Title : Displacement Mapping, Bump Mapping, and Lighting
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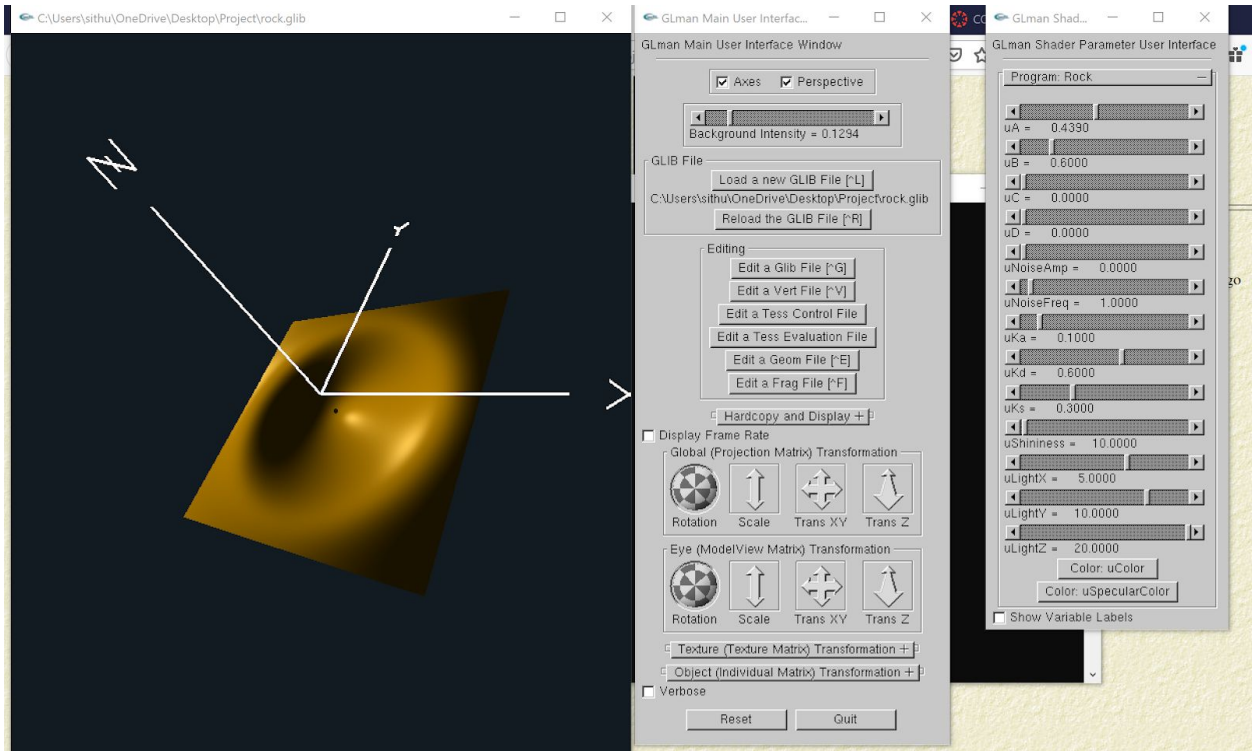
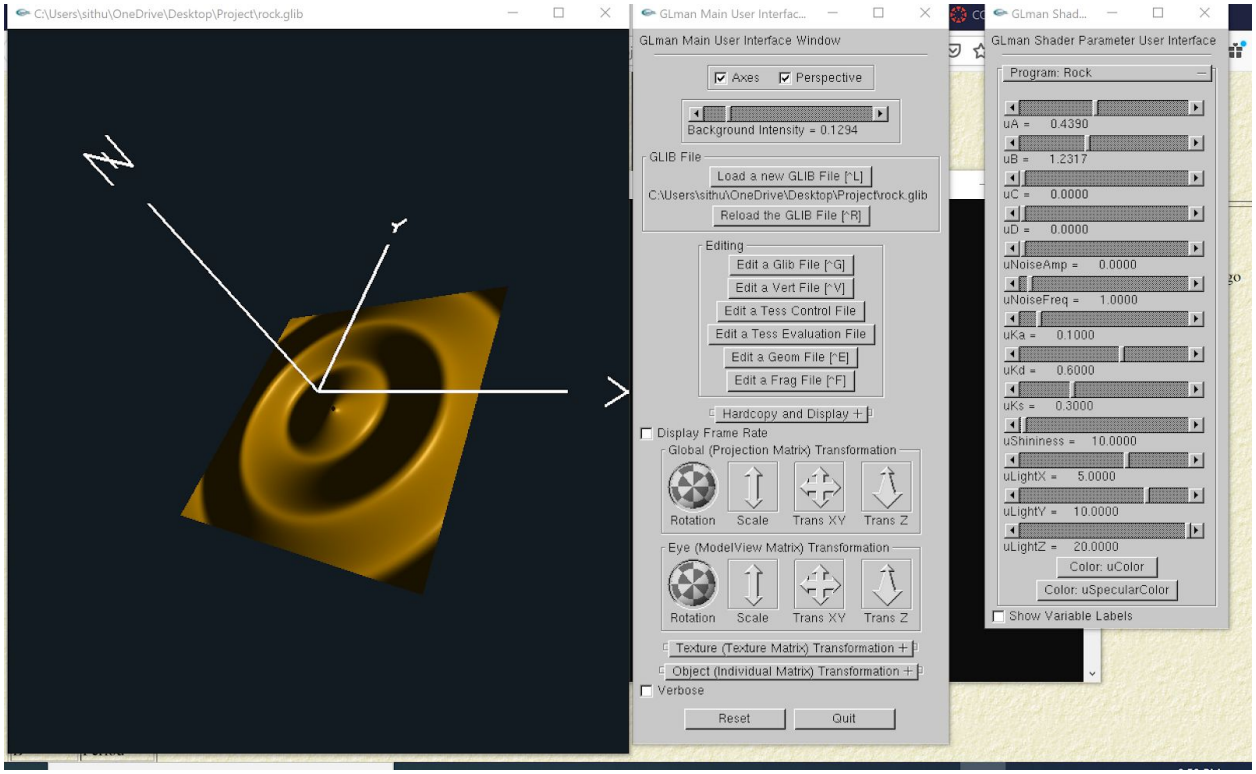
Video : https://media.oregonstate.edu/media/t/0_9fi4m2zn

uA,uB,uC and uD are for creating waves. They create the waves by changing the normal values. By changing them, the following results can be got.

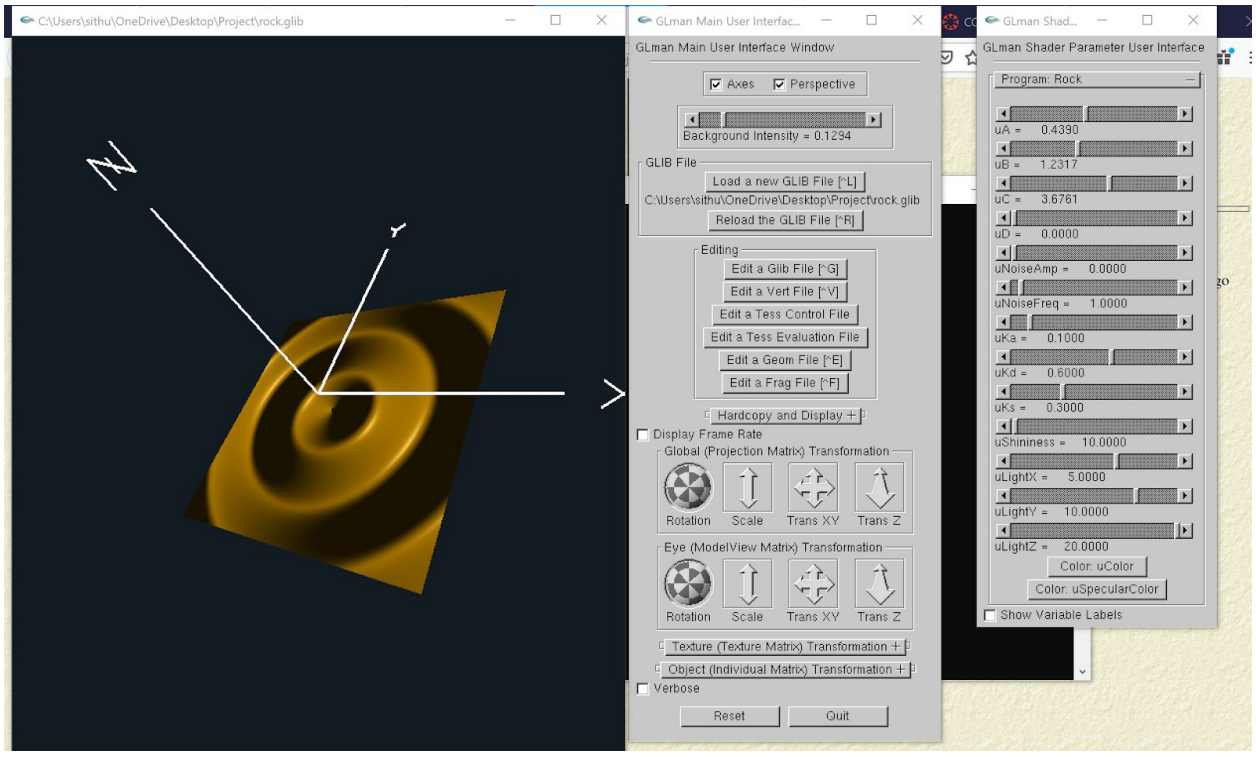
For uA,



For uB,


C:\Users\sithu\OneDrive\Desktop\Project\rock.glib
GLman Main User Interfac...
GLman Main User Interface Window
Axes
Perspective
Background Intensity = 0.1294
GLIB File
Load a new GLIB File [^L]
C:\Users\sithu\OneDrive\Desktop\Project\rock.glib
Reload the GLIB File [^R]
Editing
Edit a Glib File [^G]
Edit a Vert File [^V]
Edit a Tess Control File
Edit a Tess Evaluation File
Edit a Geom File [^E]
Edit a Frag File [^F]
Hardcopy and Display
Display Frame Rate
Global (Projection Matrix) Transformation
Rotation
Scale
Trans XY
Trans Z
Eye (ModelView Matrix) Transformation
Texture (Texture Matrix) Transformation
Object (Individual Matrix) Transformation
Verbose
Reset
Quit
GLman Shad...
GLman Shader Parameter User Interface
Program: Rock
uA = 0.4390
uB = 1.2317
uC = 0.0000
uD = 0.0000
uNoiseAmp = 0.0000
uNoiseFreq = 1.0000
uKa = 0.1000
uKd = 0.6000
uKs = 0.3000
uShininess = 10.0000
uLightX = 5.0000
uLightY = 10.0000
uLightZ = 20.0000
Color: uColor
Color: uSpecularColor
Show Variable Labels

For uC,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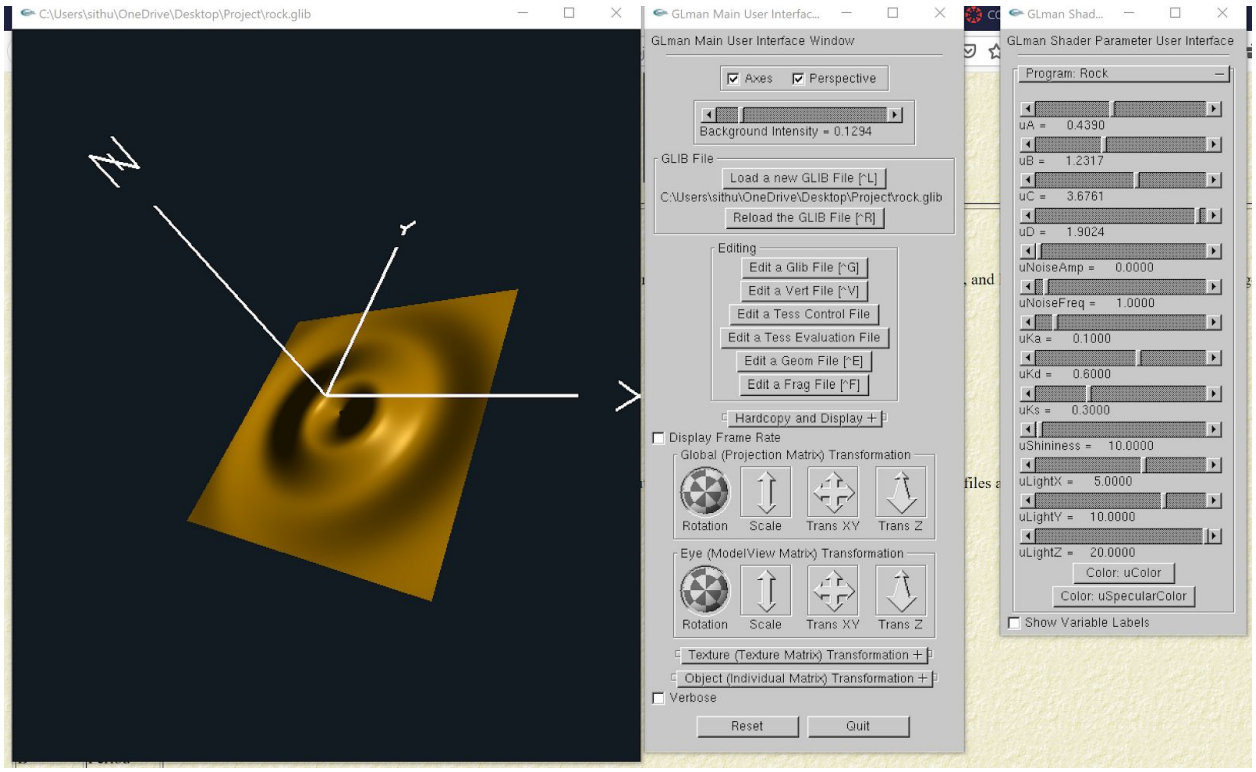
Object (Individual Matrix) Transformation
Verbose
Reset
Quit
GLman Shad...
GLman Shader Parameter User Interface
Program: Rock
uA = 0.4390
uB = 1.2317
uC = 3.6761
uD = 0.0000
uNoiseAmp = 0.0000
uNoiseFreq = 1.0000
uKa = 0.1000
uKd = 0.6000
uKs = 0.3000
uShininess = 10.0000
uLightX = 5.0000
uLightY = 10.0000
uLightZ = 20.0000
Color: uColor
Color: uSpecularColor
Show Variable Labels

For uD,



Noise is also created by changing normal values.

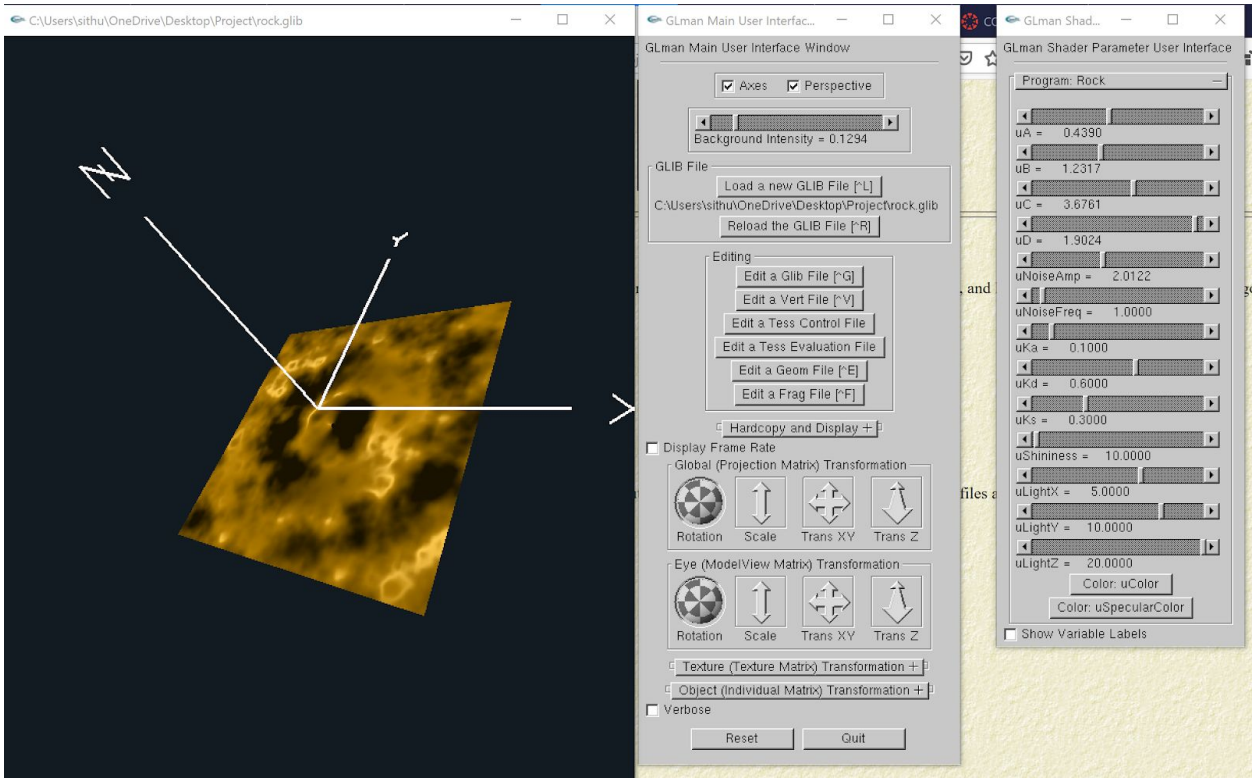
Firstly,
Angles for x and y are calculated for changing the normal value.

```
        vec4 nvx = texture(Noise3, uNoiseFreq * vMC);
        float angx = nvx.r + nvx.g + nvx.b + nvx.a - 2;
        angx *=uNoiseAmp;
        vec4 nvy = texture(Noise3, uNoiseFreq * vec3(vMC.xy, vMC.z+
0.5));
        float angy = nvy.r + nvy.g + nvy.b + nvy.a - 2;
        angy = angx * uNoiseAmp;
```

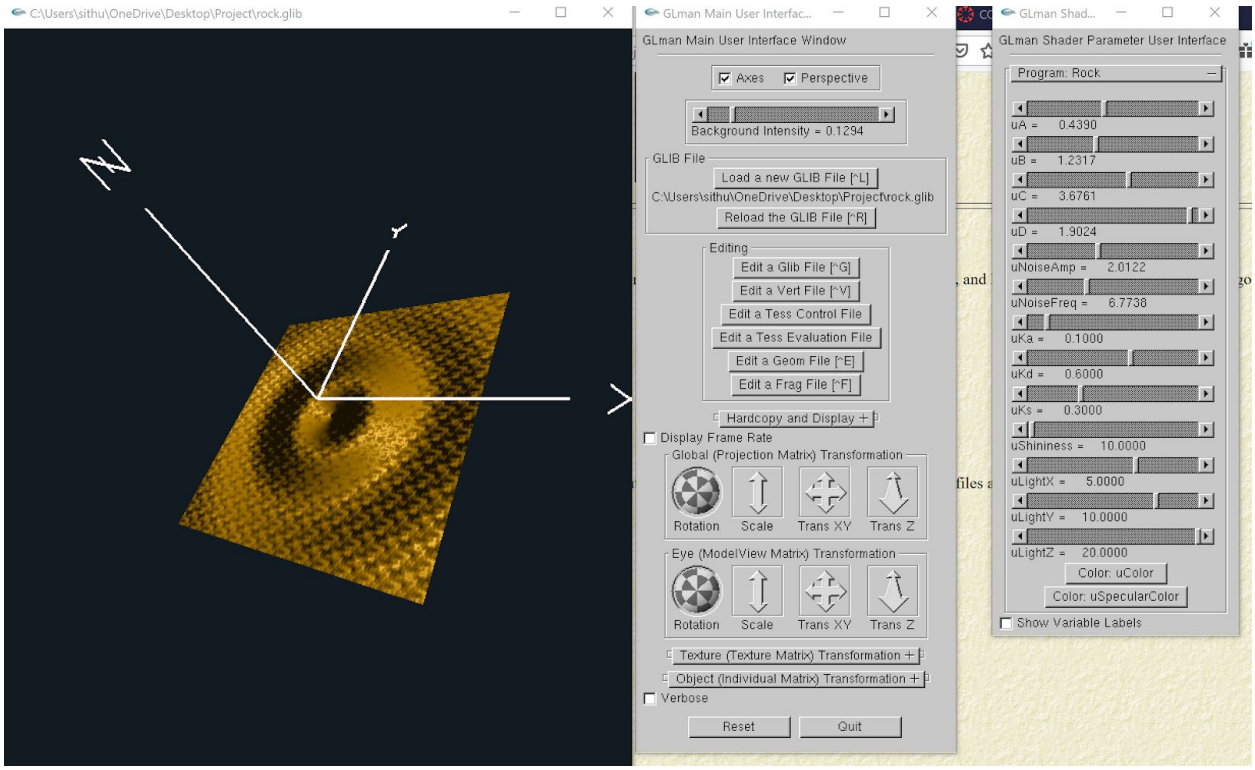
After that, these values are applied to the corresponding normal value.

```
Normal = RotateNormal(angx, angy, vNf);
```

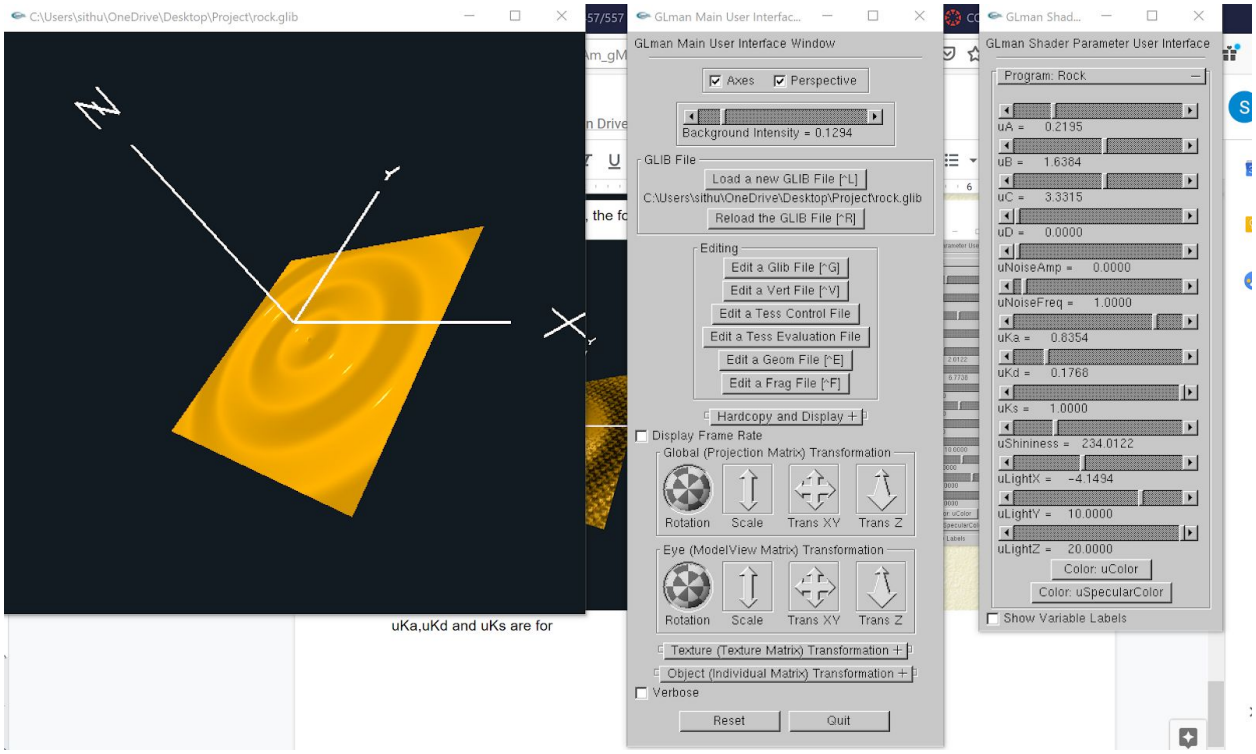
By increasing the uNoiseAmp, the following image can be got.



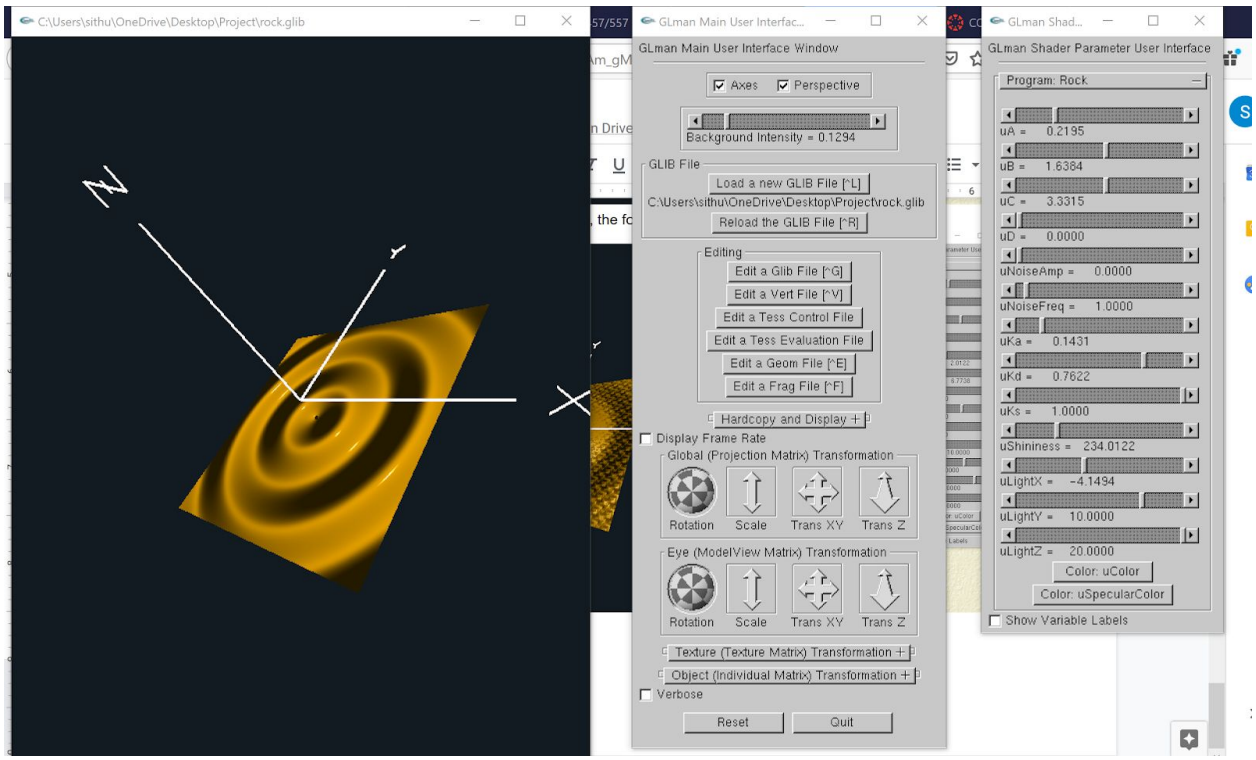
By increasing the uNoiseFreq, the following image can be got.



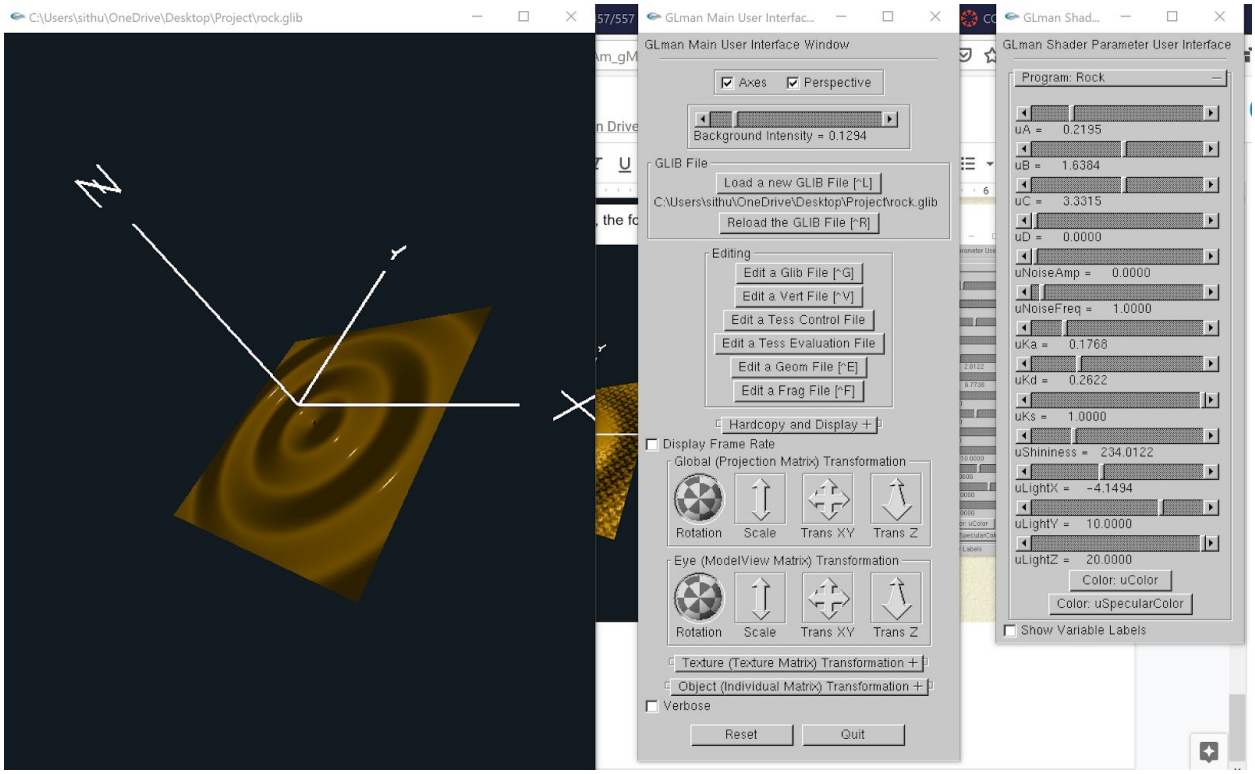
uKa,uKd and uKs are for the ambient, diffuse and specular.
By changing uKa, the following image can be got.



By changing uKd, the following can be got.

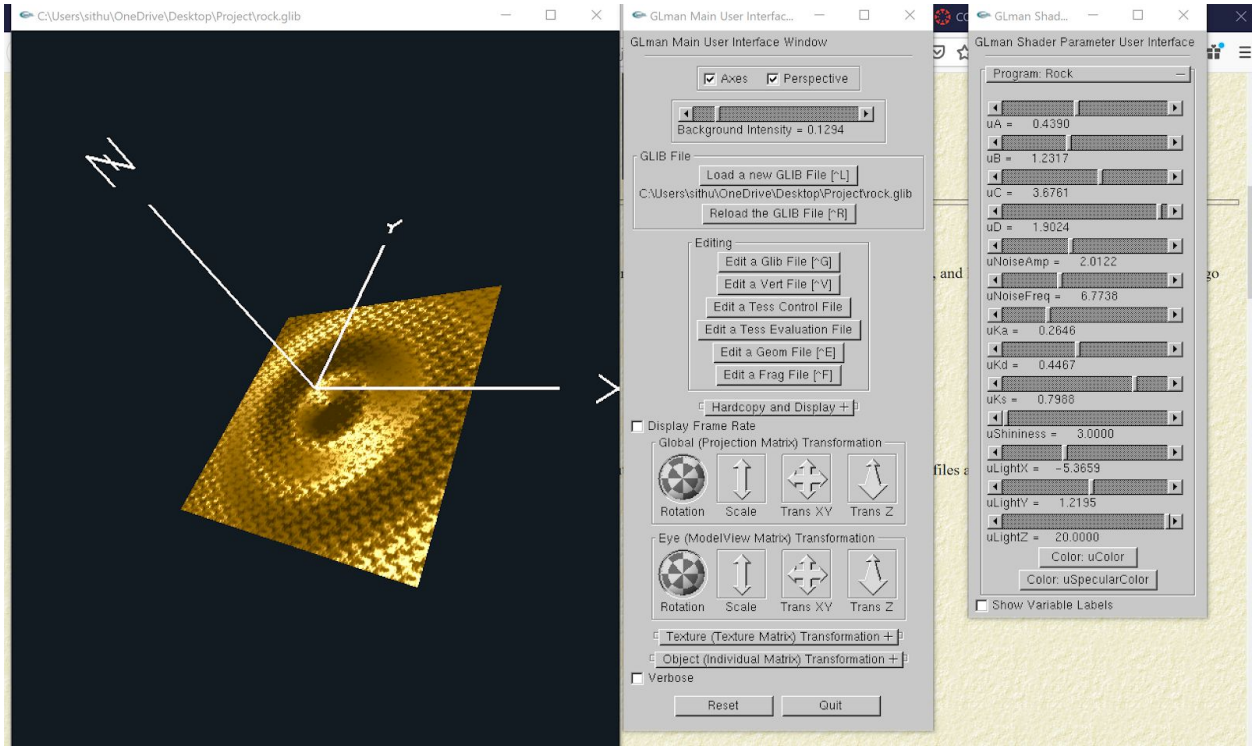


By changing uKs, the following image can be got.



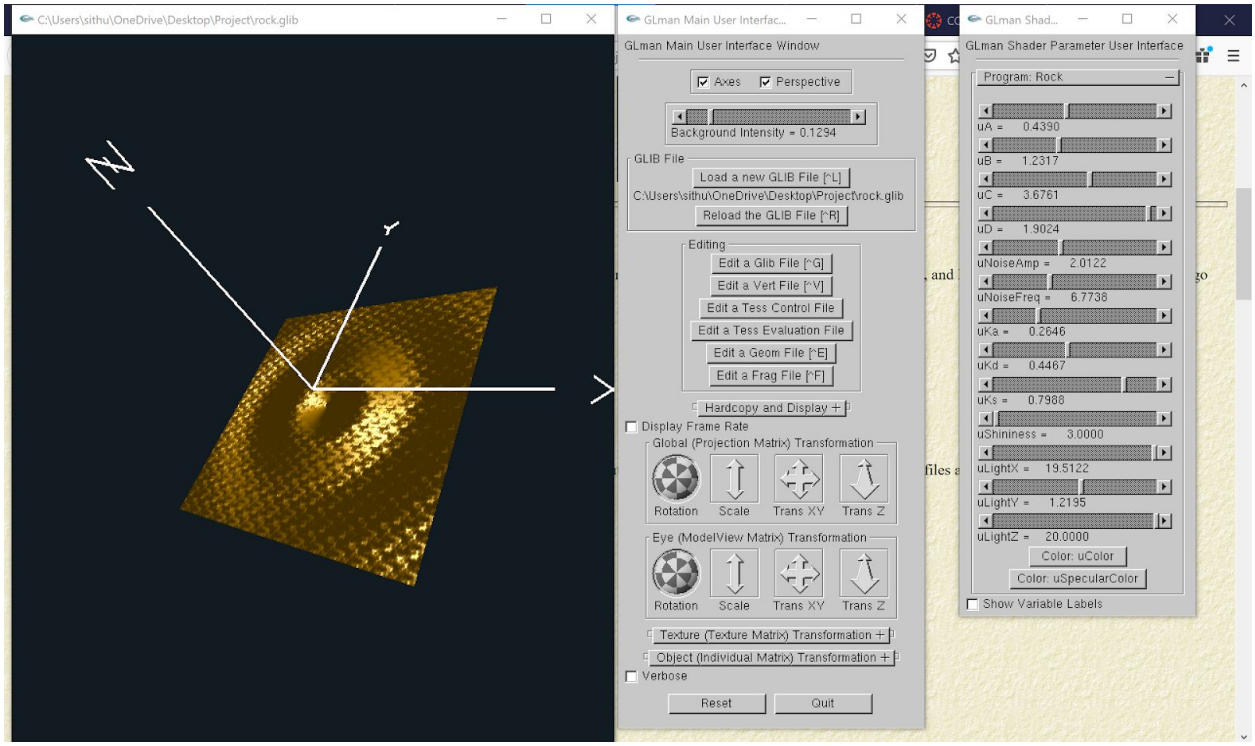
uShiness is also for the lighting.

By changing the uShininess, the following image can be got.

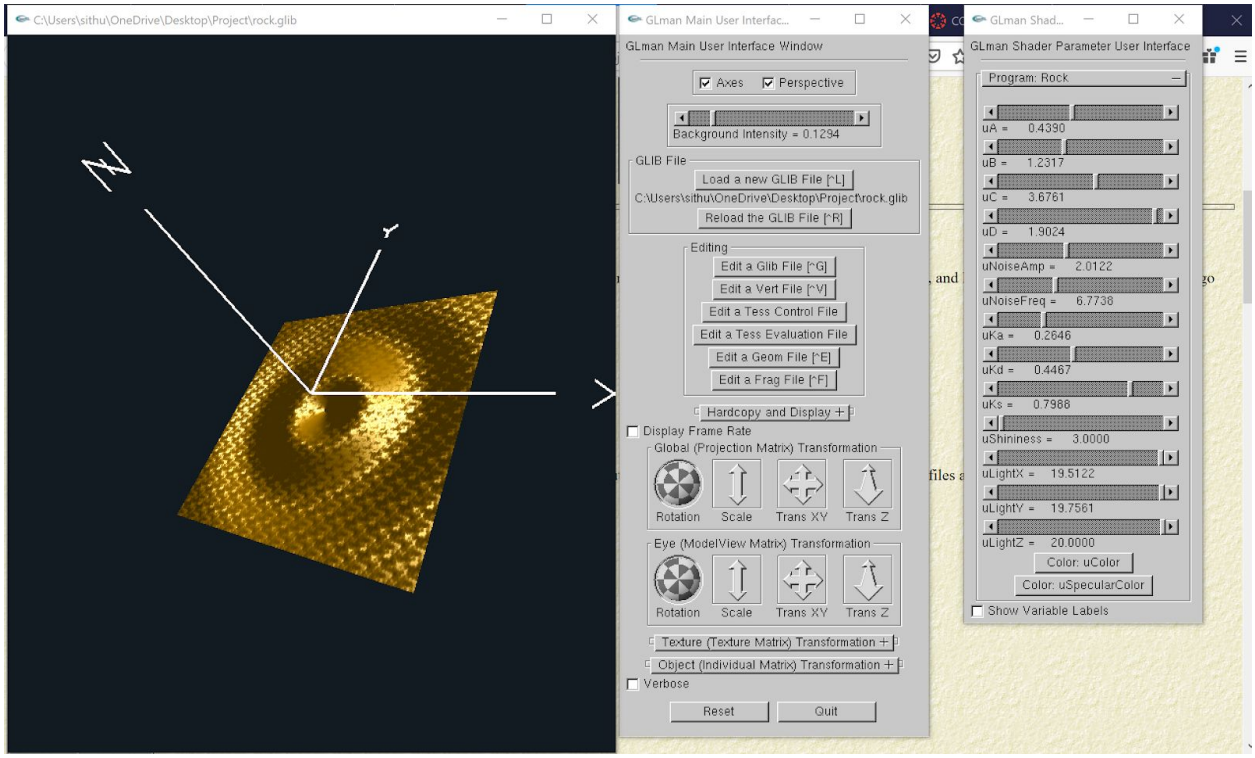


uLightX, uLightY and uLightZ are for the positions of the light.

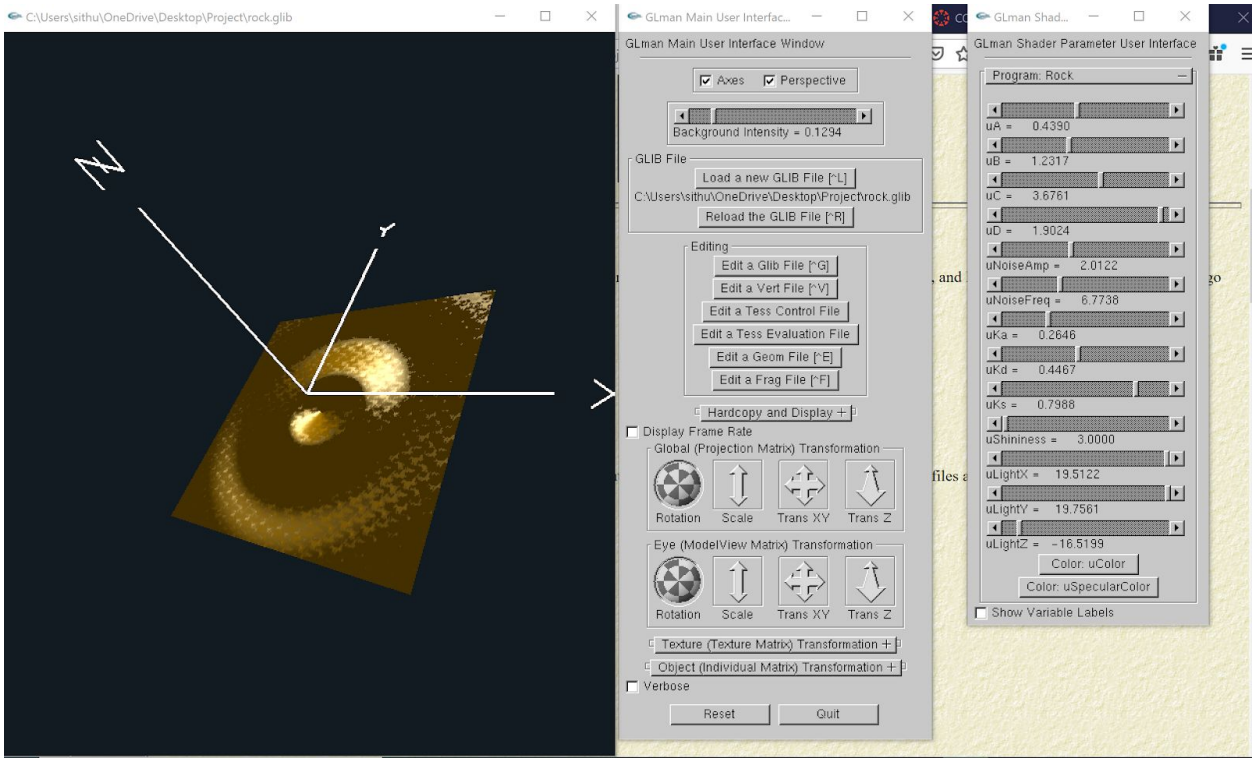
By changing uLightX, uLightY and uLightZ, the following images can be got.
For uLightX,



For uLightY,



For uLightZ,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Verbose
Reset
Quit
GLman Shader Parameter User Interface
Program: Rock
uA = 0.4390
uB = 1.2317
uC = 3.6761
uD = 1.9024
uNoiseAmp = 2.0122
uNoiseFreq = 6.7738
uKa = 0.2646
uKd = 0.4467
uKs = 0.7988
uShininess = 3.0000
uLightX = 19.5122
uLightY = 19.7561
uLightZ = -16.5199
Color: uColor
Color: uSpecularColor
Show Variable Labels