

GrowingRoots

■ Make your references

This tutorial was done after I searched and found no answer into the 3D forums on the net: I thought, there had to be a way to make animatable roots grow. After a 3 month search here¥s the°EUREKA!

The following tutorial was based upon images of "manglares", covering:

- The modeling of the path to grow
- Modeling of root itself
- Texturing the root
- Expressions
- Extra controllers

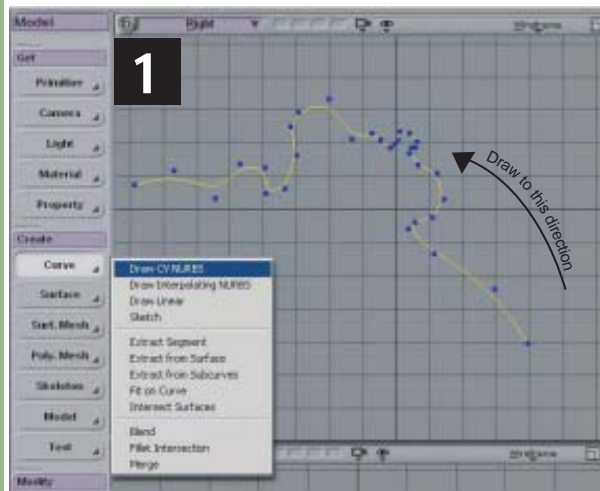
■ ANIMATION

Basically we take a nurb surface and deform it along a path, and write the expressions on the extruding animatable parameter. This effect enhances even more when we extrude along a very irregular bulged form in the 3D space.

We have the character, the perfect story, even a creepy castle, but we are missing something: Where do we get an enchanted evil forest??

Let's model an irregular nurb line and modify its points on the 3D space. For this example my root has 30 points. The bulged shape of the deformed points will give it an interesting animation (and so, that it won't look like a snake when animated) when it's got to "twist" on the grow (on real life the base of the plant obeys to environment changes, it grows slowly when changing "directions". We have to think about these factors to give our root its "personality").

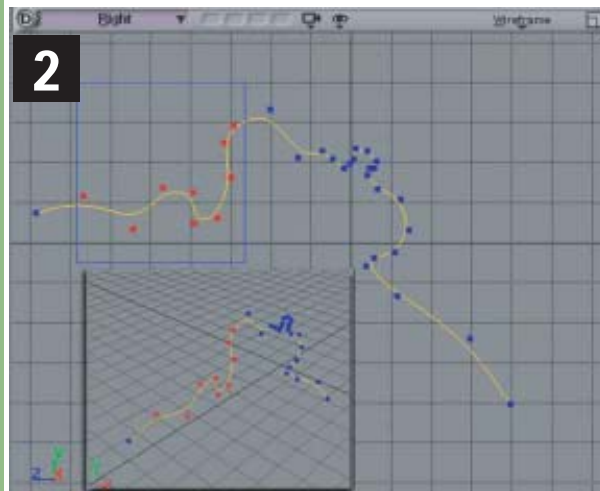
The path



- Panel MODEL >> Create >> Curve >> Draw CV Nurbs.

on the RIGHT VIEW we draw the points from right to left
Make little bulged shapes so the path isn't a straight line. Draw as many points as you desire as long as they're irregular in shape.
Press ESC when you're done.

Select small groups of points from the RIGHT VIEWPORT and move them the TOP VIEWPORT. PRESS and hold M to select only one point and translate it on the the 3D space. If you wish: select many points and press V to translate many points as you've selected.

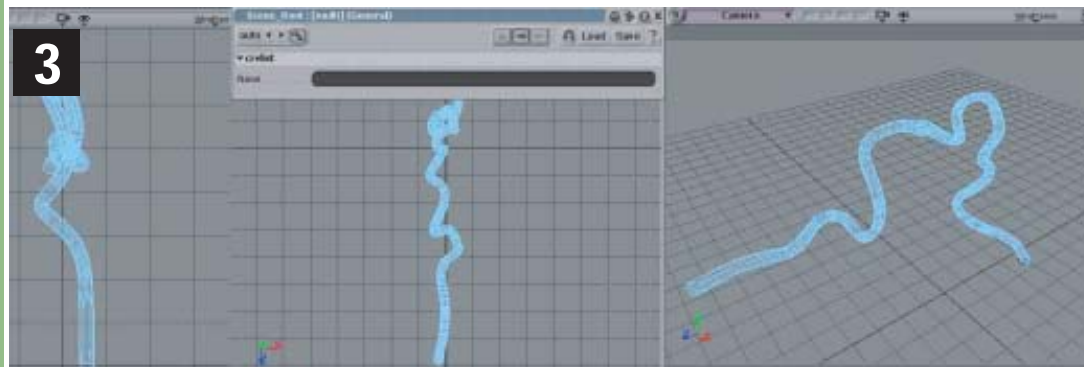


Now we are to modify points in space to give depth. Using right and middle mouse click we translate them into X and Y respectively over the TOP VIEW. Model your path trajectory to suit your needs.

- Select the curve (if it isn't already) and press T. (point selection)

My root after organizing some points and extruding a circle (Panel MODEL >> Primitive >> Circle);(MODEL >> Create >> Surface >> Extrusion along curve); (click on the nurb curve) for visual understanding of the tutorial.

Select the curve and press ENTER. on the window "Name...crvlist", rename it %root_path%.



Ok, once the nurb curve manipulation is finished, press FREEZE from the EDIT panel (right most bar).

We've finished the path. Really easy.

Let's model the root that will grow from it on the next page-->

We will use a cone as nurb surface to deform. The number of **subdivisions on V** depends on how many points the curve has, this will assure a "smooth" growing. My suggestion is that you always take -10 of the number from the total of the curve's points and use that number on V.

The root

Panel MODEL >> Get >> Primitive >> Surface >> Cone. Base Radius 0,5 (or 1 depending on how thick you'd use the root animation). Select for the SUBDIVISIONS on V: 25.

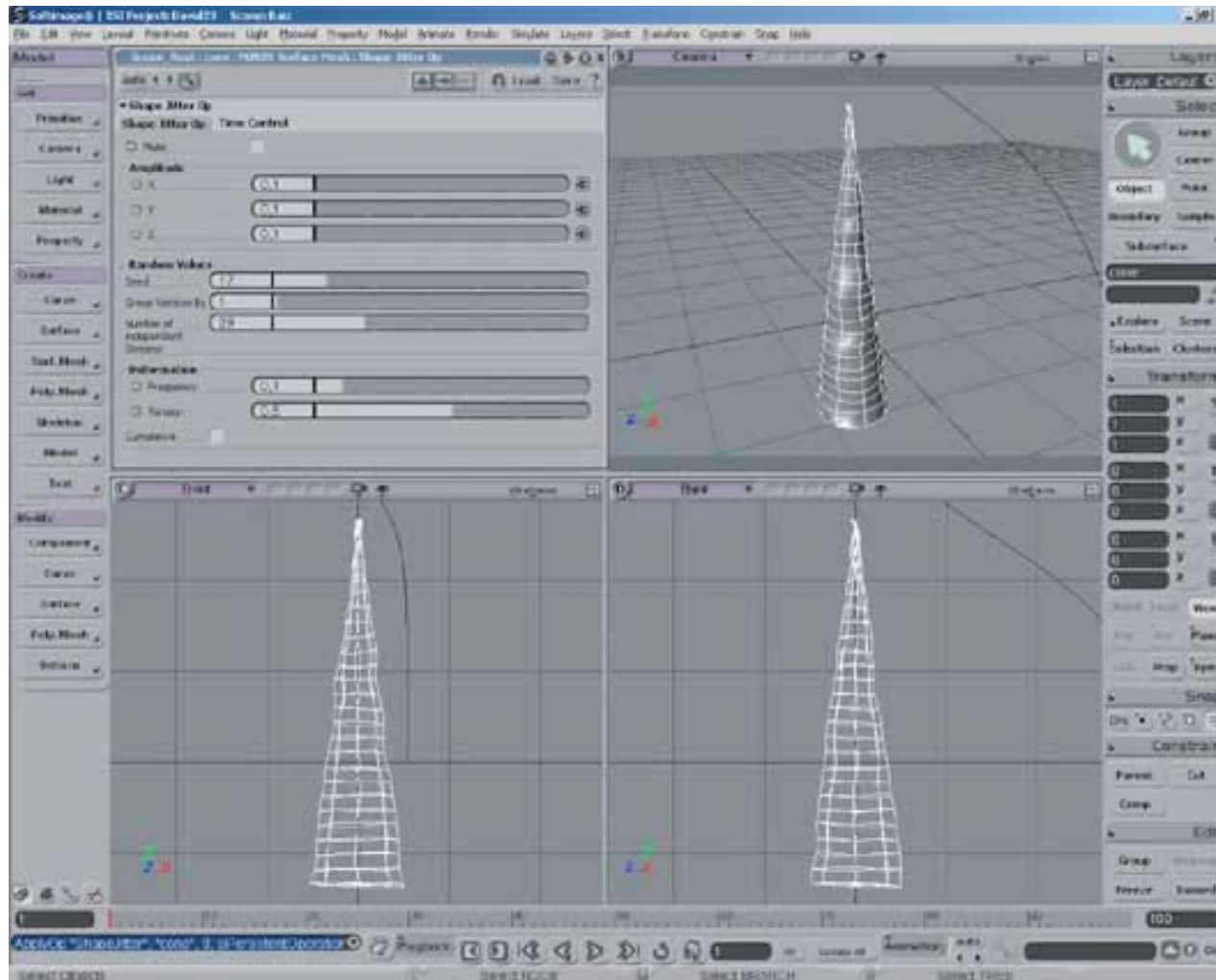
If you need to make a 360f roll onto the growing of the root, please consider using bones and for the U value place a high number.

Select the cone, MODEL >> Modify >> Deform >> Shape Jitter. Jitter to taste :).

From the EDIT PANEL (right most of screen) Select **FREEZE** (erasing the unnecessary construction history of the object)

Rename this cone as: $\sqrt{\text{root}}$

To check the properties of this object, select it and from the RIGHT MOST BAR -> SELECT -> Selection. A little floating explorer opens up, thus showing the actual deformer, parameters, etc from the current object. Use this as immediate reference to look for the parameters and deformer we'll be using later...



The material shader this root uses can be modified to our needs. I would strongly recommend that for general shots you reduce the level of details of the material to accelerate render time; while on first shot camera takes, increasing the level of detail is worth the wait. As a general suggestion you can animate changing of colors while the root grows (or it stops growing...). On real life everything that grows has an intense coloration, when it gets old and cranky it tends to become pale and de-coloration happens.

Texturing the root

- Select **root** and **MODEL >> Get >> Property >> Texture Projection >> Cylindrical**.

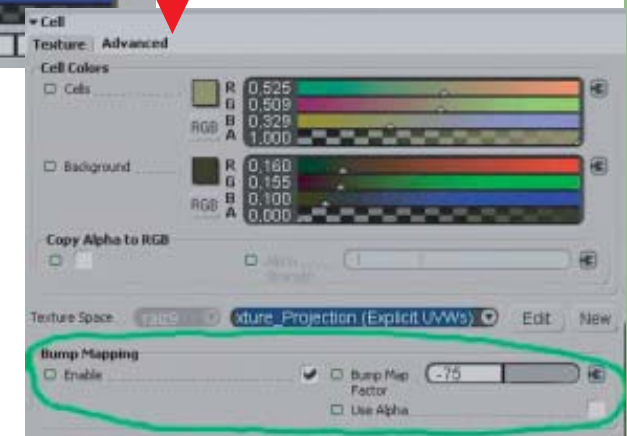
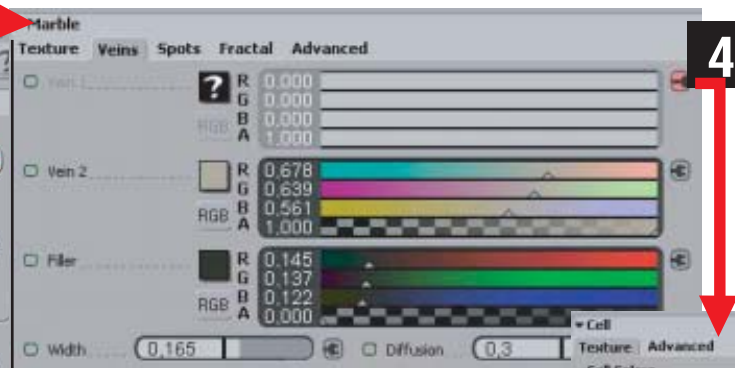
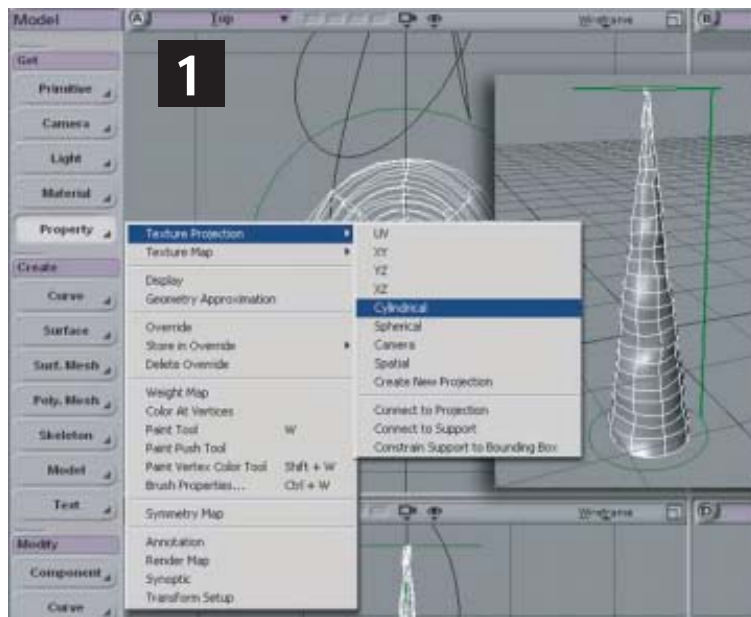
- with the "root" still selected go to **MODEL >> Get >> Material >> Simple Cook_Torrance** (v.XSI 2 // normal cook torrance for v. 1.x)

Copy the values on the windows you see here.

- Connect the diffuse color of cook torrance to a **MARBLE** material

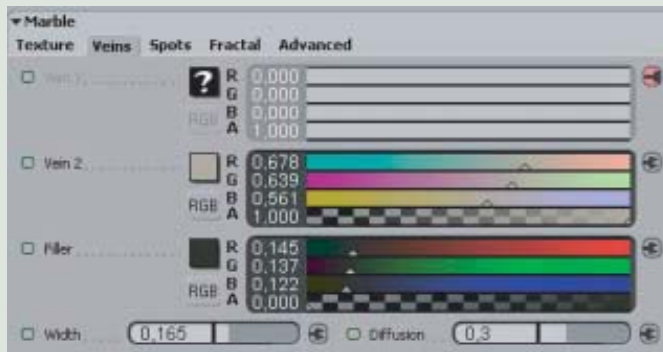
- on the Marble window click on **VEINS >> Vein 1 >>** connect this to a **CELL** material

This is a view from the render tree:



On the next page we will modify these values so that they appear very realistic and convincing.

The material shader this root uses can be modified as you wish to suit your animation needs. We will now change some values inside these sub-windows from the main material property editors. To explain deeper the marble material acts like the pattern, while the cell material acts as the mask and bump of the root.



The root texture

Marble

- Marble >> TEXTURE >> (select the cylindrical projection we had created earlier).

Bump map (enable this), put a value of 50 to it.

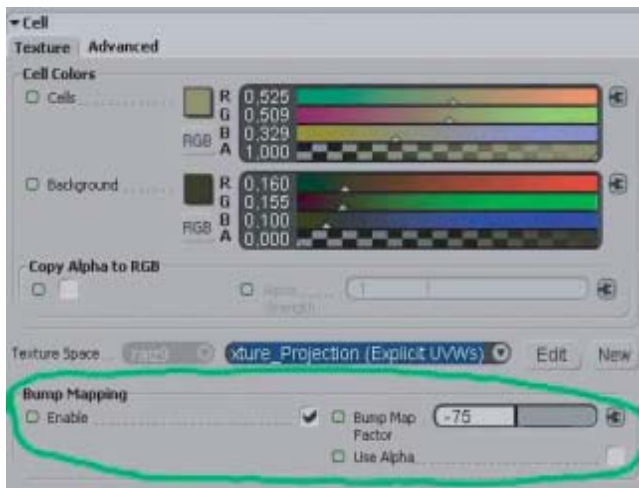
- Marble >> VEINS (vein 1 is connected to a cell material we will define later). Vein 2: R:0,678 - G:0,639 - B:0,561. Filler: 0,145 - 0,137 - 0,122. Width: 0,165; Diffusion: 0,3.

- Marble >> SPOTS >> COLOR (THIS IS WHAT SETS THE GENERAL COLOR OF THE ROOT). DENSITY (values greater than 5 to give less detail and use less than 5 when you're near the camera). Leave everything else as it is for now.

- Marble >> FRACTAL >> Frequency, this one repeats the U, V, Z that we've defined on marble *general. Amplitude 5 (this controls the longitude on the wrinkles of the wood). RATIO 1 (is good definition for closeup shots, use less to this value to accelerate render times on general takes). Play with COMPLEXITY to "wrinkle it" even more.

- Marble >> ADVANCE >> Alternate U, REPEAT on 3, 5, 0. MAXIMUM 5,3,0. Leave everything else as it is now.

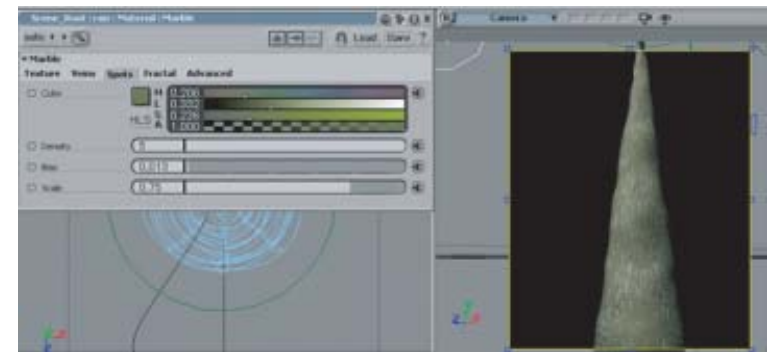
Cell



- Cell >> TEXTURE >> (select the cylindrical projection we created earlier). All colors here only make up as masks -grey, black and white, so don't use RGB colors. Just for the purpose, follow the values on the screenshots.

Bump map (enable), give a value of -75

- Cell >> ADVANCED>> Alterante V. Repeats 4,2,1. MAXIMUM 20,30,0. Leave everything as it is for now.



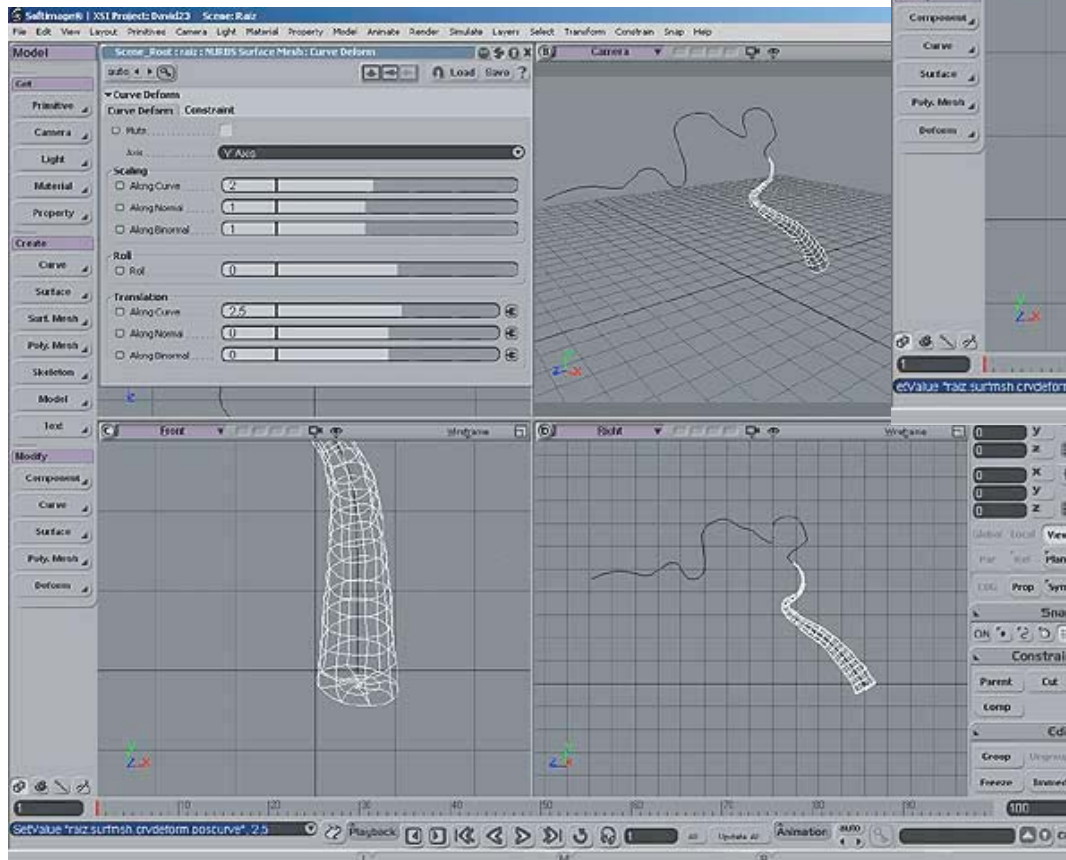
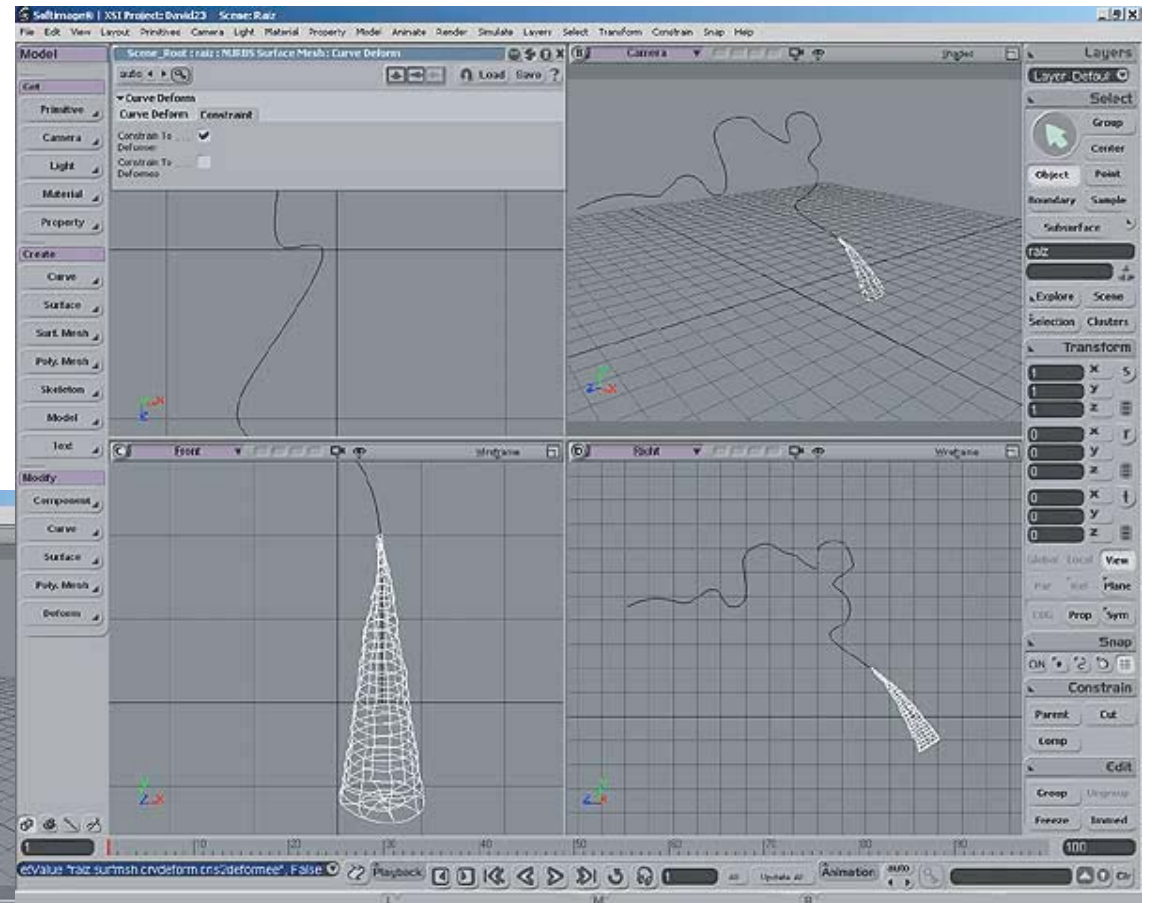
The Marble texture creates fractal values (kinda the cloud render from Photoshop) that could have a bumpmap, to create the wrinkles the wood normally would have. The Cell texture placed on one of the fractal color makes it possible to define to each wrinkle "a bumpy surface" (kinda squashed bubbles) and have it displacing it over the surface as color intensity (variety on the hue and saturation of the wood). On plain english: to give some contrast. :)

IT@S ALIVE! It's time we start deforming our sinister root. It's really simple: we got the cone and the path ready to deform it. The root will magically adjust itself, but there's something it isn't quite right. On the following pages we'll see it illustrated to solve these problems...

Deforming the root

- Select the root, go to MODEL >> Modify >> Deform >> by Curve, Select the nurb curve from earlier* (root_path)

A window pops up, Select the Constraint, window and check **CONSTRAIN TO DEFORMER**



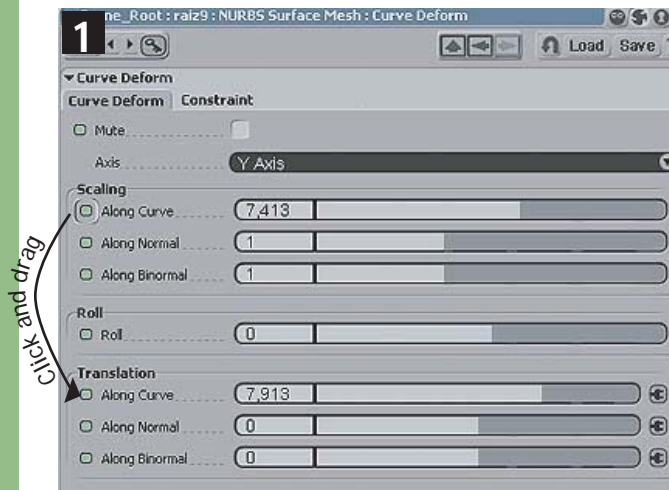
- on the **CURVE DEFORM** window move the **SLIDER >> SCALING >> ALONG CURVE**, and now we see the root follow the path to complete it's growing.



If we over-extrude the scaling along curve on the path we had created, uncorrect deformations occur. It is advisable to finish extruding where the curve ends. BUT on this animation the growing pattern is not correctly animated. Let's use expressions to correct that foul.

Mathematics are our allies. With help like that the world is very fare to animators. We'll demonstrate it IPSO FACTO. We'll drag one green animatable chip and release it onto another. The icon changes to an arrow when we edit the animation and validate it. You can mark parameters and store them later to be used into the ANIMATION MIXER. For now we'll just do a simple expression and get this done before dinner.

Growing roots using expressions



Select the root, SELECT bar from right most >> Selection >> CURVE DEFORM.

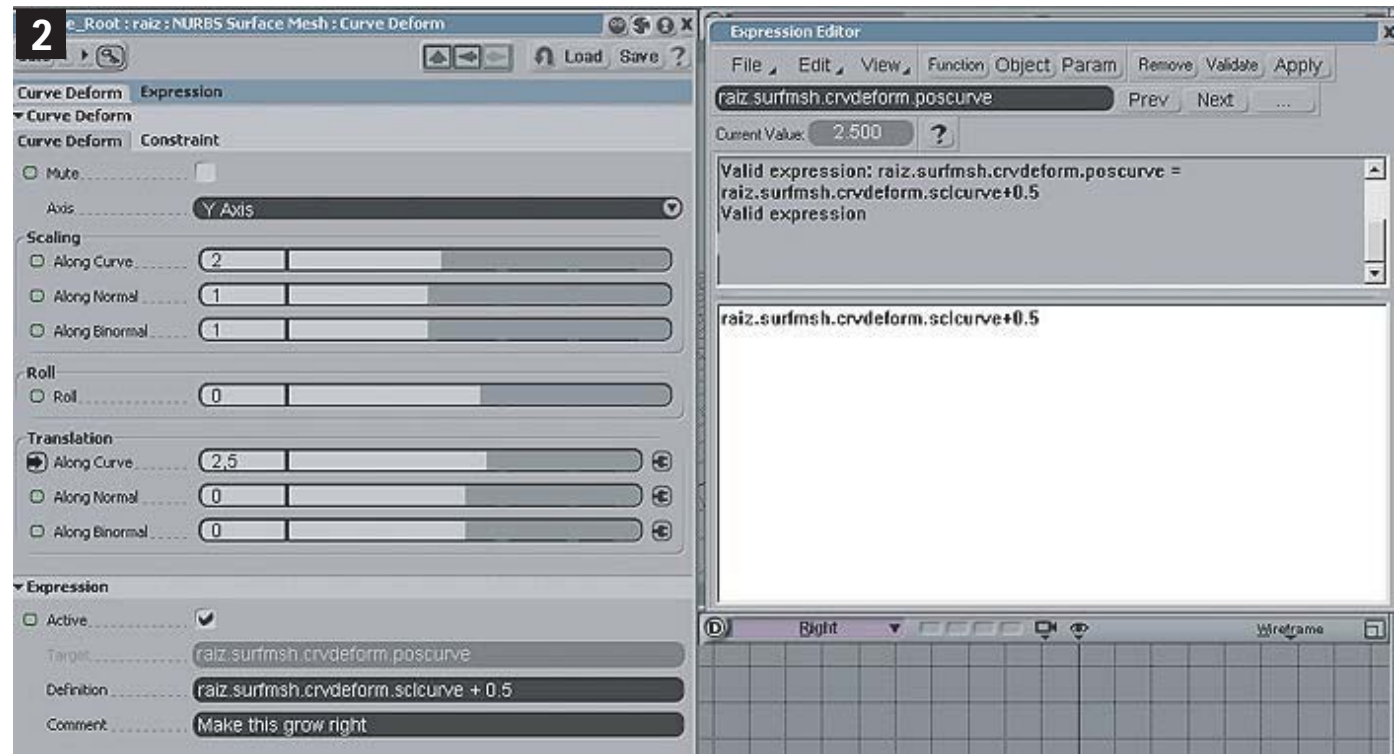
A window pops up, Select + click and drag the green chip from **SCALING ALONG CURVE** and drop it on **TRANSLATION ALONG CURVE**

Automatically pops up an expression editor.

On the editable text field we add up the value of + 0.5 after the text that is already written for the expression.

Click on the **VALIDATE** button.

If all is OK, the LOG window tells us this is a **VALID EXPRESSION** and we notice **TRANSLATION >> ALONG CURVE** green chip has an arrow icon. Meaning the animation is driven by an expression.



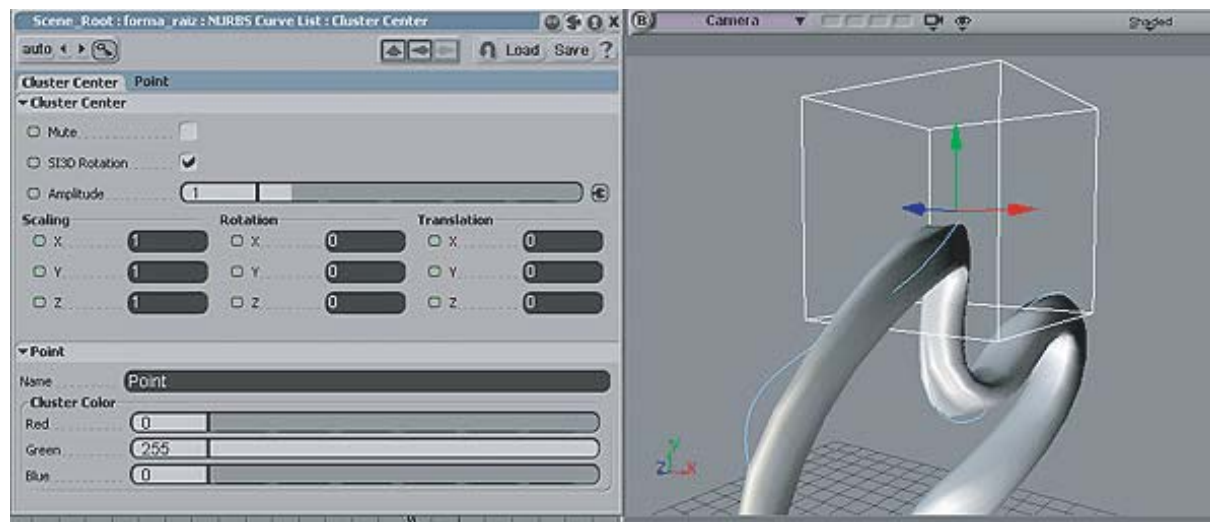
On the Property Page (PPg) of CURVE DEFORM you got a new tab: EXPRESSION. The **ACTIVE** green chip is animatable. Which means we can deactivate it on some parts of the animation. A practical use will be to make it "grow" and if it "dies" we deactivate this parameter, and use the "translation" slider freely again.

To click , drag and drop and release it on another chip, creates a relationship of **EQUALITY** (a value is same as other) this makes a window pop up to write expressions. We added 0.5 because that's the difference from one parameter to another to make the root grow "forward" -because on the real world when a plant grows "up" also extends it's roots deeper into the earth and to it's surroundings. To do this on 3D will be a waste of RAM. To write simple (add, minus, division) expressions are really easy.

We did it! This is one of the roots our enchanted forest will be using. Illuminate it accordingly and you'll get beautiful animation. Duplicate it as many times as you need it, and since the root always follows the path, reselect "root_path" and modify its points, and the root will continue to follow. Use it to give variations of this first master root. And just because you demand it: MORE CONTROL to give more personality to our character:

Controlling the roots

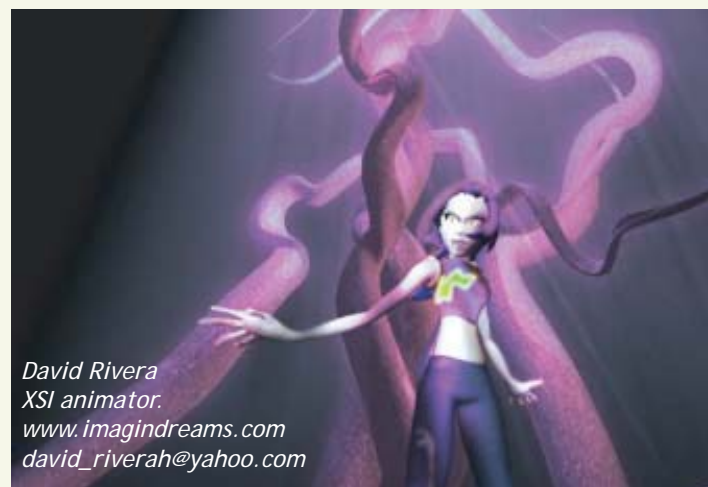
- MODEL >> Get >> Primitive >> Implicit >> Cube. Place it "containing" the bulge of the root.
Select "root_path" (nurbs curve)
- Press T. Select all the points from the bulge section.
- MODEL >> Deform >> Cluster Center >> Select the cube.
- Animate the cube and the path will follow. The root will follow the new animated path.



CONCLUSION: move your cube from left to right, and the nurbs curve will deform. you can animate this cube to give character expressions (if you need it to turn around you may place more implicit cubes; you can even edit expressions for these cubes referencing the main cube rotations automatically) all though for this settings we would use "bones". If the nurbs surface (the cone) doesn't deform accordingly, use more subdivisions on the U and V values before freezing (as in step 2 of this tutorial) .

We could have a pretty sight if we transmit feelings trough lighting (in this case: wicked for the violet-red color, with a little help of PS6). Though this is a short preview for a movie clip called EVIL LYNN (TM) & (C) 1996-2002 David Rivera. On a next tutorial i'll try to extend this basic extruding by making it BRANCH and continue to grow as the root also grows. Here goes another 3 months ;)

"Real life it's interesting, but within fantasy the extraordinary becomes life itself"
David Rivera - XSI Animador



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