

The one system is based upon the principles of truth and honesty,

the other upon the principles of falsehood and deceit.

The one system is based upon the principles of compassion and sympathy,

the other upon the principles of cruelty and indifference.

The one system is based upon the principles of freedom and equality,

the other upon the principles of slavery and oppression.

The one system is based upon the principles of justice and right,

the other upon the principles of wrong and injustice.

The one system is based upon the principles of progress and development,

the other upon the principles of stagnation and decay.

The one system is based upon the principles of individual liberty and responsibility,

the other upon the principles of centralized power and control.

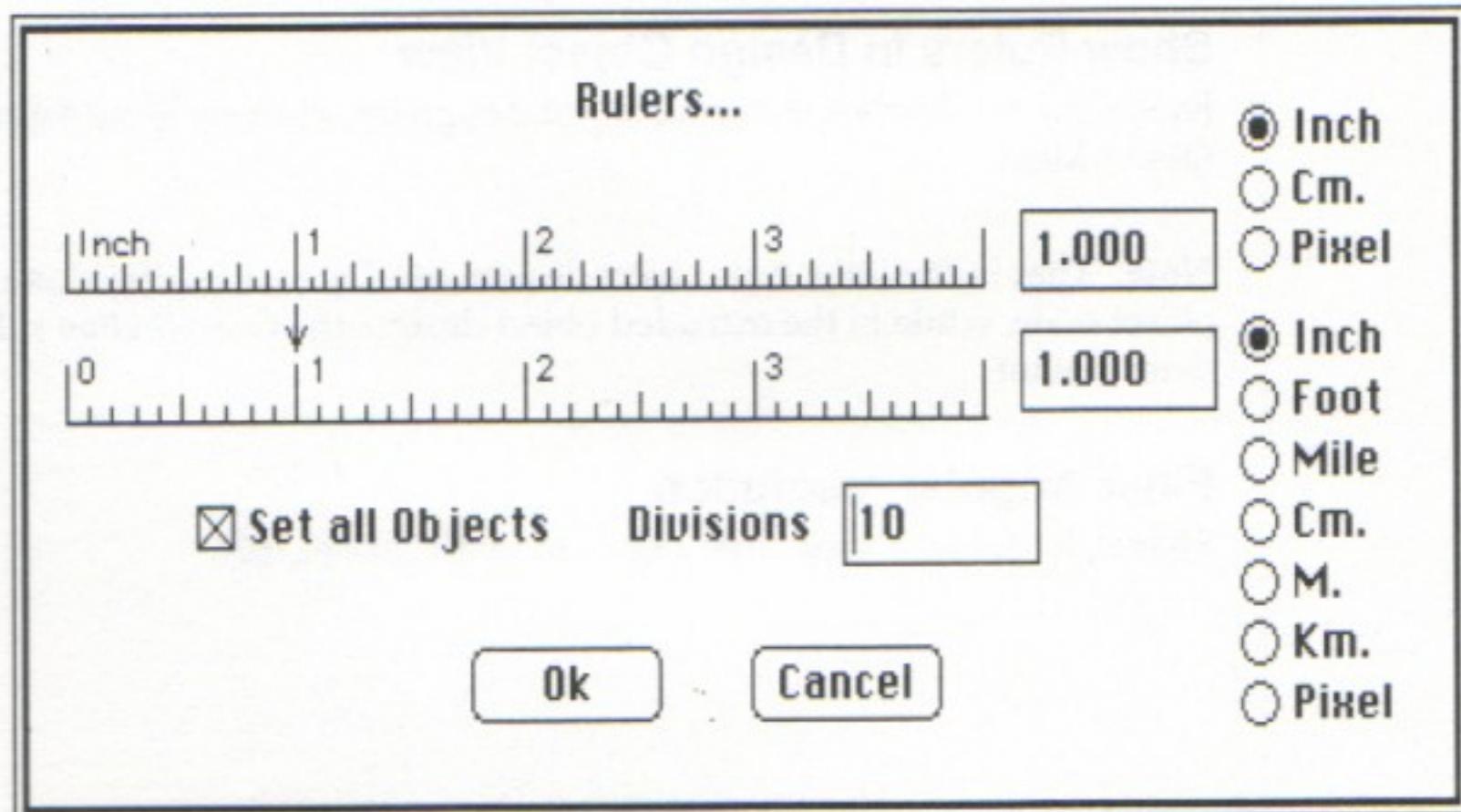
The one system is based upon the principles of democracy and popular government,

Precision Model Making: Working with Accurate Measurements

Swivel's capacity for accuracy has been improved in several ways: The addition of rulers, a new type of object called the Extruded Type, and an increase in angular resolution to tenths of degrees.

Rulers

The *Position Grid...* has been replaced with *Rulers...*. The *Rulers...* dialog box offers a choice of scales and units that can be fine tuned to match your model. Rulers allow you more freedom in selecting a scaled unit for drawing in the Object Design windows and for both the object and world grids.



To adjust the Ruler

Select *Rulers...* from the Object Menu. Checking Set all Objects makes the Ruler settings apply to the entire Swivel World. Objects are neither moved nor scaled by setting the rulers. *Rulers...* changes the measurements that are applied to a Swivel document.

Units

The Ruler in the dialog box shown is set to use inch units both in the window and in actual length. To change the units to centimeters in Swivel to represent kilometers in scaled length, select the Cm. button from the top setting and the Km. button from the bottom.

Scale

The scale shown is one to one: One inch in the Swivel Window will equal one on the model. To change the scale of the model to 3:4 (three units in the Swivel World equal to four in actual length) select the top scale box and enter 3, then select the bottom scale box and enter 4.

Divisions

Setting the divisions to 10 per inch is equivalent to setting the grid to one tenth of an inch increments: More divisions give a finer grid, less divisions a coarser one.

Show Rulers in Design Object View

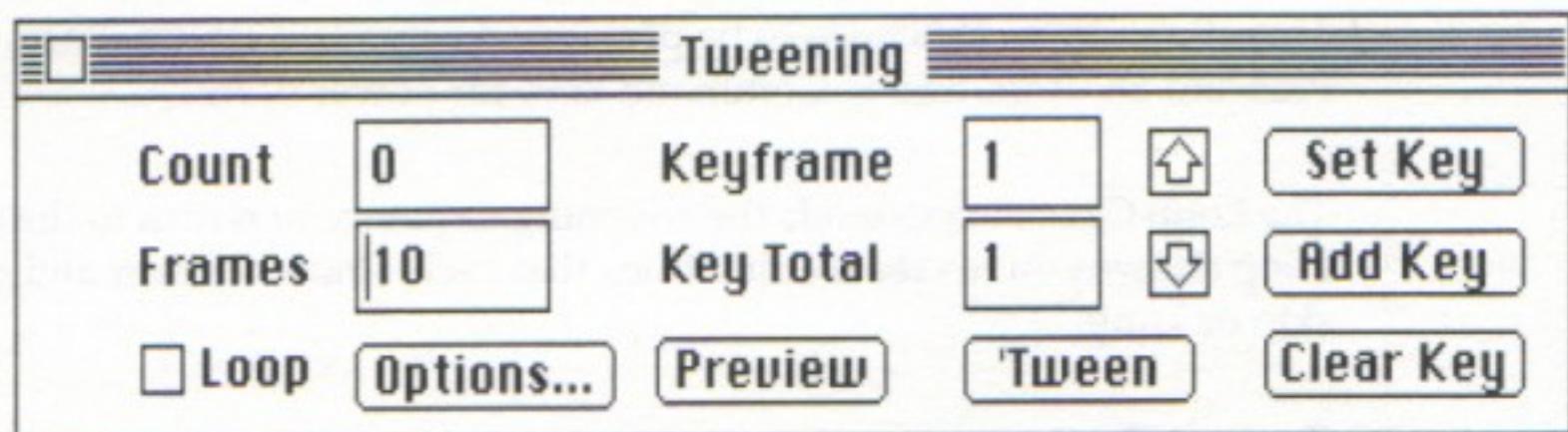
Rulers can be displayed during object design by selecting *Show Rulers* from the Object Menu.

Note: That in the lathe type object design, the *Top* and *Side* Section rulers control object scale, while in the extruded object design, the *Cross Section* ruler is the determinant.

Finer Angular resolution

Swivel 3D 1.1 now measures angles in tenths of degrees.

Animation - Changes in the Tween Panel



One of the most significant new features of Swivel 1.1 is the extension of the Tweening option from using a single path between two points to handling multiple keyframes. This means you can specify sixteen separate arrangements for your model and generate frames that have a smooth transition between each of the sixteen. Swivel remembers each of these arrangements as keyframes.

Using Keyframes

To set a given arrangement of your model as a keyframe, position the model as you wish in the World View, then open the tween panel and select the Set Key button. This is similar to using the Set Start button in Swivel 1.00. After the starting keyframe has been set, use the Add Key button to set additional frames. The number of frames between the current Key Frame and the next is set in the Frame Count field.

Use the UpArrow and DownArrow buttons to step through and display each keyframe. This is the best way to travel to a keyframe you wish to edit. After editing a keyframe be sure to remember to use Set Key to record the changes.

To insert a keyframe between two existing keyframes, use the Up or Down Arrows to step to first keyframe, position the model to the new intermediate position, and then choose Add Key.

Use the ClearKey button to completely delete the current keyframe.

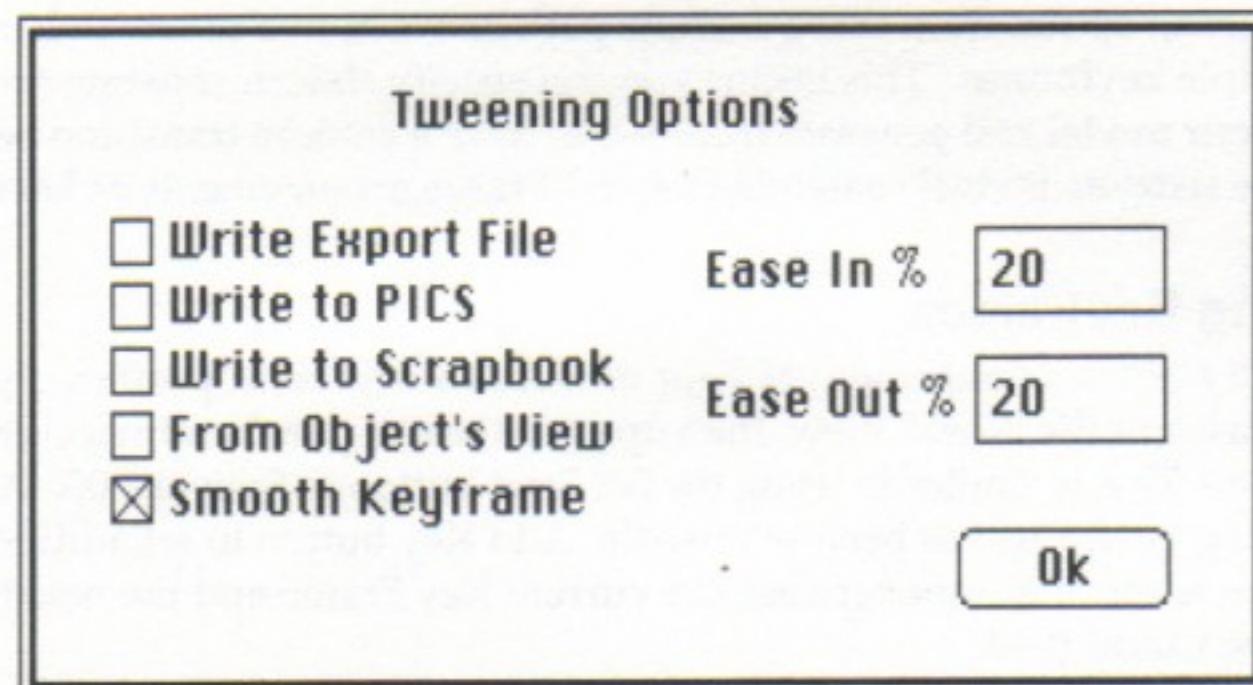
The Tween button will perform the activities selected in *Tween Options...* using the effects rendering chosen in the *Effects Options...*. It will start with Keyframe 1 and step through until Key Total is reached. The Preview button replaces the old Fast Tween. It displays each object as a wireframe cube, speeding the rendering so that the sequence of images can be observed rapidly.

The Set Key, Add Key, Clear Key, Next Key (Up Arrow), Last Key (Down Arrow) Tween and Preview buttons are duplicated as menu items in the Effects Menu. This allows these functions to be performed using less screen space, especially for Plus and SE users, and as Command keys for power users.

The Loop Checkbox extends the tweening sequence to return to the first keyframe. Loop allows you to create animations that cycle smoothly over and over without a skip or jump.

Tween Options

The rendering options for tweening in Swivel 3D 1.00 have moved to the Rendering Options... dialog in the Effects Menu.



Write Export File

Write Export File will write the file type chosen in the Output Style... dialog available in the Edit Menu.

Write to PICS

PICS files have been added to the list of file types which can be created by tweening. PICS is a standard file format for exchanging animations. It includes multiple images in one file.

Write to Scrapbook

Write to Scrapbook no longer writes to the current scrap file, instead you are asked to create a new scrapbook. Scrapbooks are an alternative method to PICS files as a way to store animations.

From Object's View

This item has been changed to more accurately show the tween sequence from the object's view. The world is now viewed from the object as a station point rather than as the object as world center. The viewing object (or camera) is not drawn. Changes in scale of the object now affect the viewpoint as well as position and orientation.

Smooth Keyframe

Sets tweening paths to be smoothed by a Bezier function.

Ease in and Ease out %

Percentages may be used to control the apparent inertia of the start and end of a tweening sequence.

Tweening without the Tween Panel

Use menu items or command keys from the Effects Menu.

Changes in Object Creation and Design

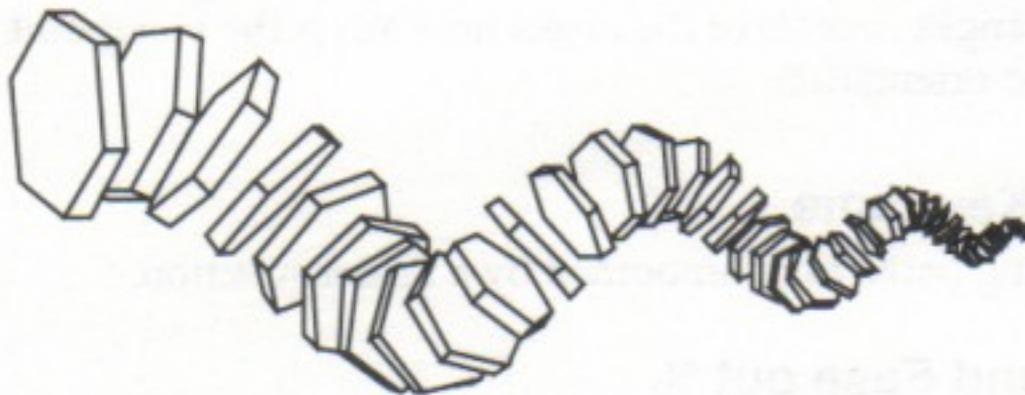
Skin Tree Objects

Skin Tree objects form a *skin* or mesh over a linked set of objects, like skin over a skeleton. Because their Cross Section may vary along their length, Skin Tree objects can take forms that were impossible for lathe or extruded objects. Skin Trees belong to a class of objects called Poly Meshes that can be created numerically using the Swivel Command File Language. See *Swivel Script Changes* for more information on using the Command file.

Creating a Skin Tree object

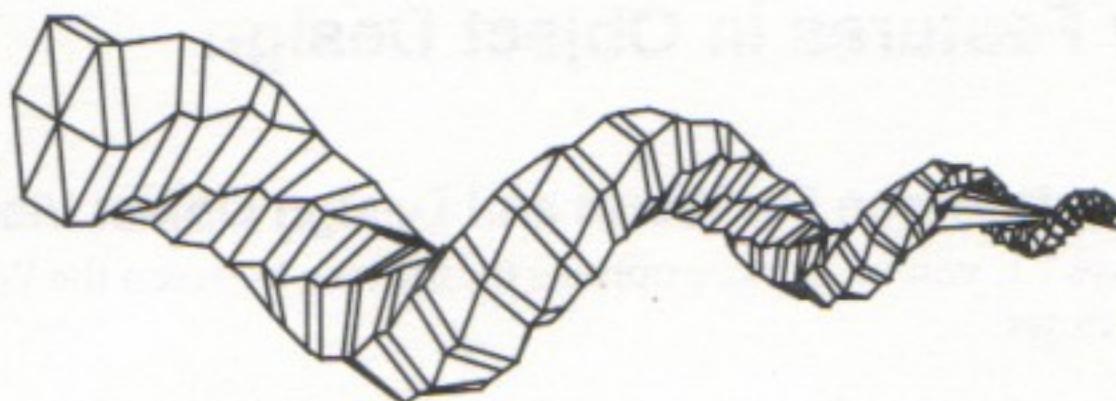
To build a frame or skeleton for the new object:

- Create an object to form the first "rib". Duplicate and link subsequent ribs, altering the contour along the way. Objects with different numbers of sides and orientations may be skinned together. For best results, use a simple linear set of links in the tree.



- Select the parent object in the skeleton.
- Select Skin Tree from the Object Menu . The new composite object is created and linked to the parent object.
- The skeleton can be left inside or the skin may be unlinked and removed.

Note: By default, Skin Objects have triangular facets. To reduce the number of polygons in the object (and the amount of memory required) deselect triangular facets in the *Object Form...* dialog under the Object Menu. Also by default, skin objects do not have front or end caps, check this setting for skinning extruded type objects.



Extruded Object Creation

There are now two types of object creation tools: Lathe Object and Extruded Object. They differ in which sections of the Design Object View control the object's true size.

Remember that Swivel Section views are not views of the actual object, they are views of the sections that are used to create the real object. The actual view of the object from the section's point of view can be seen in the object view when a section is changed or edited.

Swivel assembles objects from the Design Object View sections by deforming the Cross-section to fit the intersection of Top and Side sections. Therefore *either* the Cross Section *or* the Top and Side Sections can be drawn very accurately true to scale. There are many objects, however, for which both cannot be to scale simultaneously. Having two object types allows the critical section to determine the object's measurements.



Lathe-type Object

Lathe objects are created with the block tool. The unit grid in the Cross Section is now marked in percentages of scale rather than in measured units. As long as the Cross Section fits the unit mark (which is automatic if you use the circle or square tool to create the Cross Section), the finished size of drawing in the Side and Top Section can be accurately determined by the new rulers, or the grid.



Extruded-type Object

Extruded objects are created with the new triangle tool. An extruded object's scale is determined by its size in the *Cross Section View*. Dimensions in the Top and Side views are relative to those in the Cross Section, and their vertical units are marked in percentage units. The Rectangle and N-gon (Circle) tools automatically create unit-sized sections in the Side and Top Sections. Rulers accurately reflect object scale in the Cross Section.

New Features in Object Design

Moving Between the World and Design Object Views

In Swivel 1.1, you have more options for moving between the World and Design Object views.

To enter the Design Object View, you can:

- Select the object and choose *Redesign Object* (Command-R) from the Object Menu
- Double-click on the object

To return to the World, you can:

- Choose *Return to World* (also Command-R - this menu item toggles between Redesign Object and Return to World) from the Object Menu
- Click on the close box of the Design Object View.

Adding and Deleting Points

When you are designing objects using one of the arrow tools, you can add or delete points from an object view. To add a point, hold down the Command key and click on a place along a line. A new point will appear at the spot where the mouse was clicked. To delete a point, hold down the Option key and click the mouse on an existing point. If you add or delete a point in either the Top Section or the Side Section, the change is made to both sections. Changes in the Cross Section do not affect any other sections.

More Possible Points in Swivel 1.1L

Up to 100 points are now possible for each section view. The N-gon (circle) tool now creates up to 80-sided objects.

Templates in the Side and Top Sections

In Swivel 1.1, you can paste a PICT image from the Clipboard into either the Top Section or the Side Section and use it as a template. This feature is useful, for example, if you want to create a Swivel object in the shape of a scanned image. To add a template to a section view:

- Bring the section view to its full size by clicking on its side bar.
- Paste the PICT into the section view with the *Paste* command in the Edit Menu (Command-V).

Note: Pasted PICTS behave very differently in Cross, Top and Side sections where they are for visual reference *only*, and in the Object View where they are actually mapped on the object.

Scaling Section Views

You can tailor section views to the type of work that you are doing on an object. You can, for example, zoom in to make fine adjustments or zoom out to design very large objects.

To Zoom In: Hold down the Option key while clicking on the view's sidebar.

To Zoom Out: Hold down the Command key while clicking on the view's sidebar.

Note: Scaling the view does not affect object scale.

Scrolling Section Views

When you expand a section view to a full window by clicking its side bar, the standard Macintosh scroll bars become active so that you can work on very large drawings.

Rulers

Select *Show Rulers* from the Object Menu to display Rulers. To modify a ruler's scale or to increase or decrease the number of divisions per unit, return to the World View and Select *Rulers...* from the Object Menu. When building a Swivel model to scale, set the units and scale factor in the Rulers dialog. The Design Object View Rulers will accurately reflect the scaled size of the object.

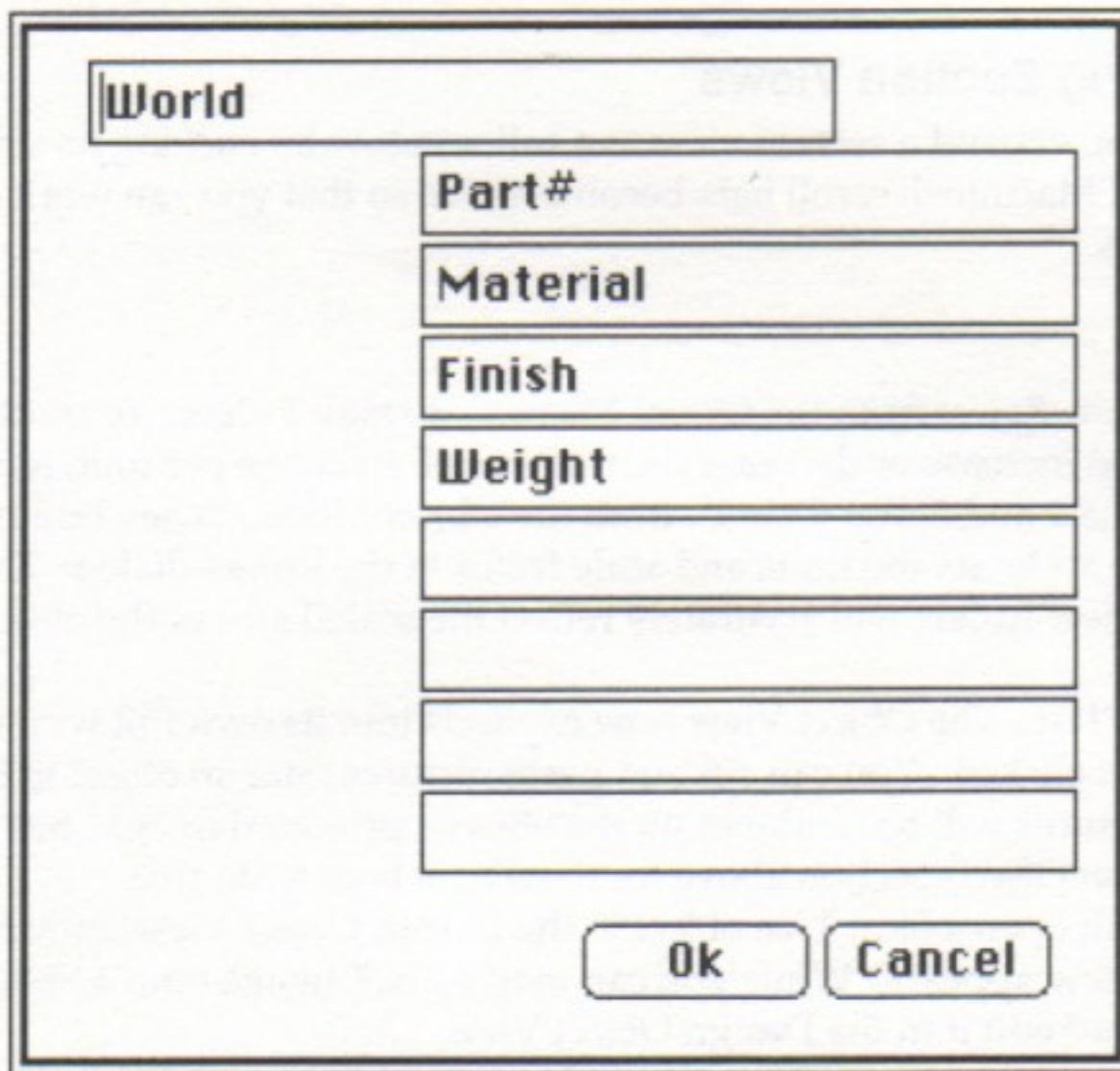
Object View: The Object View now expands into its own full window when its sidebar is clicked. You can cut and paste pictures onto an object in this view and these pictures will be rendered on the object's projected image. See the *Mapping Pictures on Objects* section above for details on how to do this.

When you open a Skin Tree object in the Design Object View, only the expanded Object View appears. While you can map a PICT image onto a Skin Tree Objects, you cannot edit it in the Design Object View.

Object Info...

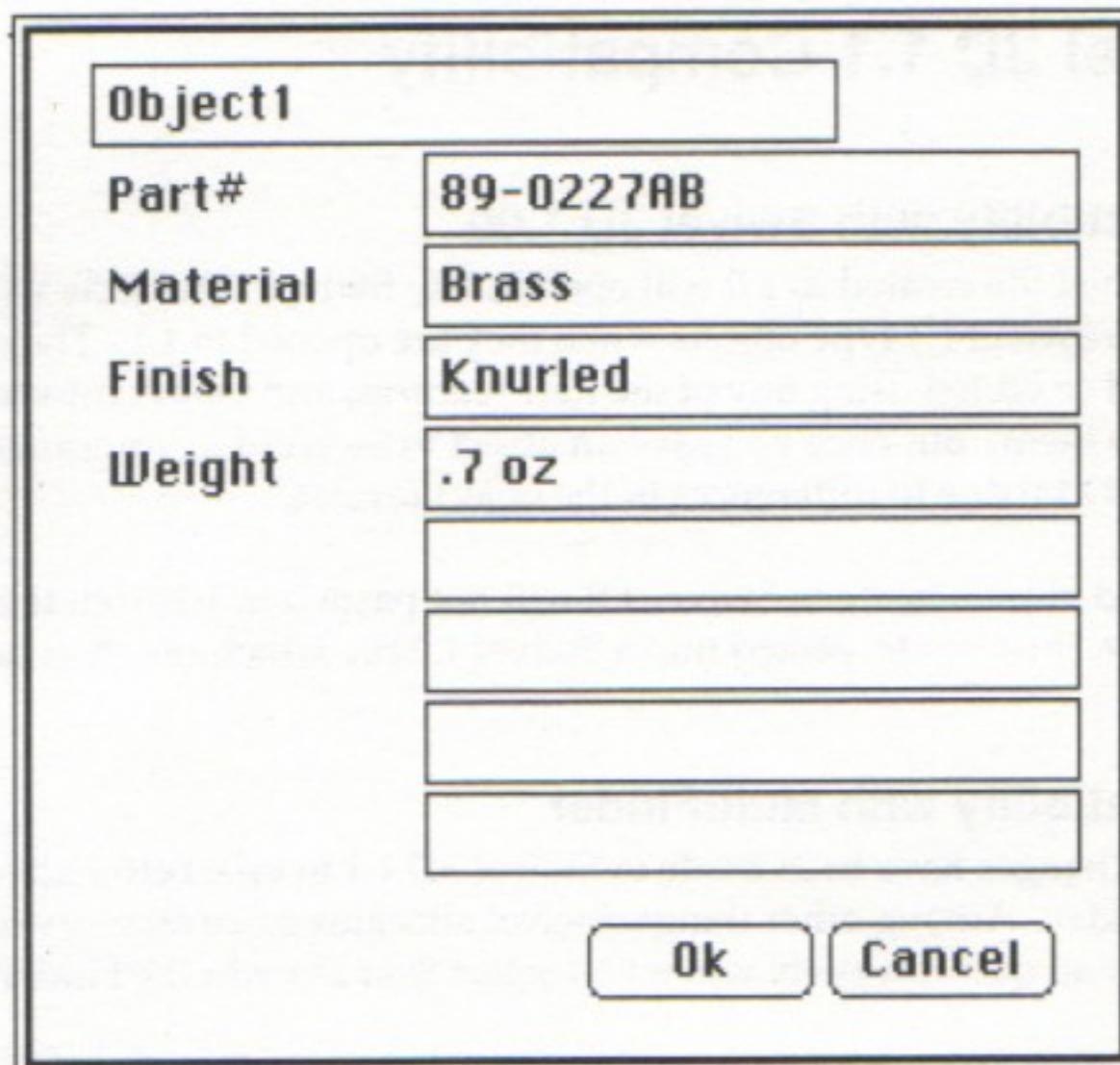
New Object Database:

Swivel now features a built-in database in which you can store useful information about objects, such as a part numbers, material specifications, mechanical properties, or storage capacities, and export it into a spreadsheet such as Microsoft Excel. Select *Object Info...* (Command-6) from the Edit Menu bring up the *Object Info* dialog box.



Up to eight user-defined fields of information can be carried by a Swivel object. To define the names of these fields, select the World (the background), and choose *Object Info...* from the Edit Menu. The text entered here becomes the titles of the fields. Each field must be 32 characters or less in length.

Once the fields have been defined for the World, you can enter the data for individual objects by selecting the object and choosing the *Object Info...* menu item.



A list of all the objects and their fields may be generated by selecting "Text for Excel" in the Output Style dialog, and then choosing *Export File* (Command-3) in the File Menu. The exported file may be opened in Excel and used as a database for the model.

Once you open this file in Excel, you can perform sorts and other operations on the information just as you would on any other Excel file.

	A	B	C	D	E
1					
2	World	Part#	Material	Finish	Weight
3	Object5	88-1206RF	Delrin	Plain	1.5 oz
4	Object4	89-0221AA	Brass	SandBlast	3.5 oz.
5	Object3	88-0630TT	Aluminum	Anodized	15 oz.
6	Object2	89-0116AA	Polyethalene	Plain	3.0 oz
7	Object1	89-0227AB	Brass	Knurled	.7 oz

Swivel 3D 1.1 Compatibility

Compatibility with Swivel 3D 1.00

Any Swivel file created in 1.0 will open in 1.1. Swivel 1.0 objects will be converted to Swivel 1.1 type objects when they are opened in 1.1. They can be rendered or edited using any of the new features, and Object Information can be added to them. But once you save an object in Swivel 1.1, you cannot open it in Swivel 3D 1.0 due to differences in the object format.

Trees and objects made in Swivel 1.0 will not paste into 1.1 from the Clipboard. However, they can be pasted into a Swivel 1.0 file which can then be opened in Swivel 1.1.

Compatibility with MultiFinder

Several changes have been made in Swivel 3D 1.1 to take better advantage of MultiFinder. Among other things, Swivel allocates more memory for you to work in and quits properly when you select *Shut Down* in the Finder's *Special* menu.

MultiFinder can be very useful when designing objects with mapped pictures. Create and copy the picture in a graphics program, switch to Swivel, and paste the picture onto the Swivel object. But be sure to save open files in *each* application (including Swivel) before switching to another in MultiFinder.

Compatibility with the Scrapbook

Save to Scrapbook during tweening Swivel 1.1 asks you to create a new Scrapbook file. You can make collections of scrapbooks this way.

Output to the Scrapbook

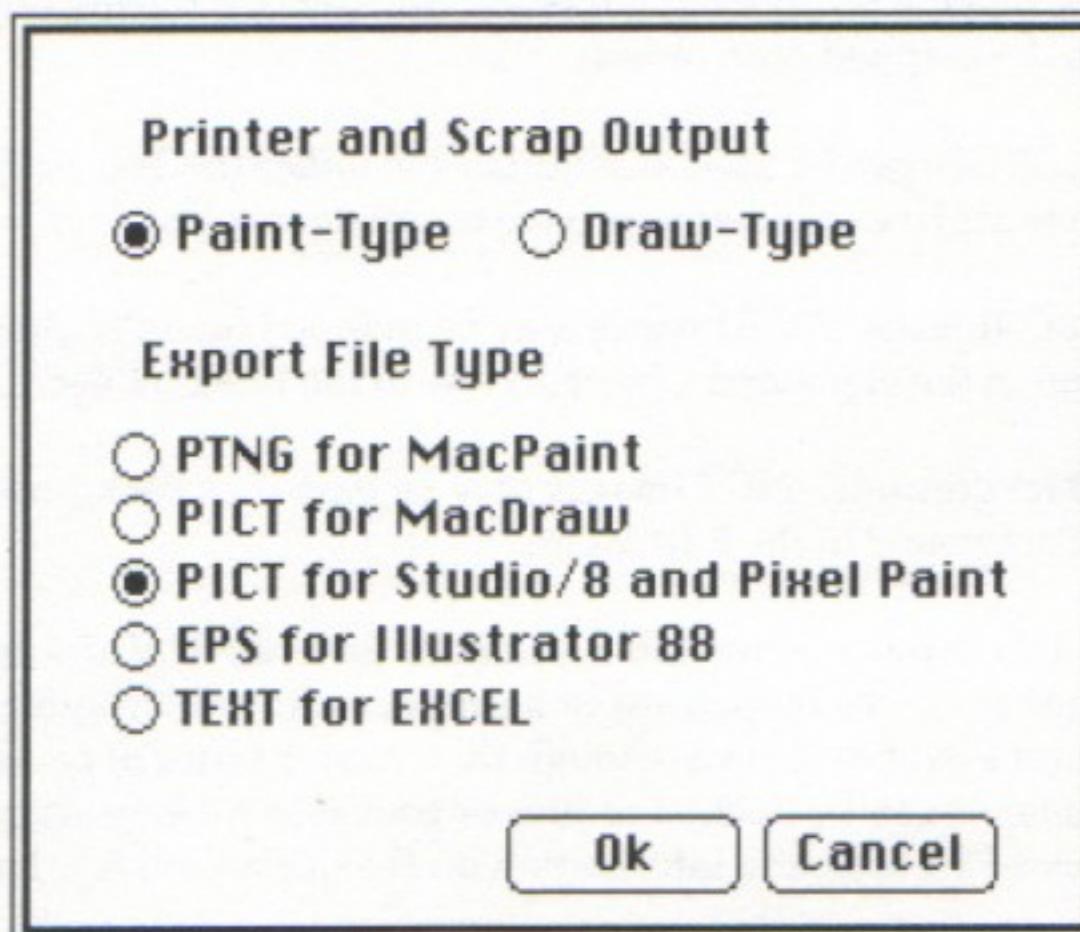
Swivel 1.1 places objects into the Scrapbook differently from Swivel 1.0 did. Swivel 1.0 embedded Swivel objects in PICTs. Swivel 1.1, however, has its own scrap type: "SWIZ", which holds more data. When an object or tree is cut or copied, both a PICT and a SWIZ object are placed on the Clipboard. They can be pasted to the Scrapbook. When copied into Swivel the SWIZ data is used to reconstruct the object in three-dimensions. Applications that understand PICT (almost everything) use the 2D PICT images stored in the Scrapbook.

Compatibility with Other Applications

Output to other applications

Files of various formats can be created and saved for export to other applications.

- Select *Output Style* from the Edit Menu
- Select the file format in the *Output Style* dialog:



- Select *Export File* from the File Menu. *Export File* replaces *Save Picture* since Swivel can now export text as well as pictures.
- *Export File* asks for a file name each time it is invoked (selected).
- Swivel specifies the creator for each file type.

Adobe Illustrator

Swivel now supports output for Adobe Illustrator by writing Encapsulated Post Script files. These files will automatically be in Draw-Type mode. To generate EPS files, choose EPS output in the *Output Style* dialog in the Edit Menu . The files that are made will be "Draw Type" files, that is they will be editable as polygons in Illustrator. Objects shading and color will be rendered faithfully in the EPS file, and polygon shapes will be saved at increased resolution. Projected images, Shadowing, and Object Intersections will not be rendered in an Illustrator EPS file.

Excel

Swivel creates text files for output of info fields to Excel. To create the database info fields use the *Object Info...* item in the Edit Menu. See the *Object Info* section above for more information on exporting to Excel.

Input from Other Applications

Input in the Design Object View: PICT images may be pasted in the Design Object View (via the Scrapbook) either as templates for tracing object contours or as images to be mapped onto objects.

Templates: PICTs can be used as templates in either the Top or the Side Section. The section must be expanded to receive template images.

Mapping on Objects: PICT Images may be mapped on individual objects by pasting them in the expanded Object's View in the Design Object Mode.

Input for Backgrounds: PICT images may be pasted as backgrounds to the world with *Paste Background* in the Edit Menu.

Command File Input: Command files can be generated by any application that generates text files, like Hypercard or a programming environment. Swivel takes these files and executes them as though they were a series of commands from the user. Commands can be opened as files or pasted in for execution. See *Swivel 1.1 Script Command Set* for more information on the Command File language.

Input from Body Electric™

Swivel 1.1 accepts Trees and Command files generated by BodyElectric, another application developed by VPL Research, Inc. BodyElectric takes input from VPL's DataGlove and transforms it into information about a 3D world. In both Swivel and BodyElectric, angular resolution is tenths of a degree.

Drawing Speed Improvements

Numerous changes in Swivel 1.1 increase Swivel's overall performance by as much as 30% in objects with many small polygons. Among the speed-improving features are the calculation of alias colors and shadow colors at the time of the color change and the remapping (instead of redrawing) of many color objects.

User Interface Description

Swivel 3D Documents

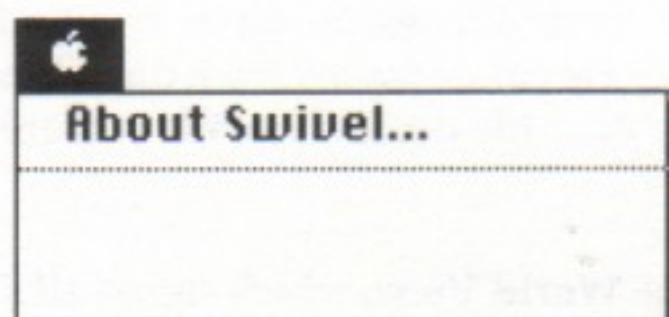
When Swivel first opens, a new, untitled document is created. The frontmost window is the active current document. Any file operation, such as saving, closing, or printing applies to the current document. Up to four Swivel documents can be open at one time. Objects cut or copied from one file can be pasted in another. It's a good idea to save your file regularly while you are working, and especially before printing.

A Swivel document has two views: **World View**, which shows all the objects from the current world orientation; and **Design Object View**, which shows the form of an individual object. Each view has a set of tools used to edit and change objects.

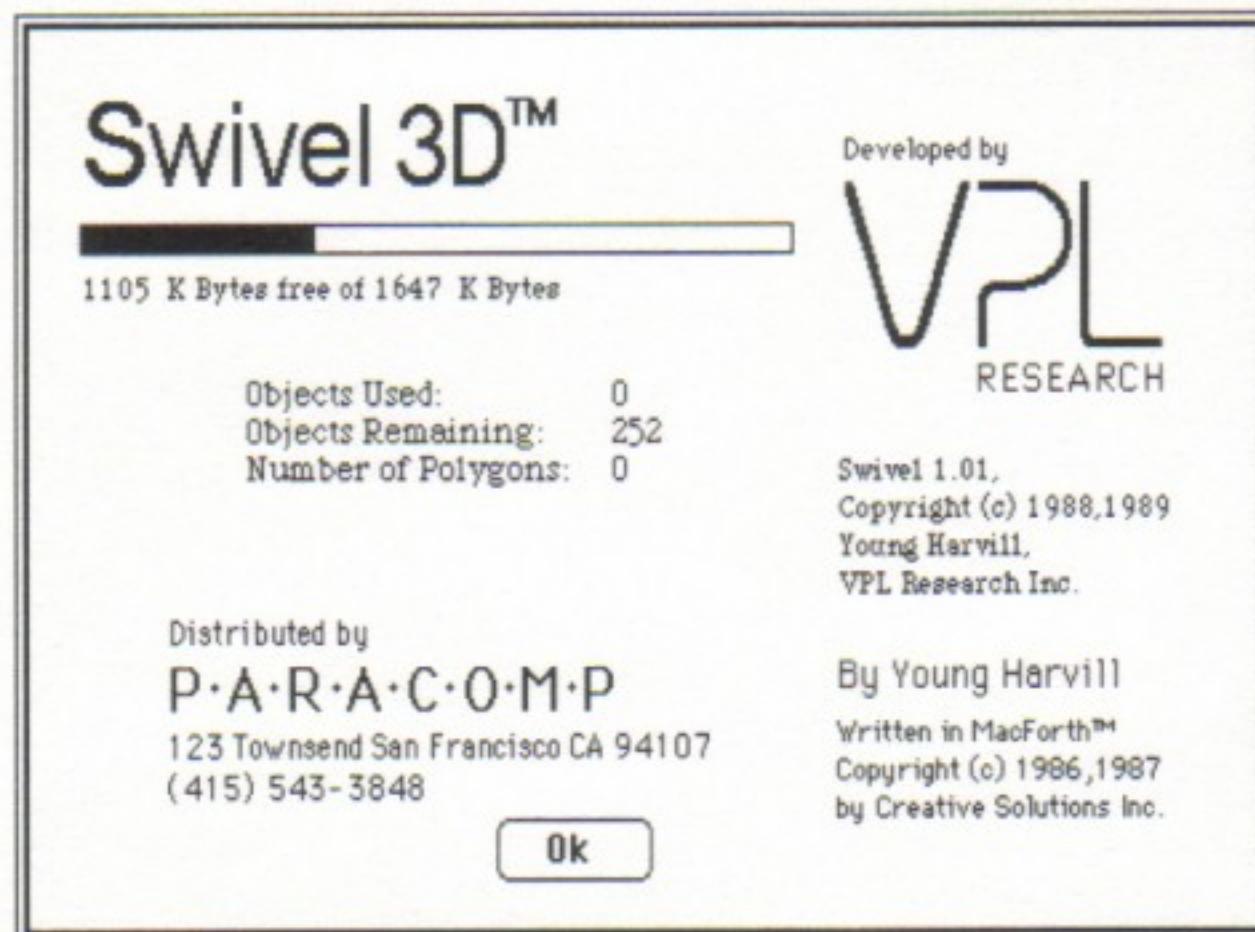
Using **Menus** and the **View Tools** you can create, move, spin, shape, and edit objects. They are the main building blocks of the User Interface.

The Menus

Apple Menu



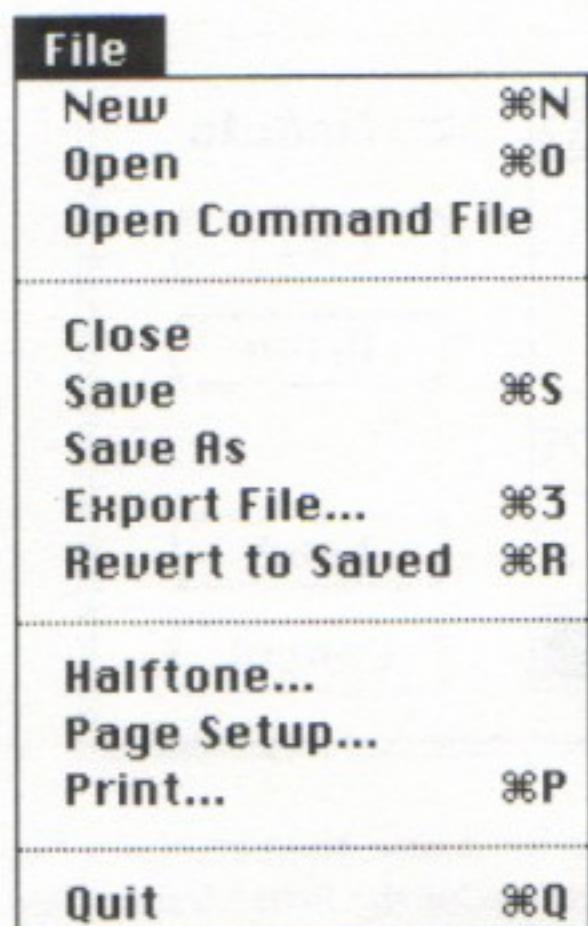
About Swivel 3D... Provides useful information about memory usage, the number of objects in the current document, and the total number of polygons in the file, as well as copyright and version information.



Desk Accessories (DAs), such as the scrapbook, may be opened and used with Swivel.

Swivel will detect changes in the Color or display settings made by DAs (such as the Control Panel) and automatically update the documents. F-Keys or other applications which dynamically change the system's color or display settings may not automatically be recognized by Swivel. Using the light tool will cause Swivel to remap to fit the new color environments.

The File Menu



New (Command-N): Creates a new **Swivel** document.

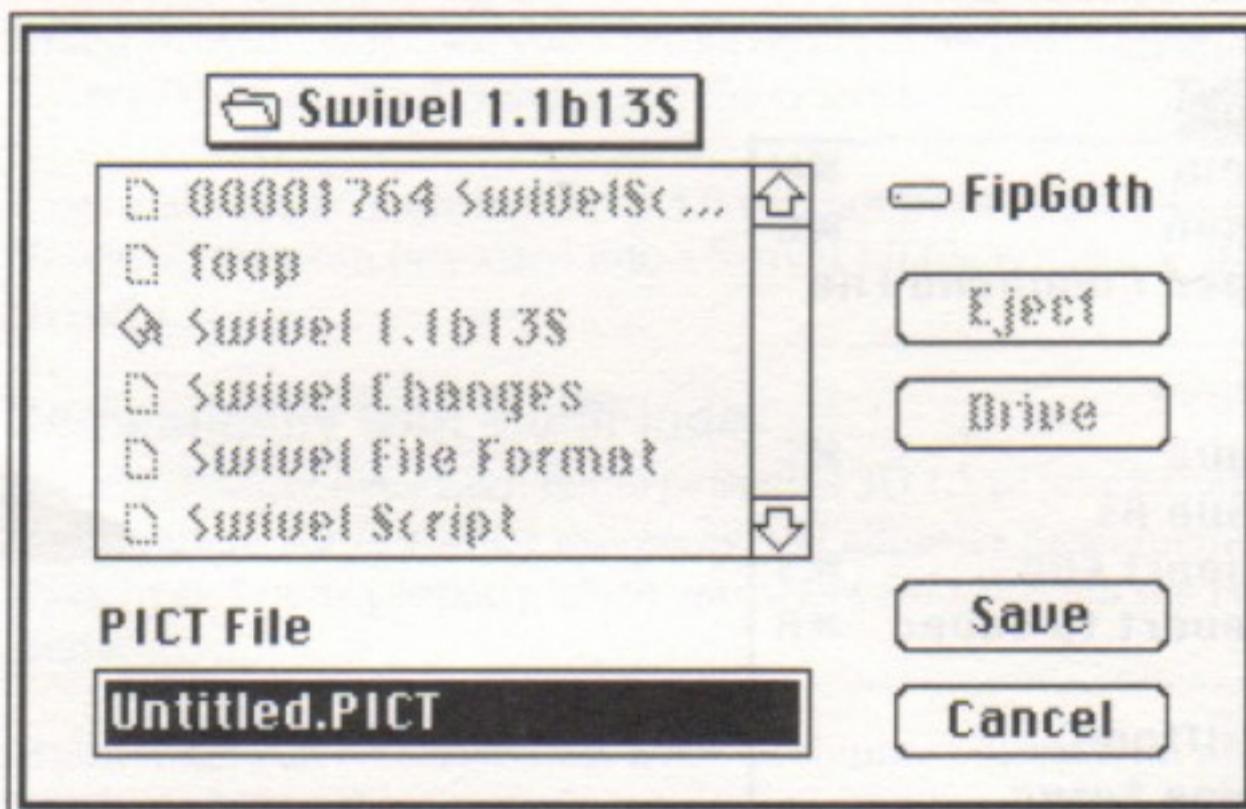
Open (Command-O): Presents a file dialog from which to open a **Swivel Document**.

Open Command File: Presents a file dialog from which to open a script in **Swivel Command File Language**. The commands in the script are executed immediately. The **Command File Language** is a feature for advanced **Swivel** users, and is not covered in the user guide. Documentation on the **Command File** language is provided in this addendum.

Close: Closes the top file open in **Swivel**. Clicking the corner box also closes the file.

Save (Command-S): Saves the Swivel file you are currently working on. If several documents are open, the top (active) file will be saved. If it hasn't been saved before, you will be asked how to save the file.

Save As... Opens a dialog in which to name the current Swivel file and a destination to which it will be saved. This allows you to save a copy of the Swivel file you are working on under a new name. The old version is left unchanged.

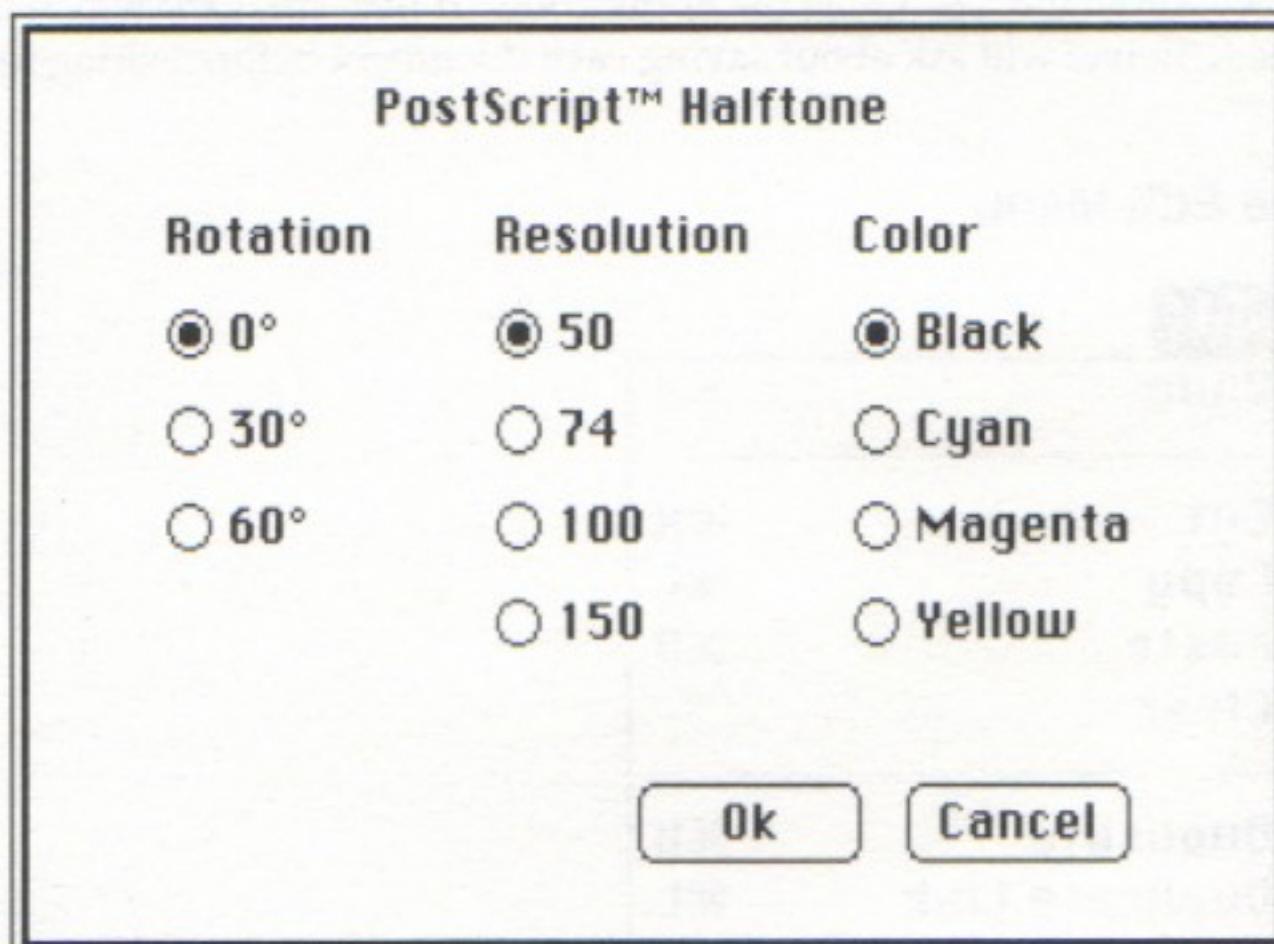


Export File... (Command-3): Asks for a file name, then creates a file of the type selected in the **Output Style** dialog box (under the Edit Menu). The file name default reflects the file type. The first four file types save a picture of the scene as a Paint or Draw type file for editing or printing in a graphics program. The Text file type is used in conjunction with the Object Info feature to save a copy of the object database. Note that **Export File** does not save the Swivel Document itself. Available file types are:

- **PNTG for MacPaint:** Save a bit map of the current image as a file you may open in MacPaint, SuperPaint, Full Paint and many others. It is best to write files of this type while in 2 color mode.
- **PICT for MacDraw:** Saves the current file as sorted polygons. This makes scaling and printing at different resolutions work better, but will not preserve many of the special effects. Lines are printed more cleanly in this type of file.
- **PICT for Studio/8 or Pixel Paint:** Writes out a bitmap pict either in color or black and white, depending on the color mode set in the control panel. It will faithfully reproduce the fully rendered Swivel image. Its size is limited to the size of the current workspace.

- **EPS for Adobe illustrator:** Writes the current Swivel world as sorted Postscript polygons. This EPS file uses Illustrator's method of color notation, so it will only open in Adobe Illustrator 88 or newer.
- **TEXT for Excel:** Saves the fields defined in Object info in a TEXT file that may be opened in Excel.

Revert to Saved (Command-R): Undoes all the changes that have been made since the file was saved.



Halftone... Opens a dialog box for configuring PostScript print output halftone and color separation. Resolutions available correspond to halftone screens with 50, 74, 100 or 150 dots per inch. PostScript printing is used with PostScript printers in 256 Color Mode or in when **Draw-type** output is selected in the **Output Style...** dialog in the Edit Menu.

Color selection is used for preparing images for print as color separations: Black, Cyan, Magenta or Yellow are the different printers produced one at a time. The halftone should be rotated for successive printers. Rotation of dot pattern of 0°, 30° and 60° maybe selected. Normal single color printing should be done on the Black setting, and need not be rotated.

Page Setup... Allows you to set options on how Swivel documents will be printed. Options include such things as paper size, orientation on the page, and reduction or enlargement. Options vary depending on the printer which is

selected. Printers may be selected using the Chooser Desk Accessory in the Apple Menu. See Swivel Output for information on using specific printers.

Print... Prints the current Swivel document. If **Draw-type** Output style is selected, sorted polygons will be printed. If **Paint-type** is selected, the bitmap of the current document will be printed. See Swivel Output for information on using specific printers

Quit (Command-Q): Quits the application. If files are open which have not been saved, Swivel will ask about saving each document before exiting to the desktop.

The Edit Menu



Undo (Command-Z): Cancels the last action. Invoking **Undo** a second time does the action again.

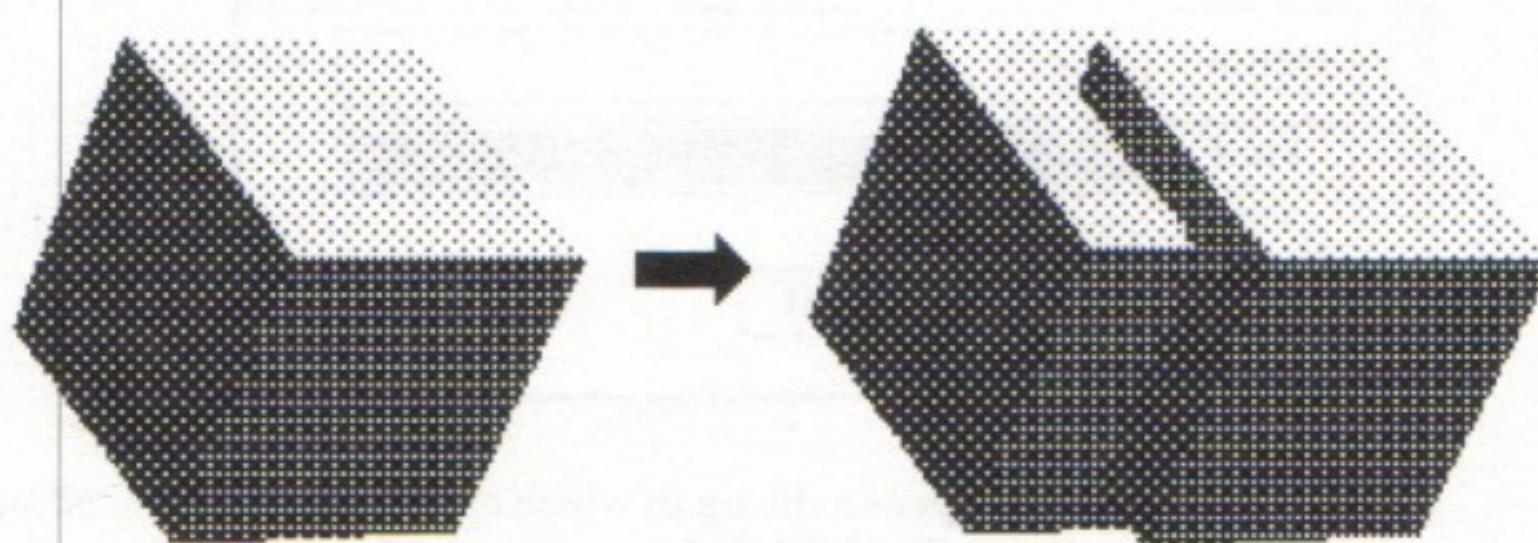
Cut (Command-X): Cuts an object and its links from a Swivel Document and places it on the clipboard.

Copy (Command-C): Copies an object and its links from a Swivel Document, and places it on the clipboard.

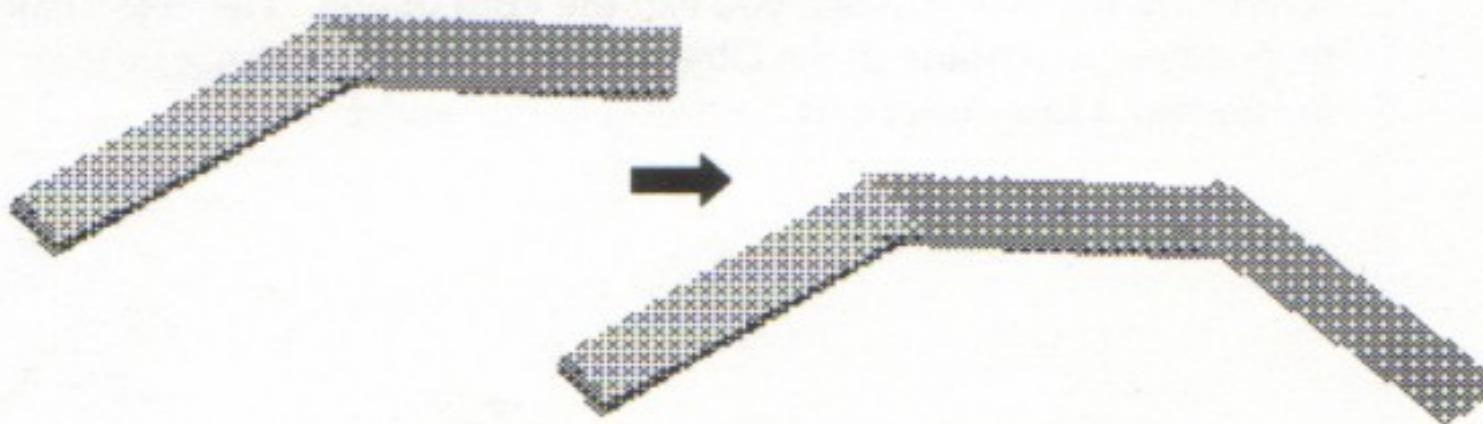
Paste (Command-V): Pastes the Swivel object on the clipboard to the document. If you are pasting into a selected object the pasted object replaces it and takes the selected objects position, orientation and scale.

Clear (Backspace on the keyboard): Deletes the selected object.

Duplicate (Command-D): Duplicates the current object and any links (down-tree objects). If a spacing pattern of duplicated objects has been established, Swivel will follow that pattern.



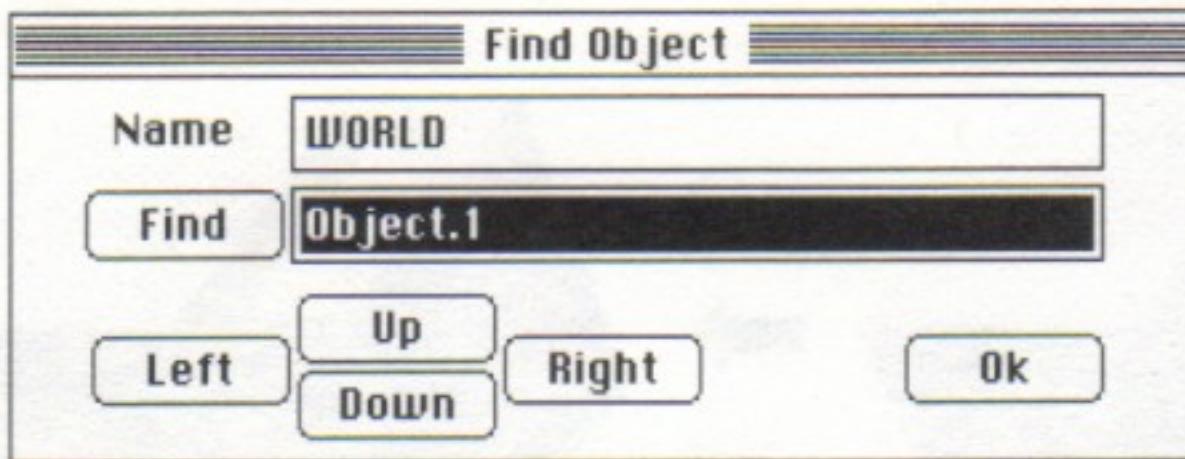
Duplicate Link (Command-L): Duplicates the object and all of its linking constraints, position, attitude, scale and form to a new object. Duplicate Link is useful for natural forms such as shells, trees, and tentacles, or geometrically repeating forms like spiral staircases.



Paste Command (Command-7): Pastes a Swivel Command File Language command from the clipboard. The command can be generated in a text editor or programming environment, then copied to the clipboard. Swivel will execute the command as though it were an action by the user such as a menu item choice or object manipulation operation.

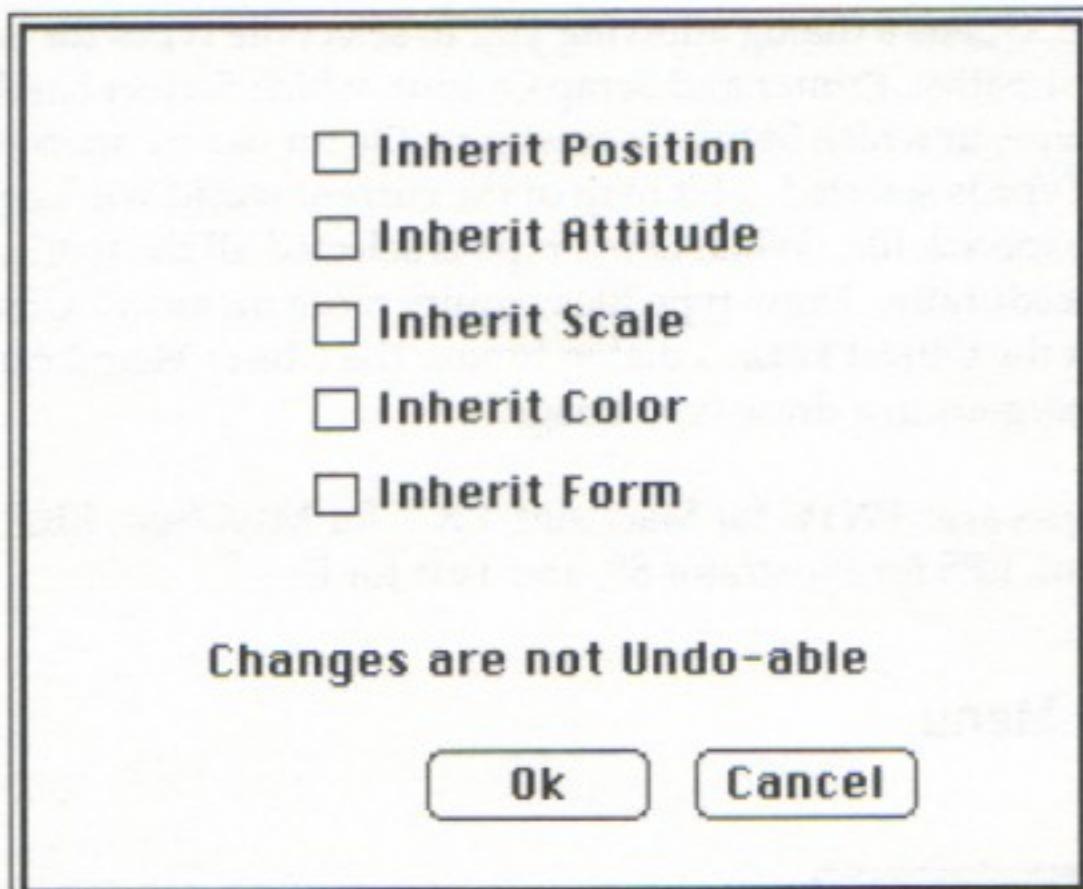
Paste Background (Command-8): Pastes a PICT image from the clipboard onto the background (hither clipping plane) of the current world. Any objects inside the workspace will be in front of the image.

Clear Background (Command-9): Deletes the PICT image pasted on the background.

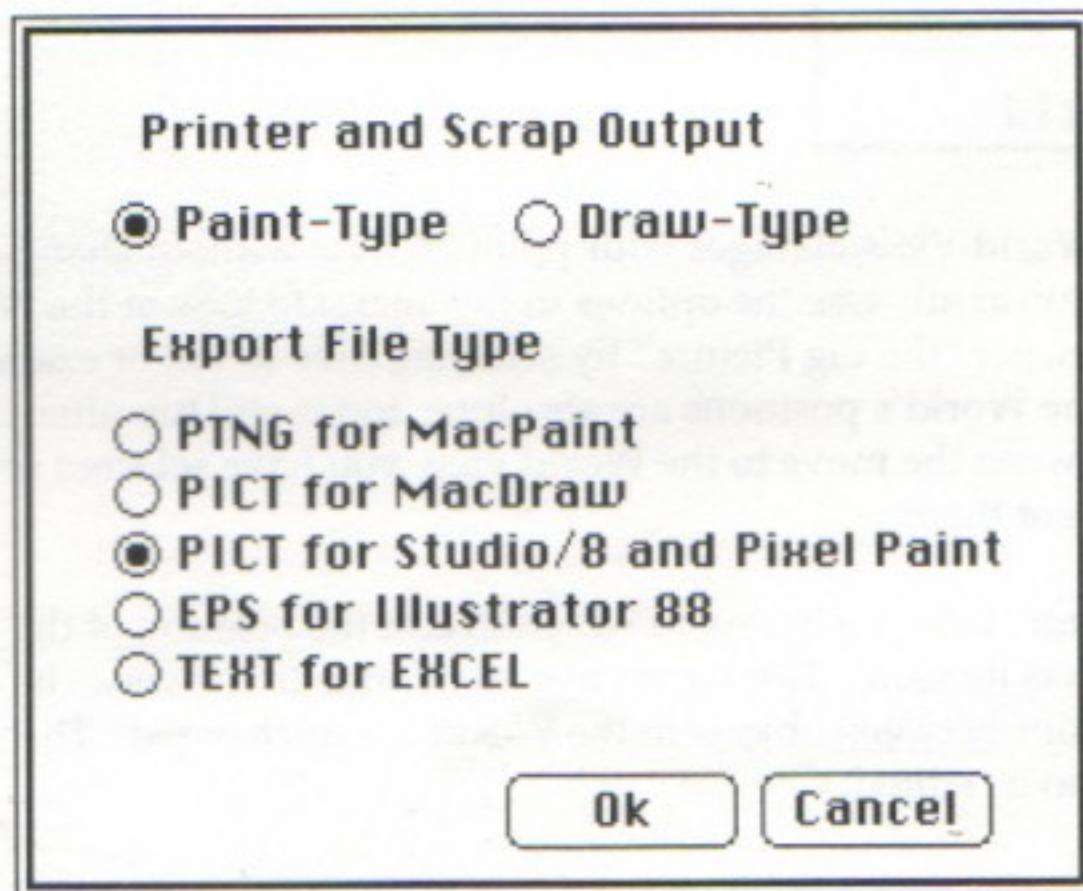


Find... (Command-F): Opens a dialog in which objects can be searched by name or by tracing their links. The Find dialog is also the place in which to name objects. Use the Find button and the text field next to it to search and select objects by name. Use the Up, Down Left and Right buttons to browse the links of the selected object. See the description of Trees in the Starting Out section of the Swivel user guide for an explanation of how Swivel 3D organizes an object's links.

Each Object is named and numbered as it is created: Object.1, Object.2 etc. When **Find** is opened, the current object's name is listed. To rename an object, type in the new name in that space. Once an object which has been found, it will be selected in the World when you exit the **Find** dialog. The object can then be edited by position or attitude in the Object Menu, even if it cannot be seen. This is useful for finding a lost object and centering in the world.



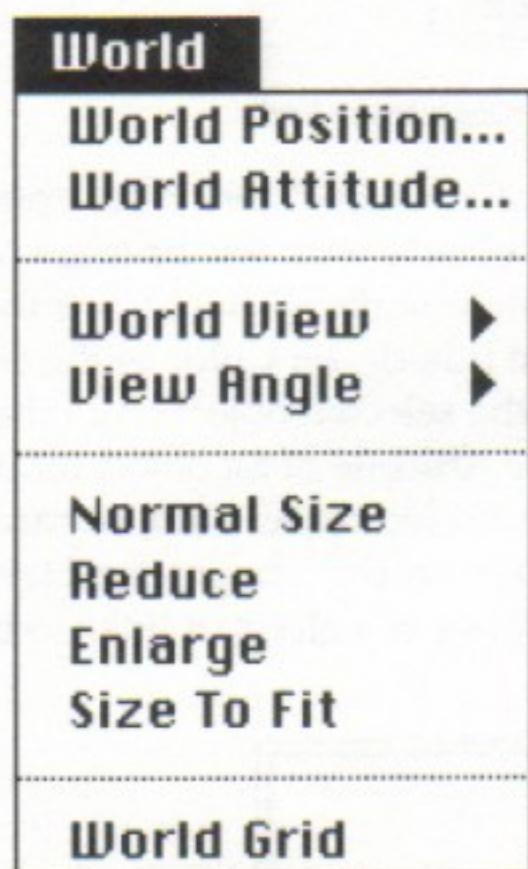
Inherit... (Command-I): Opens a dialog offering six inheritable options. Use the Inherit dialog to endow all the down-tree objects with one or more of a parent object's qualities. For example, if you wish to make all the objects in a given tree the same color as the parent object, choose Inherit, set Color as the only selected item, and click Ok. All of the children of the selected object will inherit the color of parent. When inheriting the Position or Attitude of an object remember that you are inheriting the relationship of the selected object with its parent (or if it is not linked to anything, its relationship in the world). In practical terms this means that you must choose the second object in a chain of links to inherit attitude or position.



Output Style: Opens a dialog allowing you to select file types for two distinct sorts of output paths: Printer and Scrap Output, which Swivel handles itself, and Export File Type, in which Swivel is creating a file for use by another application. When Paint Type is selected, a bit map of the current world will be printed or saved as a scrapbook file. When Draw type is selected all the world will be rendered procedurally. Draw type files require more memory. Unselecting **Draw Back Faces** in the **Object Form...** dialog (under the Object Menu) can reduce the number of polygons in a draw type image.

Export file types are: PNTG for MacPaint, PICT for MacDraw, PICT for Studio/8 and Pixel Paint, EPS for Illustrator 88, and Text for Excel.

The World Menu



Moving the World View changes your point of view without changing the actual object's position at all. Use the options in this menu to look at the World from different sides, get "the Big Picture" by selecting **Size to Fit**, or examine details by enlarging. The World's positions are absolute: top is still top after many rotations. Swivel will Tween the move to the World view you have selected so that you can see how you got there.

World Position: Opens a dialog in which to edit the position of the World in X Y and Z as well as its scale. The World moves relative to the view the user has of it. All relationships between objects in the World are unchanged. The Scale of the World can also be edited.

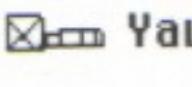
WORLD . Position

	Position	Minimum	Maximum	
 X	.000	-13.889	13.888	<input type="checkbox"/> Lock
 Y	.000	-13.889	13.888	<input type="checkbox"/> Lock
 Z	.000	-13.889	13.888	<input type="checkbox"/> Lock
Scale	100			

Absolute **Ok** **Cancel**

World Attitude: Opens a dialog for editing the attitude of the World in any combination of Yaw, Pitch, Roll or Yaw.

WORLD . Attitude

	Attitude	Minimum	Maximum	
 Yaw	90	-360	360	<input type="checkbox"/> Lock
 Pitch	0	-360	360	<input type="checkbox"/> Lock
 Roll	0	-360	360	<input type="checkbox"/> Lock

Absolute **Ok** **Cancel**

World View

- ✓Front
- Back
- Left
- Right
- Top
- Bottom

World View: Offers a hierarchical submenu of viewpoints from which to look at the world. Selecting one of the views swings the World around to look at the model from that World View. Swivel will Tween, or show intermediate positions of the World, as it moves so that you can follow the relationship of Front to the previous view.

Views are: **Front, Back, Left, Right, Top, and Bottom.** A checkmark indicates current viewpoint.

View Angle

- Very Wide Angle
- Wide Angle
- ✓Moderate Angle
- Narrow Angle

View Angle: Sets an angle of view for the current document. This item selects how close the viewer will be stationed to the viewing plane. The closer the viewer is to the view plane, the more extreme the perspective and the wider the viewing angle.

Normal Size: Redraws the World at actual scale. Individual objects which have been scaled up or down will retain their scale.

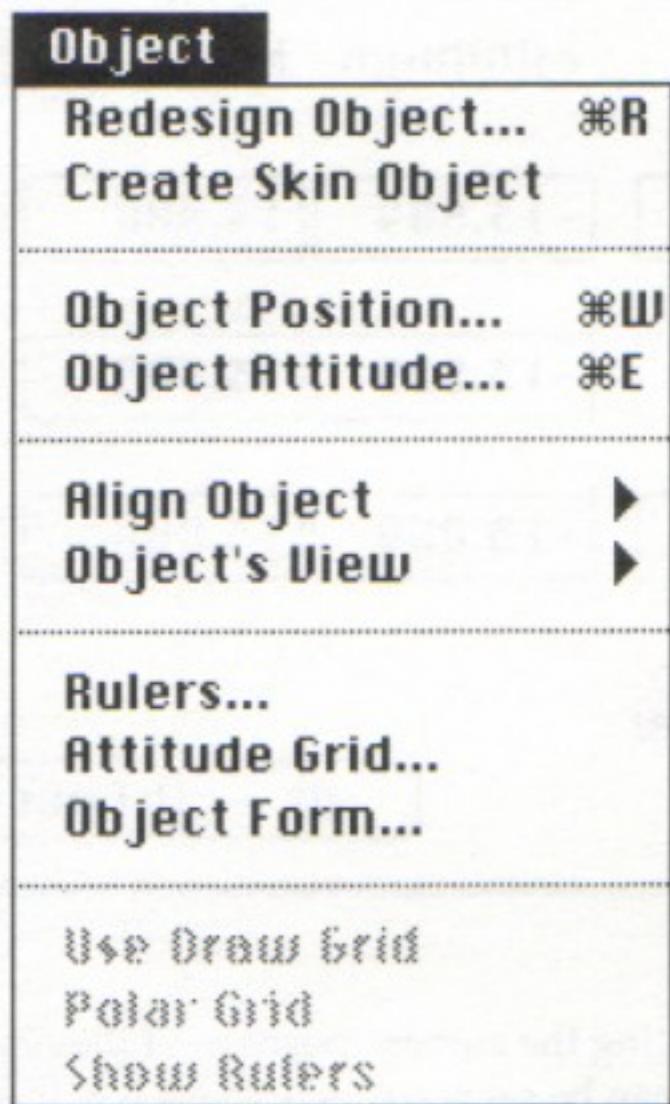
Reduce: Shrinks the World by 25% so that more space is visible. The relative size of objects is unchanged.

Enlarge: Enlarges the world 25%. The actual size of objects is unchanged.

Size to Fit: Reduces or enlarges the world to fit within the current window size.

World Grid: Uses the position grid selected in **Rulers...** and the attitude grid selected in **Attitude Grid** as a grid for the world view. If this item is checked objects will snap to these rotations and positions in the world view.

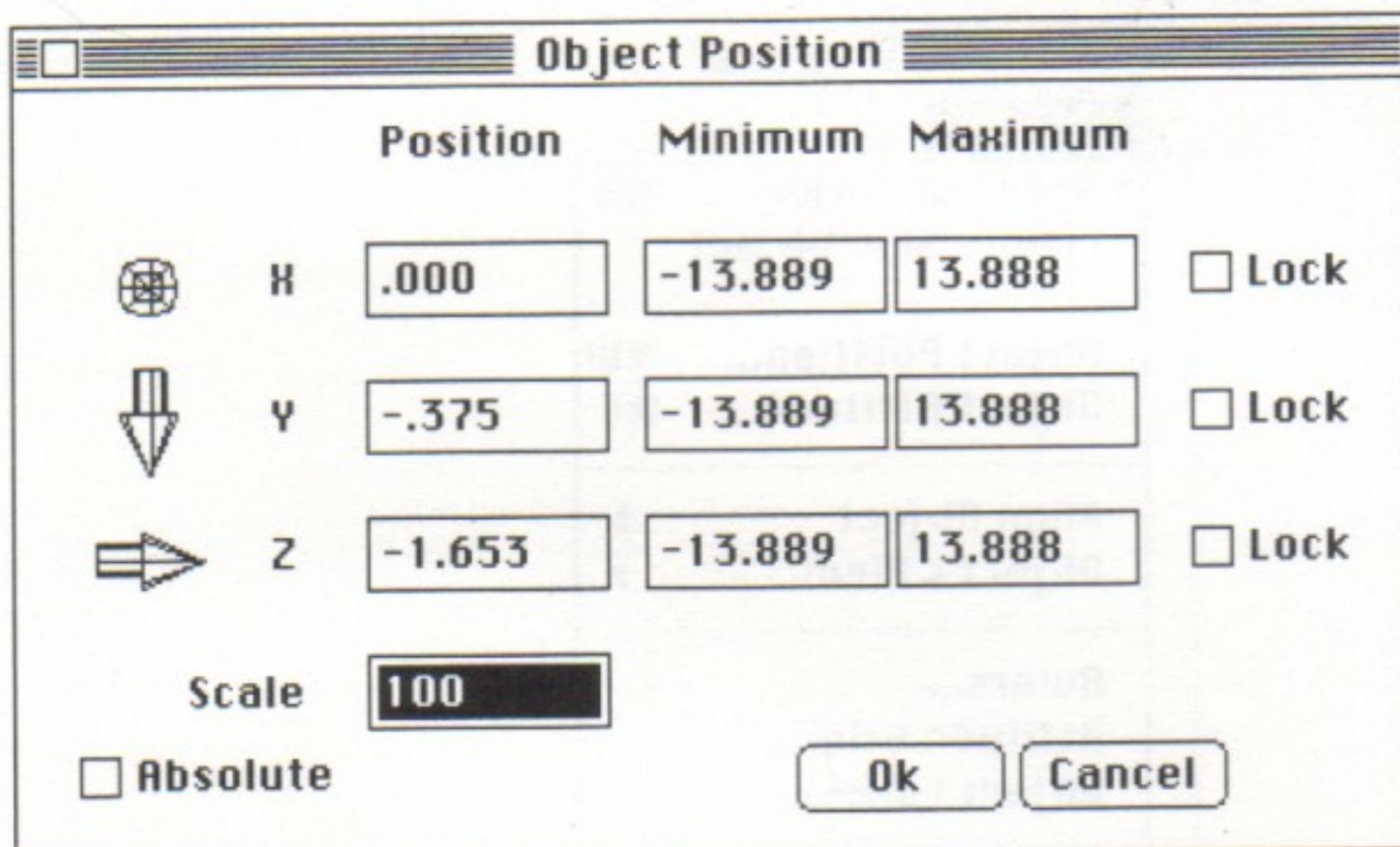
Object Menu



ReDesign Object... Opens the selected object in Design Object View, just as double clicking on the object would. This can be helpful when an object is difficult to get to click because of the way it is built into other objects. **Find** can locate the object for designing. If no object is selected, this option is named **Design New Object** and will create a new object and then present the Object Design View. In the Design Object View, this menu item toggles to **Return to World**.

Return to World: Exits the Design Object View and returns to the World View. In the World View, the menu item toggles to **ReDesign Object..**

Create Skin Object: Creates a polymesh object over the selected object and its down tree links. The new object will be stretched over its parent like a "skin". When created, the new Skin Object will be linked to the object over which it was formed. New Skin Objects will be drawn with triangular facet, Back Faces will be drawn, and no Front or End Caps will be used. These attributes may be edited in the Object Form dialog under the Object Menu.



Position... Opens a dialog for editing the current position of the object, and its allowable range of motion. Each can be set separately in each X, Y and Z axis. The arrows show which direction the object will shift. Negative numbers move the object in the reverse of the direction shown.

The object's position is measured relative to its parent object, if it has one, (unless **Absolute** is checked). Position is measured from center to center. In the example above, the center of the object is lined up with the center of its parent object in X. It is -.375 from the center of its parent object in Y, and -1.653 from the parent object center in Z. If an object has no parent object, then its position is measured relative to the center of the World.

Checking the **Lock** box will prevent any motion of the object in that axis. This can be very important in aligning objects as well as building models whose moving parts are constrained within certain limits.

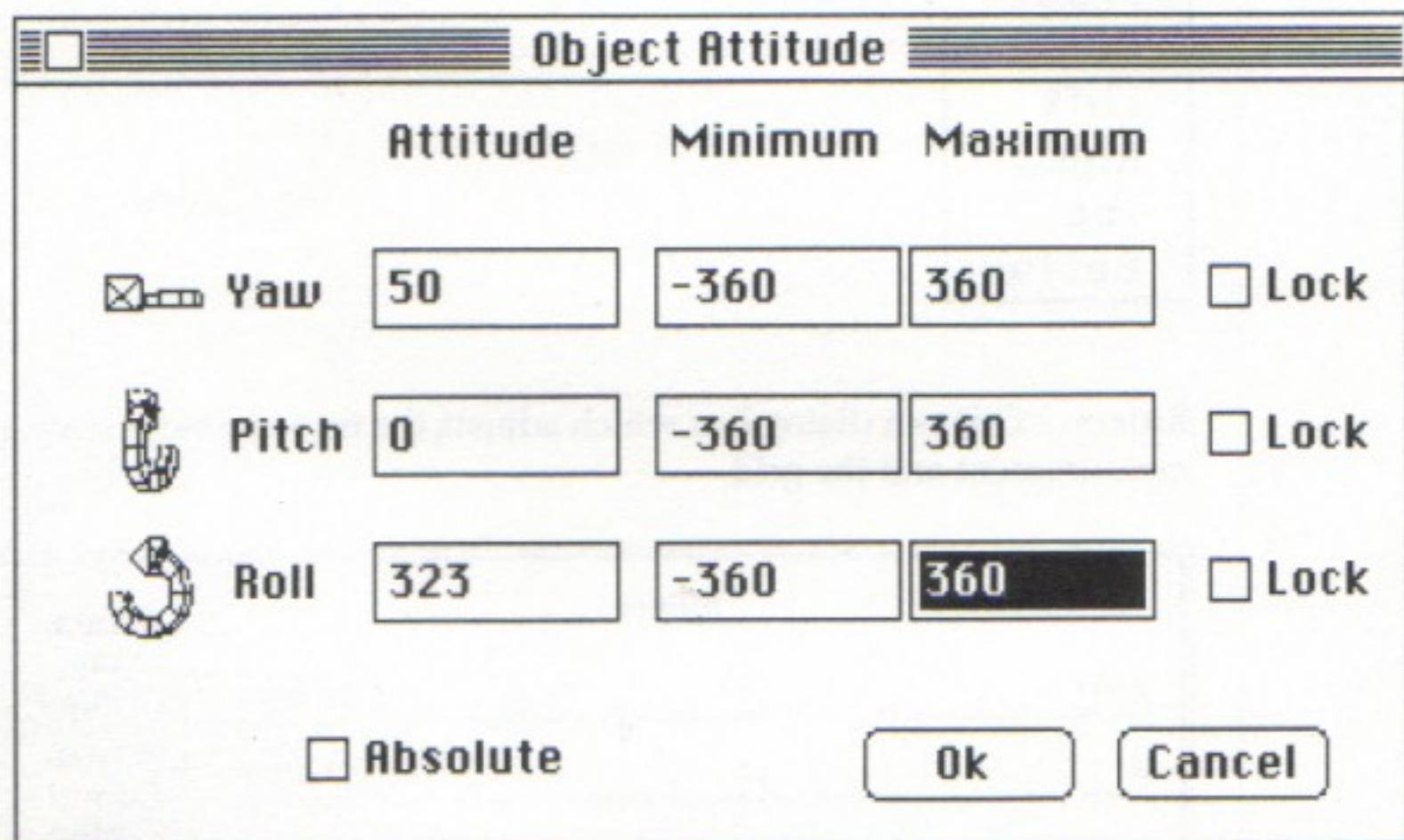
Absolute means that distance is measured from the center of the world to the center of the object. The units shown are inches, centimeters, or screen units, depending on which is selected in the **Position Grid**. The default unit is inches.

The **Maximum** and **Minimum** numbers are the range the object is allowed to move in each dimension. You might limit an elevator to travel up and down only the length of its shaft, or a chair to roll only to the end of its floor space. One easy

way to set limits is to move the object to the desired stopping point by eye, then open the **Position** editing dialog. The current object position will show in the first column. Type the number into the maximum or minimum box for the axis to be limited.

Scale is the size of the object as a percentage of the original object. All objects are created at full size or 100. You can change the scale in the **Position** editing dialog by typing in a new number: for example, 50 will reduce the object in size by half, 200 will magnify it to two times its size. Scale changes made with the Scale tool in the World View will show up in the **Position** editing dialog. Use it to fine tune a scale change you've already made by eye.

Attitude... Opens a dialog for editing the orientation of the object in space. In this panel the current angle of the object, and its allowable range of motion can be set separately in Roll, Pitch and Yaw. The arrows show how the object will rotate. Checking the **Lock** box will prevent any motion of the object in that degree of freedom. Editing can be absolute (relative to the World) or relative to the parent object. Angles are measured in degrees.



Like editing the objects position, using the **Attitude** editing dialog is especially helpful when you move back and forth between adjusting angles numerically here, and by eye in the **View Object** Window.

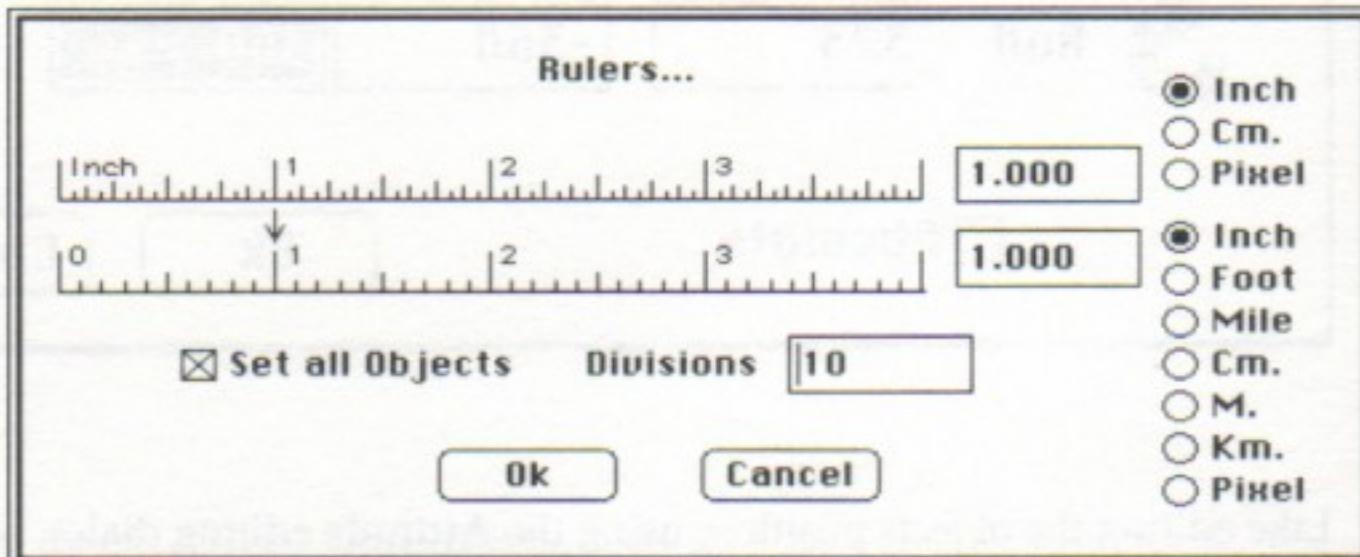
Align Object... Opens a hierarchical menu for aligning the selected object to its parent object, or the world if it is unlinked. Options are: **Align All** which will zero the object's position and attitude. **Align Attitude** which will zero the object's Yaw, Pitch and Roll, and **Align Position** which will zero the object in X, Y and Z with respect to its parent.

Align All
Align Attitude
Align Position

Object's View: Opens a hierarchical menu of views which swing the world around so that the selected side of the object is centered and facing the viewer. Like changing the World view, this doesn't alter any of the objects, or their positions, although things may look very different than you expected. It is very useful when you are aligning objects. View Points are: **Front, Back, Left, Right, Top and Bottom.**

Front
Back
Left
Right
Top
Bottom

Rulers... Opens a dialog box which adjusts the measurement scale, units of measurement and the grid.



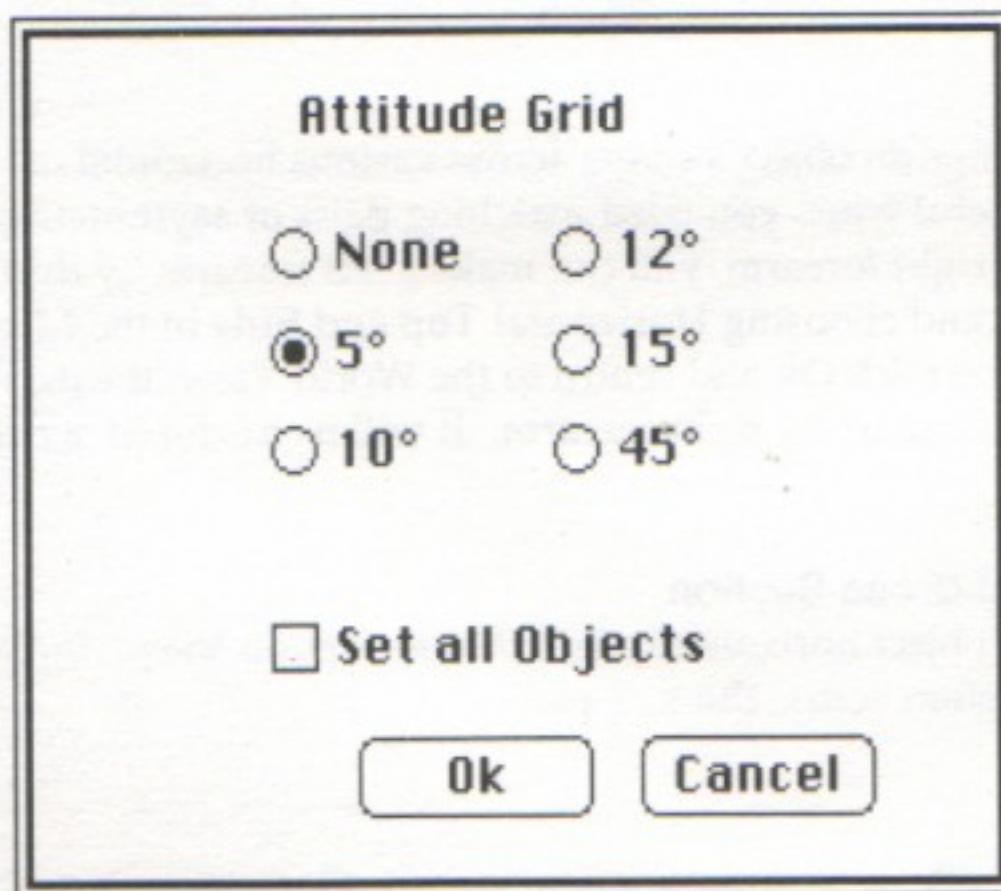
Scale: Swivel sets the measurement system used by comparing a set of units used for measuring (the top scale) with units used for drawing (bottom scale). The result is a proportion of drawn to measured units.

Units: Swivel units can be Inch, Centimeter or Pixel. These can correspond to inches, feet, miles, centimeters, meters, kilometers or pixels in the real world. The default is one inch in Swivel equals one inch in the real world.

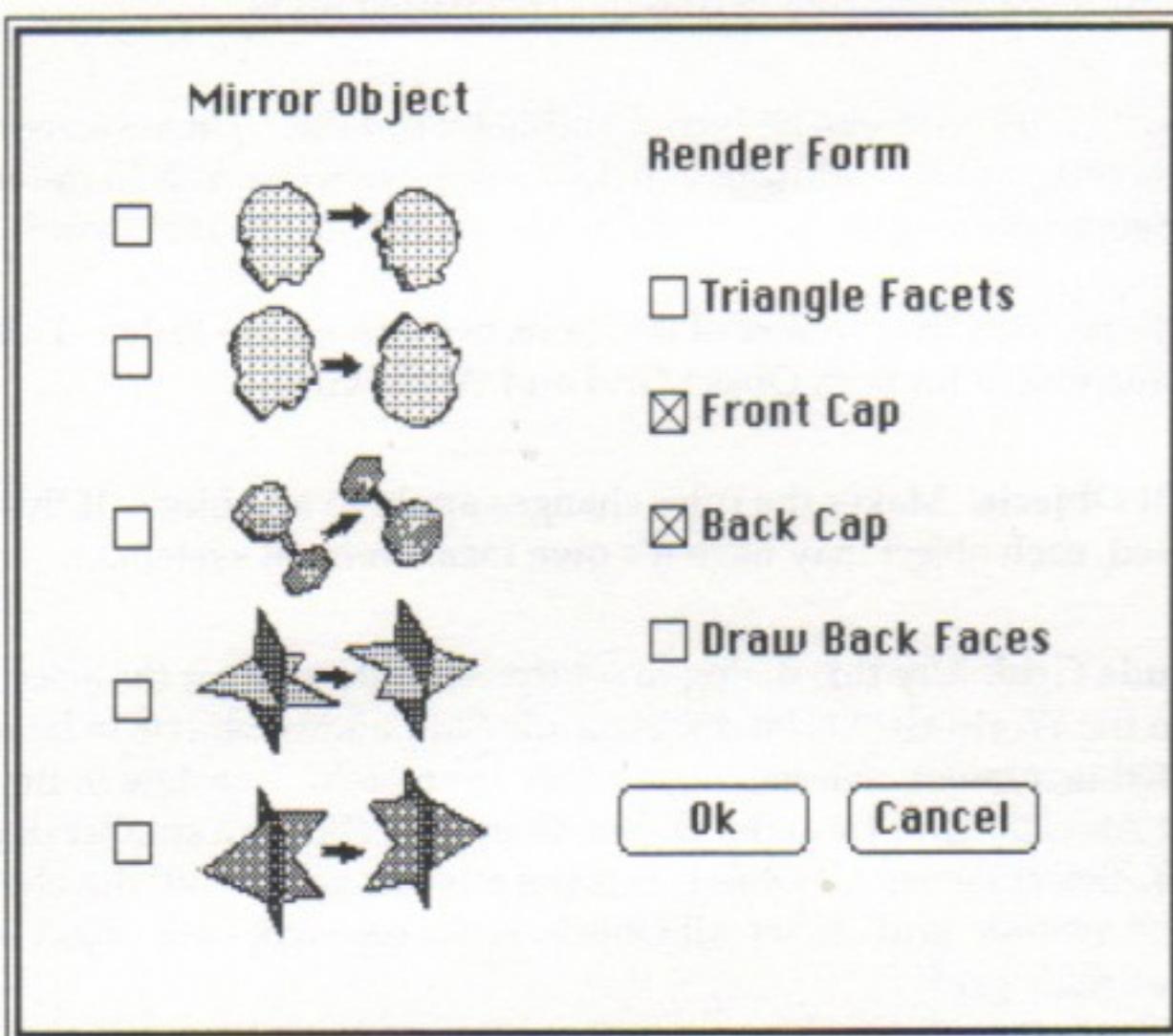
Divisions: Sets the number of divisions per unit on the Ruler. This also sets the Grid increment for both Object Grid and World Grid.

Set all Objects: Makes the ruler changes apply to all objects. If this is not checked, each object may have it's own measurement system.

Attitude Grid: Use this dialog to set the Attitude grid for the selected object. When the World Grid is on, the Attitude Grid allows objects to be rotated the selected increment, making angles easier to match. To rotate in finer increments, select Attitude Grid from the Object Menu and choose a smaller degree, (or select none). Selecting Set All Objects sets the attitude grid for all the objects to the current attitude grid . If Set All Objects is not selected, each object may have it's own attitude grid.



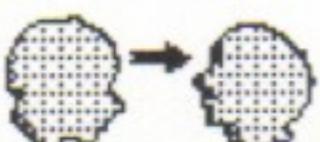
Object Form... Opens a dialog for editing an object's form by "mirroring" it , or to change that way that Swivel renders the object's form.



Mirror Object: Flips an object's shape across various horizontal or vertical planes. This is useful when you need matching pairs of asymmetrical objects. If you have made a right forearm, you can make a left forearm by duplicating the right, selecting it, and choosing **Horizontal Top** and **Side** in the **Mirror Object** column. When you click **Ok** and return to the World View, the duplicate object will be a mirror image of the right forearm. It will be mirrored across the object's XY mid-plane.

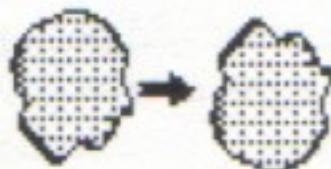
Mirror Horizontal Cross Section

Flips the selected object horizontally in its Cross Section View. In the world this flips the Cross Section across the Y, Z plane.

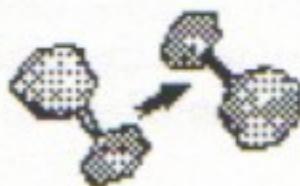


Mirror Vertical Cross Section

Flips the selected object vertically in its Cross Section View. In the world this flips the Cross Section across the X, Z plane.

**Mirror Horizontal Top and Side Sections**

Flips the selected object horizontally in its Top and Side Sections. In the world this flips the object across the X, Y plane.

**Mirror Vertical Top Section**

Flips the selected object vertically in its Top Section View. In the world this flips the Top Section across the Y, Z plane

**Mirror Vertical Side Section**

Flips the selected object vertically in its Side Section View. In the world this flips the Side Section across the X, Z plane

**Render Form**

The check boxes in this column let you override how Swivel is rendering the form of your object.

Triangle Facets: Swivel normally renders objects with rectangular facets, but if you have a very asymmetrical form, you may wish to have an object rendered with triangle facets instead.

Front Cap and Back Cap: If, when you open the **Object Form** dialog, **Front Cap** and **Back Cap** are checked, Swivel has marked this item as a extruded-type object. When an object is created, Swivel checks to see if the ends are flat to identify an extruded-type object. If they are, it will cap the front and back planes of the object with one polygon instead of making facets that meet at the center. You can override this decision by setting these check boxes to render the object as you wish. Swivel will reset them if you changed the shape of the object in the Design Object View.

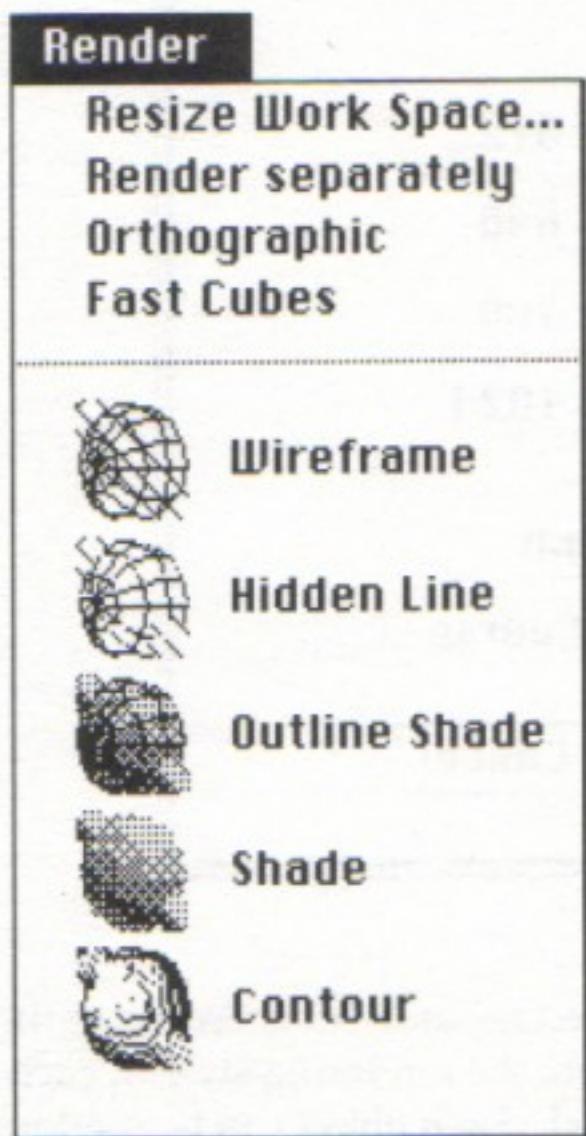
Draw Back Faces: Swivel also decides whether or not to draw the back facing sides of objects. It does this by checking to see if the envelope of the object is closed, if it is Swivel will not draw the back planes. In some cases, such as pulling objects through the hither clipping plane, you may wish the back sides of objects to be rendered. If so, check this item. This item too, will be reset if the object's form is changed in the Design Object View.

Use Draw Grid: When checked, makes the draw grid active in both the World and the Design Object View.

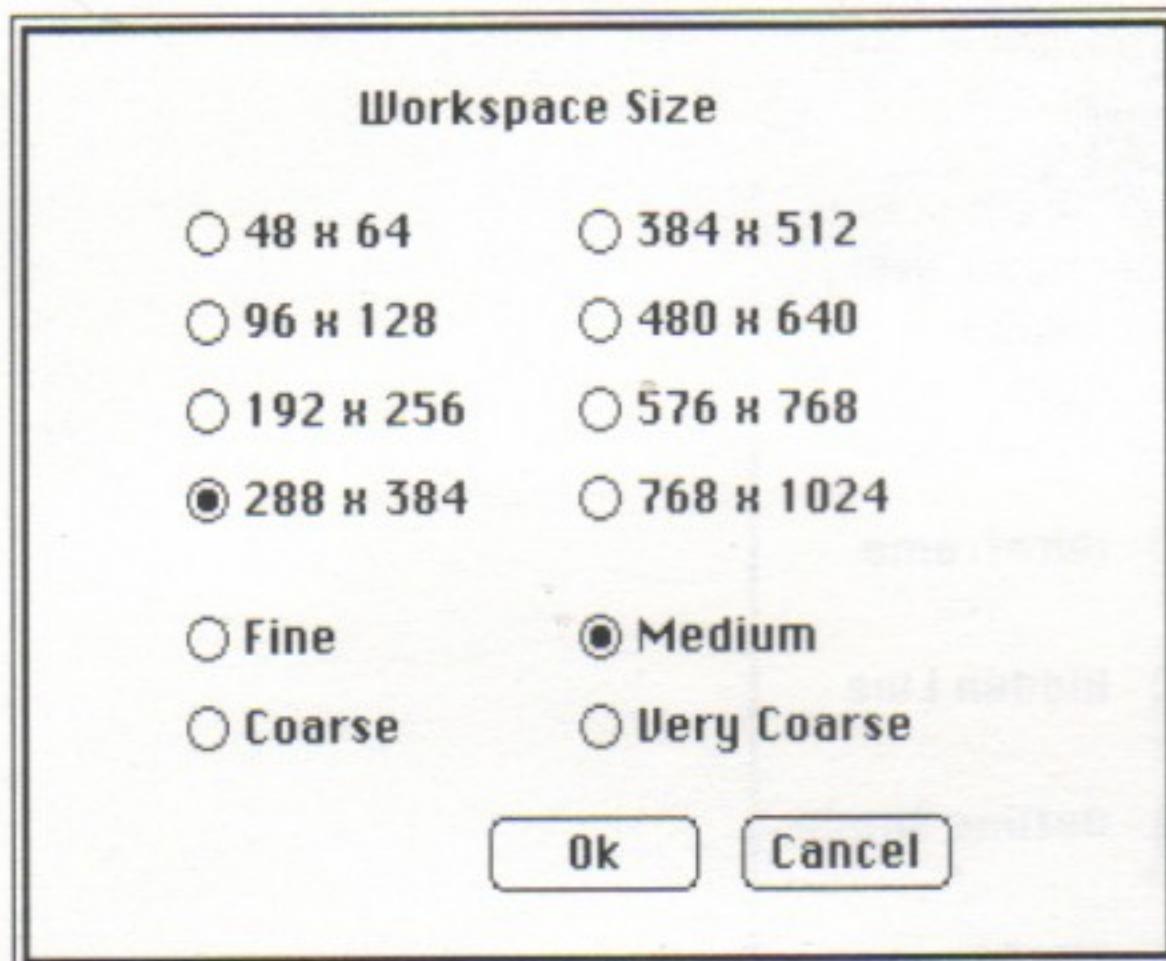
Use Polar Grid: Is an alternative to the graph-paper style grid that you find when you first open the Design Object View. It allows for shaping round forms more naturally. Polar grid uses the angle increment defined in **Attitude Grid** as its angle increment, and different grid units can be selected there.

Use World Grid: When **Use World Grid** is checked, the **Attitude Grid** and **Position Grid** are used to define a grid in the World View. Objects will "snap to" their new position and attitude by the grid increments.

Render Menu



Resize Workspace: Opens a dialog which offers choices of eight different sizes and four resolutions of the Workspace (the finite area in which Swivel operates). Units shown are in Screen Units. On opening, Swivel determines a suitable size Workspace that the available amount of memory can handle. A smaller Workspace requires less memory. If Swivel runs out of memory, you may be queried about resizing the Workspace. Resolution of the Workspace does not affect memory, but does change the appearance quality of the rendering, and the depth of the Workspace in the Z dimension. Choosing a coarser setting makes the Workspace deeper by spreading the units further apart. A Finer Workspace resolution will have less depth, but greater resolution of object intersections.



Render Separately: Renders each object separately according to the Rendering style that is selected. Swivel remembers the rendering style of each object even when **Render Separately** is not selected. Each object can be rendered in a different mode.

Orthographic: Draws the world without perspective. Because objects do not diminish as they recede along the Z axis in orthographic mode, accurate measurements can be taken from the screen or hard copy.

Fast Cubes: Renders all objects as rectangular solids. This speeds up rendering for complex models and allows rapid adjustments to be made to links.

Wireframe: Draws lines for all the sides of the polygons that make up the object. Wireframe reveals internal structure.

Hidden Line: Draws lines only for the 'front' surface polygons. Hidden line is less confusing than Wireframe for complex objects.

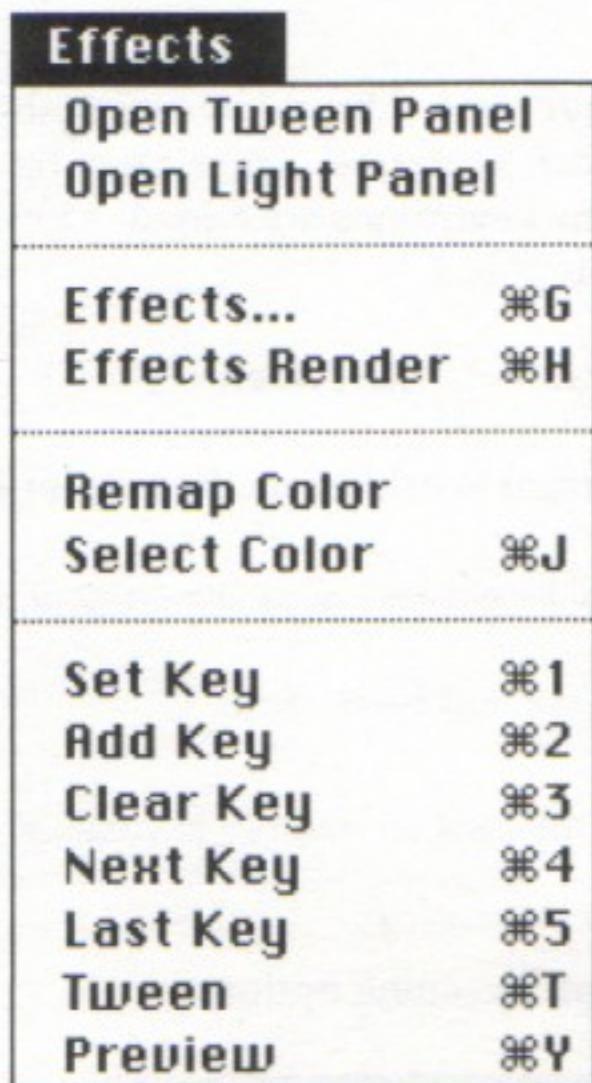
Outline Shade: Adds the poly-edge lines from Hidden Line to the tonal shade mode. The edge lines delineate the facets of the form clearly.

Shade: Draws a tone-pattern on each face of the object depending on the direction of the light.

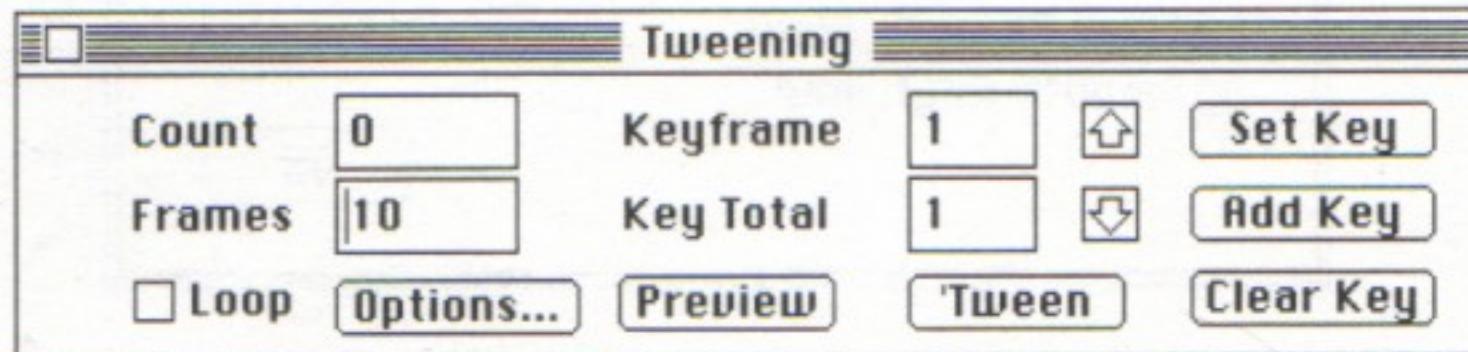
Contour: Describes the surface of the object as a contour mapping. The effect is much like cross-hatched pen and ink illustration.

Effects Menu

The Effects Menu offers display options that in most cases last only until the next time the model is moved or edited. The exception is Lighting which remains set until it is intentionally redirected. These effects are the last stage in preparing an image for export or printing.



Open Tween Panel: Opens the Tweening dialog for creating animations in Swivel. An animation consists of many still images presented quickly so slight changes one from the next appear as motion. The more images or *frames* per interval, the smoother the motion. Note that many of the functions in the tween panel have been duplicated as menu items in the Effects Menu for ease of use.



Count: The number of the current frame.

Frames: The number of frames to be rendered between the last and next Keyframe.

Last Key or UpArrow (Command-5): Displays the previous Keyframe in the Tween sequence.

Next Key or DownArrow (Command-4): Displays the next Keyframe in the Tween.

KeyFrame: Number of the current KeyFrame. During tweening the model will follow a path which travels through each keyframe. There must be at least two Keyframes for motion to occur. As new keyframes are added, a new path, from the last Keyframe to the new one is computed.

Key Total: The total number of Keyframes in the Tween

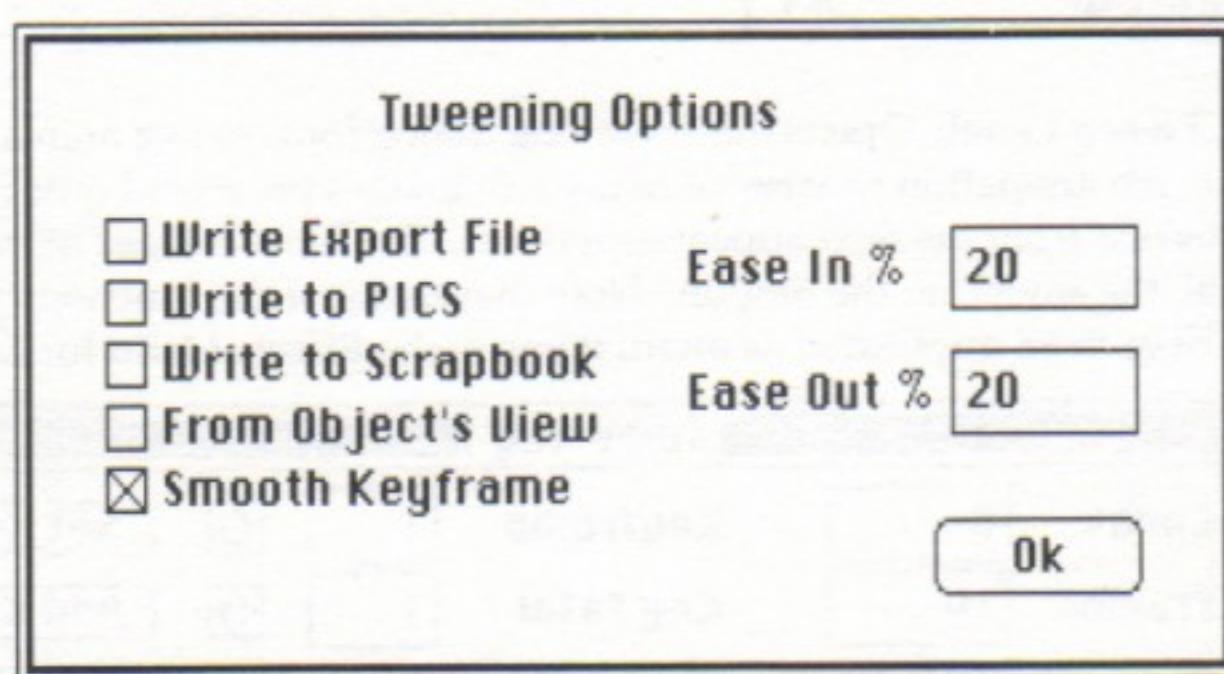
Set Key (Command-1): Makes the current World View the current KeyFrame

Add Key (Command-2): Inserts a new KeyFrame after the current keyframe.

Clear Key (Command-3): Deletes the current KeyFrame.

Loop: Makes the first KeyFrame also the Last so that the animation will form a smooth Loop.

Options: Opens a dialog box of special Tweening options.



Write Export File: Exports a file of each frame in the type selected in Output Style (under the Edit Menu).

Write to PICS: Creates a PICS set of graphic files for use by animation programs.

Write to Scrapbook: Creates a new Scrapbook to receive the Tween sequence, and asks the user to name it. A PICT image of each frame is sent to the new scrapbook in the type selected in Output Style (under the Edit Menu).

From Object's View: When this item is checked, Swivel will tween the world from the selected object's front viewpoint. Changes in the object's position, orientation and scale will be used in viewing the tween. The viewing object itself will not be shown. This turns any object into a camera. If no object is selected tweening will be performed as usual, even if this item is checked.

Smooth Keyframe: Sets tweening to be smoothed by a Bezier function.

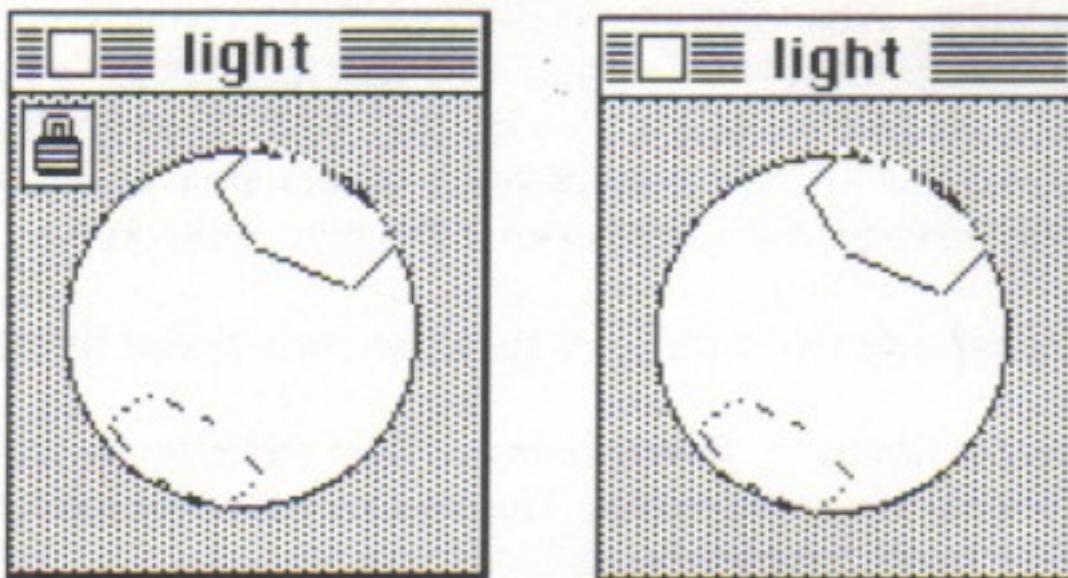
Ease In: Warps the timing at the beginning of the Tween, so the motion in the animation will be slower at the outset. This creates a sense of inertia. Entering 0% will turn Ease In off completely.

Ease Out: Warps the timing at the end of the Tween, so the animation will slow gradually before stopping. Entering 0% will turn Ease Out off completely.

Preview (Command-Y): Allows a "fast tween" of the model as simple wireframe cubes. The path can be observed without rendering delays.

Tween (Command-T): Starts the Tween with all options selected.

Open Light Panel: Brings up the Light Source Window. Drag the Lens Circle to change the direction of the light. The model will be lit from this direction until you change it again. The Lens Circle is also the light source for the "projector" used by Project Image. When the Light Source is "locked", the direction of illumination is fixed with respect to the World. When a different World View is selected, the light will change accordingly. When the light source is *not* locked, the direction of the light will stay the same in the workspace window. To lock the light to the world, click on the grey background of the light panel.



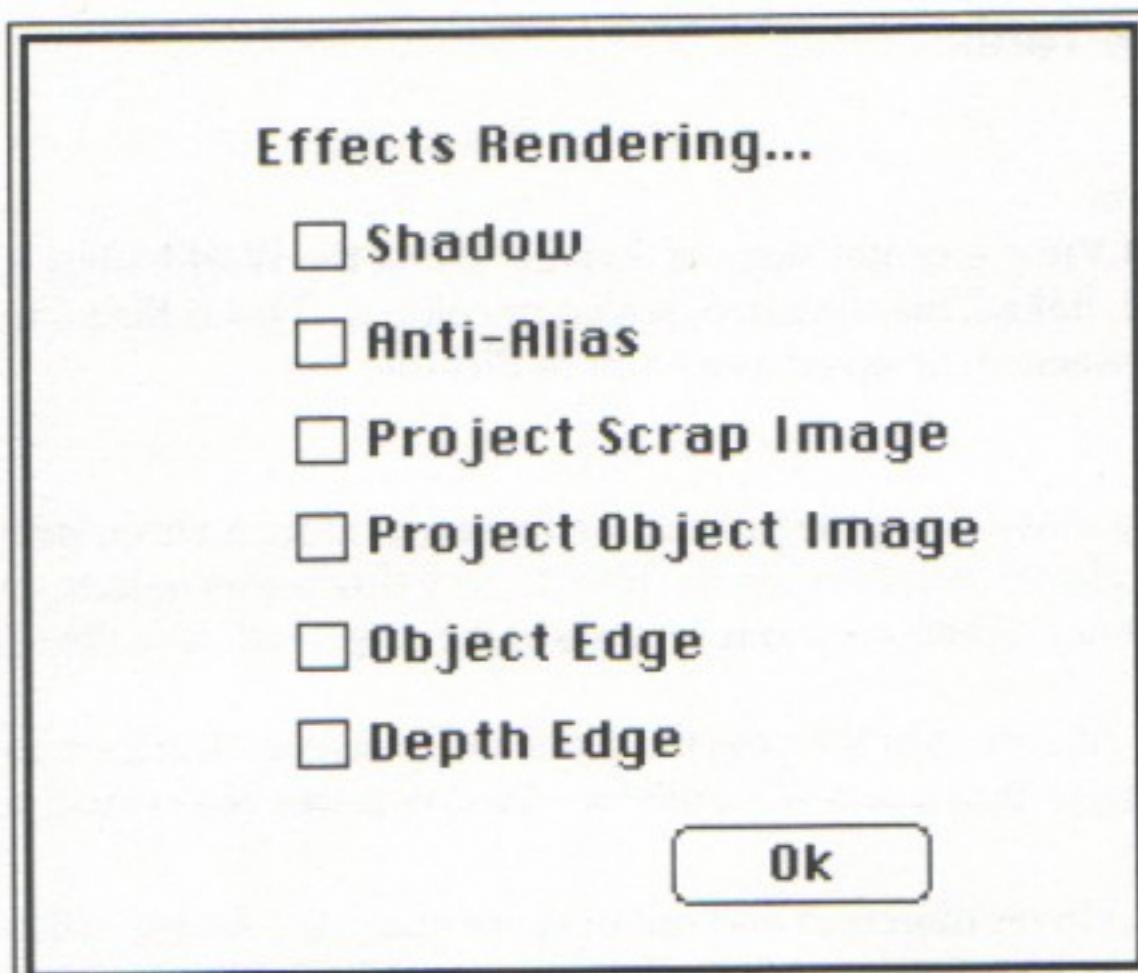
Effects... Opens a dialog box with six special rendering options. Effects chosen in the dialog will be rendered in the World when **Effects Render** is selected, and are also used in Tween files.

Shadow: Redraws the scene once with the shadow cast by the objects in the path of the light source. In Swivel 1.1, the Workspace Window itself casts a shadow, helping to define the space.

Anti-Alias: Anti-aliasing smooths object intersections and "the jaggies". To produce an anti-aliased image, each object is drawn four times, with each rendering slightly offset from the previous one. These four images are averaged together to produce the anti-aliased image. Anti-aliasing therefore takes four times longer to render than normal rendering: Anti-Alias works in all rendering modes, including Wireframe, Shadow and Project Object Image.

- Choose Anti-Alias in the *Effects Rendering...* dialog. The world will be rendered with Anti-aliasing every time *Effects Render* is selected.

Note: Selecting the **Fine** in the **Workspace Size** dialog box will improve the resolution and rendering quality of intersecting planes.



Project Scrap Image: Redraws the scene once with the image on the clipboard projected onto the world from the direction of the main light source.

Project Object Image: Renders objects with any PICT image that has been mapped on them in the Design Object View.

Object Edge: Redraws the scene once with the outside edges of the objects reinforced. Defines separate objects clearly.

Depth Edge: Redraws the scene once with the steepest edges of the objects reinforced. Heightens the sense of depth in the scene.

Effects Render: Renders the World will all selected special effects. Once drawn, effects will remain until objects are redrawn.

Remap Color: Remaps the Macintosh's internal color table and makes up a new palette based on the actual colors selected for each object. A new intermediate palette will be made with a number of colors selected to match as many of the specific object colors as possible.

Select Color (Command J): Opens the Intermediate Palette. The object which was selected when Select Color was invoked will be edited.

The View Tools

World View

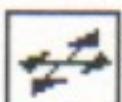
The **World View** is center stage of Swivel: Using the **World View** tools, objects are created, linked, manipulated, scaled or colored. This is the scene that will be printed, 'Tweened, or saved as a Paint or Pict file.

Tools

During any move using the position and rotation tools, a wireframe rectangular solid is displayed representing the object. Any down-tree objects linked to it will appear as lines. Their positions relative to the object will stay the same.



XY Arrow: Moves objects across the plane of the screen. Click on an object and drag it to move it to a new X Y position. Its down-tree objects will follow.



XZ Arrow: Moves objects in and out of space along the Z axis. Click on an object and drag it upwards to push it back or downward to pull it forward. Left and right moves the object in X (horizontally).



Yaw Arrow: This is the first of the rotational tools. Pivots the object around the Y axis. Click and drag the object to a new attitude. Holding the option or Command Key and dragging from side to side will also activate this tool.



Pitch Arrow: Pivots the object around its X axis. Click and drag the object to a new attitude. Holding the Command Key and dragging from top to bottom will also activate this tool.



Roll Arrow: Pivots the object around its Y axis. Click and drag the object to a new attitude. Holding the Command Key and dragging from top to bottom will also activate this tool



Scale Tool: Makes the object larger or smaller. Drag the object downward to enlarge, up to make smaller.



Lathe Object: Creates a new object. Select this tool and click where you want to put a new object. The object will be a default cube. Edit the Object's shape by double clicking it or choosing Design Object from the Object Menu



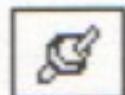
Extruded object: Creates a new object whose scale is determined in the Cross Section View. The object will be created as a flat triangular solid.



Free Link: Attaches one object to another. Select the tool, click on the object you wish to link and drag the link to the object you wish to attach it to. Use the Edit Position or Edit Attitude items in the Object Menu to edit the constraints of the link. The linking line is stretched from the child object to the parent object. The child object is free to be manipulated independently. However, when a parent object is moved, its links or children move with it. See the section on linking in Starting Out for more information on linking hierarchies.



Lock Link: Similar to the *Free Link tool*, except that the link is entirely constrained. The child-object (down-tree) cannot move at all relative to its parent. Moving the Child object will also move the Parent in a Locked Link relationship.



Ball Joint Link: Similar to the *Free Link tool*, except that the link is constrained in X, Y or Z but is free to rotate as any ball joint should.



UnLink Tool: Undoes a link with a single click on the child object.



Zoom In Tool: Zooms in to the selected rectangle. Drag a rectangle around the portion of the World you want to view more closely. The World is unchanged; you are just seeing up closer.

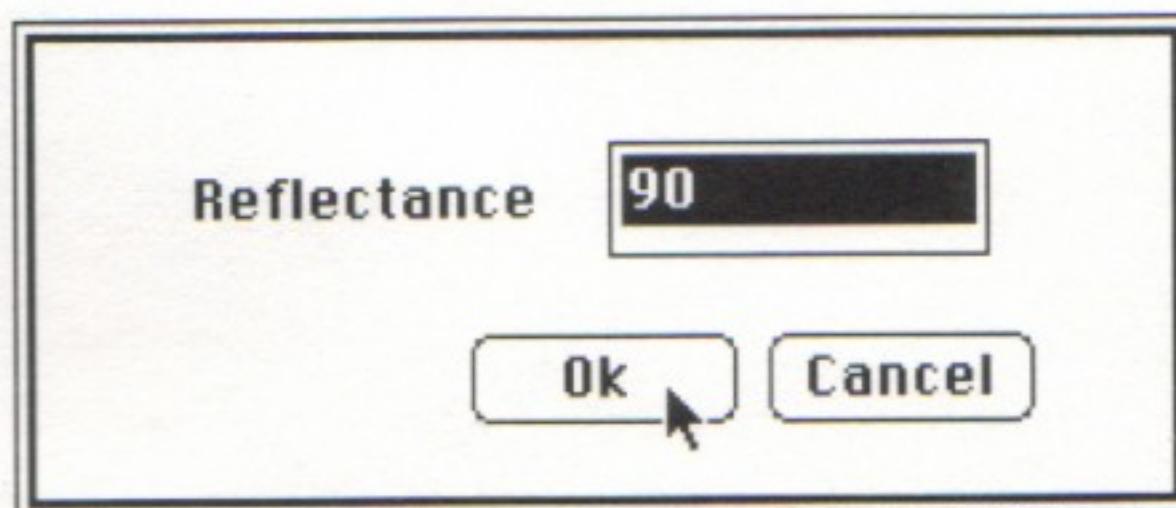


Zoom Out Tool: Zooms out to the selected rectangle. Drag a rectangle showing the area you want to shrink the current view into. The World is unchanged; you can just see more of it.



Palette Tool: Depending on whether you are working in color or black and white, the *Palette tool* opens one of two dialog boxes: Reflectance or Intermediate palette.

Reflectance: In black and white mode the reflectance of the object is the amount of light it reflects, and therefore, how light it appears. Setting the reflectance higher makes the object lighter. Default reflectance is 90%.



The Intermediate Palette

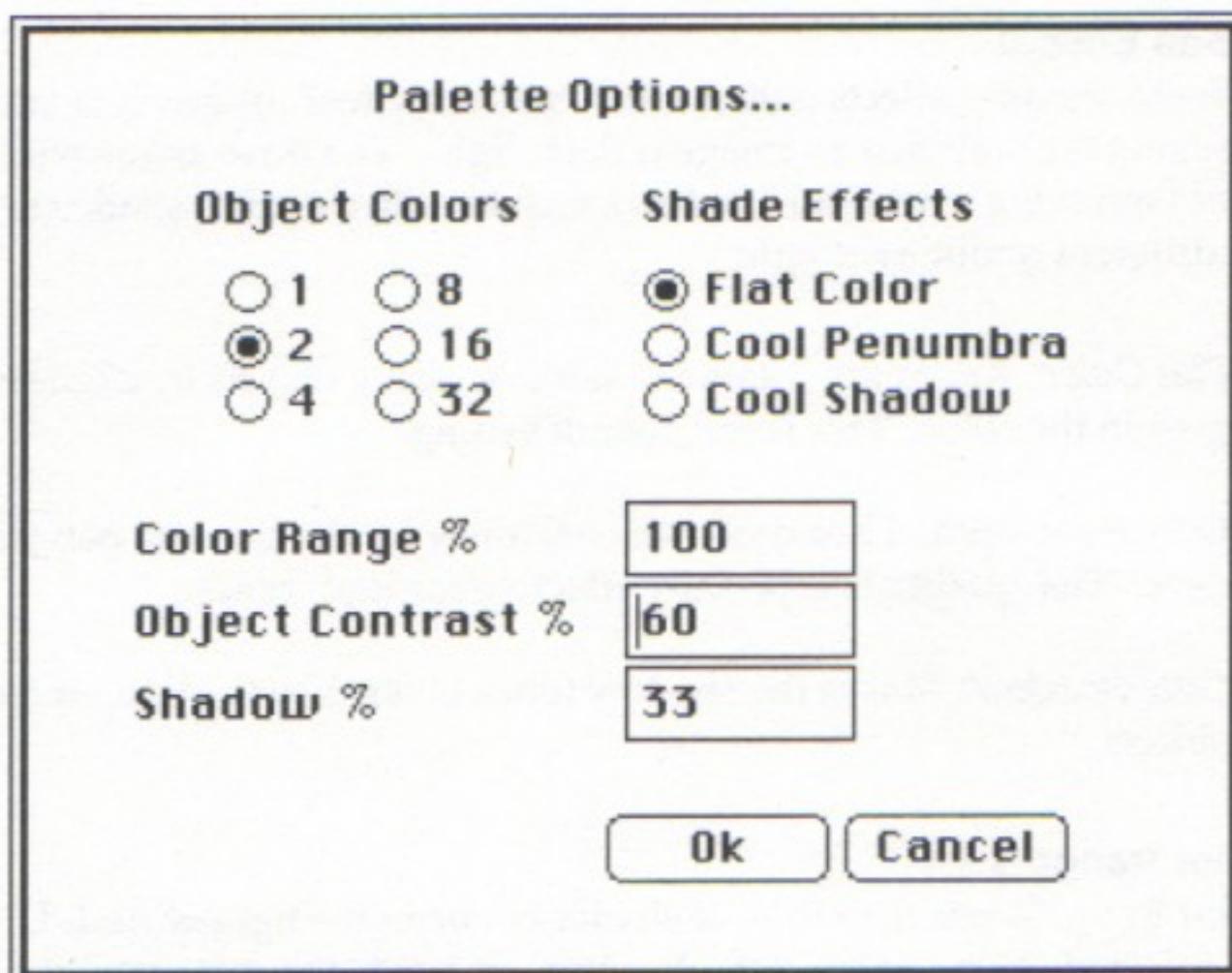
Using the new Intermediate Palette, you can customize your color palette to make the best use of the Macintosh's 256 available colors. To change an object's color, select the palette tool, and then click on the object you wish to change. The Intermediate Palette will appear. Select the new color and shade for your object, and click on the go-away box of the palette window.



The Intermediate Palette contains from 1 to 32 colors in various shades. To change a color in the Intermediate Palette, double-click on one of the color bars. This presents the standard **Macintosh Color Picker**. The color that you select on this wheel becomes the new color of the bar in the Intermediate palette. Changing a color on the Intermediate Palette will change all the objects that have that color. To change the number of colors in the Intermediate Palette, double-click on the palette icon to bring up the *Palette Options...* dialog box.

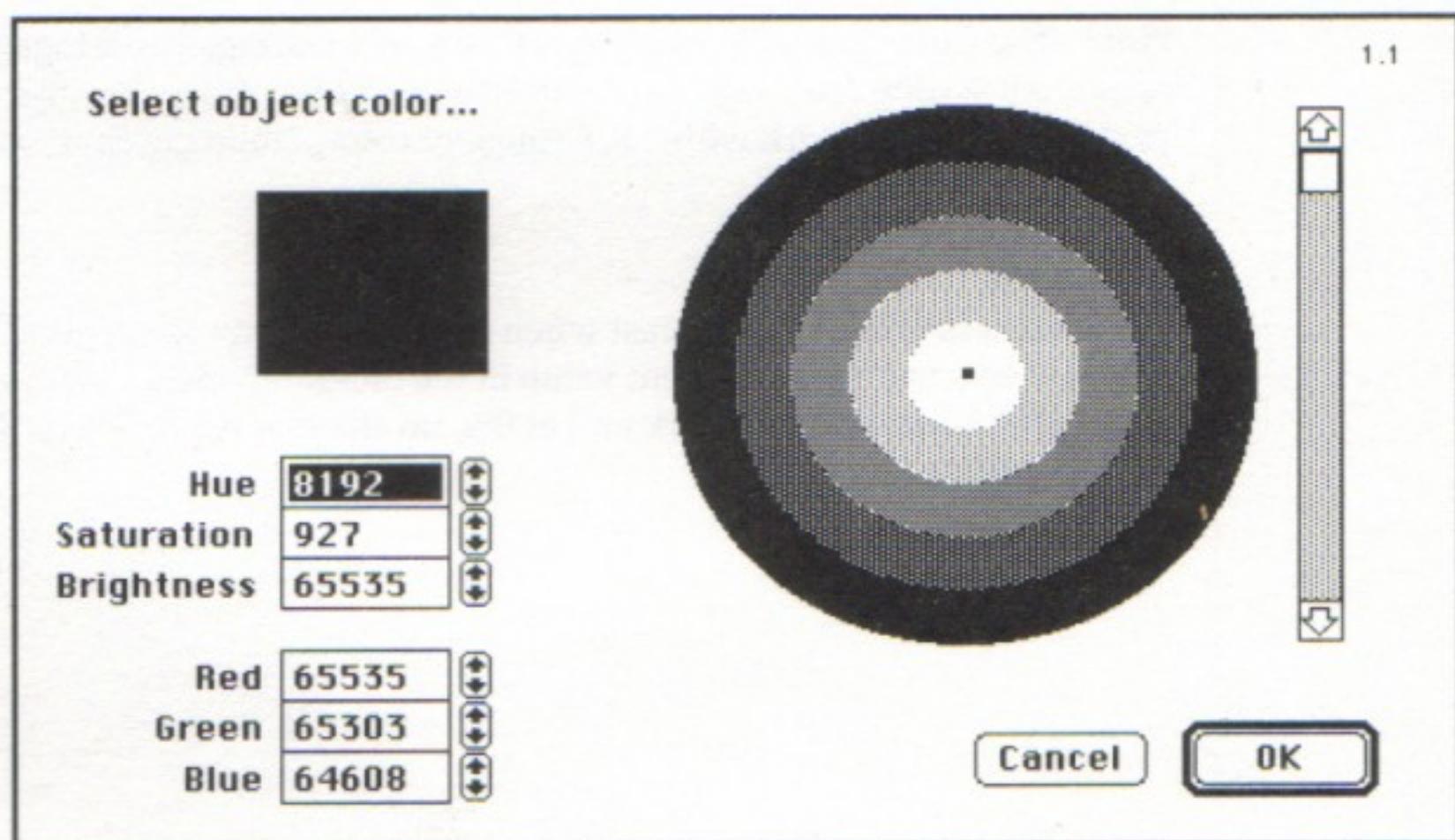
Color Palette Options Dialog Box

Double-clicking on the palette tool *icon* opens a dialog box where you can re-configure the Intermediate Palette. You can choose the number of colors that are displayed on the palette (from 1 to 32), choose range of color tones, and adjust the contrast and shadow intensity of the colors. These changes affect the entire Swivel world.



Object Colors

The number that you choose in Object Colors sets the number of colors that appear in the Intermediate Palette. As the number of colors increases, the number of shades for each color decreases.



Shade Effects

Swivel's shading effects enhance the "painterly feel" of finished images by subtly changing the way that an image reflects light. The three shade effects (Flat Color, Cool Penumbra, and Cool Shadow) each handle the color shade choices differently for different qualities of light.

Flat Color: Keeps the colors the same, shading objects by changing the level of grey in the color. This is the default setting.

Cool Penumbra: Uses cooler (bluer) tones for the shadow between light and dark. This quality is especially effective for flesh tones.

Cool Shadow: Makes the shadow tones bluer than the lighted facets of the objects.

Color Range%

Color Range% sets the range of shades between the lightest and darkest shades of the selected color. At the default setting of 100%, the color ranges from the chosen color to black. Setting the color range to 60% creates a pastel effect.

Object Contrast%

Sets the range of tone the *object* will be rendered in from light to dark (out of the available range for the given color). The default is 60%.

Note: The Color Range% and Object Contrast% settings work together. The reason for setting the range for the palette separately from the objects is to allow pasted pictures to work with a full range of color, while the contrast of the objects can still be limited.

Shadow%

The darkness of the shadow cast when Shadow in *Effect Render* is selected can be adjusted by entering a different value in the Shadow% field. With a value of 100%, the shadow is very dark and at 0%, no shadow is projected. The default setting is 33%.

Design Object View

When an object is double clicked, or when **Design Object (Command R)** is selected from the **Object** Menu, the Design Object View opens. The object will be displayed in four views: **Object View**, **Cross Section**, **Top section** and **Side Section**. Drawing tools are arranged along the left side.

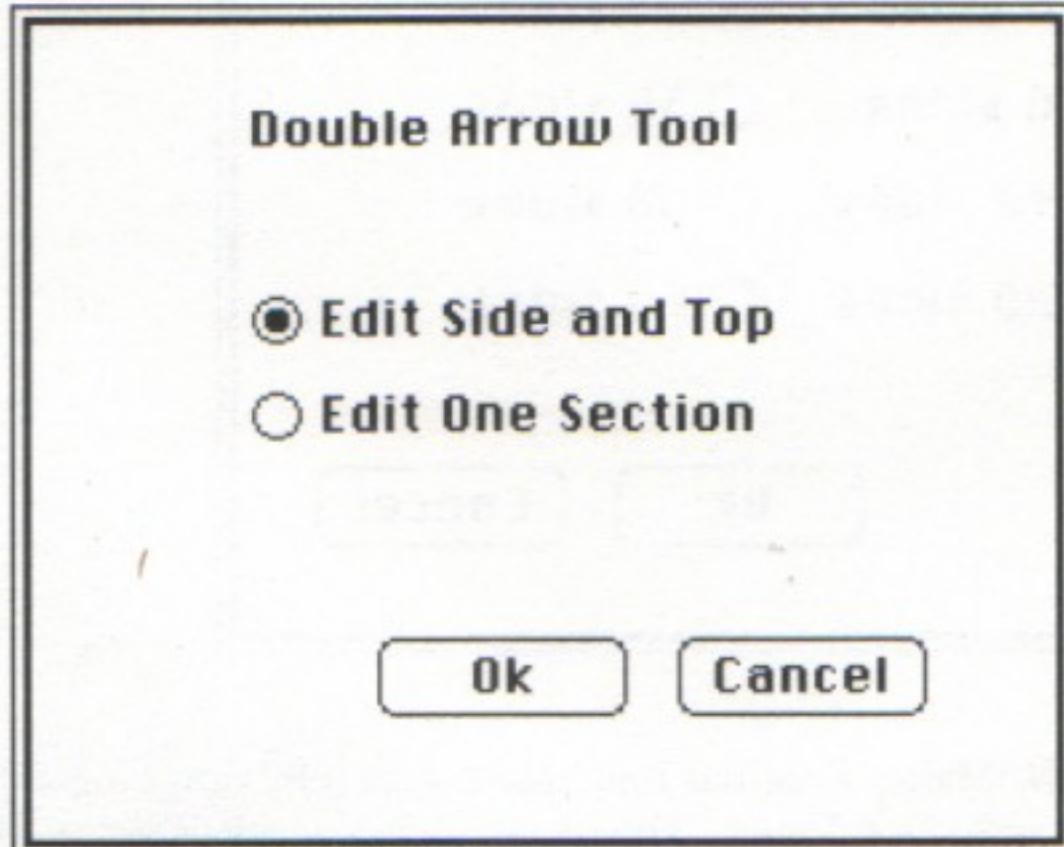
The Wireframe view is updated with each edit to show the new object from the viewpoint of the edited side. Vertical buttons labeled top, side, or cross section expand the selected view to fill the entire window.

The center point marked by cross hairs in the **Top Section** and **Side Section** views will be the pivot about which the object will roll, pitch and yaw. To reposition the center point, drag it to the new location.

Tools in the Design Object View



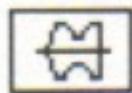
Double Arrow Tool: Edits the contour in any of the section views. It allows you to drag points to a new positions one at a time. The points can be slid along like beads on a string, or superimposed one on top of another to alter the number of vertices. Use this tool to fine tune the shape of one of the views. In the Side and Top Section Views it edits symmetrically across the center line of the section.



Double clicking the Double Arrow Tool brings up a dialog where you may set whether the double arrow tool edits both the side and top section at once, or edits them separately.



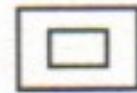
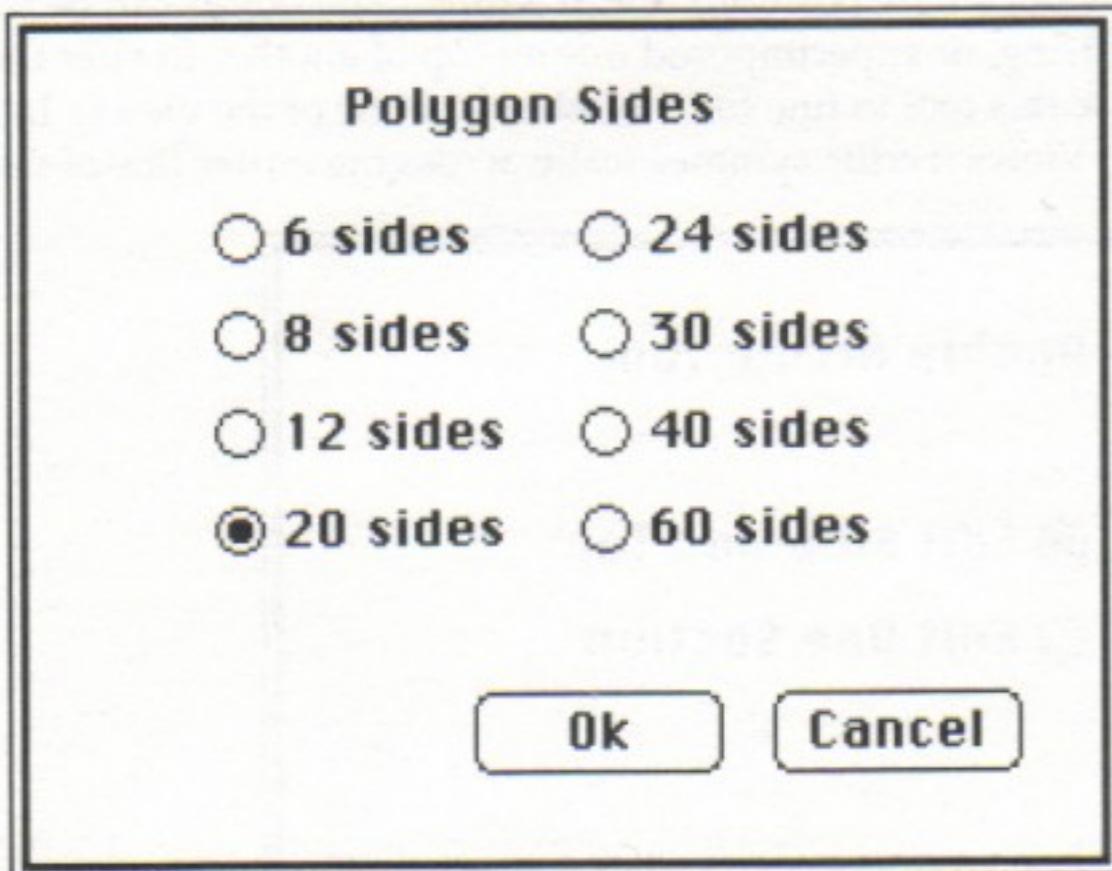
Single Arrow Tool: Lets you drag single points in any view. It always edits the Side and Top Sections individually. It allows asymmetrical positioning of points. Use this tool to modify the shapes asymmetrically.



Free Poly Tool: Draws a new object shape with a series of clicks, each of which will be a point along the object contour. In Top Section and Side Section views, the Free Poly Tool creates an object, symmetrical about the horizontal, with identical Top and Side Sections. In the Cross Section View, the Free Poly Tool makes only a single point with each click, and complex polygons can be drawn. In this view, the free Poly Tool behaves the same as poly tools in other paint and draw programs.



N-gon Tool: Draws a circle in the Cross Section View with a single click, or drags a circle in Top Section and Side Section Views. Double clicking the N-gon tool gives a choice of the number of points around the circle (polygon). Note that 80 sided polygons are available in the Large version of Swivel 1.1.



Rectangle Tool: Makes a regular four sided section by dragging a rectangle in Top Section and Side Section Views. The rectangle tool works slightly differently in the Cross Section View, where it draws a square with a single click.

The “Go Away Box” button at the upper left margin of the Window returns you to the **World View**, as does **Return to World (Command R)** in the Object Menu.

P A R A C O M P

123 Townsend Street
Suite 310
San Francisco, CA 94107