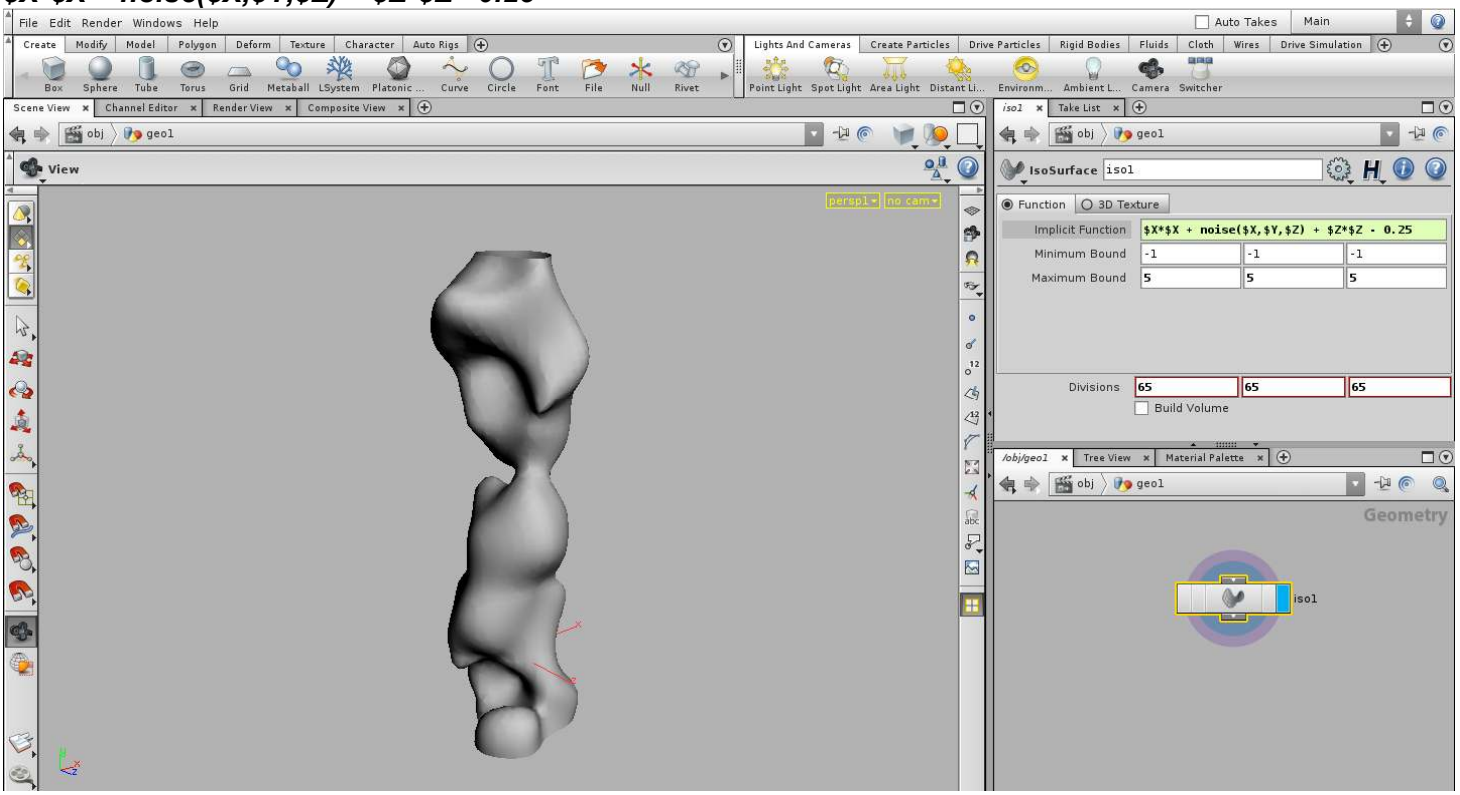
ISO Surface Examples

The Iso surface operator can create many interesting geometrical shapes based strictly on mathematical expressions. The way the Isosurface sop works is actually somewhat simple. It takes a user specified expression in R3(mathematical term meaning “having three dimensions, each taking a Real value”), and creates a surface where the function goes from being positive to negative. So if we look at the default expression when we lay down an Isosurface node which is ($X*$X + $Y*$Y + $Z * $Z – 1), the expression is less than zero within a unit sphere, and greater than zero outside. As the OP cooks, it marches through the bounding volume specified and creates geometry where the expression equals zero.

Example: Using the noise function in the implicit function.
$X*$X + noise($X,$Y,$Z) + $Z*$Z - 0.25



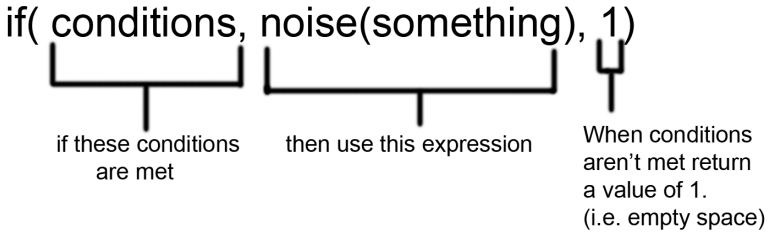
CHEESE EXAMPLE:

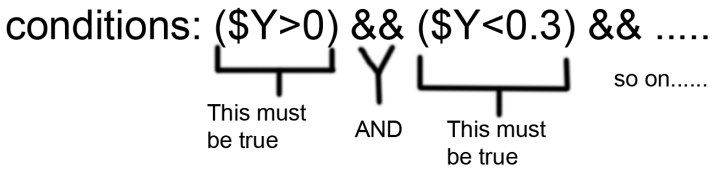
When building more specific geometry it is important to note that multiple functions can be used. For instance the if() function allows you to you to construct your function, and thus your geometry in a piecewise fashion. Let's look at an example of this in the construction of the cheese.

Begin by tabbing in a geometry node, jumping inside and laying down an isosurface Minimum Bound of (-0.5,-0.5,-0.5) and Maximum Bound of (0.5,0.5,1). Now in the Implicit Function parameter enter this expression:

if(($Y>0) && ($Y<0.3) && ($X>-$Z/3) && ($X<$Z/3) && ($Z<.9), noise($X*10,$Y*10,$Z*10)-0.3,1)

This may seem a bit overwhelming at first, but after we break it down it will become clearer as to what is going on here.





The function says that it should define a surface according to a noise function if some things are true, and should equal to 1 if any of those things aren't true. Since geometry exists only where the whole expression is zero, no geometry will exist if the criteria are false. In this way, we set up boundary conditions for the geometry we create. What are these conditions?

Several things: there are five conditions being met – each separated by an "and" operator "&&". This means that each of the conditions; ($Y>0),($Y<0.3),etc. must be satisfied in order for geometry to be created. If all five of these criteria are met, then it is up to the noise function to determine what the geometry looks like.

The first two conditions involving the $Y variable cause the upper and lower bounds of the geometry (in the Y direction) to be constrained between 0 and 0.3. This is what causes the upper and lower surface of the cheese wedge.

The next two criteria $X to $Z define the two side faces of the cheese. By relating the X component to the Z component, it can define a planar surface that is on an angle to any of the axis.

The last component($Z<0.9) defines the back plane of the triangular profile of the cheese. By altering the boundary conditions it can alter the shape of the cheese.

If any of these conditions are not met, the expression returns a value of 1, and no geometry results. If all of these conditions are met, the expression returns a noise function which can have a value between -1 and positive 1. If the noise function returns a positive value, then the hole is defined in the cheese. If the noise function returns a value less than zero, then the cheese is defined.