Shader Steps

In the global variables:

```
GLuint          SalmonDL;
float           Time;           // same as we used before
```

Near the top of the program:

```
//#include "setmaterial.cpp"
//#include "setlight.cpp"
//#include "osusphere.cpp"
//#include "osucone.cpp"
//#include "osutorus.cpp"
//#include "bmptotexture.cpp"
#include "loadobjfile.cpp"
//#include "keytime.cpp"
#include "glslprogram.cpp"
```

Right after those #includes:

```
GLSLProgram   Salmon;           // your VS+FS shader program name
```

At the very end of InitGraphics( ):

```
Salmon.Init( );
bool valid = Salmon.Create( "salmon.vert",  "salmon.frag" );
if( ! valid )
{
        fprintf( stderr, "Yuch!  The Salmon shader did not compile.\n" );

}
else
{
        fprintf( stderr, "Woo-Hoo!  The Salmon shader compiled.\n" );
}


Salmon.SetUniformVariable( "uKa", 0.1f );               // all 3 should add up to 1.0
Salmon.SetUniformVariable( "uKd",  ??? );
Salmon.SetUniformVariable( "uKs",  ??? );
Salmon.SetUniformVariable( "uShininess", ??? );         // whatever you like from P3
```

In InitLists( ):

```
SalmonDL = glGenLists( 1 );
glNewList( SalmonDL, GL_COMPILE );
    LoadObjFile( (char *) "salmon.obj" );
glEndList( );
```

In Display( ):

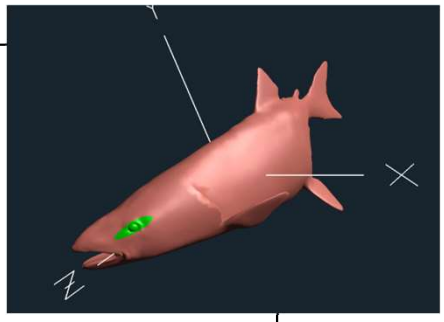
```
Salmon.Use( ); // turns the Salmon shader program on
                        // no more fixed-function – the shader Salmon now handles everything
                        // but the shader program just sits there idling until you draw something

float amp  = <<some function of time>>          // sine wave amplitude
float freq   = <<some function of time>>        // sine wave frequency
float speed = <<some function of time >>        // overall speed of movement
        . . .
Salmon.SetUniformVariable( "uTime", Time);              // 0.-1., set in Animate( )
Salmon.SetUniformVariable( "uAmp",  amp );              // keytimed, menued, keyboarded?
Salmon.SetUniformVariable( "uSpeed",speed );            // keytimed, menued, keyboarded?
Salmon.SetUniformVariable( "uFreq",   freq);            // keytimed, menued, keyboarded?

glCallList( SalmonDL );  // now the shader program has vertices and fragments to work on

Salmon.UnUse( );                // go back to fixed-function OpenGL
```

salmon.vert:



```
#version 330 compatibility
uniform float   uTime;
uniform float   uAmp;
uniform float   uSpeed;
uniform float   uFreq;

out  vec2      vST;          // texture coords
out  vec3      vN;           // surface normal vector
out  vec3      vL;           // vector from point to light
out  vec3      vE;           // vector from point to eye

const vec3     LIGHTPOS      = vec3(  10., 10., 5. );      // light position
const float    PI            = 3.14159265;
const float    TWOPI          = 2.*PI;
const float    LENGTH         = 5.;                        // salmon length

void  main( )
{
      vST = gl_MultiTexCoord0.st;
      vec3 vert = gl_Vertex.xyz;
       // which direction on the salmon will do the wriggling?
       // what multiplies time to get distance (wriggled)
       // what multiplies position to get how many wriggles we see?
      vert.? += uAmp * sin( TWOPI*( (???*uTime)+(???*vert.z/LENGTH) ) );


      // setup for the per-fragment lighting:
      vec4 ECposition = gl_ModelViewMatrix * vec4( vert, 1. );
      vN = normalize( gl_NormalMatrix * gl_Normal );  // surface normal vector
      vL = LIGHTPOS - ECposition.xyz;                 // vector from the point to the light position
      vE = vec3( 0., 0., 0. ) - ECposition.xyz;       // vector from the point to the eye position
      gl_Position = gl_ModelViewProjectionMatrix * vec4( vert, 1. );
}
```

salmon.frag:

```
#version 330 compatibility

uniform float   uKa, uKd, uKs;          // coefficients of each type of lighting
uniform float   uShininess;             // specular exponent


in  vec2  vST;                          // texture coords of the current fragment
in  vec3  vN;                           // surface normal vector of the current fragment
in  vec3  vL;                           // vector from current fragment to the light
in  vec3  vE;                           // vector from current fragment to our eye

const float EYES                        = 0.80;                     // not correct!
const float EYET                        = 0.50;                     // not correct!
const float R                           = 0.03;                     // radius of salmon eye
const vec3 SALMONCOLOR                  = vec3( 0.98, 0.50, 0.45 ); // "salmon" (r,g,b) color
const vec3 EYECOLOR                     = vec3( 0., 1., 0. );       // color to make the eye
const vec3 SPECULARCOLOR                = vec3( 1., 1., 1. );

void
main( )
{
      vec3 myColor = SALMONCOLOR;       // color if not in the eye
      float ds = ?????;                 // s distance from current frag to salmon eye
      float dt  = ?????;                // t distance from current frag to salmon eye
      if( <<we are within the eye circle>>)
      {
            myColor = EYECOLOR;
      }


       // now do the per-fragment lighting:

       vec3 Normal    = normalize(vN);
       vec3 Light     = normalize(vL);
       vec3 Eye       = normalize(vE);

       vec3 ambient = uKa * myColor;

       float d = max( dot(Normal,Light), 0. );      // only do diffuse if the light can see the point
       vec3 diffuse = uKd * d * myColor;

      float s = 0.;
      if( d > 0. )                                  // only do specular if the light can see the point
      {
            vec3 ref = normalize(  reflect( -Light, Normal )  );    // perfect reflection vector
            float cosphi = dot( Eye, ref );
            if( cosphi > 0. )
                  s = pow( max( cosphi, 0. ), uShininess );
      }
      vec3 specular = uKs * s * SPECULARCOLOR.rgb;
      gl_FragColor = vec4( ambient + diffuse + specular,  1. );
}
```