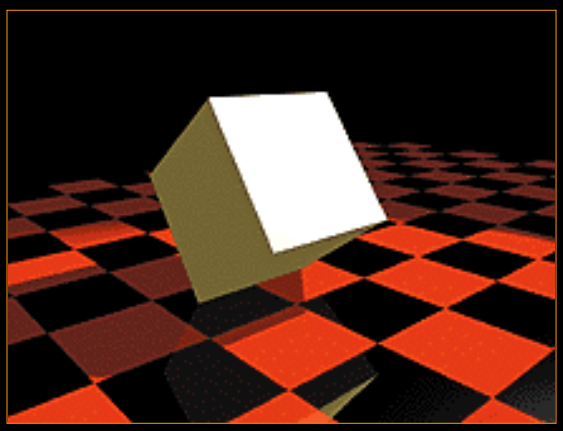
HOW TO ANIMATE A ROLLING CUBE

By Alan Harris

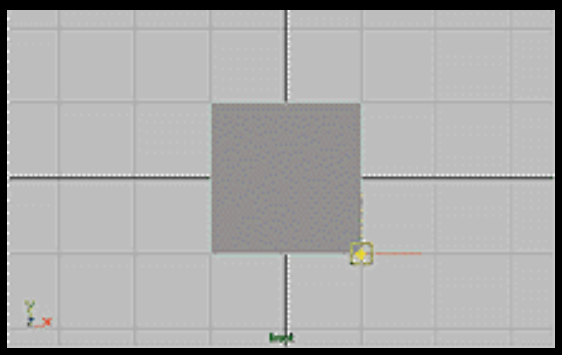
Maya Complete Animation



Play Movie [~480kb]

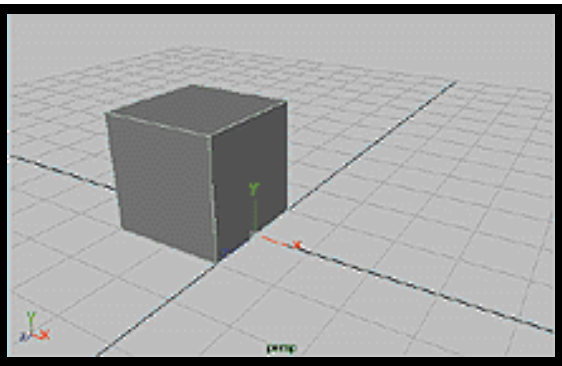
One of the many powerful features of Maya is the ability to animate the location and properties of an object's pivot point. In this lesson, you will use the animatable properties of a primitive cube's pivot point to animate it rolling on its edges. This process will involve the use of the Channel Control window to make certain attributes keyable. Once they are keyable, they will be available in the Channel Box for you to set keys and edit their value. In this lesson, you will also use the Graph Editor to refine the animation curves to get exactly the kind of motion that you need.

STEP ONE



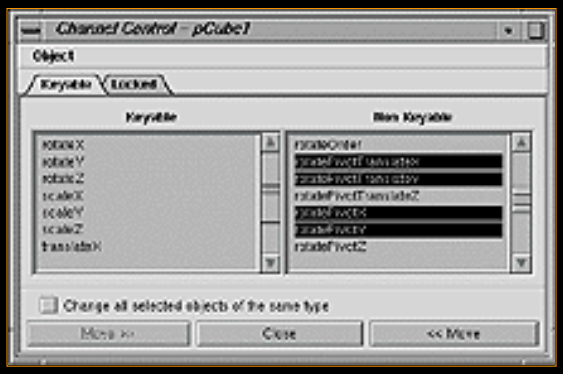
Place a primitive poly cube into the scene and scale it to 2, 2 and 2. Select the **Move** tool. Place the front of the cube at 0 along the Z axis. Press the **Insert** key to go into edit mode then move the pivot point to the middle of the cube's front edge. You may want to use grid snapping to help you position the pivot.

STEP TWO



Now press the **Insert** key to return to the Move tool then move the cube to the origin. Select **Display** -> **Object Components** -> **Local Rotation Axes** and **Rotate Pivots**. These icons will help you visualize these components as you begin animating the pivot.

STEP THREE



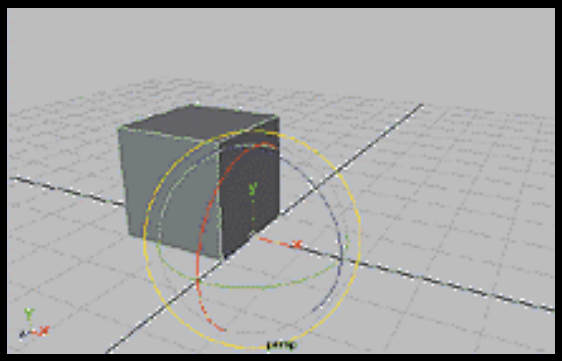
Click to view larger version

Select **Window** -> **General Editors** -> **Channel Control** and select the following non-keyable attributes:

Rotate Pivot Translate X
Rotate Pivot Translate Y
Rotate Pivot X
Rotate Pivot Y

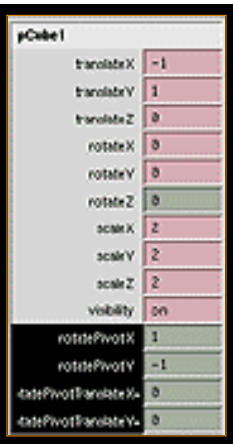
Use the **Move** button to make them keyable attributes. They will now appear in the Channel Box.

STEP FOUR



With the cube selected, set a linear key for Z rotation at frame 1. Go to frame 10 then **Rotate** the cube by
-90 in Z and set another key.

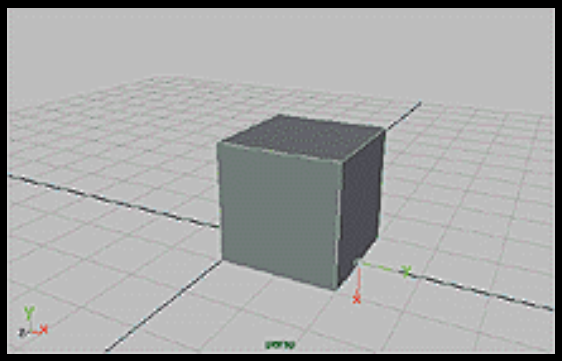
STEP FIVE



Return to frame 1. Select the *Rotate Pivot Translate X*, *Rotate Pivot Translate Y*, *Rotate Pivot X*, and *Rotate Pivot Y* in the Channel Box then use your RMB to choose **Key Selected**.

Click to view larger version

STEP SIX

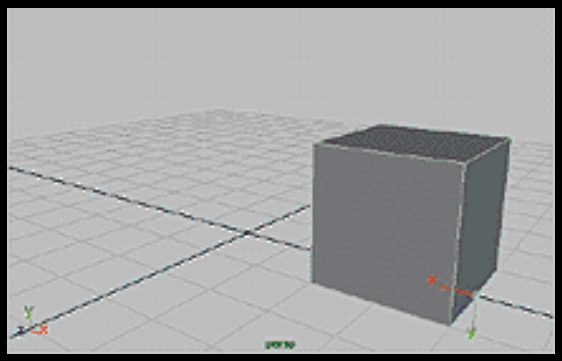


Go to frame 10. Open the Attribute editor and open up the **Pivots** -> **World Space** section. Set **World Rotate X Pivot** to **2**. You should notice that the pivot moves to the front of the cube. Now you can continue rotating the cube.

In the Channel Box, set a key for the *Rotate Pivot Translate X*, *Rotate Pivot Translate Y*, *Rotate Pivot X*, and *Rotate Pivot Y* channels.

Editing the World Rotate Pivot in the Attribute Editor affects these four attributes therefore they must all be keyed.

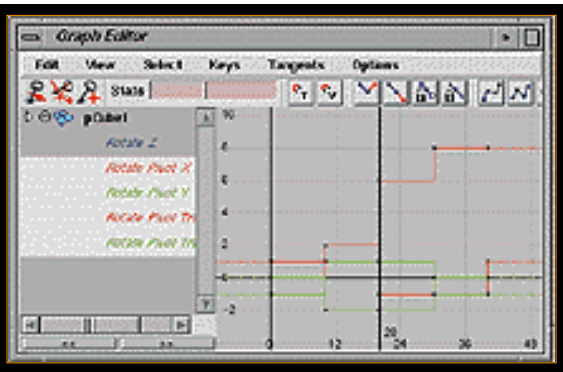
STEP SEVEN



Go to frame 20. Set another linear key frame for a **Z rotation** of **-180**. Set the **World Rotate Pivot** to **4** then set keys for the four pivot channels in the Attribute editor.

If desired, keep rotating the cube and moving the pivot using the steps outlined above. If you playback the animation at this point, the roll of the cube will not seem correct. You need to change the animation curve tangents for the pivot attributes.

STEP EIGHT



Click to view larger version

The incorrect motion is because the pivot point needs to stay in one location for 10 frames then jump to its new location. Open the Graph Editor. Select the four pivot action curves and then select **Tangents** -> **Stepped**. This will create the desired results.

Playback the scene.

CONCLUSION

Learning how to animate the pivot location on an object demonstrates how there are hidden attributes on your Maya objects that can be used to create interesting results. Since all attributes in Maya can be turned into keyable attributes, the possibilities can enhance how you animate your scenes.

If you would like to see this cube animate like gelatin, you may want to complete the How to animate a Gelatin cube lesson.

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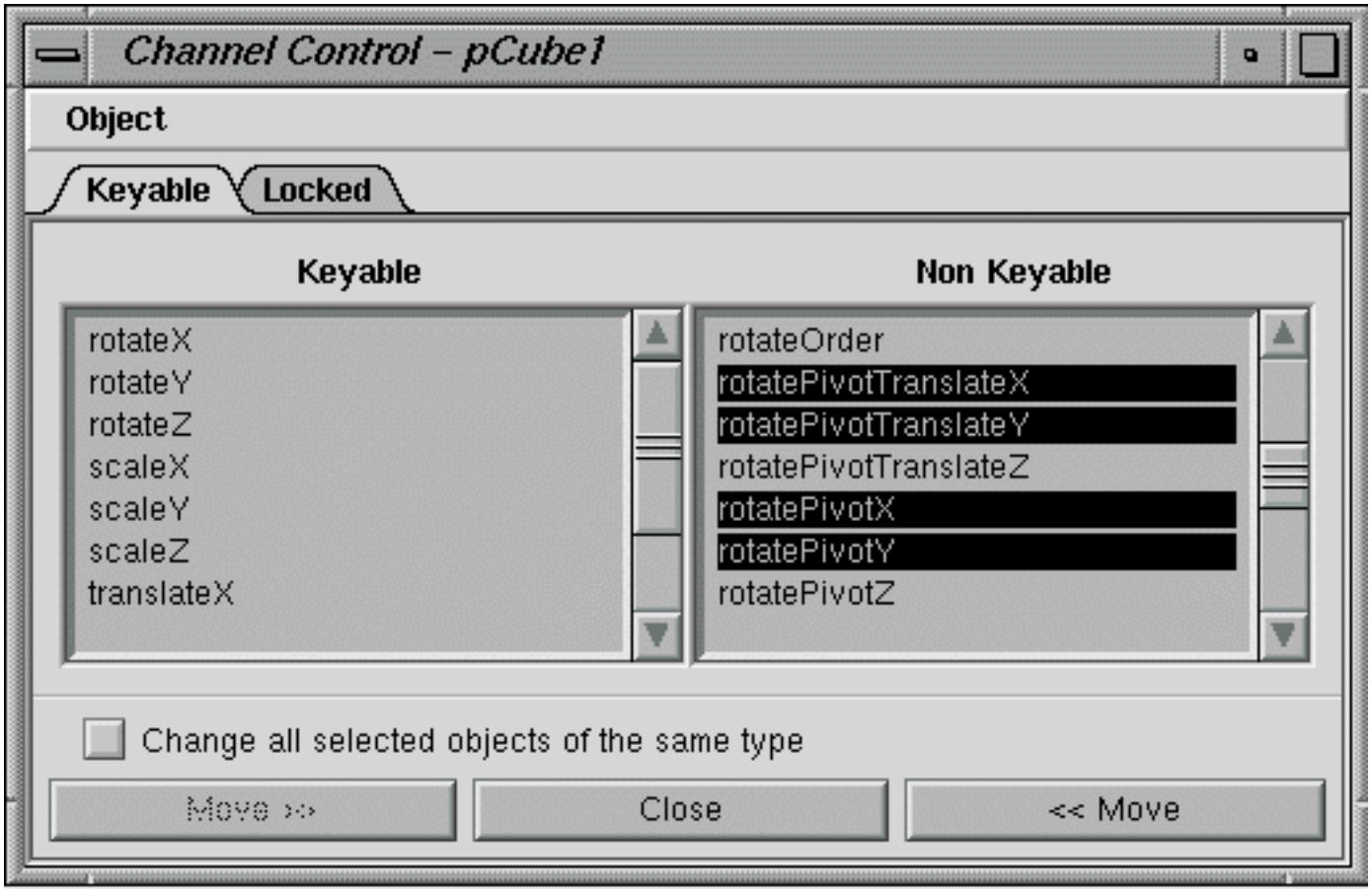
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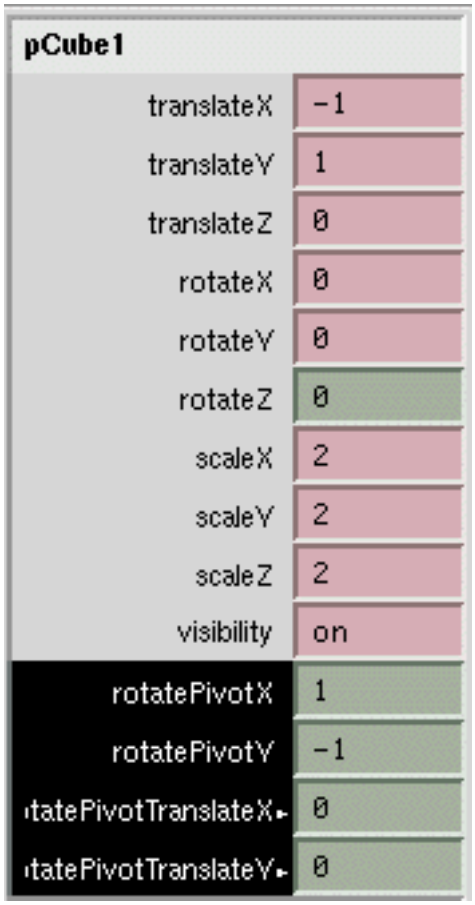
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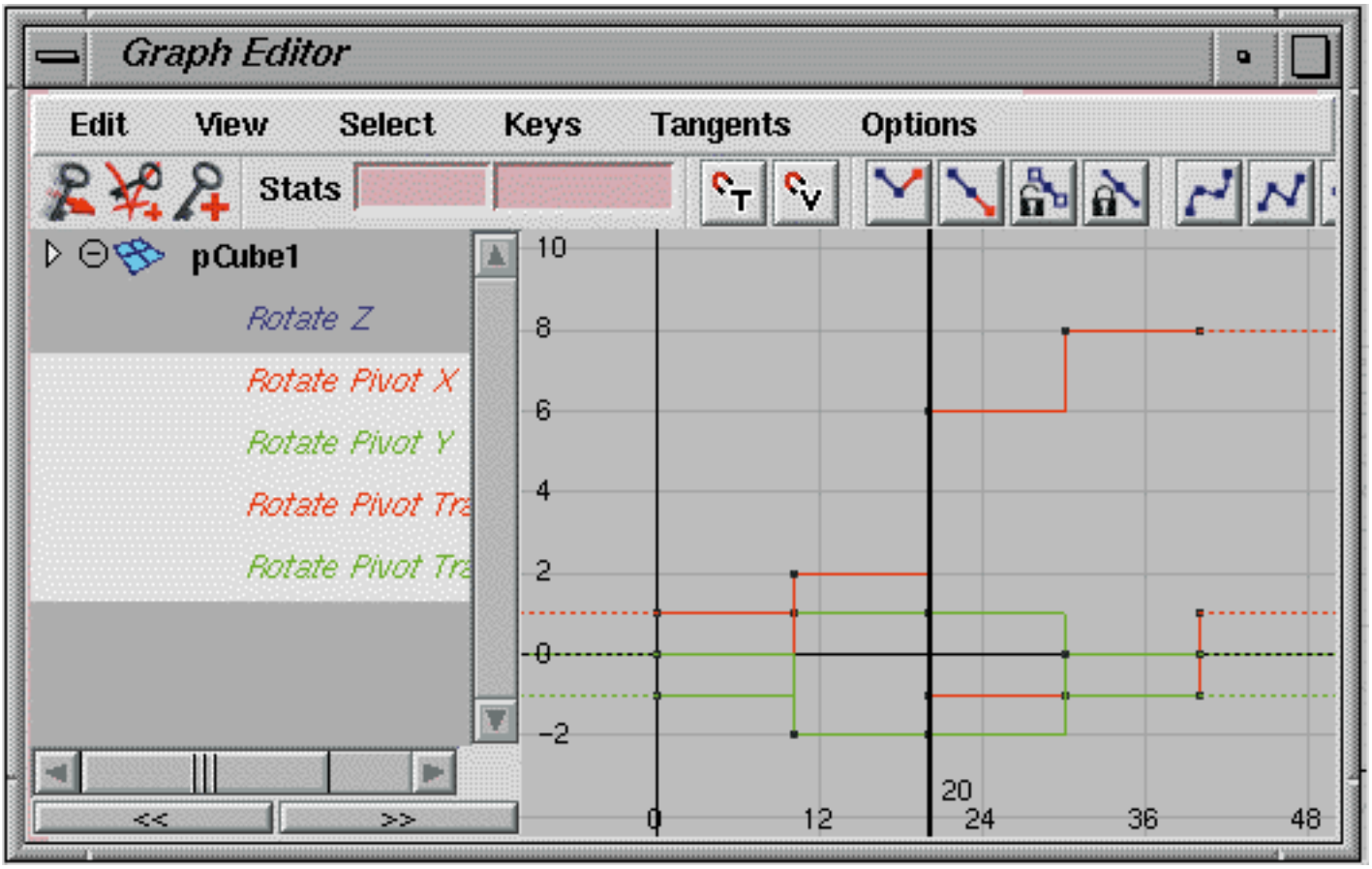
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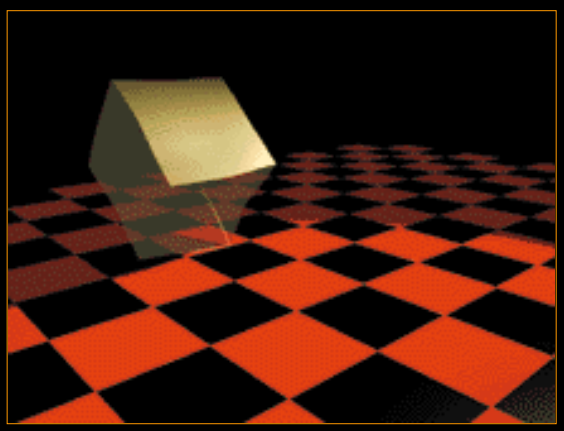
HOW TO ANIMATE A GELATIN CUBE

by Alan Harris

MAYA: FX
Soft Body Dynamics

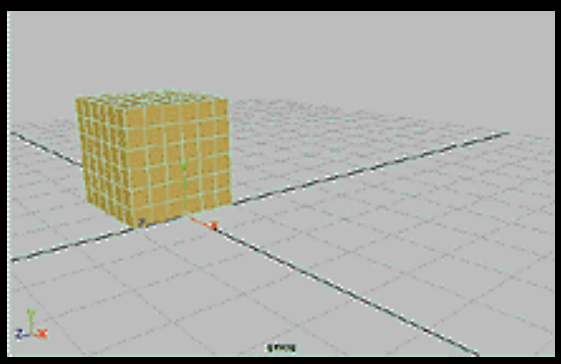


The Soft Body dynamics in Maya F/X allow you to give surfaces a more organic quality as they animate. Using the cube from the How to Animate a Rolling cube lesson, you can use Soft Body dynamics to create the rolling Gelatin cube.

Play Movie [~480kb]

This process will start with the creation of a Soft Body cube that uses the original cube as a goal. The soft body will therefore follow the first cube while colliding with the ground and jiggling along with a turbulence field that you will add to the scene. Once all the pieces have been connected, you will have your animated dessert.

STEP ONE



Select the polycube from the How to Animate a Rolling cube lesson. Click on the *polyCube* Input node in the Channel box then increase the **Subdivisions** along X, Y and Z to 6.

When you create a soft body object for the cube, every vertex on the cube will be matched by a particle on the soft body. If you want more jiggle then you may want to set this value higher than 6.

STEP TWO

- Go to the Dynamics menu set and select **Bodies** -> **Create Soft Body** - **options**, and set the following:

Create Options to **Duplicate, Make Copy Soft;**

Hide Non-Soft Object to On;

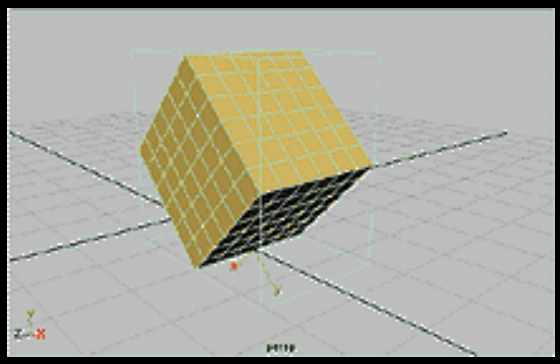
Make Non-Soft a Goal

Weight to **0.66**.

- Press **Create**.
- Rename *copyOfCube1* to *Geletan.*
- *Rename pCube1 to GeletanGoal.*

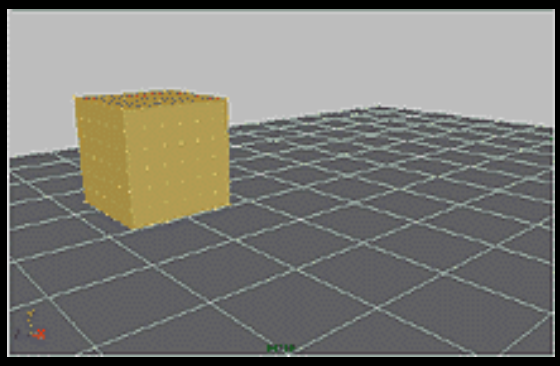
These settings will create a soft body object that uses the original cube as a goal. Each particle will try to match the position of the vertices on the cube with a 0.66 rate of accuracy. This less than perfect accuracy will help create the follow through in the gelatin.

STEP THREE



Click on the **Play** button to see the soft body rotate across the screen. Because the soft body has nothing to collide with it seems to float. Now you will create a rigid body floor surface for the soft body to collide with.

STEP FOUR

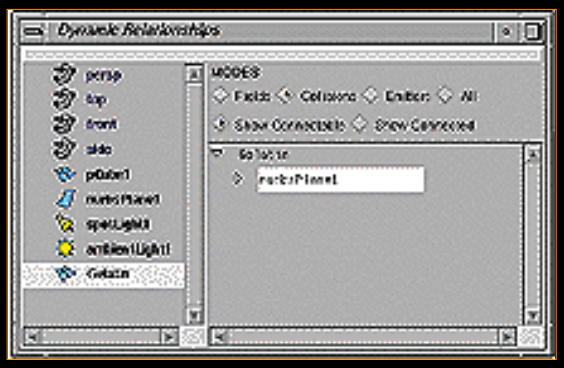


Create a poly plane and scale it out. Increase the **U**and **V patches**. Set its **Translate Y** value to **-0.1**. This makes sure that the gelatin and the floor are not touching initially.

Go to **Dynamics** -> **Bodies** -> **Create Passive Rigid Body** - options. Set **Particle Collision** to **On**. Click **Create**.

If you playback the scene right now, you won't see any collisions. This is because the collision of the particles and the floor have not yet been connected.

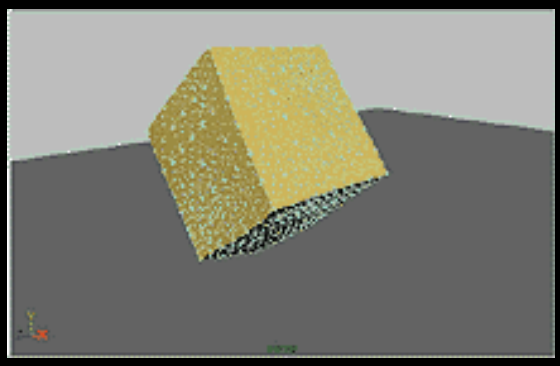
STEP FIVE



Select **Window** -> **Animation Editors** -> **Dynamic RelationIships...** In this window, click on the *Gelatin* surface then set the **Modes** to **Collisions**. Click on *pPlane1* to connect the collisions of the particles to the soft body particles.

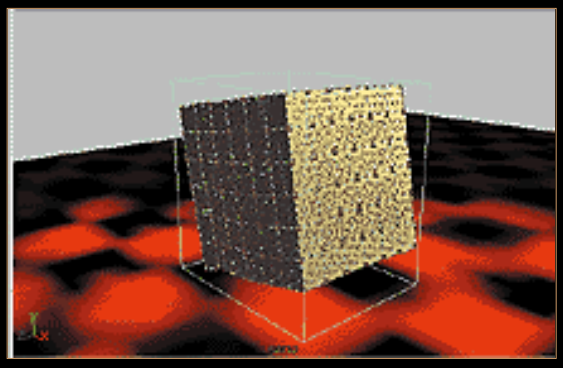
When working with particle collisions, you will find that you often have to manually connect the rigid bodies and the particles in this manner.

STEP SIX



Playback the scene to view the collision of the soft body with the ground. The particles are being pushed back as they collide with the plane. Now you want to add some more motion to the Gelatin surface.

STEP SEVEN



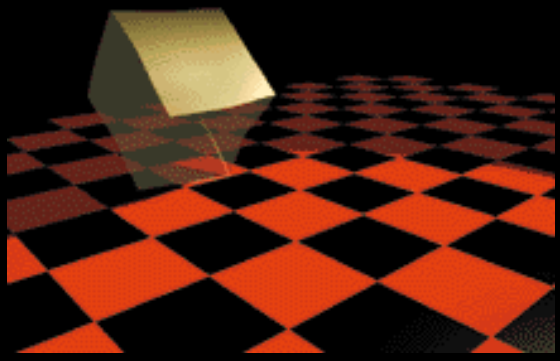
Select the Gelatin soft body object. Select **Fields** -> **Create Turbulence**. In the Channel box, change the **Magnitude** to **60**. This will make the Gelatin jiggle a little more as it moves.

Again select the Gelatin soft body. Select **Bodies** -> **Create Springs** -> options. Set **Creation Methods**, to **Min/Max**, then set the **Max Distance** to **1.0**. Click **Create**.

The springs will help preserve the volume of the soft body as it animates. Springs also provide a sort of internal structure to a soft body as it animates.

STEP EIGHT

Playback the scene. The Gelatin surface now bounces and jiggles in a recognizable manner. You may want to create a Shading group to give the soft body a semi-transparent Gelatin-like surface then render the scene.



CONCLUSION

To animate all the jiggling of the resulting Soft Body cube using traditional deformation techniques would have been very difficult. The advantages of using Soft Body dynamics become clear as you see the subtle movement in the surface.

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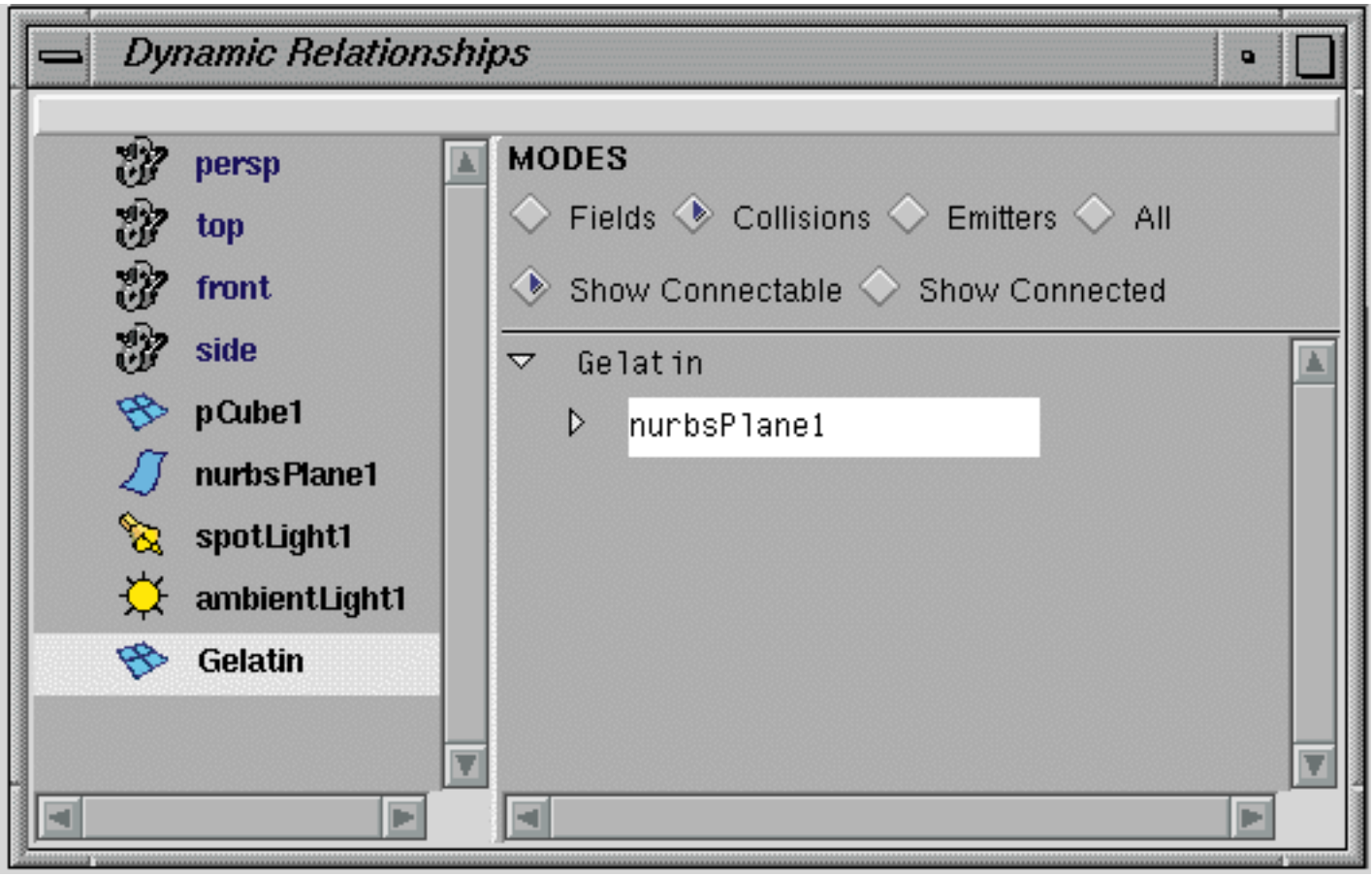
Dynamic Relationships
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