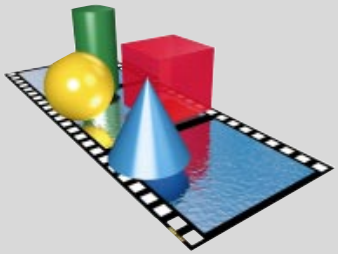
welcome to

CINEMA 4D®



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CINEMA 4D

QUICKSTART

CINEMA 4D QUICKSTART

Program by: Richard Kurz, Philip Losch, Christian Losch.

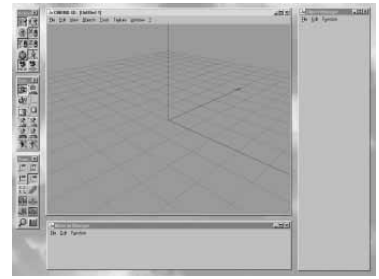
Quickstart by: Jeff Walker & Richard Kiernan, HiSoft Systems.

Design and Layout by: Jeff Walker, HiSoft Systems.

CINEMA 4D QUICKSTART

INTRODUCTION

Welcome to CINEMA 4D. The aim of this book is to introduce you gently to many of CINEMA 4D's powerful features, from the basic functions all the way up to some exciting rendering and animation techniques.

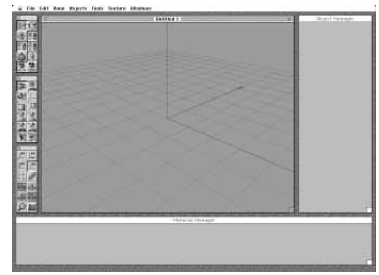


CINEMA 4D's Windows™ interface.

This book contains two tutorials. First we are going to create a scene using objects, materials, textures and lights. In creating this scene we will learn the basics of modelling and raytracing—we'll use all of the fundamental CINEMA 4D functions, and a few of the more advanced ones. In particular we'll gain valuable experience with the toolbar buttons, the object manager and the material manager. We are going to learn how to apply textures and even how to create our own materials from scratch.

In the second tutorial we'll learn how to excite this static scene into life by using some simple but nonetheless spectacular animation techniques.

The scene tutorial should take about 60-90 minutes for you to complete; the animation tutorial will take considerably longer as there will be multiple frames to render. Both tutorials are structured so that you can stop at any time and later pick up where you left off. For every section of both tutorials we have indicated how long we estimate it will take you to work through that section.



CINEMA 4D's Macintosh interface.

We hope you will enjoy your first steps with CINEMA 4D. As you work through this book we know that all sorts of imaginative ideas for future projects will jump into your head. At this stage you don't know the program and you may be unsure if what you are imagining is possible to do in CINEMA 4D. We can confidently predict that it will be simply a matter of *how* it is done rather than *can* it be done. When you have finished working through the tutorials in this book, you will be well down the road to becoming a master modeller.

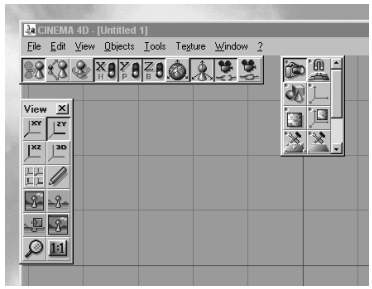
Mouse buttons

We recommend that you use a two-button mouse with CINEMA 4D. These can be hard to come by for the Macintosh, so if you are using a single-button mouse and you read "...using the right mouse button", you can simulate this action by holding down the Command key (also called the Apple key) while using the single mouse button.

Toolbars

The Windows version of CINEMA 4D uses toolbars that are docked—that is, they attach themselves to the appropriate window and move when the window to which they are attached moves. These toolbars can be positioned inside or outside a window. To save space, when a toolbar is docked within a window its outline will be removed. To remove a toolbar from the screen, position the mouse pointer over the toolbar, click the right mouse button and select Remove from the pop-up menu.

The Macintosh operating system (Mac OS) has no docking function, instead the toolbars float over the other menus and will never be obstructed from view.



The Windows version allows you to attach the toolbars to either the inside or outside of windows.

Local Menus

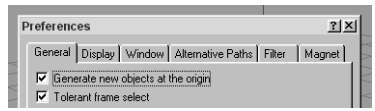
The menu bar is quite different for Macintosh and Windows versions. Every Manager window has its own "local" menu bar. In the Windows version this menu bar is situated beneath the title bar of each window. In the Macintosh version there is just one menu bar situated along the top of the screen; the appropriate local menu will appear there depending on which Manager window is currently active.

In the Mac version only, in order to reduce the number of mouse miles you have to travel when using high resolutions or multiple monitors, hold down the Alt key while clicking the mouse button to open the local menu for the active window as a pop-up menu at the current position of the mouse pointer.

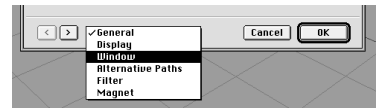
The Macintosh version allows you to pop-up local menus by holding down the Alt key while clicking the mouse.

Dialog Pages

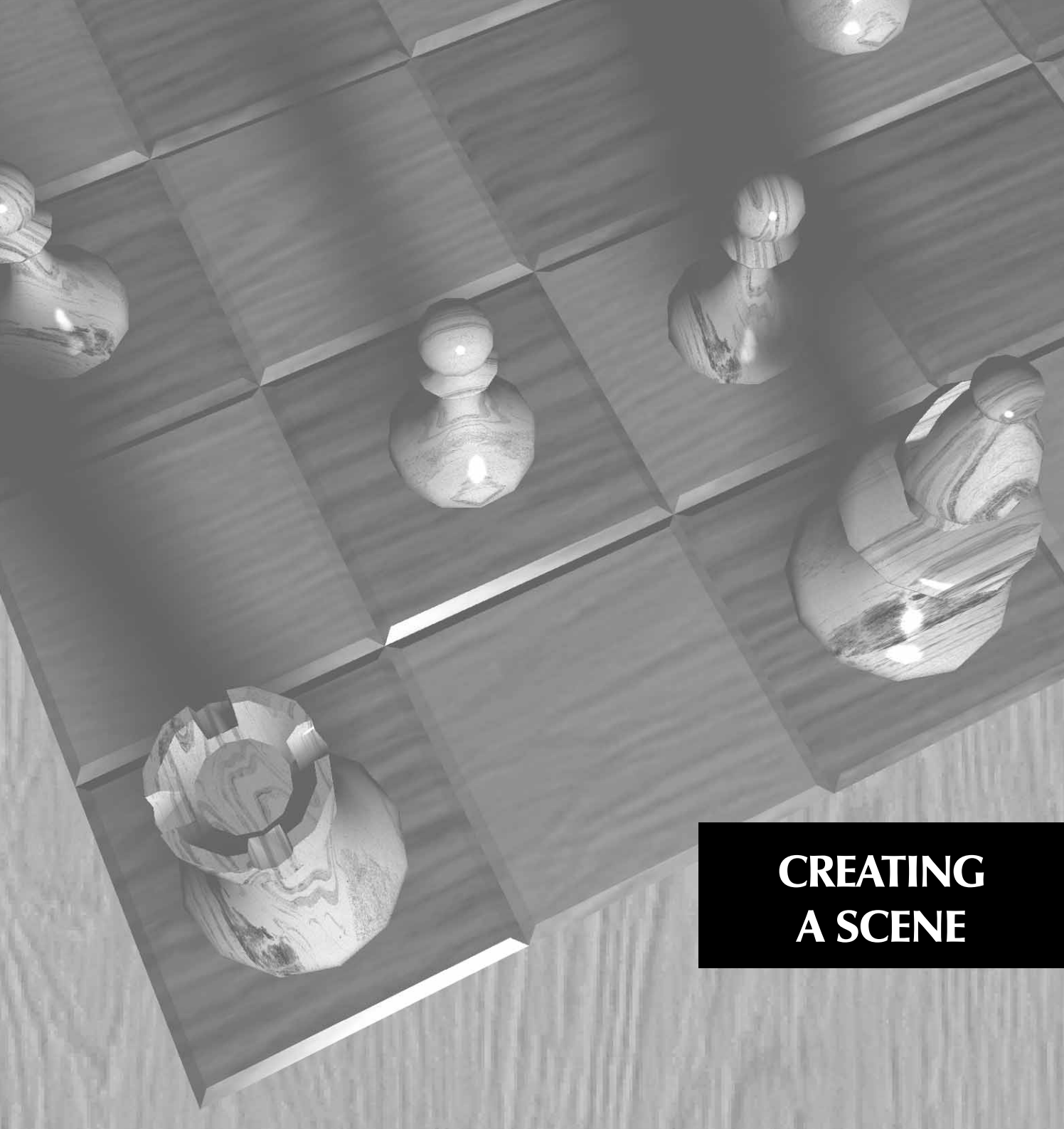
In some dialogs you can switch between several pages of options. In the Windows version this follows the tabbing principle—the page titles are on tabs along the top of the dialog. In the Macintosh version, switching between pages is achieved by selecting them from the pop-up menu at the bottom left of the dialog. Alternatively you can use the arrow buttons to flip through the pages.



The Windows version lists dialog pages on tabs along the top of the dialog.



The Macintosh version lists dialog pages in pop-up menus at the foot of dialogs.



CREATING A SCENE

1. CREATING A SCENE

This is the scene we are about to create. CINEMA 4D will do all the hard work for us.

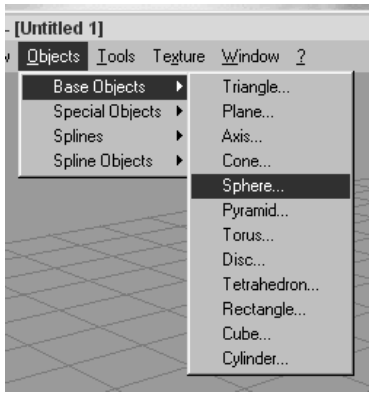
At this early stage we don't want to burden you with advanced drawing techniques, so the scene we are going to create is going to use simple objects that we can create quickly and manipulate easily. Simple objects or not, we can use CINEMA 4D to turn mundane shapes into "living" 3D objects.

We will create a scene that has a floor and a sky. On the floor we will sit a plinth and on the plinth we will sit a crystal ball. In front of the plinth we will stand some metallic lettering. Using materials, textures and lighting we will discover that you *can* turn a pig's ear into a silk purse.

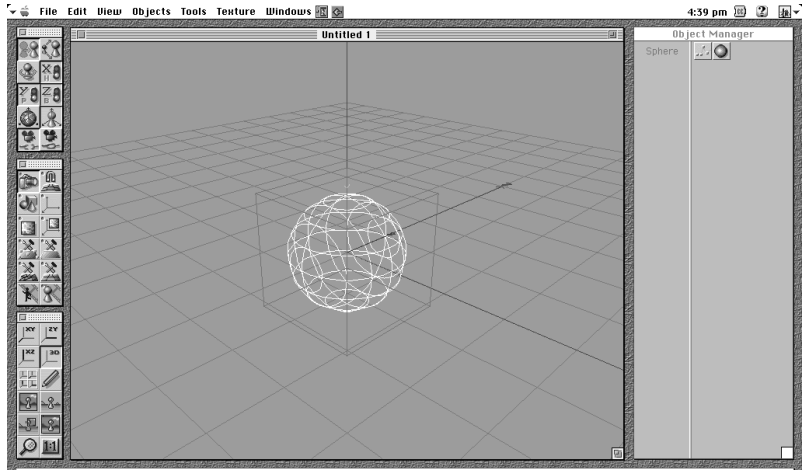
This section will take about 10 minutes to complete.

The Sphere

1 *After running CINEMA 4D, create a sphere by selecting Sphere from the Objects>Base Objects menu. (Mac: If you cannot see an Objects menu title it will be because the Scene Editor window is not active. Click in the Scene Editor to activate its local menu.) Press OK to accept the default values after ensuring that the Perfect Sphere option is selected (has a tick next to it).*



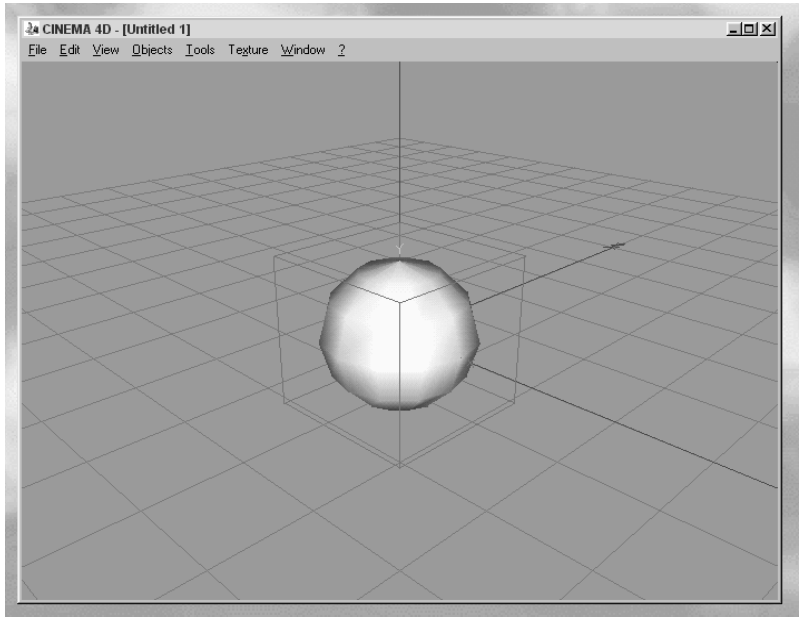
In the Objects>Base Objects sub-menu you'll find the basic building blocks from which objects are created.

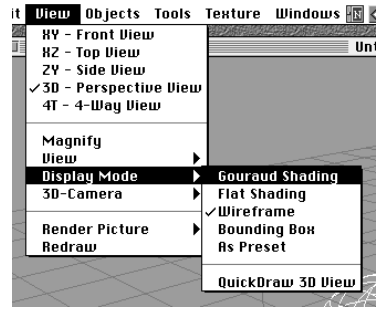


A white wireframe sphere will appear in the Scene Editor, surrounded by a red cube—the red cube is CINEMA 4D's way of letting you know which object is currently selected. Notice that the sphere has also appeared as an entry in the Object Manager. Don't worry about the meaning of the little icons at this stage, you can read all about them later in the main CINEMA 4D Reference Manual.

The wireframe display has the advantage of being very quick, but pretty soon you'll discover that you need to see a solid representation of objects in order to get a better feel for what you are doing. CINEMA 4D has several display modes, but the one you'll probably use most while working on your scenes is Gouraud Shading.

2 *Select Gouraud Shading from the View>Display Mode menu. (Mac: If you cannot see a View menu title it will be because the Scene Editor window is not active. Click in the Scene Editor to activate its local menu. This is the last time we are going to remind you that each window has its own local menu.)*





There are several display options. Wireframe is the fastest, but Gouraud shading gives you a better feel for the scene.

The wireframe sphere will turn into a solid, shaded white sphere. From now on, when the Scene Editor is at rest—when you aren't editing the scene in other words—CINEMA 4D will quickly use Gouraud Shading to change wireframes into solids. If at any time you want to force CINEMA 4D to shade the scene—say because you've interrupted CINEMA 4D so that the scene is only partly shaded—then you can use the Redraw button to make CINEMA 4D refresh the Scene Editor window.

3 *Press the Redraw button.*

The Redraw button.

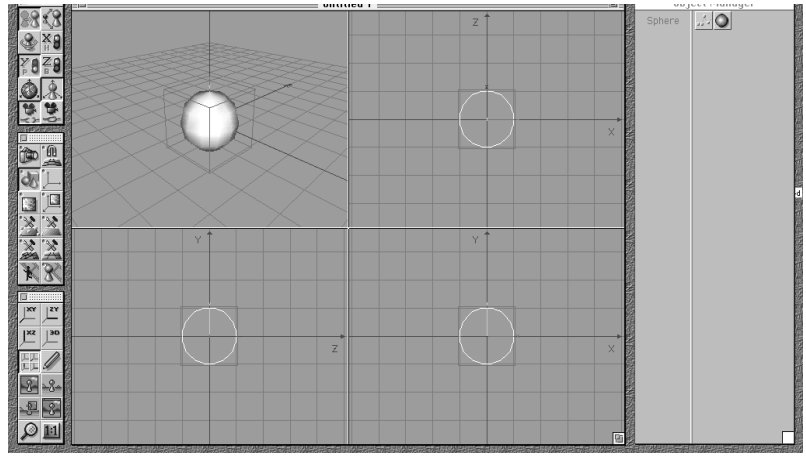
The sphere quickly turns into a wireframe and then just as quickly gets Gouraud Shaded again.

Now we want to raise the sphere a little so we can put a plinth underneath it. Moving an object accurately is very difficult to achieve in the 3D view, so let's change to the 4-Way-View (4T) view in which it is much easier to move objects.

The 4-Way-View (4T) button.

4 Press the 4-Way-View button.

The Scene Editor changes so that you now have four views of the object—the 3D view (top left), a view from above (top right), a view from the side (bottom left), and a view from the front (bottom right). Because the sphere is completely symmetrical, the above, side and front views of it look the same, but notice that the axes are labelled differently. In CINEMA 4D, Y is the vertical axis (up-and-down), X is the horizontal axis (left-and-right), and Z is the depth axis (toward you and away from you. Let's move the sphere.



The Edit Object button.

5 Press the Edit Object button (underneath the Edit Camera button).

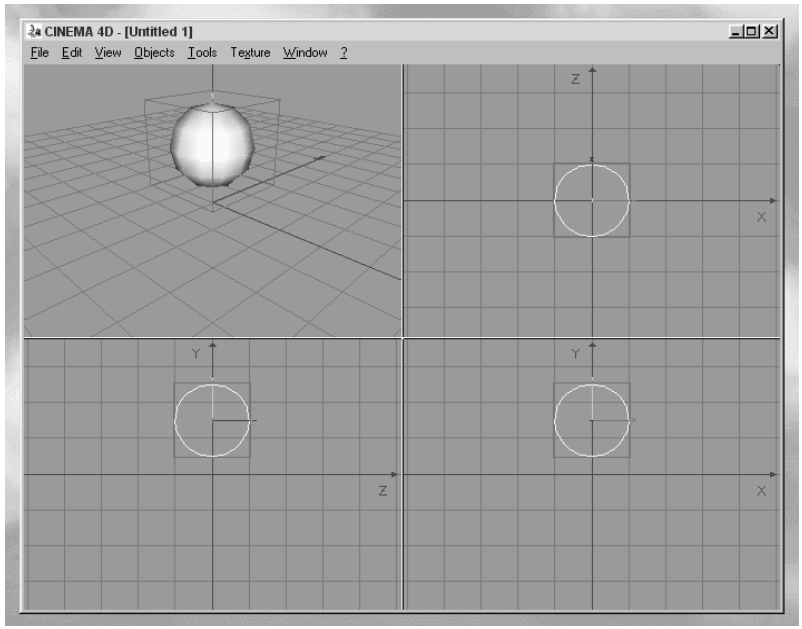
If we don't press the Edit Object button then we will end up moving the camera instead of the object.

The Axes buttons, with X and Z locked or "switched off".

As all we want to do is raise the sphere—move it along the Y axis in other words. We can ensure that we don't move it along either of the other two axes by locking them while we perform this operation.

6 Press the X axis and Z axis buttons so that the buttons appear raised or "switched off".

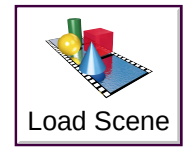
7 *Click in the bottom left quadrant of the Scene Editor (the side view) and while holding down the (left) mouse button push the mouse away from you until the bottom of the sphere is about halfway to the first grid line above the Z axis.*



Moving the mouse while holding down the mouse button is called “dragging” the mouse. From know on we will use that term.

Notice that the 3D and front views also move as you move the object in the side view. The from-above view doesn’t change because the object is not moving along either the Z or X axes, just the Y axis.

OK, that’s it, we’ve finished with the sphere for the moment. Next we’ll create the plinth, but before we do that, let’s save what we’ve got so far.



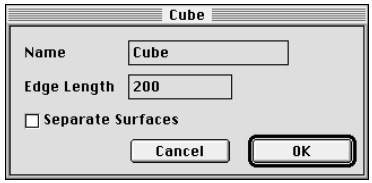
8 *Select Save from the File menu, select a folder, give your work a filename, press the Save button.*

This section will take about 5 minutes to complete.

The Plinth

For the crystal ball's plinth we are going to use an ordinary cube object and flatten it a bit. Later we'll give it a texture (as we will everything else), but for the moment all we are concerned with is creating the various objects that comprise our scene.

1 *Hold down the Shift key and select Cube from the Objects>Base Objects menu.*



Holding down the Shift key while selecting an object from the Base Objects sub-menu is a time-saving technique to bypass the object's parameters dialog

We now have a cube in our scene and it is sitting under the sphere. Let's reshape the cube.

2 *Ensure that the cube is the selected object (click on its name in the Object Manager).*

3 *Ensure that the Edit Object button is selected.*

4 *Press the Scale button.*

The Scale button.

As all we want to do is squash the cube a little—scale it along the Y axis in other words—once again we can lock the X and Z axes.

5 *Press the X axis and Z axis buttons so that they appear raised or "switched off".*

6 *Click in the 3D view and drag the mouse slowly to the left until the height of the plinth is about one-third its width. (Remember, dragging means moving the mouse while holding down the mouse button.)*

The Magnifying Glass button.

Now we've got the shape we want, but it is not positioned correctly. We need to raise the plinth so that it sits smack on the X axis (which is where our floor will be).

7 *Press the Magnifying Glass button and click in the front view (bottom right) just above and to the left of the top left corner of the plinth. Drag the mouse just below and to the right of the bottom right corner of the plinth. Then let go of the mouse button.*

We have zoomed in on the plinth so that it is easier for us to position it accurately using the mouse. Notice that the 3D view remains as it was; this is because the

3D view is always the view as seen from the camera, and as the camera position hasn't changed, neither has the 3D view changed.

8 *Click on the Move button.*

9 *If they are not already locked, press the X axis and Z axis buttons so that they are locked.*

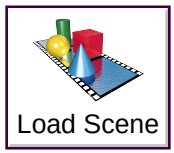
10 *Click in the front view window (bottom right) and drag away from you until the white line of the plinth's base is sitting on the X axis.*

OK, so now the plinth is almost where we want it and the sphere should be on top of the plinth and slightly sunk into it. In a moment we are going to rotate the plinth and the camera view into the positions we want them, but as rotating is new to us and we might muck it up, this seems like a good time to save our work so we can revert to it when we do muck it up. Let's zoom out first...

11 *Press the Magnifying Glass and click in the front view with the right mouse button. With the right mouse button held down, drag the mouse down and to the right so that the box you are dragging is about the same dimensions as one of the grid squares. Then let go of the right mouse button. (Mac users, hold down Command while dragging to simulate this action.)*

When zooming out, the smaller the box you drag, the further out you zoom. Now let's save.

12 *Select Save from the File menu.*



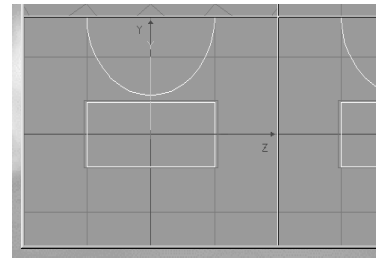
Rotating the Plinth

The plinth has got one of its edges facing us and what we really want is one of the faces pointing towards us. We could move the camera, but it's quicker to rotate the plinth.

1 *Ensure that the plinth (cube) is the selected object.*

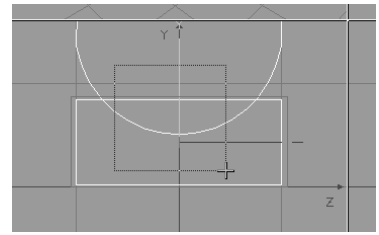
2 *Ensure that the Edit Object button is selected.*

3 *Select Coordinates Manager from the Windows menu.*



Positioning objects by mouse is made easier if you zoom on the area in question.

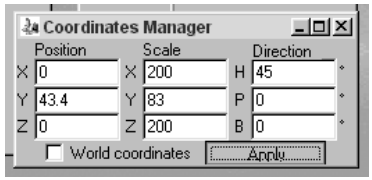
The Move button.



To see more of your scene in the 4T views, drag a small box with the right mouse button.

This section will take about 3 minutes to complete.

Note that the Managers are all on easy-to-remember keyboard short-cuts.



If you know exactly where you want your object to be, the Coordinates Manager is very often the best tool to use.

4 *In the Coordinates Manager, change the value in the Direction H field (the object's heading) from 0 to 45 and press the Apply button.*

The plinth rotates about its Y axis by 45 degrees and ends up facing towards the camera. We used the Coordinates Manager to rotate the plinth simply to show that there is more than one way to skin a cat... (er, better make that peel a potato if you're a vegetarian.)

If you prefer, you can rotate objects with the mouse using the same techniques we are about to use to rotate the camera view.

You can close the Coordinates Manager window now if you like.

OK, so let's adjust the camera position. We want to adjust it so that we are looking at the scene from eye level rather than the "slightly up in the air" view that we currently have.

The Edit Camera button.

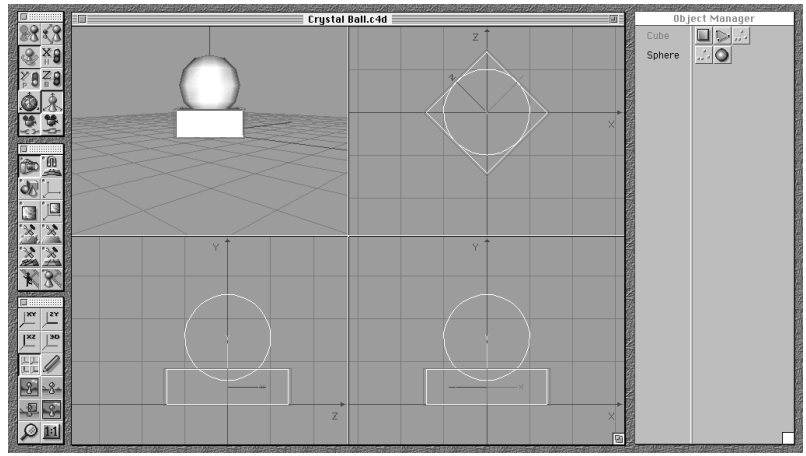
5 *Press the Edit Camera button.*

The Rotate button.

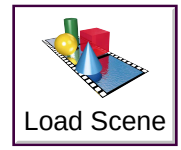
6 *Press the Rotate button.*

7 *Lock (switch off) the X axis and the Z axis, leaving the Y axis switched on (unlocked).*

8 *Click in the 3D view and drag towards you until the grid lines that are farthest away from you fall just below the shoulders of the plinth.*



And we're done rotating. Well, for now at least. Next it's about time we created our floor and sky objects. Better save first, though...



9 *Select Save from the File menu.*

Sky and Floor

This section will take about 2 minutes to complete.

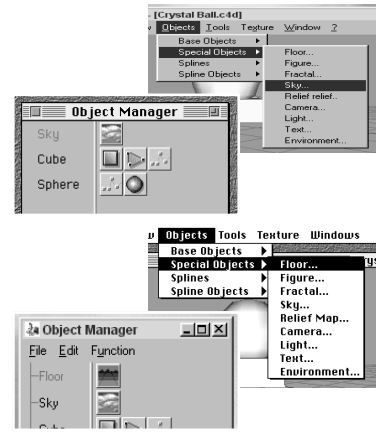
The Sky and the Floor are Special Objects. You can't scale them, you can't move them... pretty much all you can do is give them a texture. (Well, actually, something neat you could do in an animation is make the texture move over the Sky or Floor object, but that's another story for another day.)

1 *Select Sky from the Objects>Special Objects menu and confirm the dialog.*

Nothing apparently happens in the Scene Editor, but you'll notice that an entry for Sky has appeared in the Object Manager. The Sky is an object that totally encloses our scenes like a big globe. Just as the real sky is all around the Earth (that is, not just above us), so our scene's sky is all around the scene. Later we will put some clouds in our sky.

2 *Select Floor from the Objects>Special Objects menu and confirm the dialog.*

Again, nothing apparently happens in the Scene Editor, but you'll notice that an entry for Floor has appeared in the Object Manager. The Floor is an object that sits on the grid you can see in the 3D view and stretches to infinity in all directions. Later we will lay some shiny linoleum on our floor.



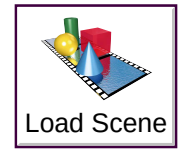
Although we have placed Sky and Floor objects in our scene, nothing appears to have changed. Rest assured the sky and floor are there, as you can see in the Object Manager.

Right, we have just one more object to create, the text that we're going to stand on the floor in front of the plinth. We'll be spending a little time on this Text object so now might be a good time to save what we've done so far and go put the kettle on.

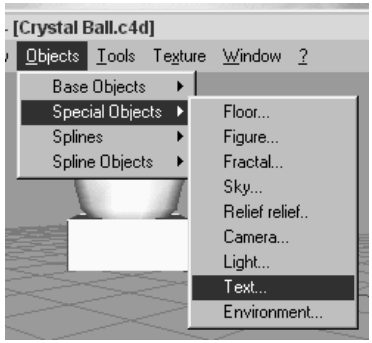
Placing the Text

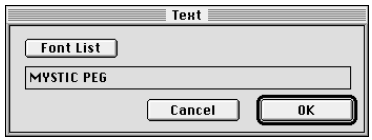
This section will take about 4 minutes to complete.

Like Sky and Floor, Text is a Special Object. What we are going to do is place some 2D text in the scene, then make CINEMA 4D create a 3D version of that text using a technique known as "extruded splines".

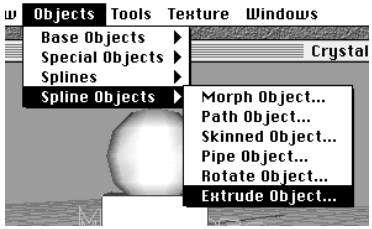


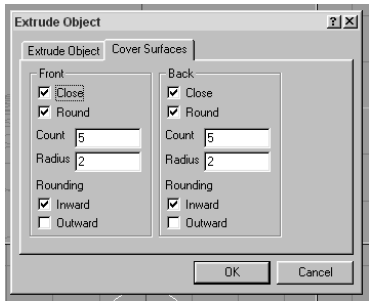
The word "splines" is just the technical term for the outlines of an object. Extruding is a term borrowed from the manufacturing industry—it's the process





Two-dimensional text can be added to your scenes as easily as this.





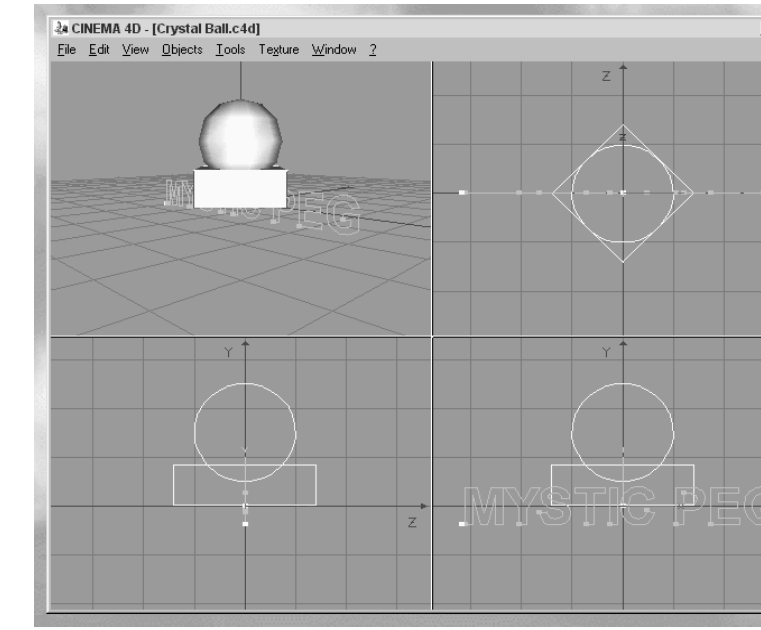
To turn 2D text into 3D text, the text object has to be "extruded".

used to create plastic and metal mouldings by forcing the material out under pressure from a shaped die. So our 2D object is the die that CINEMA 4D will use to produce the moulding—the 3D object, that is.

1 *Select Text from the Objects>Special Objects menu.*

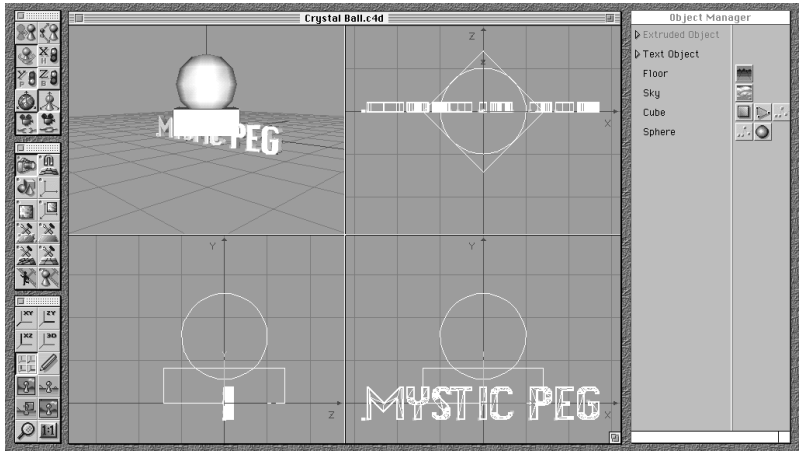
2 *Type some text into the dialog that appears (we have used the text "MYSTIC PEG") and press OK.*

Our text will appear in the scene, flat as a pancake. It's also running right through the plinth, but don't worry about that because we'll be throwing away this text object in a while. Now let's get CINEMA 4D to extrude the splines of the text.



3 *Select Spline Objects>Extrude Object from the Object menu.*

4 *In the dialog that appears, go to the Cover Surfaces page and select Close and Round for both the Front and the Back of the text, and then press OK.*



After a very short delay while CINEMA 4D does its sums, a new object appears in our scene—a 3D version of the text.

If you look in the Object Manager you'll see that an Extruded Object entry has been added above the Text Object entry. We don't need the Text Object any longer, so let's get rid of it.

5 *Click on the Text Object name in the Object Manager to select the object.*

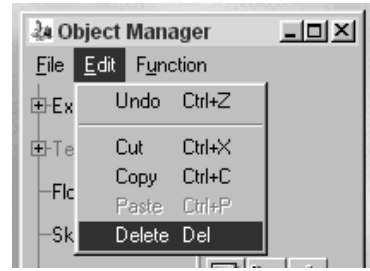
6 *Select Delete from the Edit menu. (Or simply press the Del key on your keyboard.)*

And while we're tidying up, let's move that Extruded Object down the list and give it a more sensible name.

7 *Click on the Extruded Object name in the Object Manager.*

8 *Drag towards you until the mouse pointer is below Sphere in the list, then let go of the mouse button.*

The Extruded Object entry will move to the foot of the list. We could just as easily have dropped the Extruded Object anywhere else in the list. Give it a try.



Always keep your scenes uncluttered by deleting objects that are no longer needed.

Where an object is in the list isn't important to the scene, but often when you have many objects in a scene you may want to structure your object list in a logical manner—drag-and-drop is how you do it.

9 *Select Rename from the Function menu. (Or simply double-click on the Extruded Object name in the Object Manager.)*

10 *Give the object a new name (we called ours "Mystic Peg") and press OK.*

This section will take about 8 minutes to complete.

Positioning the Text

To position the text we can use the techniques we learnt earlier when positioning the sphere and cube.

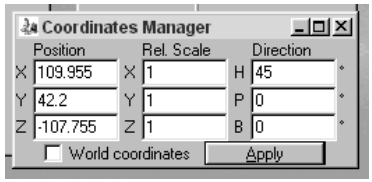
1 *Ensure that the text is the selected object (click on its name in the Object Manager).*

2 *Click on the Edit Object button.*

3 *Click on the Move button.*

4 *Ensure that the X, Y and Z axis buttons are switched on.*

5 *Click in the side view of the Scene Editor (bottom left) and drag the mouse away from you until the base of the text is sitting on the Z axis.*



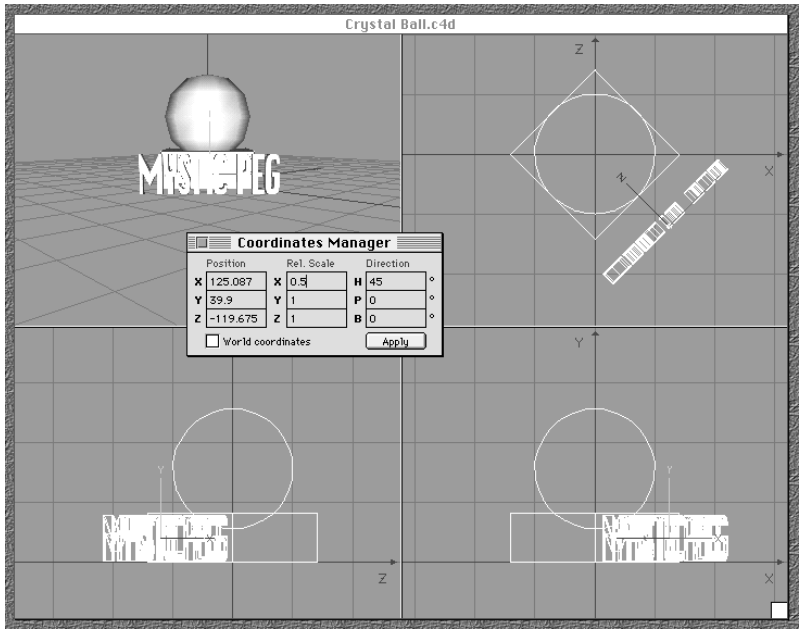
The easy way to alter the direction an object is facing is to change its Heading in the Coordinates Manager.

6 *Open the Coordinates Manager and change the H field under Direction to 45 and press Apply.*

7 *Click in the from-above view (top right) and drag the object down and to the right a bit until the text is slightly in front of the plinth.*

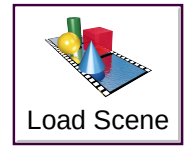
As you perform these operations you will see the text moving around in all four quadrants of the Scene Editor. It is possible that when you have positioned the text in front of the plinth that you cannot see its full width in the 3D view. If you do not want to move the camera further away (so all the text comes into view) you can scale the text so that it becomes narrower and/or shorter.

8 *In the Coordinates Manager, under the Rel. Scale heading, alter the X field to be 0.5 and press Return. (Pressing the Return key has the same effect as pressing the Apply button.)*



The text will become half the width it was—that is 0.5 times as big. Notice that the X field has gone back to a value of 1. That's because we are altering the relative scale, and an object is always its size times 1—it's full size is always the size it currently is, in other words. To change back to the previous width we would have to enter 2 into the X field to make the text twice as wide as it currently is.

Play around with the Rel. Scale X and Y fields until you are happy with the size of your text. (You did save before you started playing, didn't you?)



OK, that's it, all our objects are in place. Now comes the fun part, covering our objects with materials and textures so that they look more realistic.

APPLYING MATERIALS

2. APPLYING MATERIALS

Applying a material to an object is like putting a tight-fitting cover on a sofa. The difference is that in CINEMA 4D you can change the appearance of the material without changing covers. To start with the material is plain. The simplest thing you can do to a material is give it a colour, but by selecting various options and applying textures you can make materials look like any material you want—wood, metal, leather, plastic, glass, water, smoke... literally anything!

The Sky

This section will take about 9 minutes to complete.

We'll start with the sky object. What we want is a blue sky with some fluffy white clouds floating in it.

1 *Open the Material Manager (from the Windows menu) if it isn't already open.*

2 *Click in the Material Manager and select New Material from the File menu.*

A button (named New) with a shaded white sphere on it appears in the Material Manager. As we adjust the material, the appearance of the sphere will change to give us a rough idea of what the material looks like.

3 *Double-click on the New material to open the Edit Material dialog.*

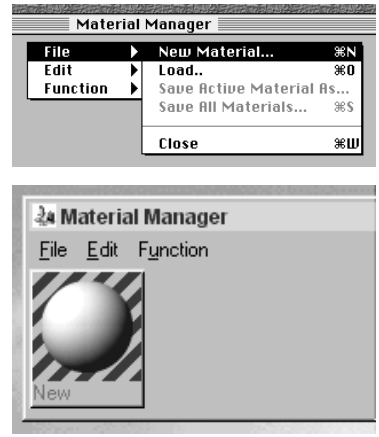
The Edit Material dialog has quite a few pages. Currently we are looking at the Colour page. We will be visiting most of the other pages as we make and apply materials to our various objects.

4 *Click on the File button and use the file selector to find and open a picture named "Clouds.tif" in the "Tex" folder.*

A thumbnail of the picture appears to the right of the filename. We are going to "paint" this picture all over the Sky object.

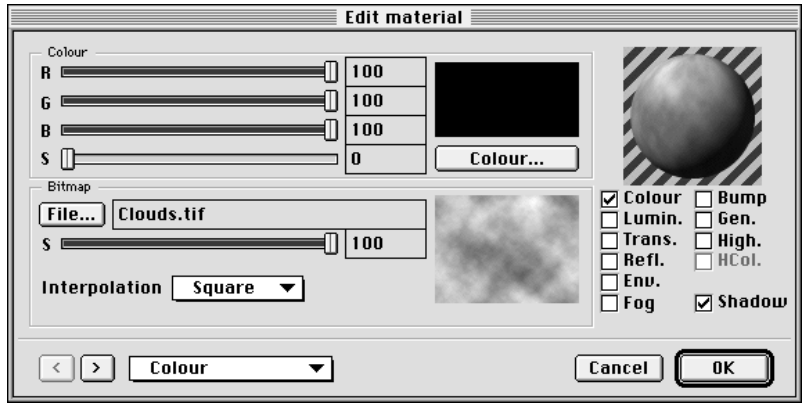
5 *Under the Colour heading, change the S value to be zero, then click OK.*

The R, G, B and S sliders are used to give the material a colour. We don't want our material to have a colour (because the picture we have opened uses the correct colours for a sky) so we have set the strength of the material to zero,

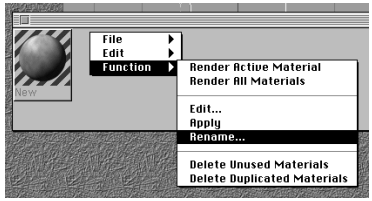


Materials are represented in the Material Manager by a shaded sphere. The appearance of the sphere will change to reflect the properties of the material.

which means no colour. If we hadn't opened a picture then the material would appear black—black being what we see when there is an absence of colour—but as we have opened a picture then what we see is the picture.



Now then. The picture we have opened is only small and the Sky is big, way bigger than the picture. And, of course, the picture is flat and rectangular whereas the Sky is curved. How does CINEMA 4D completely fill a big round hole with one little square peg?



Always give your materials sensible names.

In the Object Manager materials are represented by an icon of a sphere with a little square of colour on it.

Tiling is the answer. CINEMA 4D uses the picture over and over again, distorting it where necessary, until it has covered the entire object. The important point here is that where CINEMA 4D has joined the tiles, seams may show if the picture isn't designed to tile seamlessly (the "Clouds.tif" picture is).

6 *Click on the New material, select Rename from the Function menu and give this material a sensible name (like Sky, for instance).*

7 *Position the mouse pointer over the newly-named Sky material, hold down the (left) mouse button, drag the pointer over the Sky entry in the Object Manager, then let go of the mouse button.*

We have just used the drag-and-drop technique to apply the material to the object. Alternatively, if we felt like doing it the long way, we could have clicked on the object name in the Object Manager, clicked on the material in the Material Manager, and then selected Apply from the Function menu.

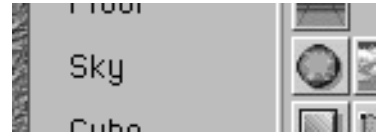
Right, hold on to your horses and don't get too excited here because it won't be anything to write home about, but we are going to render the scene.

The Render to External Window button.

8 Click in the Scene Editor and press the Render in External Window button.

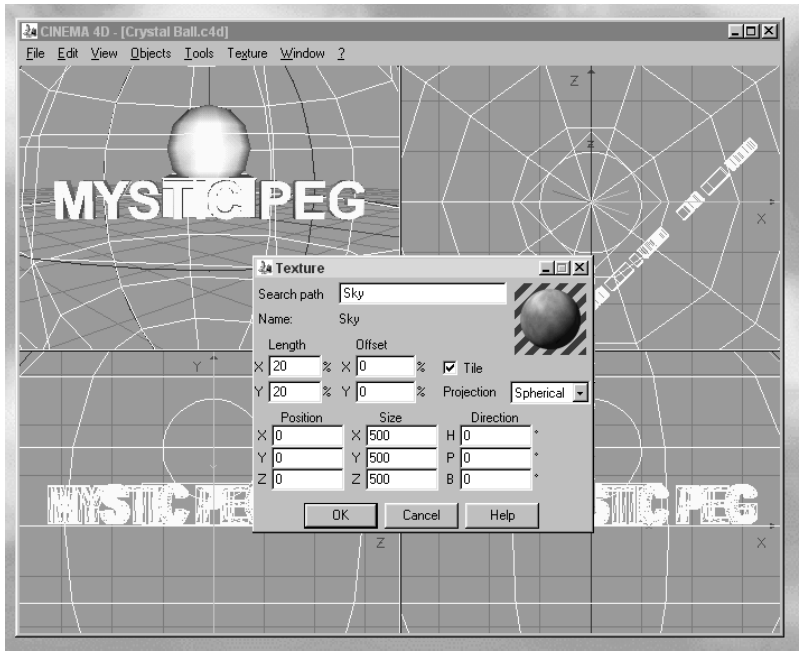
The scene will start to render and you will see the blue of the sky. Not very good, is it? Doesn't look much like a cloudy sky to us. There's a reason for that, and we can fix it.

9 In the Object Manager, to the right of the Sky entry, double-click on the icon that represents the material—the one that looks like a dark circle with a little blue square in the centre of it.



Double-click on this type of icon in the Object Manager to edit a texture.

The Texture dialog that appears contains some fairly advanced features and this Quickstart book is not the right place to describe them, so we'll concentrate on just the two settings that we need to adjust in order to put the clouds back into our sky.



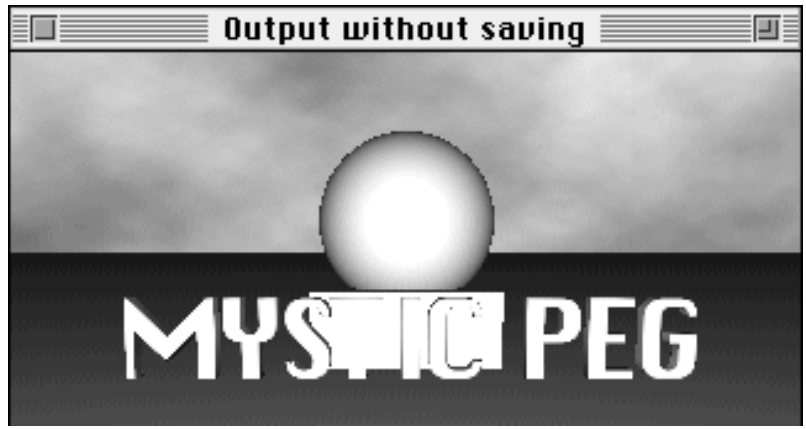
To understand what we are going to do you need to understand what CINEMA 4D has done with the picture we've used as a texture for the sky. Right now, CINEMA 4D is doing its level best to tile the sky using as few "copies" of our picture as possible by stretching it out. So the clouds in our picture are actually there, washed out a bit by the stretching process, and by the looks of it mostly in another part of the sky.

Now then, because we can put lots of copies of this particular picture together like a jigsaw and not see the joins, we can ask CINEMA 4D to use lots of copies instead of stretching out a single picture. We do this by specifying how much of the sky should be covered by one copy of the picture.

10 In the Texture dialog that we have open, change the values in the X and Y Length fields from 100 to 20, then press OK.

We have told CINEMA 4D to cover only 20 per cent of the sky with one picture instead of 100 per cent of the sky with one picture. Let's render it again so we can see the difference.

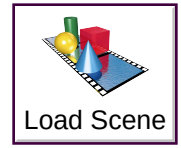
11 Click in the Scene Editor and press the Render in External Window button.



There we go, that looks more like a sky. If you change the percentages to 10 or 5 the sky will become even cloudier, but although you won't be able to see any joins you will begin to see a regular pattern of clouds, and that would destroy the illusion. Try it!

When you are using tiled pictures for textures, keep a weather eye out for this type of regular pattern; one way to destroy the pattern is to enlarge those X and Y Length percentages.

OK, that's it for the sky. Time to save and move on to the floor.



This section will take about 6 minutes to complete.

The Floor

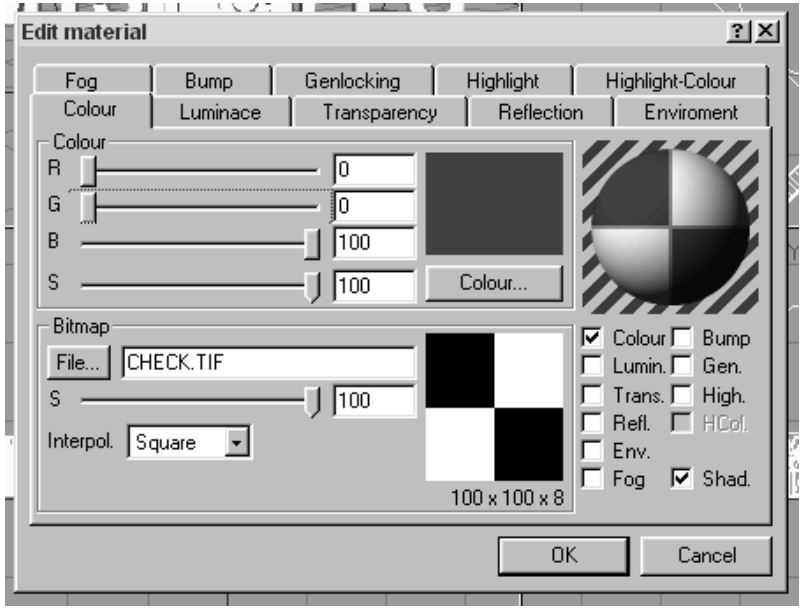
For the floor we are again going to use a picture as a texture, but we are going to give the floor some properties so that it looks like shiny linoleum. The first few steps of this process are the same as they were for the sky.

1 *Open the Material Manager if it isn't already open.*

2 *Click in the Material Manager and select New Material from the File menu.*

3 *Double-click on the New material to open the Edit Material dialog.*

4 *Click on the File button and use the file selector to find and open a picture named "Check.tif" in the "Tex" folder.*



The checks are black and white. We don't like black and white checks, but we do like blue and white checks.

5 *Under the Colour heading, change the R and G values to 0, leaving the B and S values at 100. (Don't close the dialog yet.)*

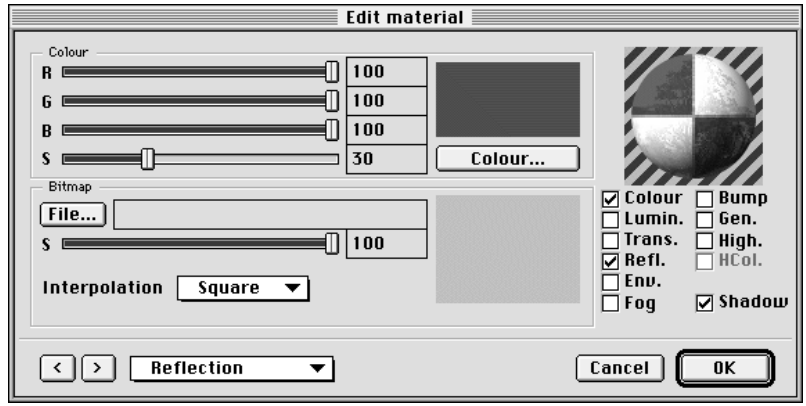
Notice that the material thumbnail in the top right of the dialog now shows the texture to have blue and white checks. Right, lino is shiny—it reflects things in other words—so let's make it shiny.

6 *Go to the Reflection page.*

The settings on this page all have an effect on how a material should reflect light. But only if reflections are turned on...

7 *Click in the little white box to the left of the Refl. option so that a tick appears.*

We have now switched on reflections for this material and we can see the effect this has had on the material thumbnail. Much too shiny, let's tone it down a bit.



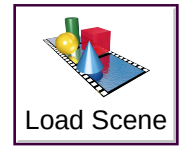
8 *On the Reflection page, adjust the strength of the colour (the S slider under R, G and B) from 100 to 30.*

Better. That's the floor finished. All we have to do now is give the material a sensible name and apply it to the Floor object.

9 *Click OK in the Edit Material dialog and then select Rename from the Function menu. Give the material a sensible name (like Floor for instance).*

10 *Apply the floor material to the Floor object by dragging the material's icon on to the Floor object in the Object Manager.*

Go on, we know you're busting for it... have a quick render to see what the scene looks like now. But save first!



This section will take about 4 minutes to complete.

The Plinth

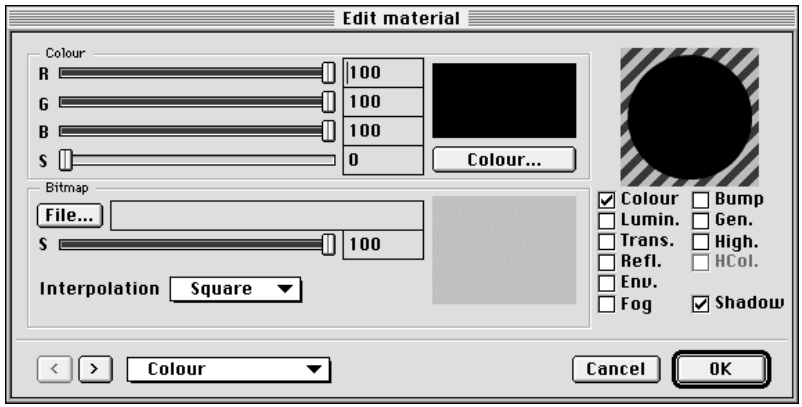
Let's make the plinth have a black plasticky kind of PVC type texture.

1 *Open the Material Manager if it isn't already open.*

2 *Click in the Material Manager and select New Material from the File menu.*

3 *Double-click on the New material to open the Edit Material dialog.*

4 *In the Colour page, set the strength of the colour to zero.*



5 *Go to the Bump page.*

This time, instead of using a picture to give our material a texture we are going to use something called a bump map—so named because it gives a material a bumpy kind of texture.

A bump map *is* actually a picture, but instead of the actual picture being used for the texture the shade differences in the picture are used in combination with the other settings for the material. For this reason bump maps are normally created in shades of grey, but any shade of any colour can be used, or even a normal colour picture.

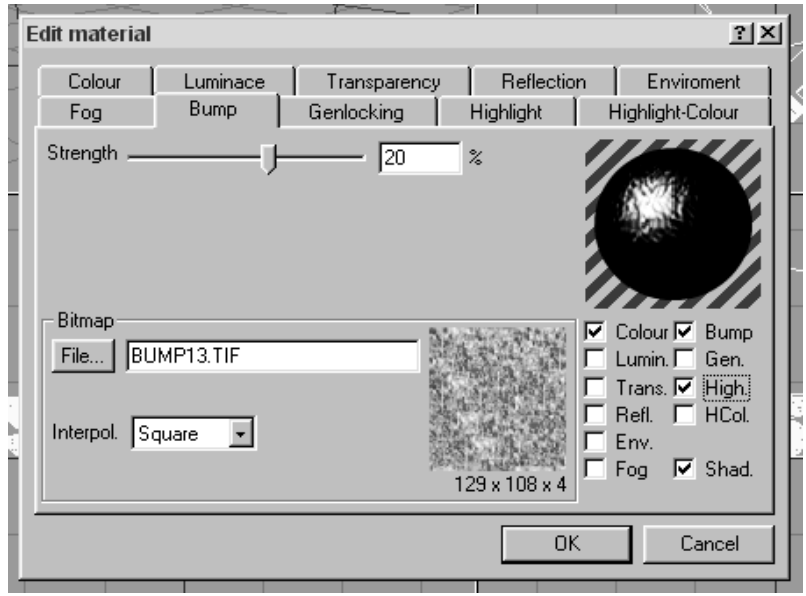
For bump maps to work we first have to switch on that feature for the current material.

6 *Click in the little white box to the left of the Bump option so that a tick appears.*

7 *Press the File button and use the file selector to find and open the bump map named "Bump13.tif" in the "Tex" folder.*

8 *Adjust the Strength setting to read 20%.*

The appearance of the texture in the material thumbnail hasn't changed at all yet. That's because our material is not reflecting any light. We don't want full reflections on this material, all we want is highlights where the texture wobbles up and down.



9 *Click in the little white box to the left of the High. option so that a tick appears. (Note that we don't have to go to a function's page just to switch on that function, only when we want to alter settings for that function.)*

The material thumbnail now has some texture. Does that look like a black plasticky kind of PVC type texture to you?

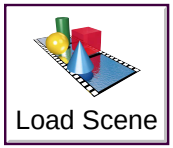
10 *Click OK in the Edit Material dialog, give the material a sensible name (like Plinth for instance), and apply it to the Cube object.*

So much for the plinth. Next we come to the... tch, go on then, have a quick render to see what it looks like. But do save first!

Didn't look particularly good, did it? Don't fret, all will become clear soon.

Our scene is beginning to take shape.

This section will take about 3 minutes to complete.



The Crystal Ball

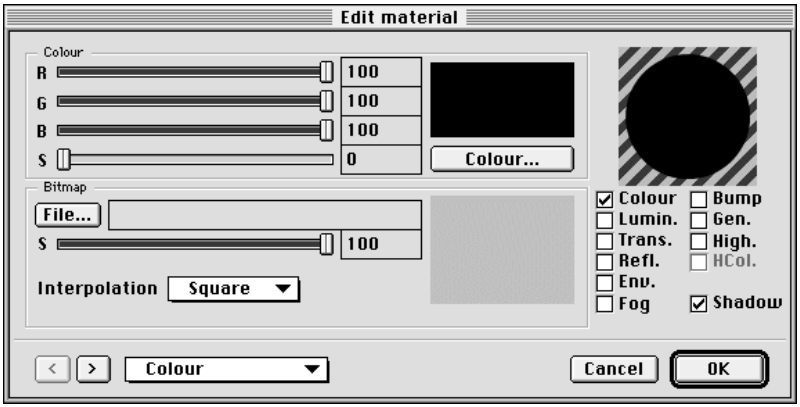
A crystal ball is, quite naturally, made of crystal, so that's the type material we have to create for it. It's actually very easy to create a glass or crystal material because CINEMA 4D does all the hard work for us.

1 *Open the Material Manager if it isn't already open.*

2 *Click in the Material Manager and select New Material from the File menu.*

3 *Double-click on the New material to open the Edit Material dialog.*

4 *In the Colour page, set the strength of the colour to zero.*



Remember, a colour strength of zero means "colourless" not "black". The material will appear black unless we do other things to it, but that's because it lacks colour, not because it has been "painted" black.

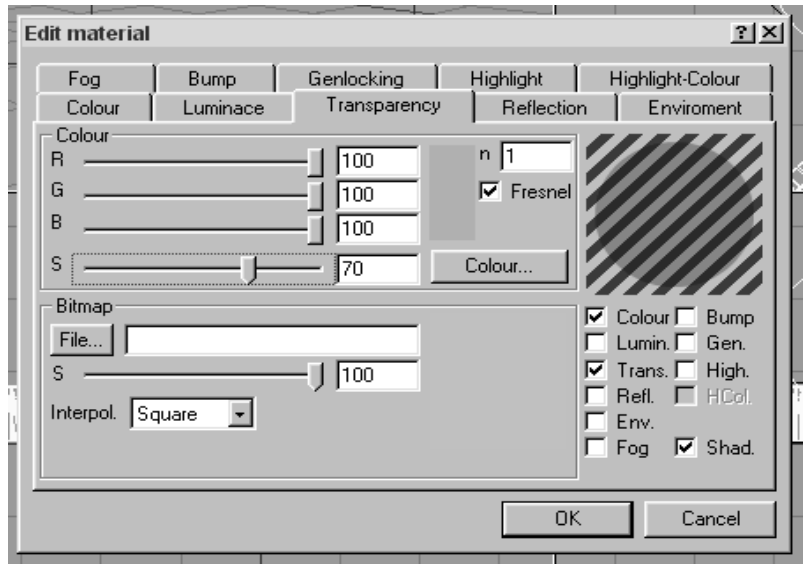
Now we need to turn our colourless ball into a crystal one.

5 Go to the Transparency page.

6 Click in the little white box to the left of the Trans. option so that a tick appears.

The material is now transparent. In fact it is so transparent that we can't see it. That's easily fixed.

7 Still on the Transparency page, adjust the the strength of the colour to 70.



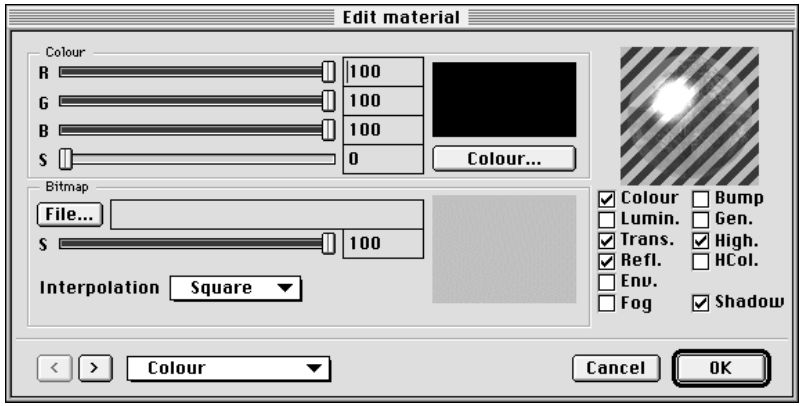
Now the texture shows up in the material thumbnail as light grey. Crystal balls are highly reflective and will have highlight spots when lights are shone on them, so let's turn on those options.

8 *Go to the Reflection page.*

9 *Click in the little white box to the left of the Refl. option so that a tick appears.*

10 *Adjust the strength of the colour to 25 to tone down the reflections.*

11 *Click in the little white box to the left of the High. option so that a tick appears.*

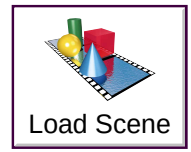


The material thumbnail now looks very much like a crystal ball. We may need to tweak it later, then again we may not... For the moment let's settle for what we've got.

12 *Click OK in the Edit Material dialog, give the material a sensible name (like Crystal for instance), and apply it to the Sphere object.*

If you render the scene now you'll be fairly pleased with the results, but it's far from perfect. Perfection will come later, but first we must give a material to our final object, the text in front of the plinth.

Don't forget to save before starting on the next stage.



Now we can see into our crystal ball.

This section will take about 5 minutes to complete.

The Text

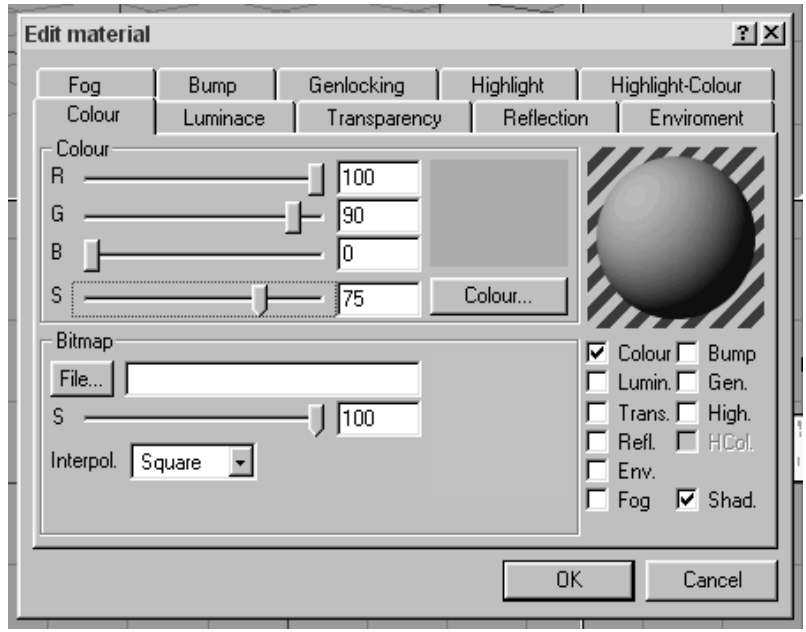
For the crystal ball we created our own material from scratch, without the help of pictures or bump maps. We are going to do the same thing for the text to try to give it a shiny gold metallic appearance.

1 *Open the Material Manager if it isn't already open.*

2 *Click in the Material Manager and select New Material from the File menu.*

3 *Double-click on the New material to open the Edit Material dialog.*

4 *In the Colour page, set R to 100, G to 90, B to zero and S to 75.*

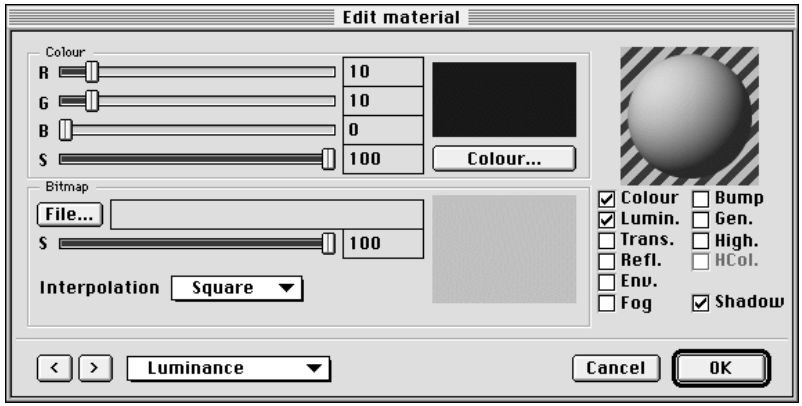


That's our basic gold colour. Now, the thing about gold, so people say, is that it kind of glows on you. It doesn't actually glow, but people are always saying how gold seems to have its own light almost as if in a pitch black room you would still be able to see gold. We can do that.

5 *Go to the Luminance page.*

6 *Click in the little white box to the left of the Lumin. option so that a tick appears.*

7 *Set the R value to 10, G to 10, B to 0 and leave S on 100.*



We have now set up the material so that even in a pitch black room with absolutely no light anywhere, we will still be able to see it as this very dark olive green kind of colour.

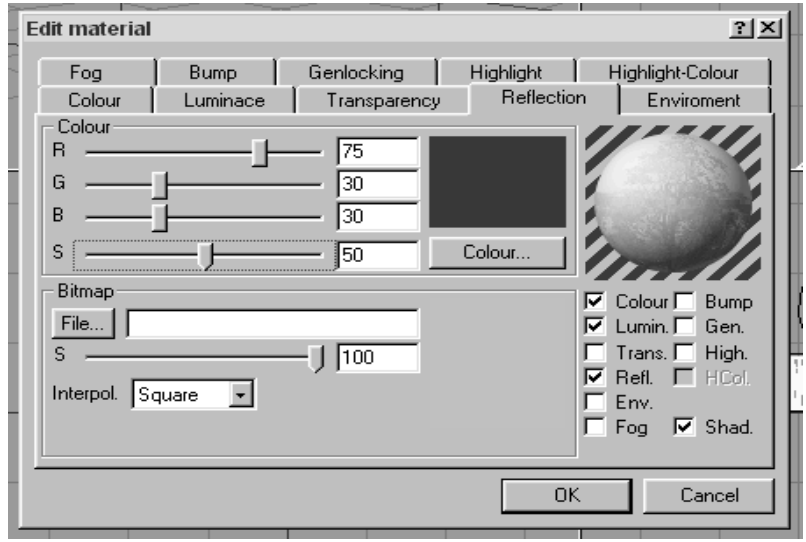
Don't think of luminance as a light. It isn't. Although the material is luminous, it is emitting no light so it will not illuminate the scene in any way. The material is luminous, not illuminant.

Lastly, to make the material appear metallic we need to make it shiny and give it highlights.

8 *Go to the Reflection page.*

9 *Click in the little white box to the left of the Refl. option so that a tick appears.*

10 *Set the R value to 75, G to 30, B to 30 and S to 50.*



What we have done here is limit the colours that get reflected. Think of a silver mirror. If you look in that mirror in normal daylight you'll see yourself reflected in that mirror pretty much as you look in real life. If you have a red nose, your reflected nose will be red.

Now look in a gold plated mirror. Will your nose still be red. No, it won't, it'll be a "goldy-red" colour. The gold doesn't reflect the entire spectrum of colours, which is why it looks gold to us and not silver, or pink, or tartan or whatever.

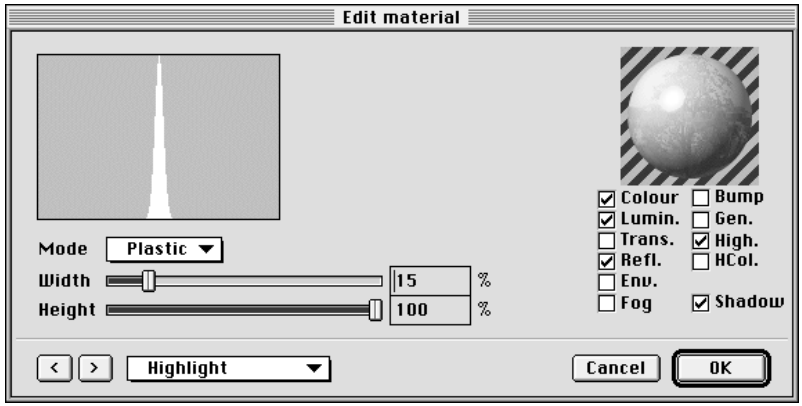
So we have set the sliders to reflect the maximum amount of each colour that can be reflected. One way of visualising this is to think of the entire spectrum being reflected, but only up to the level each slider is set to.

Setting our maximums to this murky red colour is ultimately what will give our material a realistic gold appearance.

But it won't look right without highlights...

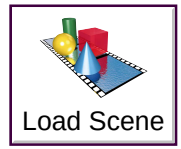
11 Go to the Highlight page.

12 Click in the little white box to the left of the High. option so that a tick appears.

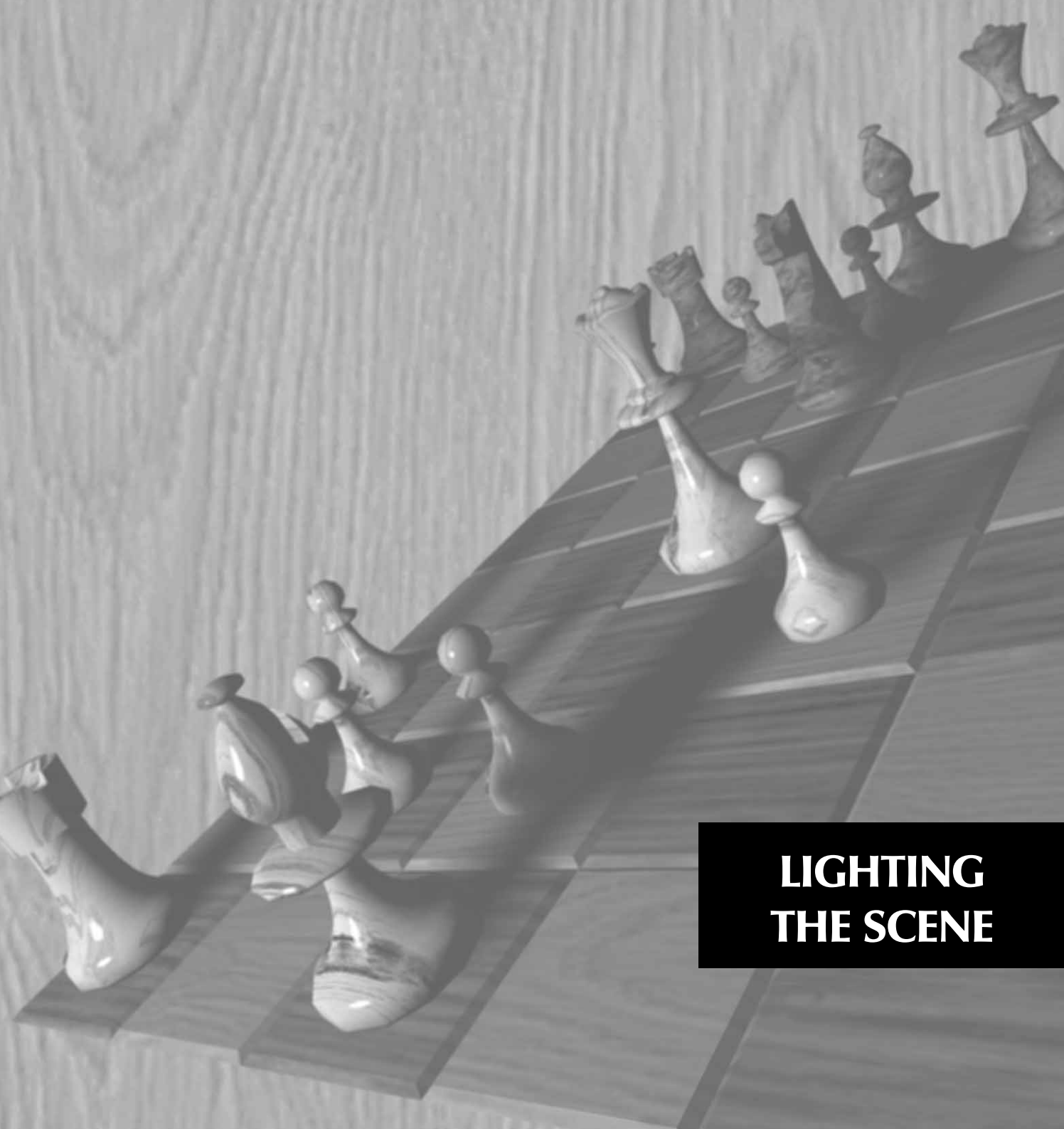


13 *Leave the Mode as Plastic (in this case we think it just happens to look better than the Metal mode), but change the Width setting to 15 so that the highlights aren't too big, more like sparkles.*

14 *Click OK in the Edit Material dialog, give the material a sensible name (like Gold for instance), and apply it to the Mystic Peg object (or whatever else you called the text).*



And we're all done with materials. Don't bother rendering the scene because we'll be doing that in a minute anyway. Save your work and let's take a break. When we come back we're going to spend some time seeing the light.



LIGHTING THE SCENE

3. LIGHTING THE SCENE

This section will take about 4 minutes to complete.

If you haven't already rendered the scene, do it now... Like it? It's a fairly pleasing scene, but the lighting's all wrong. The only light at the moment is that being provided by a light that CINEMA 4D automatically places behind the camera—you can think of it as an auto-flash, and, like a real auto-flash, if we light the scene ourselves the auto-flash won't flash. So let's light the scene.

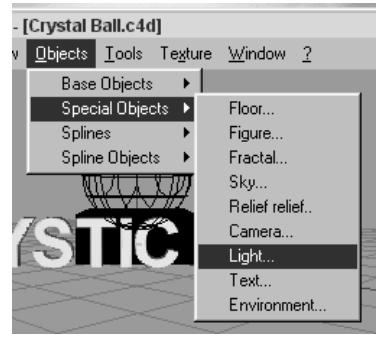
We'll start with some ambient light—a general light source that will emit light in all directions—and we'll position it up in the air above the crystal ball.

1 Select Light from the Objects>Special Objects menu.

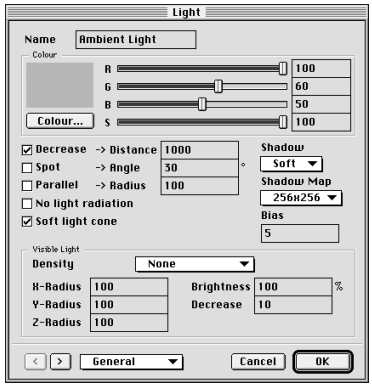
2 Rename the object to Ambient Light.

Let's give our ambient light some character rather than have it a bland and unnatural white.

3 Set the R value to 100, G to 60, B to 50 and S to 100.



Light is a Special Object in the Object menu.



Lights can have many properties. For this scene we are starting with a simple, soft red light whose strength decreases with distance.

And let's reduce its strength a little by forcing the light to decrease gradually over a distance. This ought to add some shading to our floor.

4 *Click in the little white box to the left of the Decrease option so that a tick appears.*

5 *Press the OK button.*

The Ambient Light object appears in the Object Manager and in the scene we can see it at the intersection of the X, Y and Z axes. It's not a lot of good to us there, so let's move it.

6 *Ensure that the Move button is selected.*

7 *Ensure that the Edit Object button is selected.*

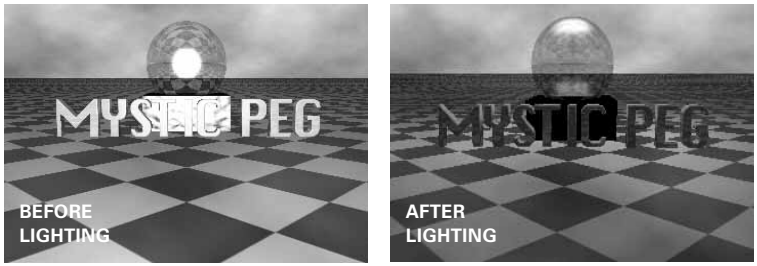
8 *Ensure that Ambient Light is the selected object.*

9 *Open the Coordinates Manager if it isn't already open.*

10 *Click in the side or front view and drag the Ambient Light up until the Y Position coordinate in the Coordinates Manager is about 500.*

Remember, you can lock off the X and Z axes to stop the object wandering off in the wrong direction, or simply reset the X and Z Position coordinates to zero in the Coordinates Manager.

11 *Press the Render in External Window button.*



What a difference, eh? And it's going to get a lot better still.

More Light

This section will take about 4 minutes to complete.

The scene is well lit now, but the text looks a bit drab. How about if we stick a spotlight on it?

1 *Select Light from the Objects>Special Objects menu.*

2 *Rename the object to Spotlight.*

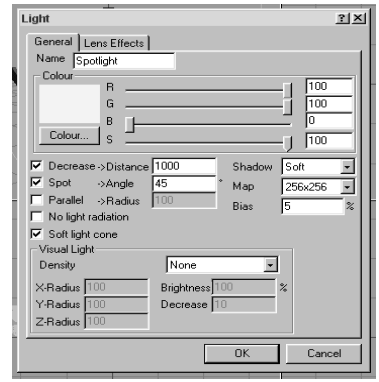
3 *Ensure that the R and G colour sliders are set to 100, then set the B colour slider to zero so that the spotlight is bright yellow.*

4 *Turn on the Spot option (click the white box to the left of it).*

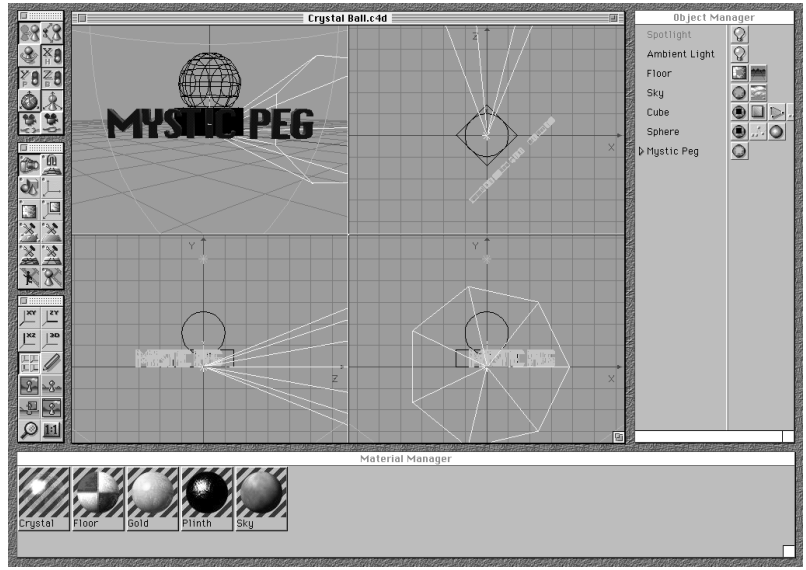
The default Spot Angle is a bit narrow for our purposes, so let's widen it.

5 *Set the Spot Angle value to 45 and press OK.*

The Spotlight object appears in the Object Manager, and in the Scene Editor you can see the Spotlight as lines radiating from the intersection of the X, Y and Z axes. Now we have to move it and point it at the text.



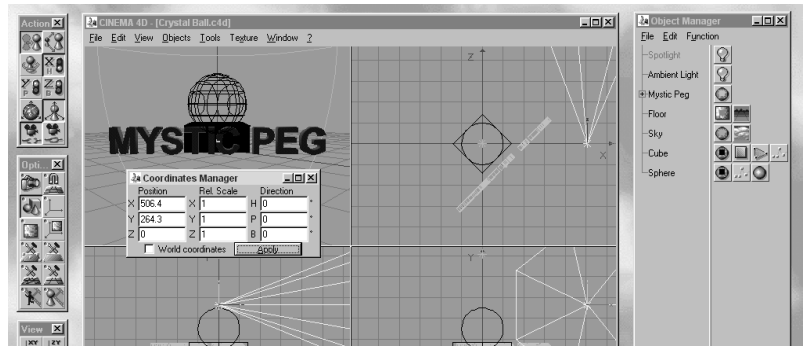
To create beams of light that widen from a narrow point, you need to switch on the Spot option and set the required Angle.



6 *Ensure the Move and Edit Object buttons are selected.*

7 *Switch off the X and Z axes (leaving the Y axis switched on), then drag the Spotlight up (the Y axis) until it is at about the same height as the top of the crystal ball.*

8 *Switch on the X axis, switch off the Y and Z axes, then drag the Spotlight off to the right of the scene until its X Position coordinate in the Coordinates Manager is at about 500.*



Good. So our Spotlight is in position. But it isn't pointing at the text. We could do this with the mouse (using the Rotate and Edit Object buttons) but only if we really enjoy doing things the hard way. Which we don't, so we're going to do it the easy way.

8 *Ensure the Spotlight is the selected object, then select Align to Object from the Tools menu.*

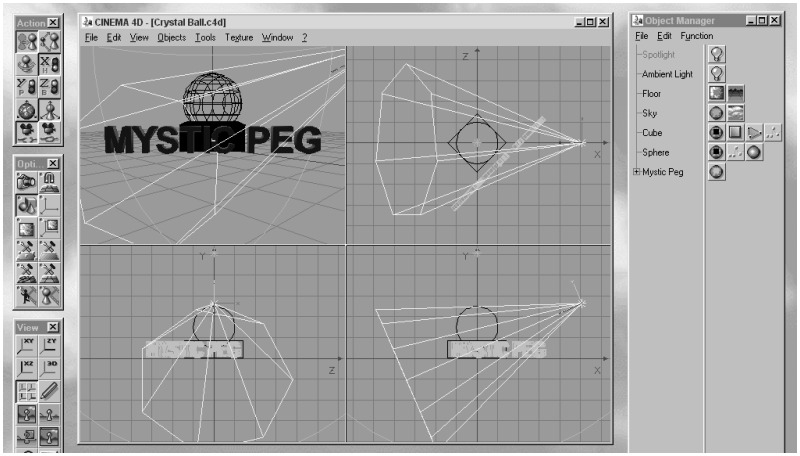
If it helps, think of Align to Object as meaning Point at Object. You'll use this feature a lot with lights. The dialog that opens wants to know which object to point the Spotlight at.

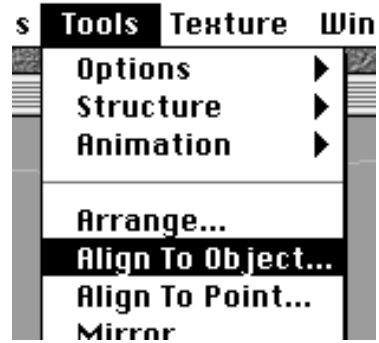
9 *Type the letter "c".*

Below the text field CINEMA 4D will display the name "Cube", which is our plinth of course. The text is directly in front of the plinth and if we point the spotlight at the plinth (cube), the text should fall within its beam as well. This way we get to spotlight the plinth and the text with just the one light.

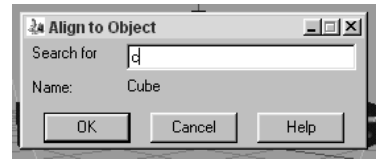
10 *Press OK.*

CINEMA 4D will grab hold of the spotlight and point it at the Cube object. And that's it, the scene is finished. Now we can render it properly.

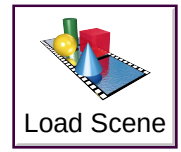


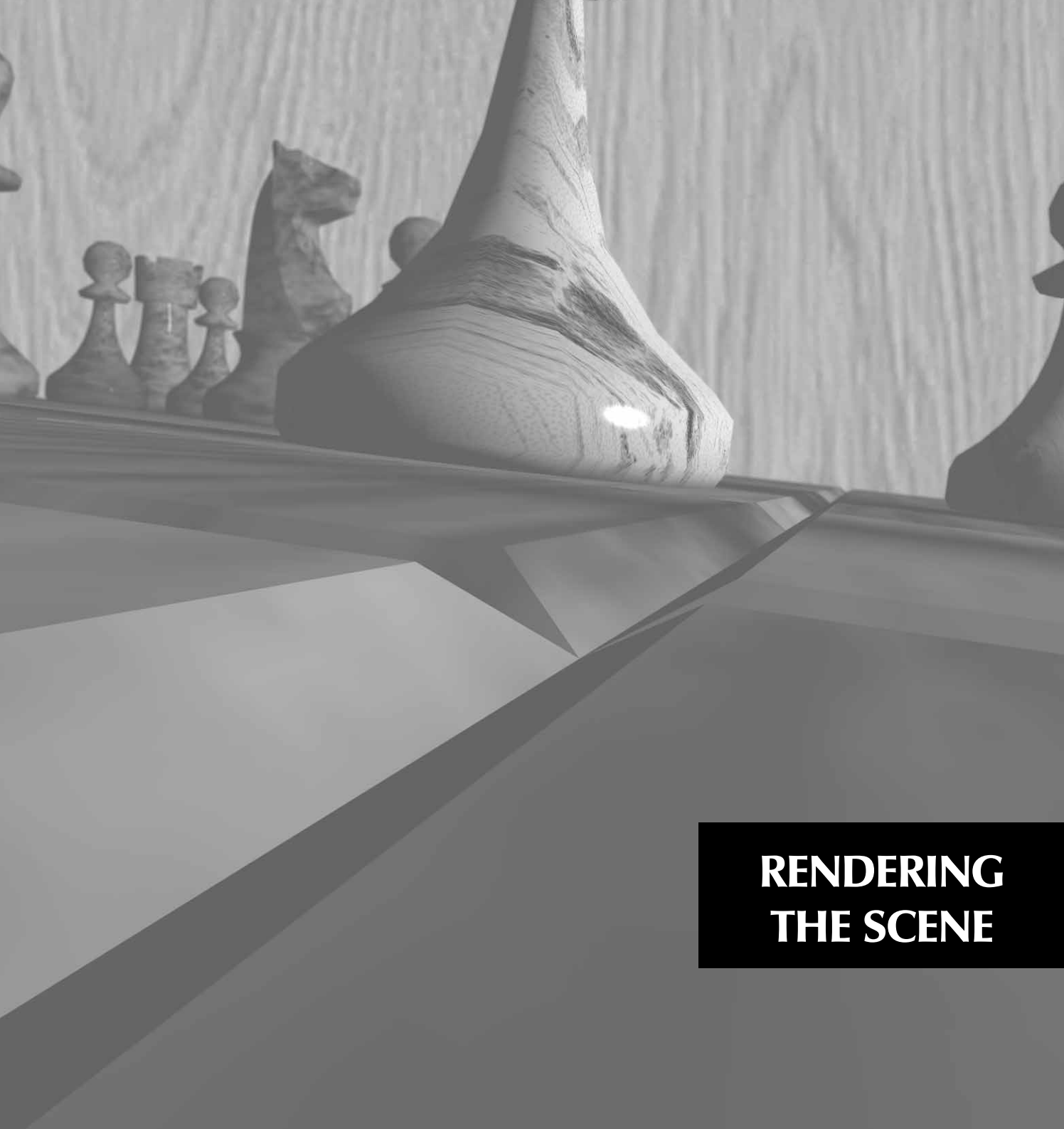


The easy way to make any object point at any other object is to select the first object and then pick this menu option.



As you type into a Search For text box, CINEMA 4D will save you time by trying to complete the name for you.





RENDERING THE SCENE

4. RENDERING

This section will take about 5 minutes to complete (not inc. rendering time).

At the moment, all of the fancy rendering functions are turned off. There's no shadows, no anti-aliasing and the picture is being rendered in a fast, lower quality mode known as "scanline" rendering. We'll adjust the render settings in a moment, but before that let's do a quick render to see what we've got.

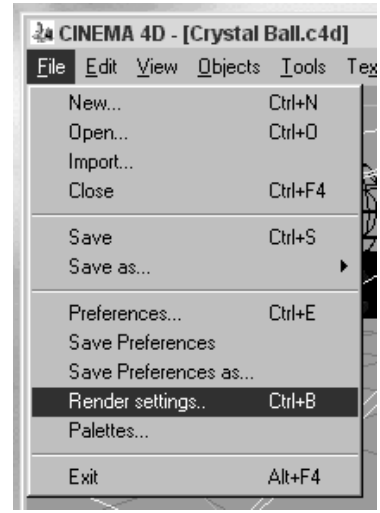
1 Press the Render to External Window button.

If you study the output closely you'll notice that most of the curves and diagonals are a bit jagged. And there are a few things about the picture that don't seem quite right: the lino isn't shiny, there aren't any shadows, the spherical crystal ball isn't refracting the light passing through it...

We can fix all this and more in the Render Settings dialog.

2 Select Render Settings from the File menu.

3 Set Render Mode to Raytracing.



Before you render, always check that the Render Settings are set appropriately.

Raytracing is the highest quality rendering mode. We used scanline rendering while developing the scene because it renders much more quickly.

4 Set Antialiasing to Always.

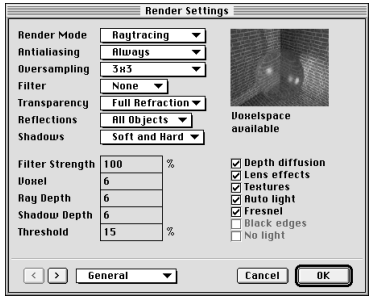
5 Set Oversampling to 3x3.

Antialiasing will get rid of those jagged diagonals and curves. We've set it so that anything CINEMA 4D decides needs antialiasing will get antialiased. In particular, antialiasing will cause tiny floor tiles in the distance to blur together, which is how they would appear in reality.

The higher the level of oversampling, the more of the surrounding pixels are taken into account when CINEMA 4D is deciding whether to antialias a pixel or not. A setting of 2x2 or 3x3 is normally sufficient. Keep in mind that each level of oversampling will cause the render to take twice as long as the previous level.

6 Set Transparency to Full Refraction.

Setting this option will ensure that light is refracted (bent) correctly when it passes through transparent objects. This will dramatically improve the appearance of our crystal ball.



The General render settings are where you decide the quality of the output.

7 Set Reflections to All Objects.

The default setting (Floor & Sky) means that only the floor and sky objects will be reflected in any material that has reflections switched on. That's why our lino wasn't shiny—all it has been reflecting is the sky. Now it will reflect the text and the crystal ball and will make a massive difference to our picture.

8 Set Shadows to Soft and Hard.

No shadows were being cast in our earlier renders. Setting this option will give everything a better appearance of depth.

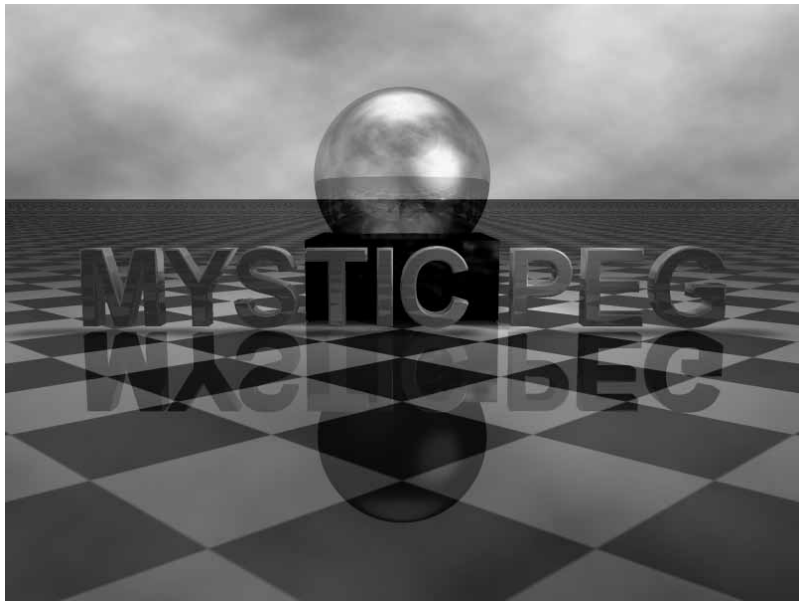
9 Go to the Output page.

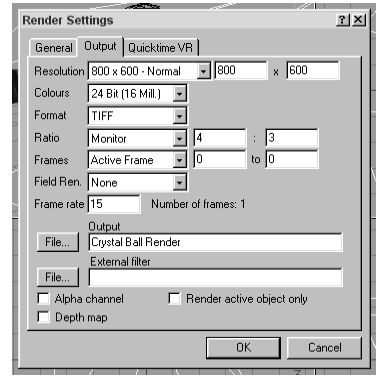
10 Set Colours to 24 Bit.

11 Set Resolution to 800 x 600.

12 Press the File button and then select a folder and give your picture a filename.

Giving your picture an output path and filename will cause it to be saved to disk automatically after it has rendered. If you don't provide a path and filename, when the picture has rendered you can save it by selecting Save Picture As from the File menu. The picture will save in whatever file format was set in the Output page of the Render Settings dialog.

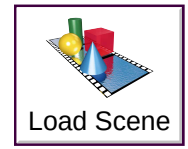




The Output render settings page is where you decide the output format of the frame or frames to be rendered.

All Done

We hope you have enjoyed your first tour of CINEMA 4D. We covered a lot of ground creating our simple scene and you now know enough to be able to follow the animation tutorials with confidence. And that's when the real fun starts...



ANIMATING THE SCENE

5. ANIMATION

Having used many 3D features to create a static scene, now we are going to use many of the 4D features to bring that scene to life.

As with the scene tutorial, the aim here is not to show you every single feature of CINEMA 4D, but rather to introduce you gently to the basic animation features so that you have a solid foundation on which to build.

This is the plan.

First we are going to learn about a simple animation technique called “key frame animation” by making the text fly off and come back again, while at the same time spinning through 360 degrees.

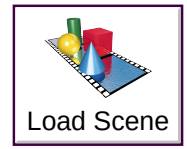
Second we’ll learn about a slightly more advanced technique called “time line animation” by making the individual letters of the text rotate and tumble while the whole text is flying and spinning.

Third we’ll learn about animation paths, the technique we must use if we want to have total control over how each and every object in the scene moves or changes over time. In this final part of the animation tutorial we will introduce a glowing light into the scene that changes colour while floating around the scene, and then we’ll “pick up” the camera and zoom right in on the crystal ball.

This section will take about 20 minutes to complete (not inc. rendering time).

Key Frame Animation

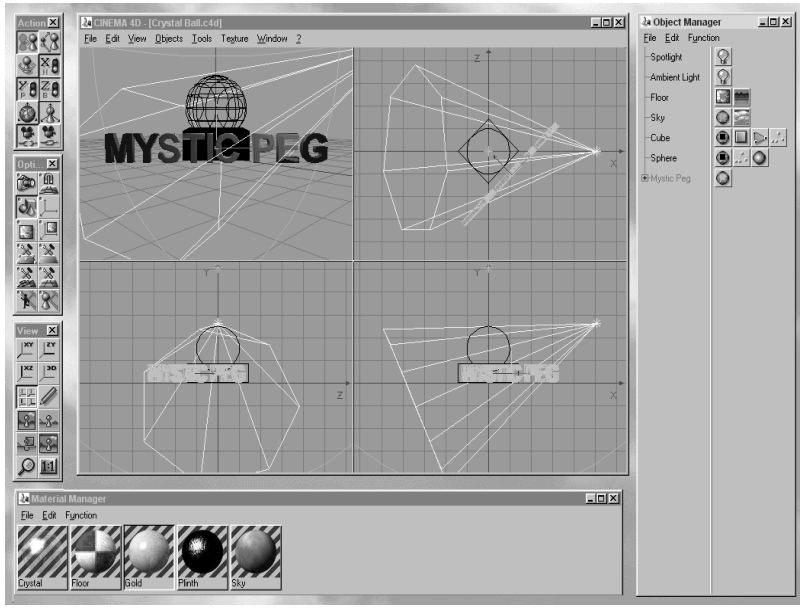
Keyframe animation is the simplest form of animation within CINEMA 4D and it involves just three steps. First we take a snapshot of an object at one point in time, then we take a snapshot of the same object at another point in time. If between the two snapshots (known as key frames) the object has moved, changed colour, grown, shrunk or has been altered in any way, CINEMA 4D will perform the third step in the process—it will create an animation that transforms the object from the first key frame to the last key frame.



Using the scene created in the previous section, for our key frame animation we are going to animate the text so that it moves towards the camera while rotating through 360 degrees.

1 *Open the Crystal Ball scene and select the 4T view.*

2 *Open the Object Manager if it isn't already open and click on the name of the extruded text object (that we named "Mystic Peg" and you might have named something else), and then ensure that the Edit Object button is selected.*

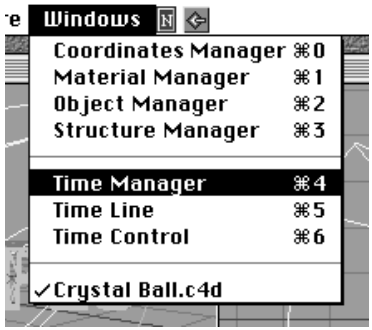


Now we must set the key frames that CINEMA 4D will use to build the animation. We do this in the Time Manager.

3 *Open the Time Manager from the Windows menu.*

This window contains a slider and some VCR style buttons. The slider represents a point in time in an animation, represented as a time in seconds or as a frame number. Note that a frame that is at 2 seconds on the slider would also be the 30th frame of an animation that has a frame rate of 15 frames per second (fps).

The buttons are used just like a VCR—they enable us to navigate through the animation and its key frames.



The Time Manager is where you record the key frames of your animation.

3 *Set the slider to frame zero if it is not already there. Ensure that the Position and Angle options are selected.*

4 *Press the Record button.*

This has recorded a key frame for the text at time zero. The key frame will include data for the object's position in the 3D world as well as the angle at which the object is pointing.

The animation needs to start somewhere, so we record frame zero as our first key frame.

5 *Ensure that the fps field is set to 15 frames per second, then drag the slider to the right until it reads 40.*

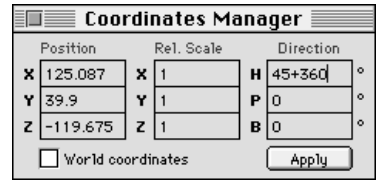
6 *Open the Coordinates Manager. Ensure that World Coordinates is switched off, then add +360 to whatever value is currently in the H field under Direction.*

We move the slider to frame 40 ready to record that frame as a key frame after we have made the changes.

CINEMA 4D allows us to enter formulae into value boxes. So entering +360 next to the H value will cause 360 degrees to be added to the current heading of the selected object.

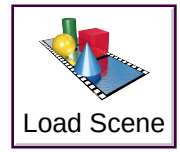
7 *Select Apply (or press Return).*

The 360 now gets added to whatever value was in the H box.



CINEMA 4D makes life easy by allowing us to enter sums into value boxes.

8 *In the Time Manager, press the Record button.*

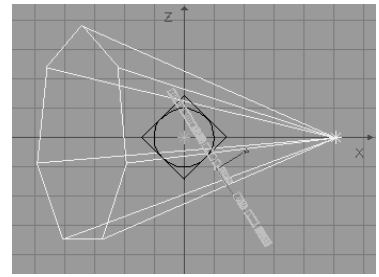


It appears as though nothing has happened. Ah, but it has. Drag the Time Manager slider between 0 and 40. See?

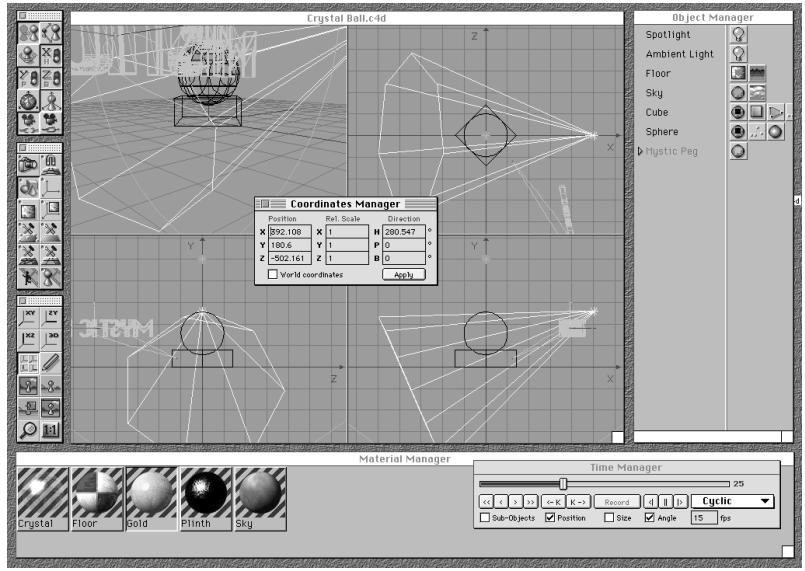
Getting CINEMA 4D to rotate our text through 360 degrees is that easy. But you've probably already spotted the problem. As the text rotates, it splats right through the plinth. We need to move the text away from the plinth.

9 *In the Time Manager, drag the slider to the 25 position.*

10 *Using the mouse, drag the text up and away from the plinth until the Z Position value in the Coordinates Manager is at about -500. You will probably find that it is easiest to perform this action in the side view (bottom left).*



Now we must move the text because it is passing straight through the plinth.



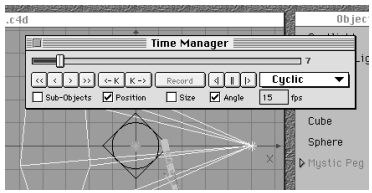
As we move the text, in the 3D view we can see that the text grows larger as it approaches the camera and shrinks as it moves away from the camera.

11 Once the text is no longer cutting into any part of the plinth or crystal ball, press the Record button in the Time Manager.

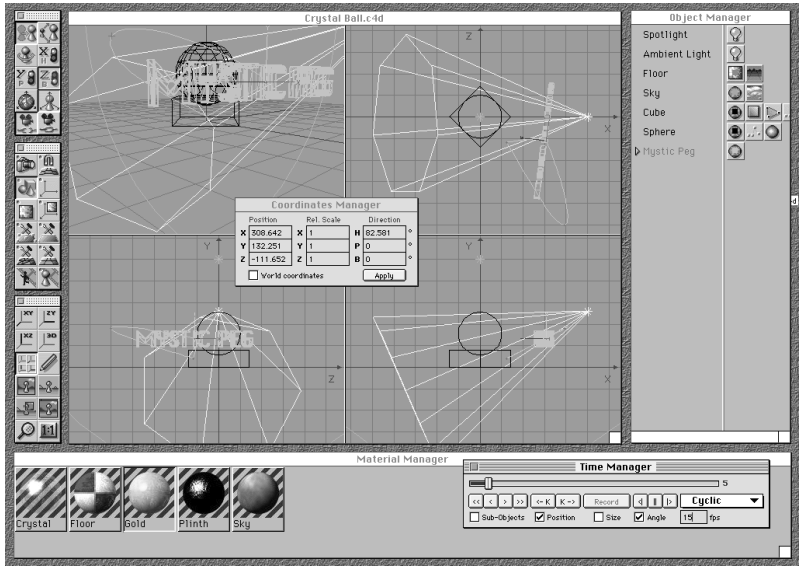
Pressing the Record button has taken a snapshot of the current frame of the scene (a key frame) just as we have set it up. CINEMA 4D will work out what has to be moved or changed from the previous key frame to get the scene to look like this. If we don't press the Record button, the snapshot will not be taken. Forgetting to press the Record button is a common mistake that many novice animators make.

OK, if we now review the animation (by pressing the Play button in the Time Manager) we can see that the text still collides with the plinth at around frame 6 or 7. To fix this we will have to go to the frame just before the text collides with the plinth, move the text away from the plinth, then add that frame as another key frame.

12 In the Time Manager, move the slider to frame 5.



The text is still colliding with the plinth at about frame 7, so we must go to an earlier frame and move the text further away.



13 Using the mouse, move the text up and away from the plinth. When the text is in a suitable position, press the Record button in the Time Manager.

We have almost finished our first animation. To complete it we have to render it as a movie. On the PC this will be as an AVI file, on the Mac it will be as a Quicktime Movie file.

14 Select Render Settings from the File menu and set the General settings to the same as those used in the scene tutorial.

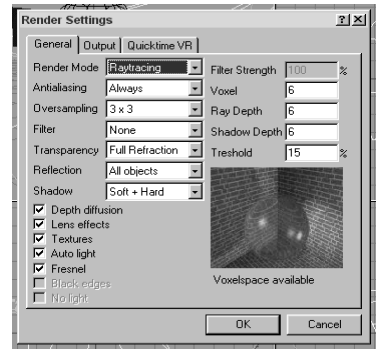
15 Select the Output page.

16 Set Resolution to 320x240.

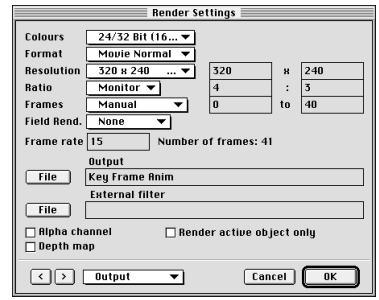
17 Set Colours to 24 Bit.

18 Set Format to AVI Medium (PC) or Movie Normal (Mac).

19 Set Frames to Manual and change the field on the far right from 75 to 40.



For a much quicker (but lower quality) render, set Antialiasing to None.

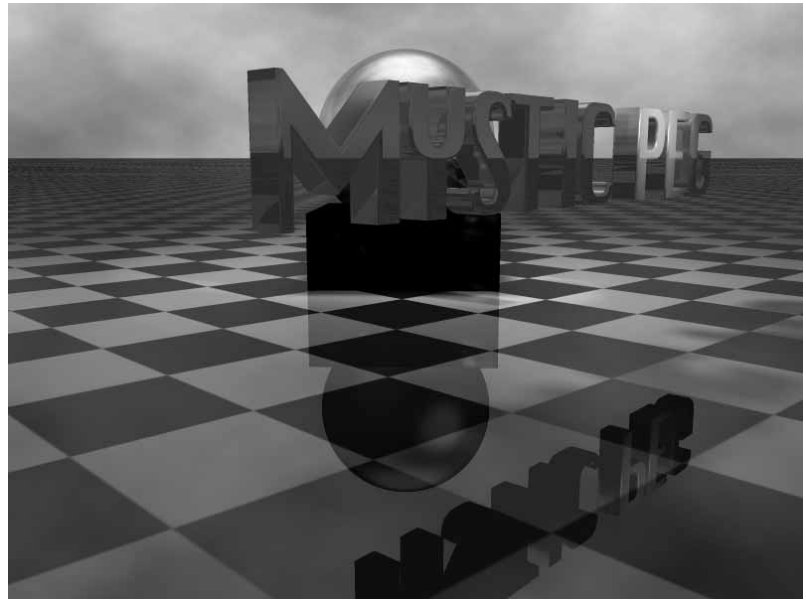


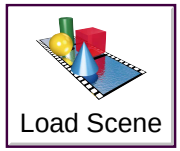
When rendering animations, always check that the Frames setting is set correctly.

20 *Press the File button, select a folder and filename for the movie file, then press OK.*

21 *Press the Render in External Window button.*

A new window will open in which our frames will be rendered one by one, and our complete animation will be saved to the file named in the Render Settings dialog.





To play the animation, double-click on the finished movie file and your default movie viewer will play it for you. (On the PC this will normally be Media Player, on the Mac it is usually Movie Player.)

In the next section we are going to use the Time Line window to animate the individual letters of the text.

Time Line Animation

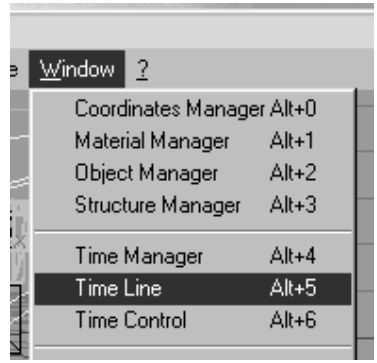
This section will take about 15 minutes to complete (not inc. rendering time).

Keyframe animation is ideal for producing an animation that uses only a few simple transformations. For more complex and professional effects we need to use the time line—a visual representation of when an action starts and stops.

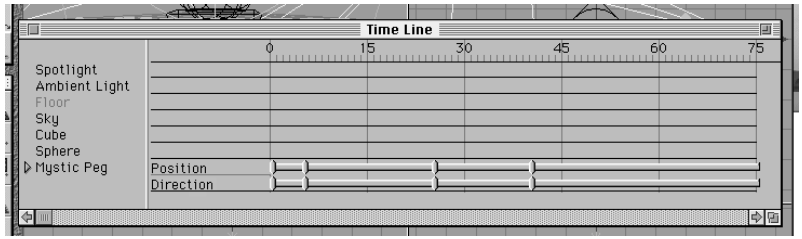
There are three terms we must become familiar with before using the Time Line window in anger, these are tracks, sequences and key frames.

1 *Open the Crystal Ball animation.*

2 *Select Time Line from the Windows menu.*



The Time Line provides a record of every action performed in an animation, and allows us to edit those actions.

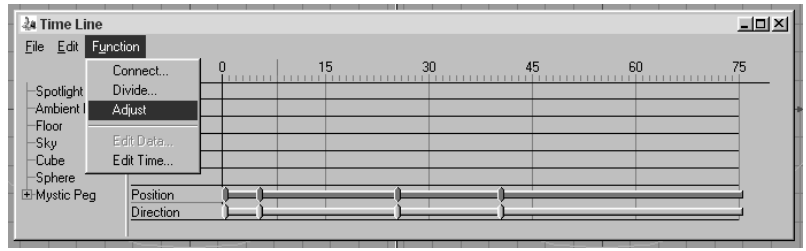


In the Time Line window you will notice that there are two entries labelled Position and Direction. These are tracks that CINEMA 4D created automatically for what we animated in the previous tutorial. The lines running off to the right of the track names are called sequences. Along the sequences there are some little markers. These represent the key frames (a term often shortened to just "keys") that again CINEMA 4D created automatically for the previous animation.

If we double-click on a key or a sequence, a settings window for that key or sequence opens. Double-clicking on a position key opens a window showing the X, Y and Z coordinates of the object at that key frame, double-clicking a direction key opens a similar window but this time showing the heading, pitch and bank (HPB) of the object at that key frame. A double-click on a sequence body opens a window that enables us to set the start and end time of that sequence.

Notice that the sequence has a "tail" that extends beyond frame 40, the last frame of our previous animation. This is for no other reason than because the default animation length happens to be 75. If the tail of a sequence bothers or confuses you, simply select that sequence (click on it so that it turns red) and

select Adjust from the Function menu. This will shorten the sequence so that it ends at the last key frame on that sequence.

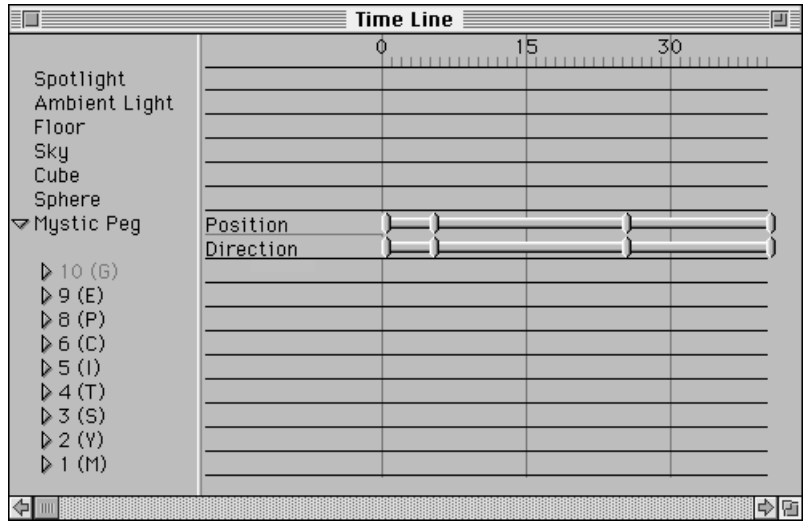


OK, we are now ready to start animating the individual letters.

3 *In the Time Line window, click on the little symbol to the left of the name of our text object.*

This symbol tells us that the object is actually a group of objects. Clicking the symbol opens a list of all the sub-objects for an object. (The same system is used in the Object Manager.) The main object is known as the parent object, the sub-objects are known as the children of that parent object.

4 *Click on the first sub-object of our text (which will be G if, like us, you used "MYSTIC PEG" as your text).*



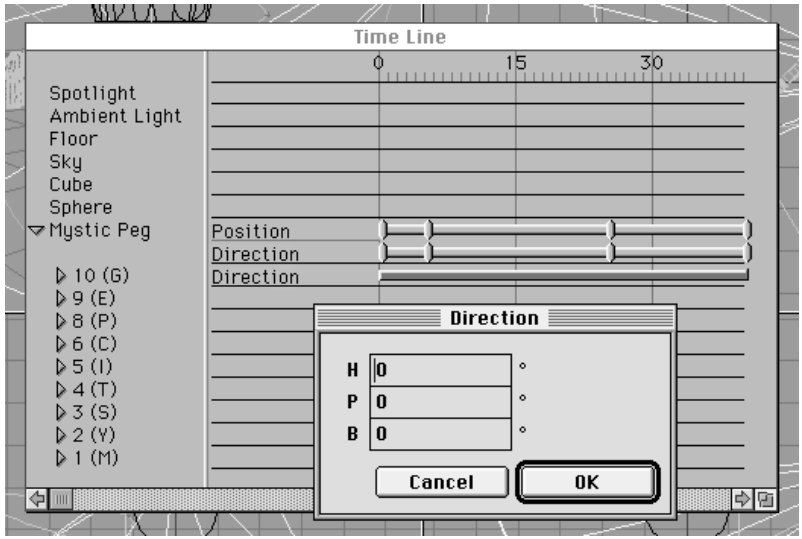
It will turn red and all other object names in the list will be displayed in black.

5 *Go to the File menu and select Direction from the New Sequence submenu.*

6 *In the Sequence Edit window that appears, enter 0 into the From field and 40 into the To field, then press OK.*

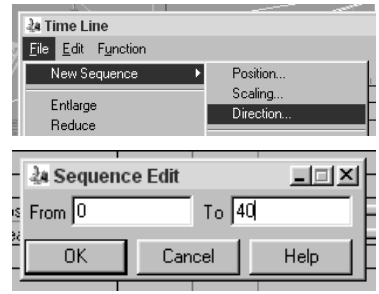
We have created a new direction sequence, starting at frame 0 and ending at frame 40. Now we need to add some key frames to the sequence.

7 *Hold down the Ctrl key and click right at the start of the direction sequence we have just created. A Direction window opens that enables us to add a key frame for the direction. Simply press OK.*

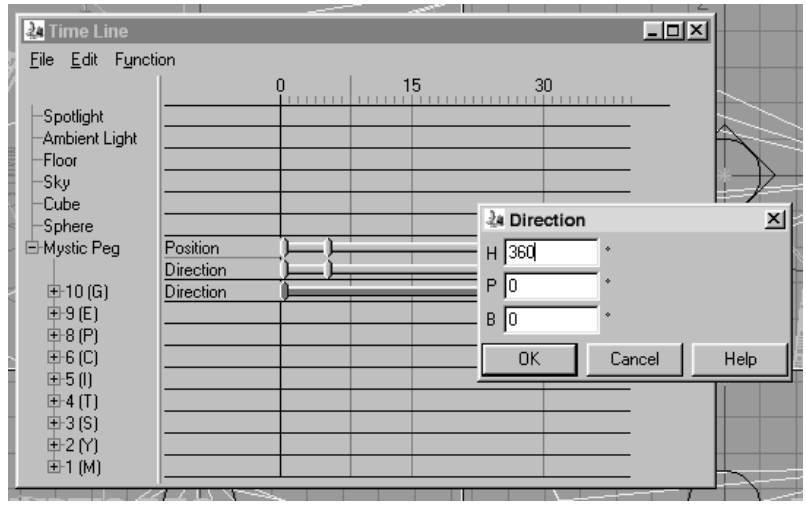


8 *Hold down the Ctrl key and click right at the end of the new direction sequence. The Direction window appears again, this time enter 360 into the H (heading) field.*

The two key frames we have just set will cause the letter to spin 360 degrees about its Y axis. This action will be completely independent of the parent object's sequences.



To animate a letter we have to first select it in the time line and then start a new sequence for the animation to run along.



9 *Go through steps 4 to 8 again to add a new direction sequence to the next sub-object (E in our example), add a new start key, and an end key that has 360 entered into the P (pitch) field.*

10 *Go through steps 4 to 8 again to add a new direction sequence to the next sub-object (P in our example), add a new start key, and an end key that has 360 entered into the B (bank) field.*

Hmm. All this adding of new keys is getting rather tedious. There must be an easier way. Indeed there is. CINEMA 4D allows us to drag-and-drop copies of sequences.

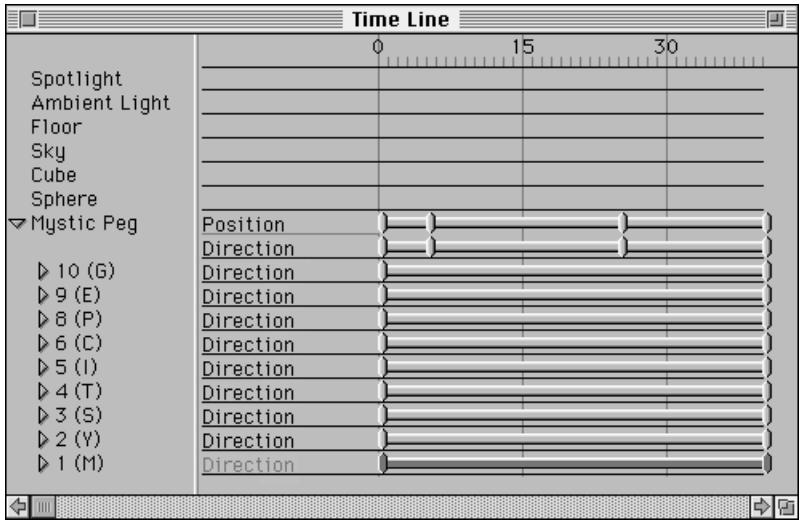
11 *Hold down the Ctrl key and drag the first sequence we created (for G) until it is over the first blank sub-object (the C of "MYSTIC"), then let go of the mouse button to drop a copy of the sequence there.*

If the left edge of the copy isn't lined up with the sequences above it, simply drag the sequence to the left until it lines up. If you click on and drag the Direction track label (rather than the sequence line itself), then the alignment of the original sequence will be duplicated and you won't have to fiddle around with the copy after dropping it.

Because we were holding down the Ctrl key, we have dragged a copy of the sequence and key frame data. If we hadn't been holding down the Ctrl key then we would have moved the sequence rather than copied it.

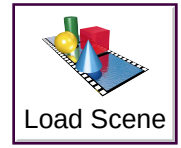
12 *Using the same drag-and-drop technique (holding down the Ctrl key, remember), take the second sequence we created (for E) and drag it on to the next blank sub-object track (I in our example), aligning after dropping if required.*

13 *Using the same drag-and-drop technique, add direction sequences to all the remaining sub-objects.*



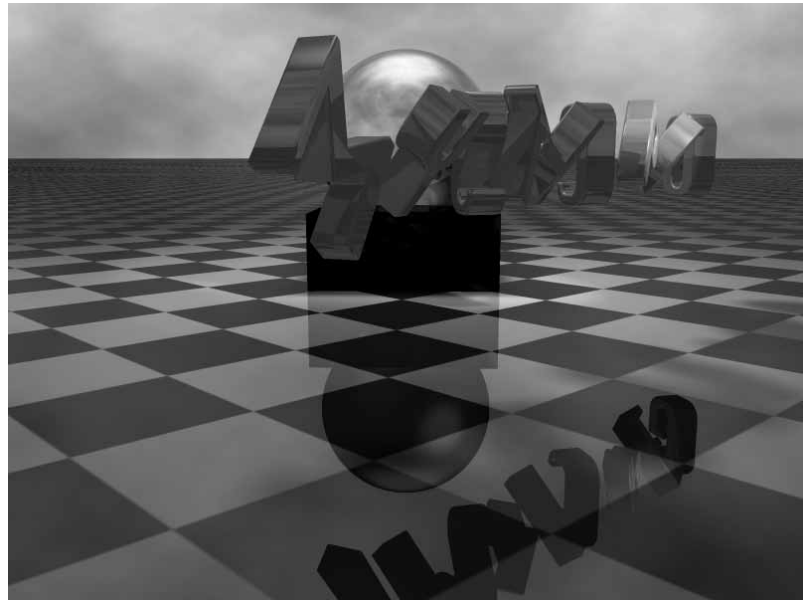
OK, let's have a quick look at what we have done.

14 *Click in the Scene Editor and select Time Manager from the Windows menu, then press the Play button to view the animation in the Scene Editor.*



The text is now taking off, as it was before, but now the individual letters are spinning as well. Looks good to us, let's raytrace it!

15 *Using the same settings as we used for the previous animation, render this new animation (but give it a new filename if you want to keep a copy of the old animation).*



So far we've looked at two animation techniques, and both ask CINEMA 4D to work out for itself how to move objects from A to B. This is fine for simple work, but there will come a time when we know exactly how we want an object to move from one point to another. To do this we need to lay down paths for objects to follow. And that's just what we're going to do next.

This section will take about 10 minutes to complete (not inc. rendering time).

Animation Paths

If we are building a complex animation that has lots of objects moving at the same time, we are going to have a problem remembering where to set key frames. To help with this, CINEMA 4D allows us to define a path which we can tell an object to follow. The technical term for this path is a "spline path".

A spline path is nothing more than a line defined by a series of dots—imagine a 3D join-the-dots puzzle. CINEMA 4D includes a selection of predefined splines, such as circles and squares, but when you become experienced you will be able to draw any shaped spline path you like. To start with, let's animate an object along a predefined spline path.

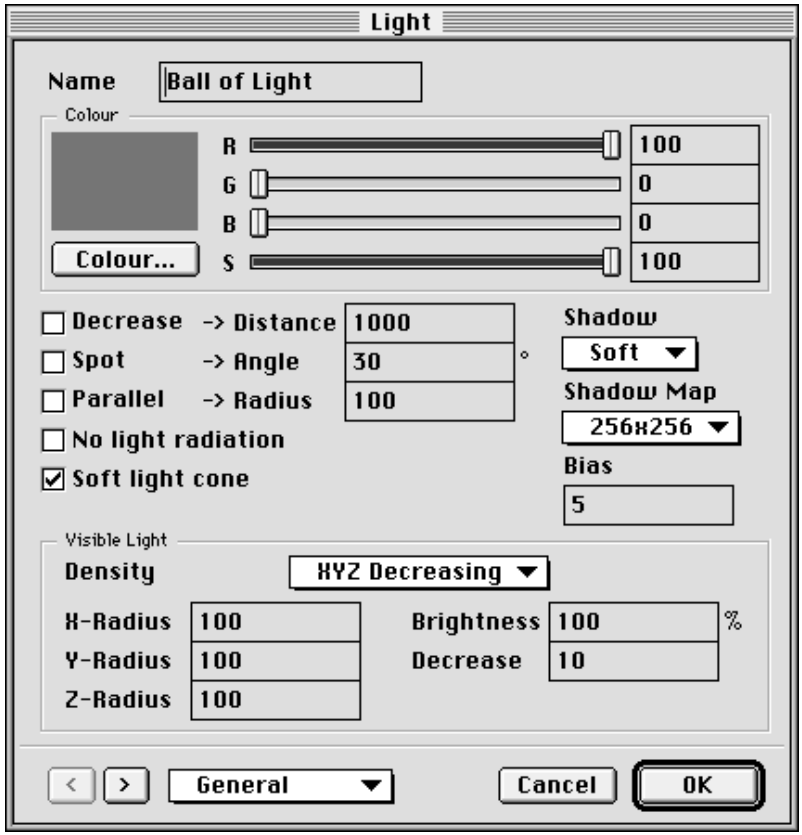
1 *Open the Crystal Ball scene from the last section.*

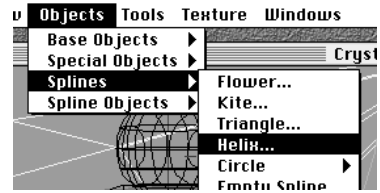
2 *Select Splines>Helix from the Objects menu.*

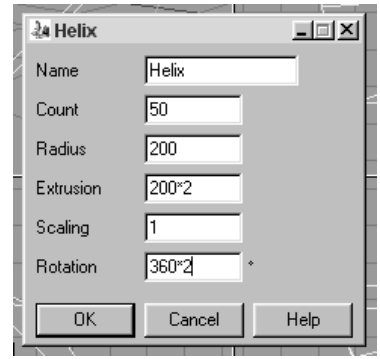
3 *In the Helix settings window, enter *2 next to the value in the Extrusion field and *2 next to the value in the Rotation field, then press OK.*

CINEMA 4D allows us to enter formulae into value boxes. So entering *2 next to the Extrusion and Rotation values will cause the default values of 200 and 360 to be doubled to 400 and 720.

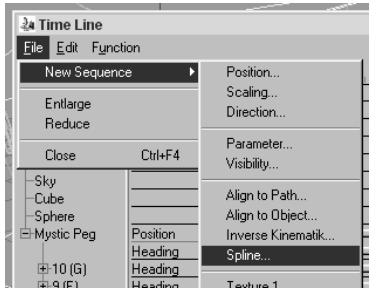
4 *Add a new light source to the scene (Objects>Special Objects>Light) and rename it to Ball of Light.*







Our first step in animating an object will normally be to create a "spline path" for the object to travel along.



If we want to move an object along a path, first we must create a spline sequence for that object.

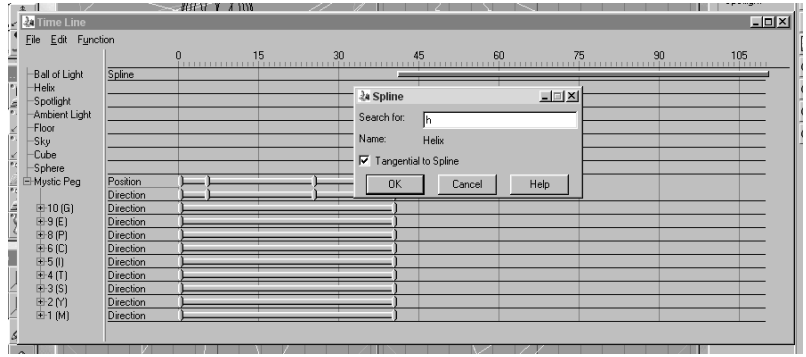
5 *In the Light settings dialog for the Ball of Light, adjust the colour sliders so that R is 100, G is zero, B is zero and S is 100.*

6 *Select XYZ Decreasing from the Visible Light pop-up menu, set X, Y and Z Radius settings all to 100, then press OK.*

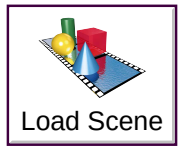
7 *Open the Time Line window, ensure Ball of Light is the selected object, and select New Sequence>Spline from the File menu. Create a spline sequence for the Ball of Light that starts at frame 41 and ends at frame 110.*

8 *Add a new key on the spline sequence (click with Ctrl held down) at frame 41. A box will appear asking for the name of a spline.*

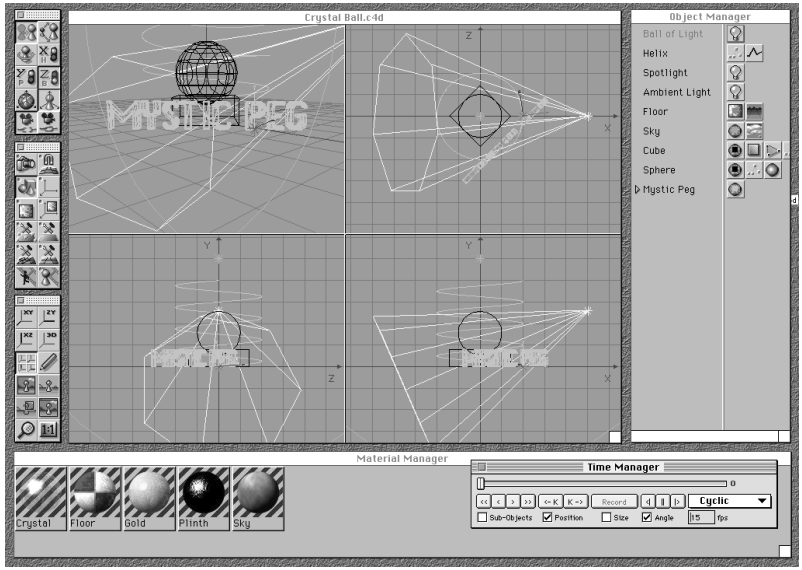
9 *Start typing "helix" and before you even get to typing the "e" you will see that the word "Helix" appears below the entry field. This is CINEMA 4D completing the name for us. Press OK.*



If we now return to the Scene Editor and review the animation by moving the Time Manger's slider, we will see the ball of light wind around the crystal ball as it follows the path of the helix.



10 *Open the Render Settings dialog and using the same settings as we used for the previous animation (ensure that the Frames option is set to All Frames), render our new animation. (Give it a new filename if you want to keep a copy of the old animation).*



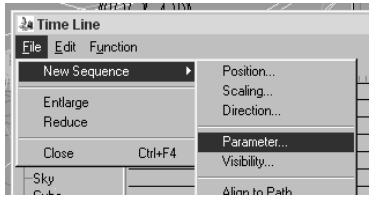
Recall that we have added 70 frames to the animation so it is going to take about three times as long to render as either of our previous animations.

For our final two tutorials we are going to use some more advanced features to add spit and polish to our animation. First we are going to fade the ball of light into the scene so that it doesn't just appear out of the blue, then we are going to zoom the camera into the crystal ball and fade the whole scene out to white.

Animating Lights

This section will take about 2 minutes to complete (not inc. rendering time).

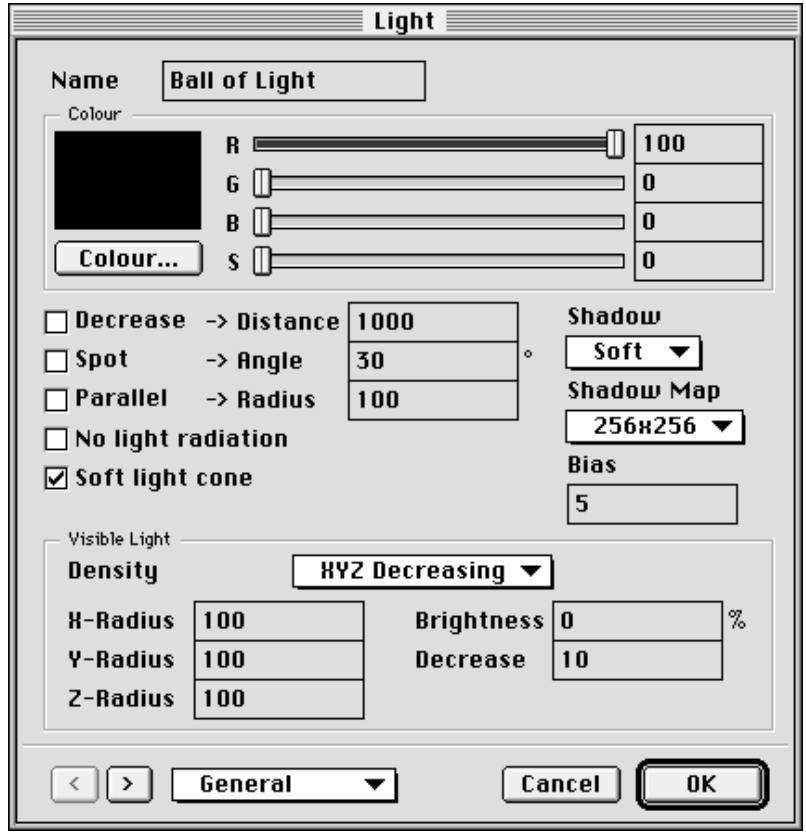
If you've played the animation rendered at the end of the previous section you will have noticed that the red ball of light suddenly appears at the base of the plinth and then starts moving up the spline path. This is not a particularly elegant way of introducing the ball of light to the scene. What this section will deal with is animating the ball of light so that it fades into the scene, then changes colour as it travels along the spline path.



We are going to change the parameter settings (colour and strength) for the ball of light, so we must first create a parameter sequence for it.

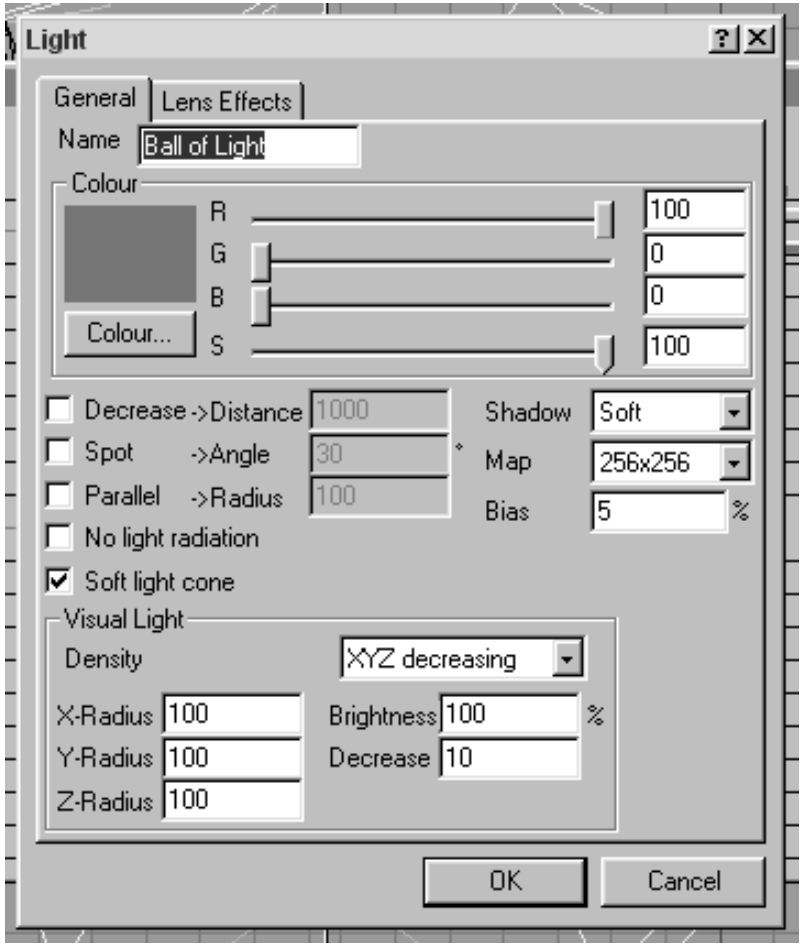
1 *Open the Time Line window, ensure that Ball of Light is the selected object, and select New Sequence>Parameter from the File menu. Create a parameter sequence between frames 41 and 110 for the Ball of Light.*

2 *Hold down Ctrl and click the left-hand end of the new parameter sequence (labelled Light in the list) to add a key frame there. The Light dialog will open. Leave the RGB values alone but set the strength of the colour (S) to zero and set the Visible Light Brightness to 0%. Press OK.*



What we've done here is stop the light emitting any rays. In effect, we've turned off the light. Now we've got to set a key frame where the light is full on.

3 *Hold down Ctrl and click the Light sequence at around the frame 70 mark. Leave the RGB values alone, ensure the strength of the colour is set to 100 and Visual Light Brightness is set to 100%. Press OK.*

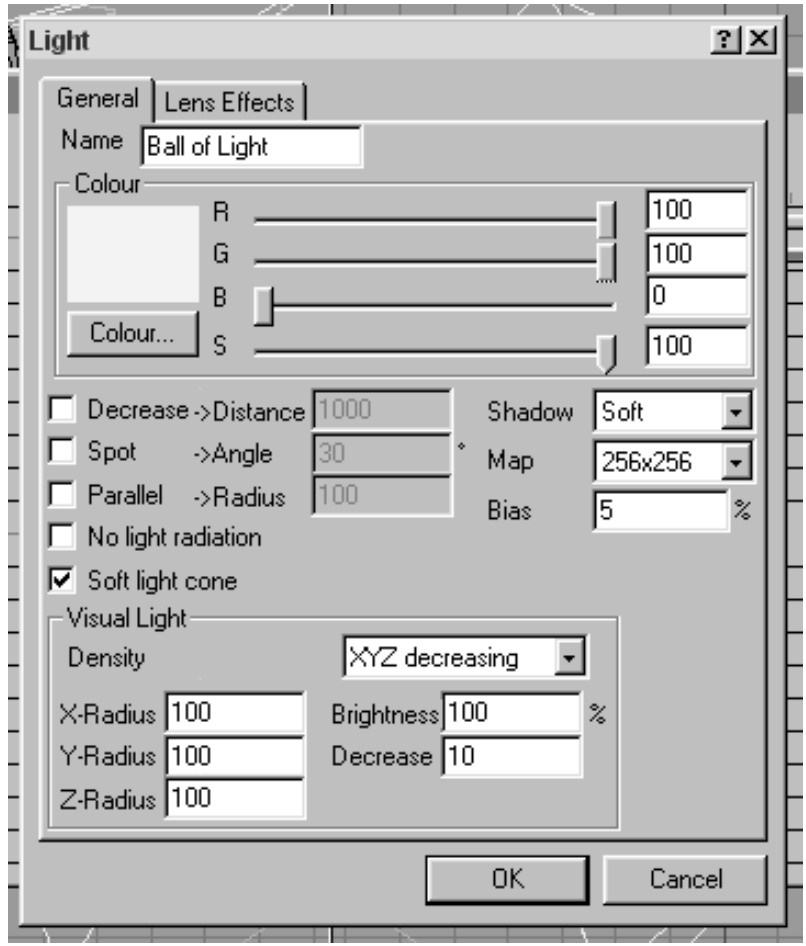


Hmm. Have we set the key frame at the correct point? Sure, it looks like frame 70-ish, but we want it to be exactly frame 70.

4 *Click on the key frame we've just created and select Edit Time from the Function menu. The frame number of this key frame is in the entry field. If it isn't 70, make it 70 and press OK.*

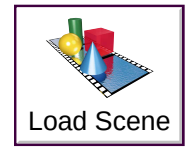
CINEMA 4D will automatically fade in the ball of light from nothing to full brightness over 30 frames (two seconds). Now we want it to change colour.

5 *Add another key at the end of the Light sequence, and this time set R to 100, G to 100, B to 0, S to 100 and Visible Light Brightness to 100%.*



If we now play the animation from the Time Manager, the Scene Editor will show the light change in colour as it goes from black (off) to red (frame 70) and then to yellow (frame 110).

Don't render the scene again at this point because we have just two little finishing touches to put to it.



This section will take about 2 minutes to complete (not inc. rendering time).

Animating Textures

For the final scene of our animation we are going to make the camera move from its current static position towards the crystal ball, and when it gets to the point at which the crystal ball fills the camera view we are going to fade the crystal ball to white (which in effect will fade the whole scene to white). Let's do the fade first.

1 *Open the Material Manager, add a new material, rename it to White.*

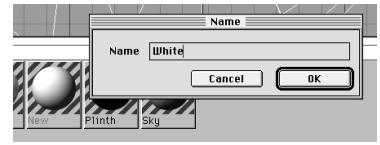
2 *Double-click on the new White material to edit it.*

3 *Switch off the Colour option (no tick in the box).*

4 *Switch off the Trans. option.*

5 *Switch of the Refl. option.*

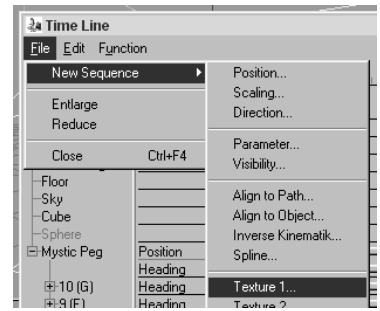
6 *Go to the Luminance page and switch on the Lumin. option. Set the R, G, B and S values to 100.*



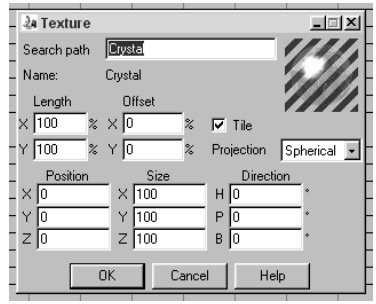
We are creating a new White material so that we can "animate" the Crystal material gradually from one material to another.

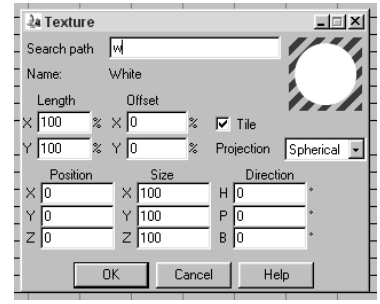
So what have we been doing? The material we have created has a brilliant, pure white luminance, but it has no colour, no transparency and is not reflective. We are going to feed this material into the Time Line so that CINEMA 4D can smoothly change the texture of the crystal ball from its current glass-like appearance to this brilliant white.

6 *Go to the Time Line window, ensure that Sphere is the selected object and select New Sequence>Texture 1 from the File menu. Create a texture sequence for the sphere (the crystal ball) that starts at frame 170 and ends at frame 200.*



We want to gradually change a texture, so we first need to create a Texture sequence.





7 *Add a key at the start of the texture sequence (Ctrl-click) and leave this set to Crystal.*

8 *Add a key at the end of the sequence and set the texture to White.*

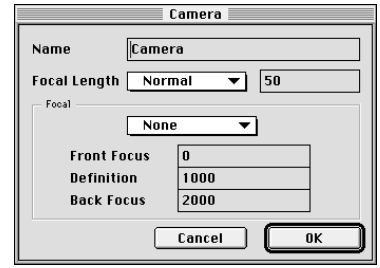
This section will take about 6 minutes to complete (not inc. rendering time).

Animating a Camera

1 *Open the Time manager if it isn't already open and move the slider to frame 110.*

Since we are planning to move the camera, we need to add a camera object to the scene so that we can set position sequences.

2 *Go to the Scene Editor and select Objects>Special Objects>Camera. Ensure Lens is set to Normal and Focal Length to None, then press OK.*



The new camera object will be placed in the same location as the current Scene Editor camera.

The Attach Editor Camera to Active Object button.

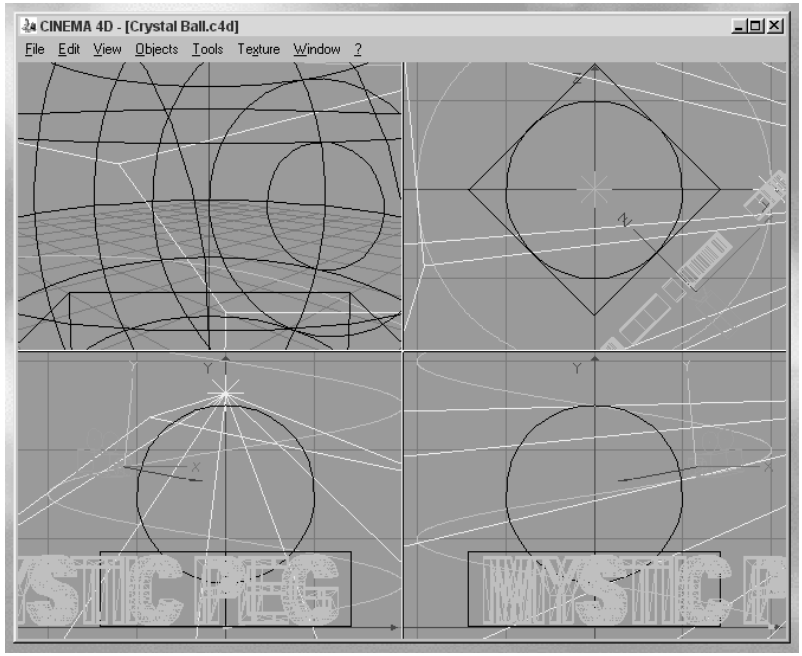
3 *In the Action toolbar, select the bottom right button—Attach Editor Camera to Active Object.*

This button attaches the Scene Editor camera to the currently selected object. Since the new camera object is the currently active object, the Scene Editor view will switch to the view from the new camera object.

4 *Press the Record button in the Time Manager and then move the slider in the Time Manager to frame 170.*

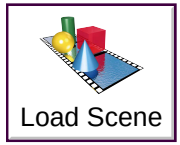
5 *Ensure that the Edit Object button is selected and then lock the X axis (leaving Z and Y unlocked).*

6 *In the Scene Editor, drag the camera object so that it almost touches the crystal ball. (Ensure that it is the green-coloured camera you are moving, not the red-coloured spline path for the camera.)*



7 *Press the Record button in the Time Manager.*

Our animation is now complete. Well, OK, we haven't rendered it yet, but that's all there is left to do.



The Final Render

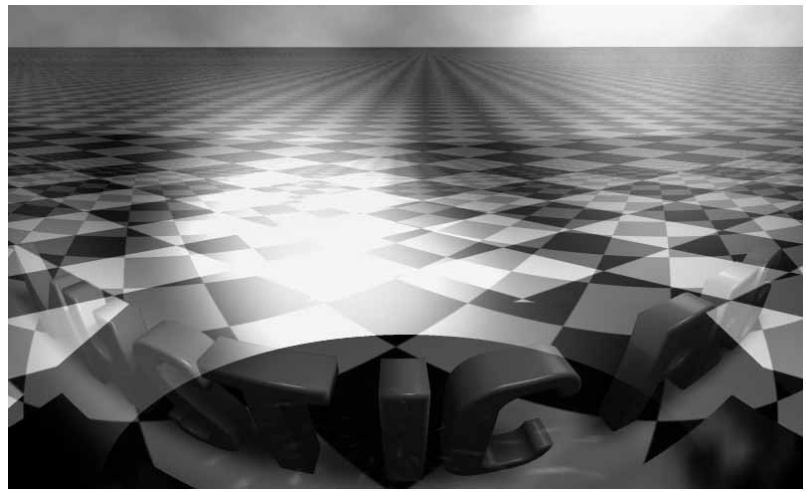
Now then. We've got 201 frames here with refractions and reflections all over the place. Even at 320 by 240 pixels (VHS NTSC size) it is going to take quite a while to raytrace. Exactly how long will depend on the speed of your computer.

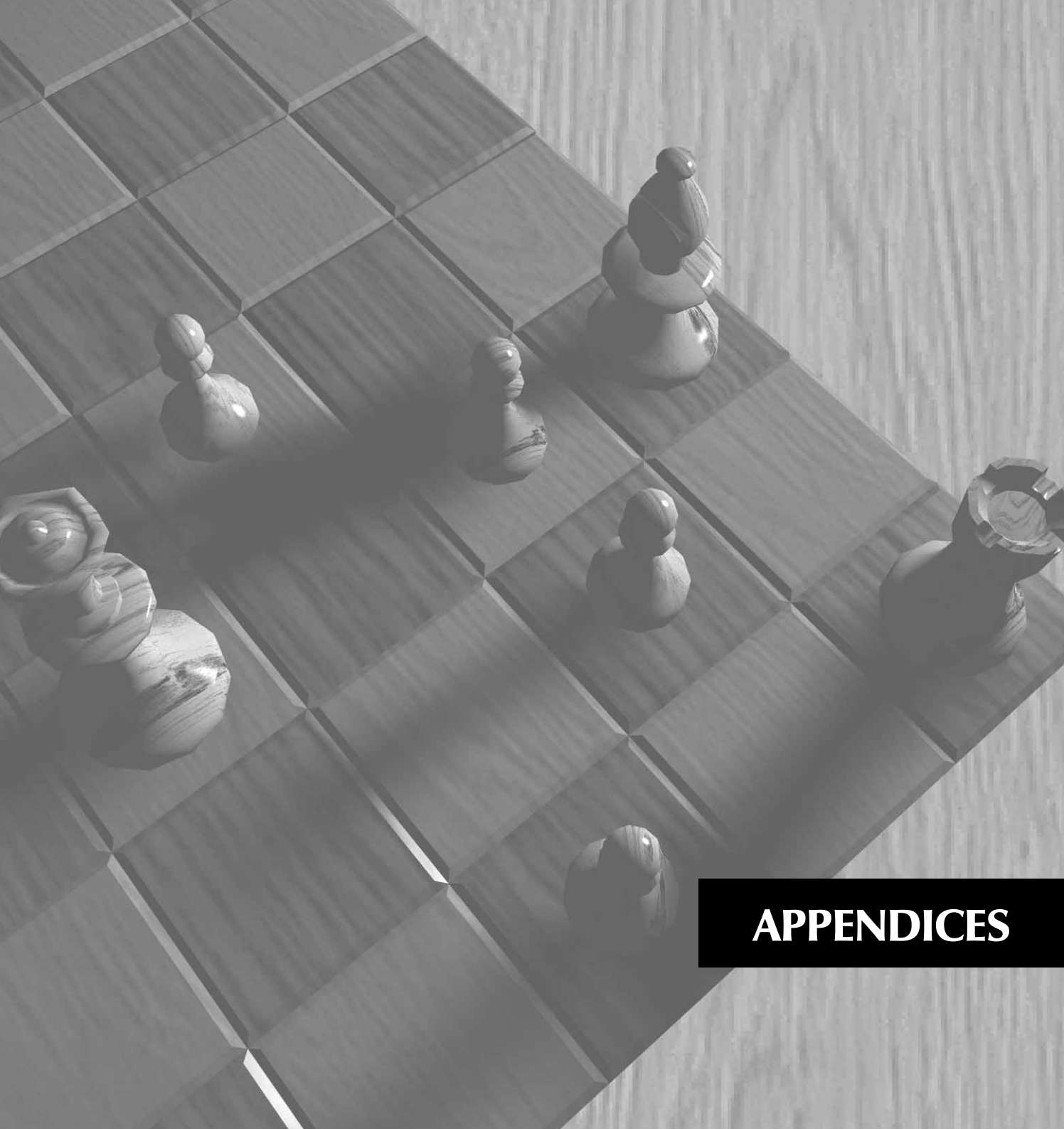
With antialiasing and 3x3 oversampling, on the fastest professional Macintosh it'll take maybe two hours. On a fast home PC we're looking at about nine hours. On the slowest Power Mac it'll take about two days.

If you are busting to view the animation as quickly as possible, then render it with the settings we used before, but switch off antialiasing. The animation won't look quite as nice, the floor tiles in particular will have very jagged edges, but the animation will render much more quickly—about four hours on the slowest Power Mac; about one hour on a fast home PC; about 15 minutes on the fastest professional Macintosh.

Also keep in mind that there is nothing to stop you rendering a high quality version of the animation in lots of small stages, perhaps 10 or 20 frames at a time, then using a suitable program to join the bits of the animation together.

Of course, we're lucky, we bought CINEMA 4D. Had we bought some other modeller/raytracer then we might have had to wait a week, two weeks, a month or more for this animation to render on our home PC or Power Mac.





APPENDICES

A. WHAT NOW?

Having completed the scene and animation tutorials, you now have a solid foundation on which to build. If you're new to 3D modelling and animation, the trick is not to be too ambitious to start with.

Begin by changing the tutorial scene and animation. How about making the crystal ball lift off the plinth, fly about a bit, then land and roll off into the distance? If you have followed along with the tutorials, you have the skills to do this.

Change the materials, change the textures, change the colours... change everything. You will learn more from this type of experimentation than by attempting to create a scene or animation from scratch that at this stage is too ambitious for you.

After changing everything, add things. Adding more lights is a good place to start. How about putting a sun in the sky? And how about adding more crystal balls and having them "dance" around the scene?

Adding to an existing scene or animation is a good way to exercise your imagination and build on your current skills. When you hit an impasse, when you feel you are stuck because you can't think how to achieve the effect you are after, get out the main CINEMA 4D reference manual, read about all the features that you think might be related to what you want to do, then experiment with simple scenes and animations. If you want to see what effect a setting has on an object, make a big change to the setting so the difference is obvious.

The secret to success here is remembering what changes have what effects. In the early weeks and months with a creative program like CINEMA 4D it is so easy to create an impressive effect and then completely forget how you did it. So keep a record. Write down what you are doing. A couple of minutes recording your actions could save hours of thrashing about trying to duplicate that neat little effect you created three months ago.

And always remember that it is the manner in which you combine features and settings that produce those very special effects that take the breath away. As a small example, think back on how our tutorial animation changed when we decided to make the little glowing light gradually change from red to yellow.

The red light moving around looked nice, but when it changes from red to yellow the scene around the crystal ball is set on fire spectacularly.

This is something which cannot be taught. It has to be discovered. All the tools are here in CINEMA 4D, all you have to do is come up with innovative ways of using them. We firmly believe that the speed and ease-of-use of CINEMA 4D means that you will be producing expert scenes and animations faster than you would with any other 3D or 4D modeller and raytracer.

Thank you for taking the time to read this book and follow along with the tutorials. We are not going to wish you luck with your modelling, instead we wish you swift inspirations.

B. WHAT IS RAYTRACING?

Raytracing is the oldest and most elegant method of creating life-like images on a computer. With the aid of laws of physics and mathematical formulas, raytracing simulates the natural behaviour of light rays.

To start with a few thousand rays of a light source are selected, and their route is traced. Some rays hit an object and will be reflected, refracted or absorbed. Others will vanish into infinity or will hit upon the surface of the scene. Eventually—directly, or indirectly via reflections—only a fraction of these rays will end up on the focal plane of the imaginary camera (simulated by the screen of the computer) and will create the corresponding pixels with the computed brightness and colour.

It didn't take long for people to realise that this method, though physically correct, is far from efficient, especially since enormous numbers of rays have to be calculated, none of which may even end up on the screen. So nowadays we use the raytracing system the other way round. The rays start on the focal plane of the camera. The program selects exactly those that pass through a pixel of the monitor. The program traces the route of each ray through the scene until it hits an object, the surface or the sky. It then computes the brightness of the point of impact related to the lighting of the scene by the various light sources.

If shadows are to be computed then the program has to calculate rays from the point of impact to all light sources in the scene in order to establish whether or not there are one or more objects between the point of impact and the light sources. If the program also has to compute reflections then it has to calculate a reflected ray (originating from the point of impact) with subsequent new points of impact, shadow rays, and so on. To calculate transparency and light refraction, separate rays are needed. Thus the original ray branches out into more and more reflected and refracted rays.

As the computing time and hard disk space of a computer are not infinite, the program stops after a user-defined depth of branches is reached. When the program reaches this cut-off point it averages the brightness of the established points of impact to an overall brightness value for the pixel from which the ray originated. In order to put colour on the screen, the brightness is calculated separately for red, green and blue, the three primary colours.

Even though this method traces only those rays which are relevant to the brightness of a pixel, the computations required are vast. The program has to consider every object in a scene for every single ray, and then calculate the intersections with that ray. The intersection nearest to the origin of the ray is then selected.

Even a slow computer takes only a fraction of a second for such a calculation, but an average scene would require several million of these computations so you can see that even mainframe computers would not able to calculate reasonable pictures in a reasonable time without the use of some kind of accelerating method.

Among many other methods, one recently developed is known as the voxel method.

Voxels

The voxel method minimises the computing time needed to calculate the intersections. As many rays will intersect with only a few objects of the entire scene, it is therefore desirable for the program to calculate only the intersections with these few objects. In order to achieve this, the space in which the scene is situated is divided into small cubes called voxels—a kind of 3D pixel.

The program will check in which of the voxels objects are found, and will remember which objects are in which voxels. When the program wants to calculate which objects a certain ray will hit, it now simply has to look up which voxels are passed by the ray on its path. Empty voxels will be disregarded. An intersection computation with the few objects within a voxel are needed only when the program finds a full voxel. All other objects are no longer considered. An enormous amount of time is saved using this method.

CINEMA 4D goes even further in its quest for the fastest possible rendering times. The raytracer used by CINEMA 4D is known as an adaptive raytracer. In many areas of a picture no calculation of reflected or transmitted rays is needed; so in these areas the raytracer automatically switches to the faster scanline method of rendering, thus saving even more computing time.

C. RENDERING TIME SAVERS

- *Switch off reflections.*
- *Switch off transparency.*
- *Switch off shadows.*
- *Use soft shadows instead of hard ones.*
- *Use Floor & Sky reflections instead of All Objects (or use environment mirrors, which can be computed extremely quickly).*
- *Use Edges & Colours instead of Always when selecting an antialiasing mode.*
- *Don't set the Threshold value below 15%.*
- *When the picture allows it, switch off the the Fresnel option.*
- *Construct models using squares instead of triangles.*
- *Avoid using light sources that create shadows. Light sources that don't create shadows take relatively little time to compute.*
- *Keep in mind that objects which are distant in a scene can be constructed using simpler techniques (fewer segments, for example).*
- *Don't overload your models with bump maps. Use bump maps only when they really enhance the picture.*
- *Split-up your scenes where possible. When computing a complex animation you can save a lot of time by excluding non-visible or non-relevant objects when using certain camera angles.*

D. STUNNING SCENES

When you work with CINEMA 4D you have to be modeller, director, lighting technician, cameraman, editor and a whole lot more all in one. There is no substitute for experience, but we can give you some general guidelines.

Learn to Observe

Start looking at advertisements and films with a new and detailed eye. If you see something of interest on the TV, videotape it and study it frame by frame. Pay special attention to where the light is coming from and what colour filters have been used. Perhaps one corner of the scene is emphasised?

In short, ask yourself: How do the professionals do it? Study what you see and then try to emulate it. Never hesitate to enhance your pictures using a painting program. (It's not cheating!)

Light is the Key

The quality of a scene largely depends on the lighting. Clever use of light can make up for a less than perfect scene. On the other hand, poorly considered lighting can make a brilliantly constructed scene appear unrealistic, as if it has been made out of plastic. So don't spare the lighting effects, but think about what you are doing.

A common accident that beginners have is making the scene too bright. Remember, each light source adds to the overall lighting of the scene so, if you have lots of lights, reduce the brightness of each.

Use coloured light. Sunlight, for example, is a bit yellowish during the day and redder towards evening.

For every scene use at least one light source that does not light the scene directly, but from behind or from the side. This way the scene looks more realistic. The standard camera "flash" light is useful while constructing scenes but is not suitable for high quality pictures.

Please make full use of fading light, spotlights, light maps, lens flares and light halos, but keep in mind that another common mistake made by beginners to modelling and rendering is the overuse of lens flares. For well over a hundred

years optical engineers and photographers have been trying to eliminate these refractive artifacts from camera lenses, so easy does it, eh?

Don't forget about visual light, by the way! Visual light—a torch beam piercing the darkness, for example, can enhance even the dullest of scenes, and as visual light does not add to the scene lighting it costs next to no extra computing time.

Above all, use your camera position in a creative way. For example, tilting your camera angle will almost always create a more dynamic picture.

NOTES