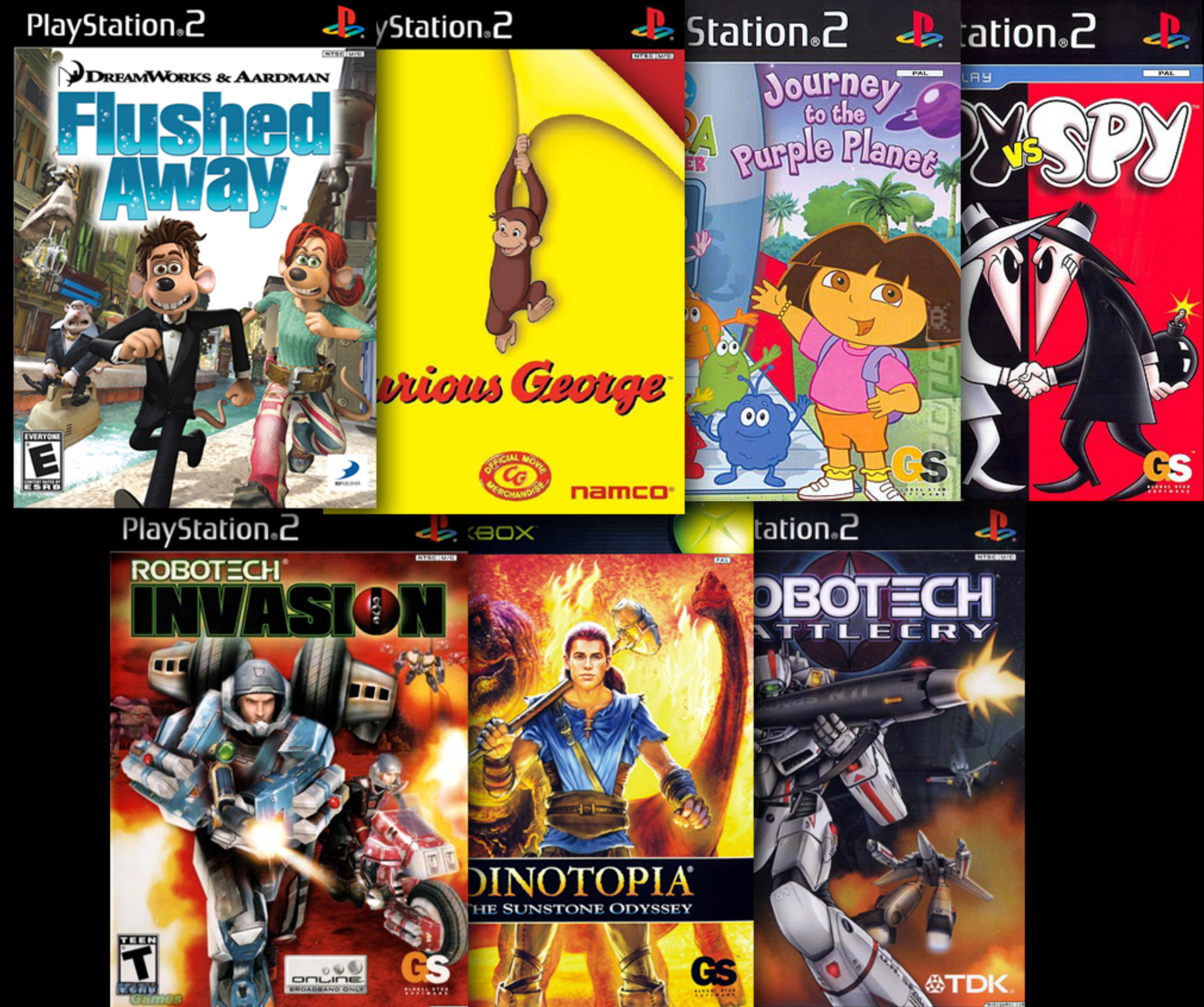
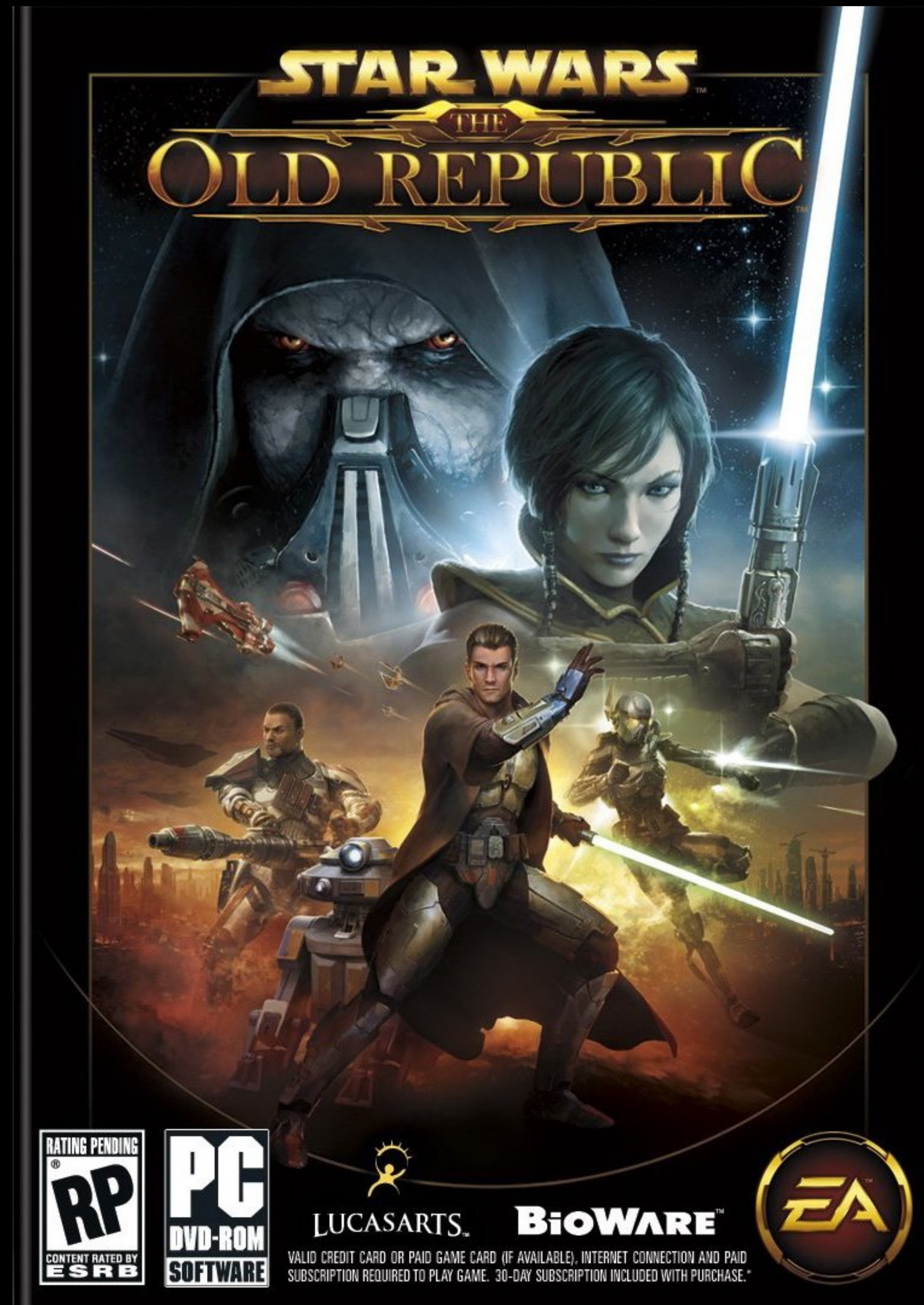


# Shading the World of Anthem

Ben Cloward  
CG Supervisor  
Bioware



# Who Are You?







# ANT-HEN<sup>TM</sup>



# ANTIHEM



# Shader Challenges

Diverse environments

Dynamic weather system

Day/Night cycles





Video showing environment variety





Video showing dynamic weather  
2x Speed







Video showing day/night cycle





# Steps to Solve Shader Challenges

- Collect reference material
- Identify key elements - the essence
- Create the shader step by step based on the key elements



# Shader Examples from Anthem

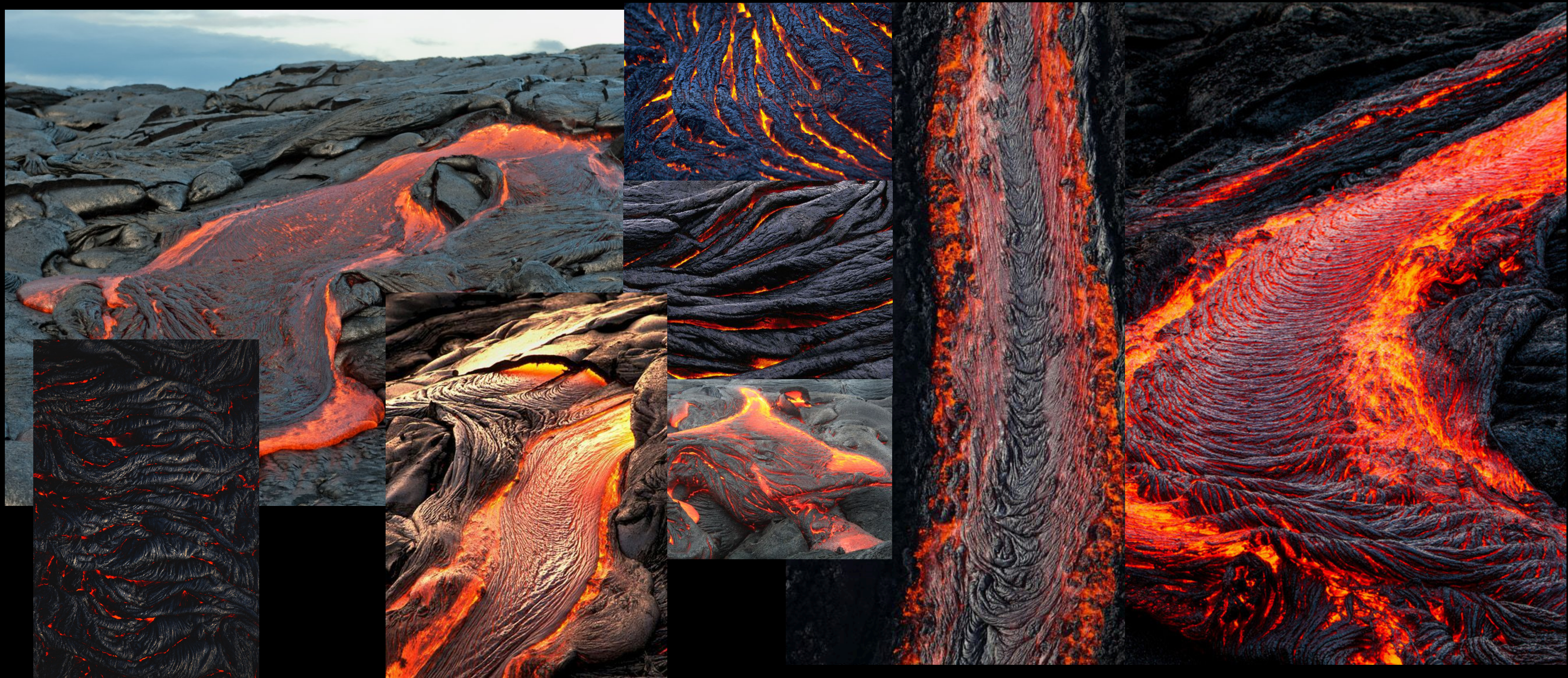
- Lava
- Weather
- Water



Lava

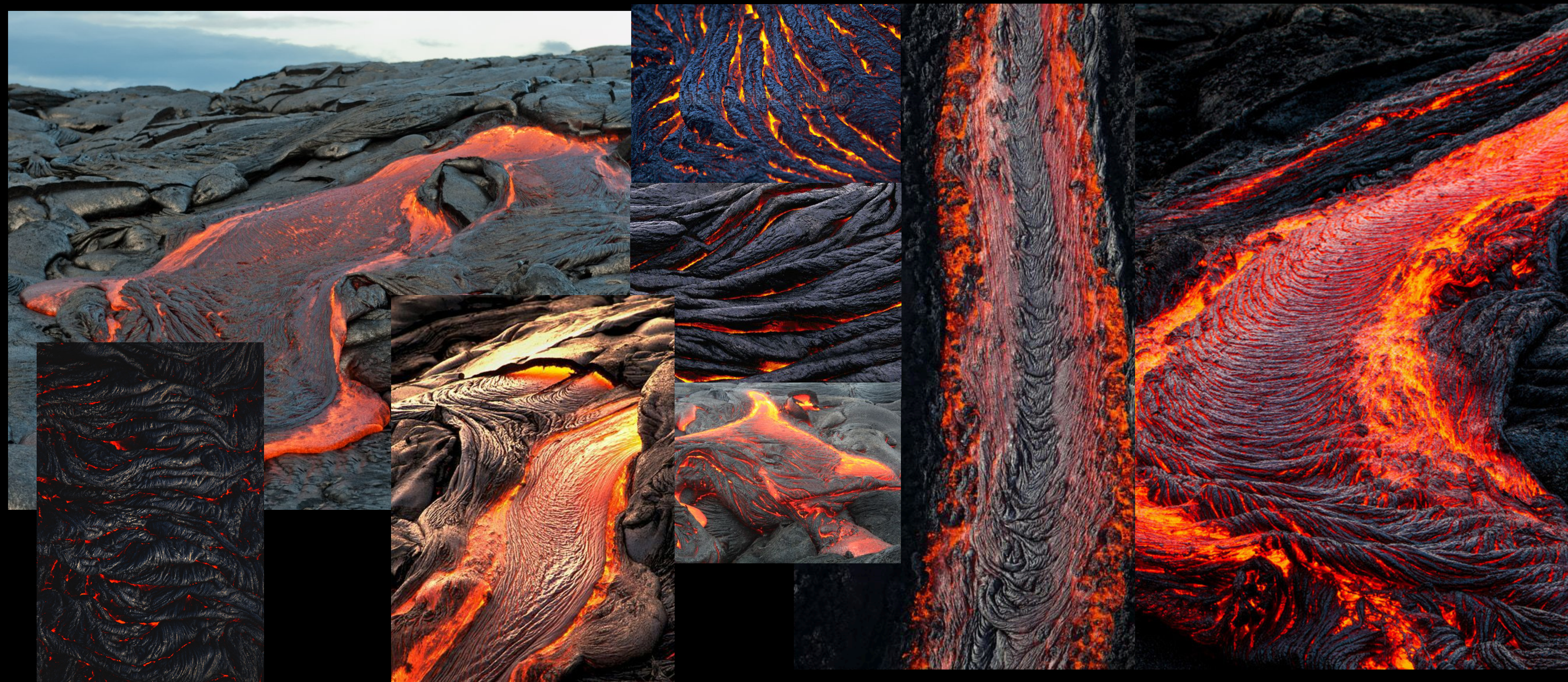


# Lava Reference





# Lava Key Elements



- Folds and wrinkle shapes
- Molten vs hardened
- Yellow, orange, red gradient
- Irregular flowing movement



# Hawaii Photogrammetry Trip





# Source Textures

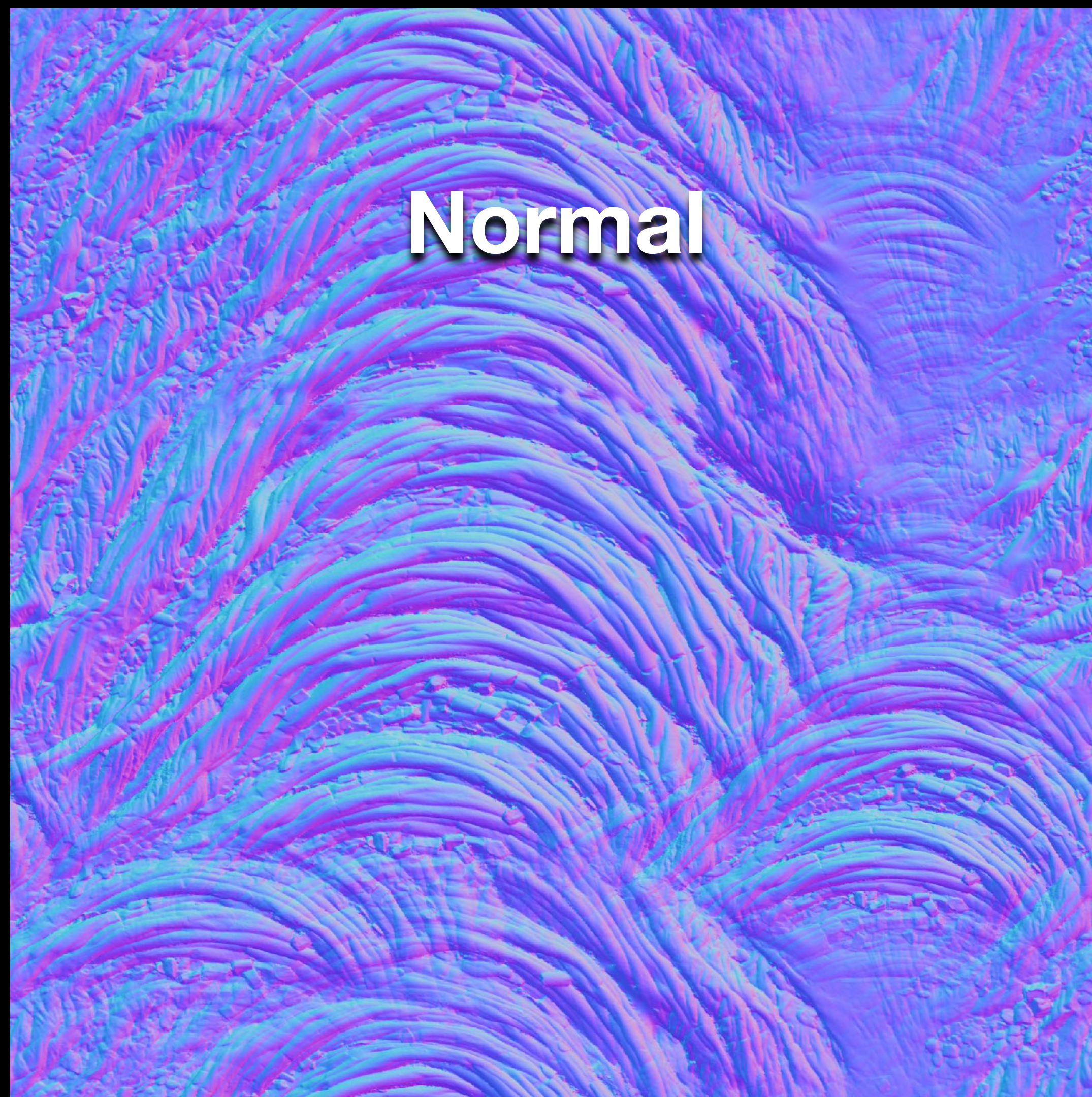
**Base Color**



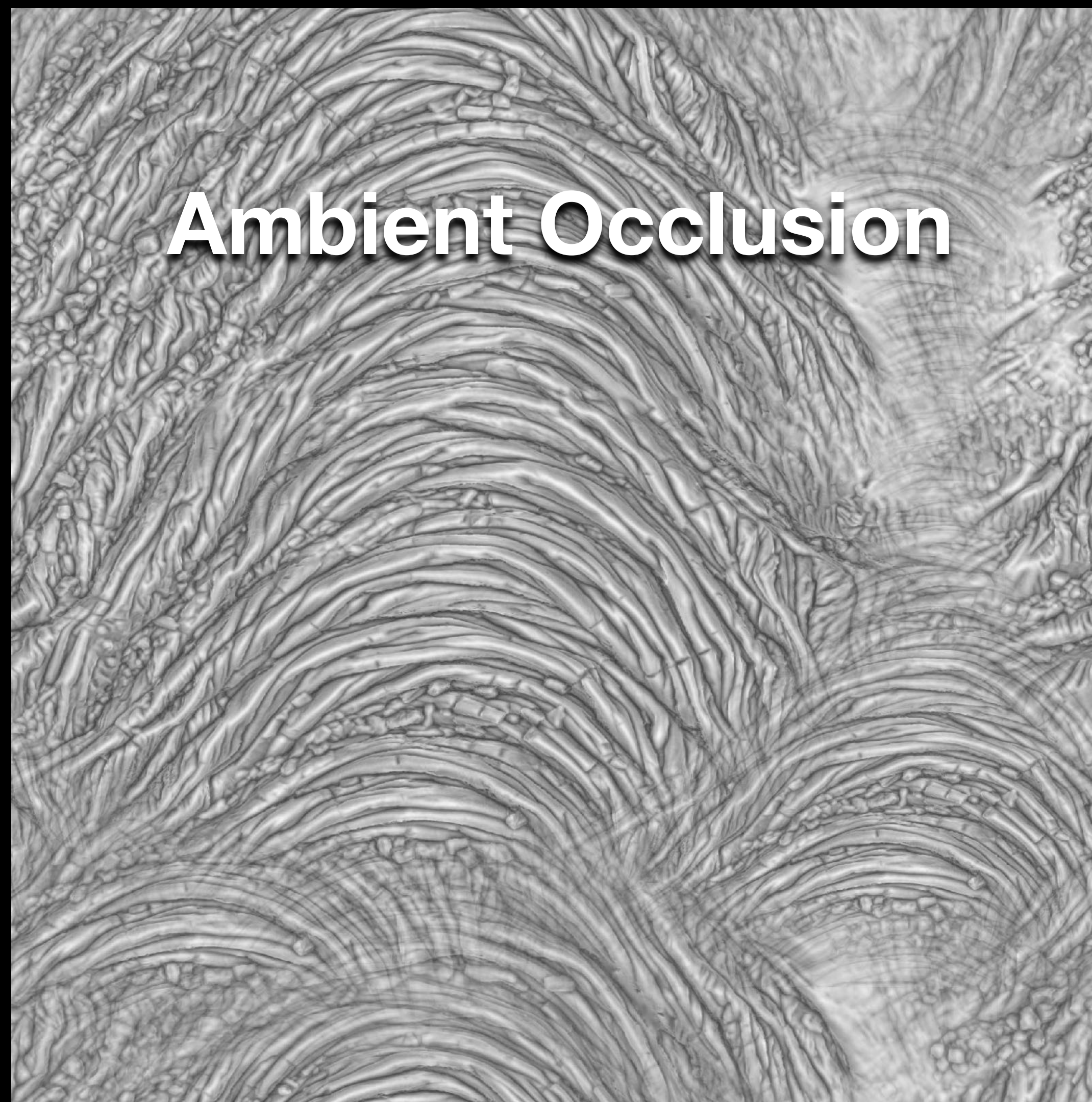
**Height**



**Normal**



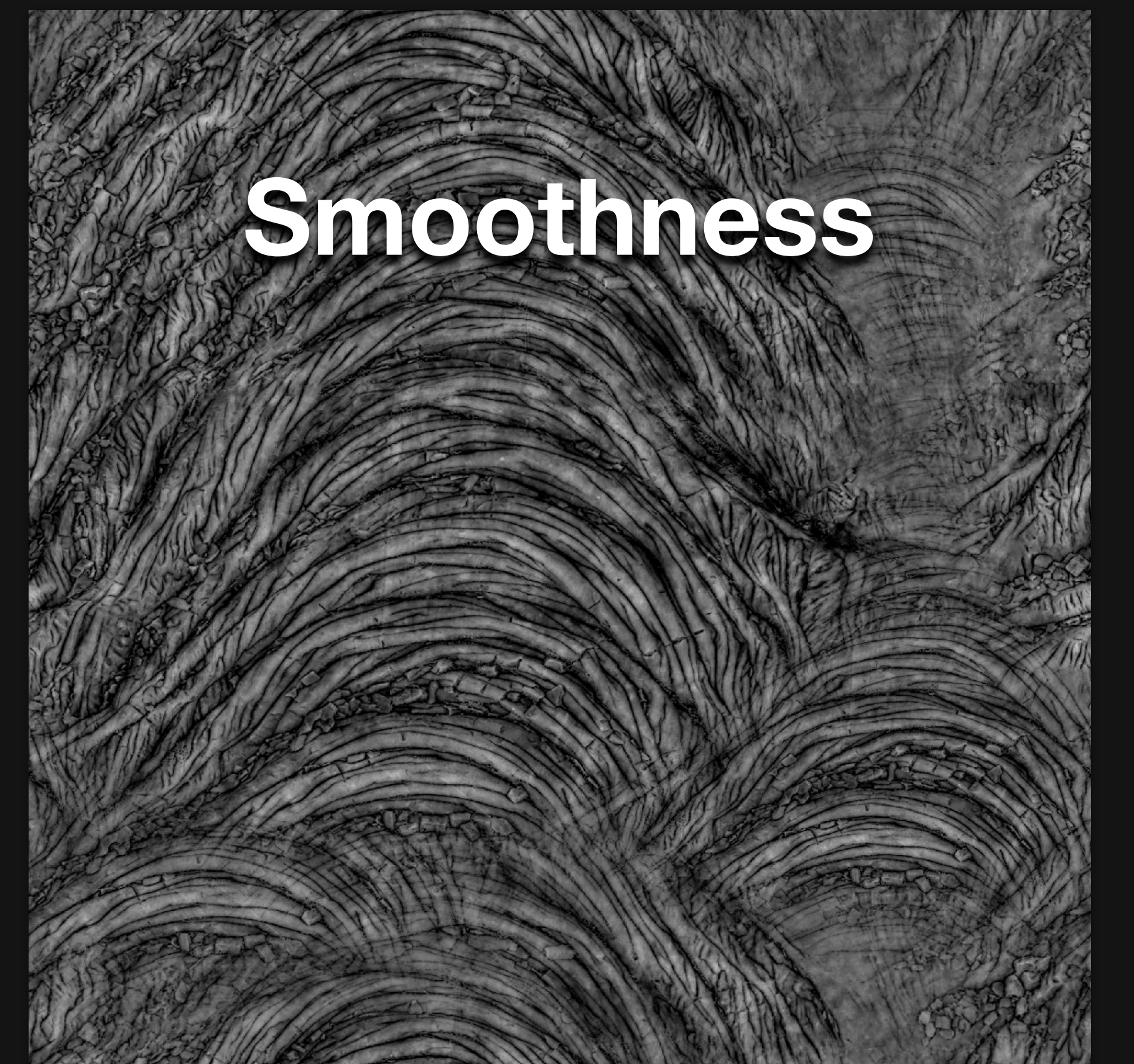
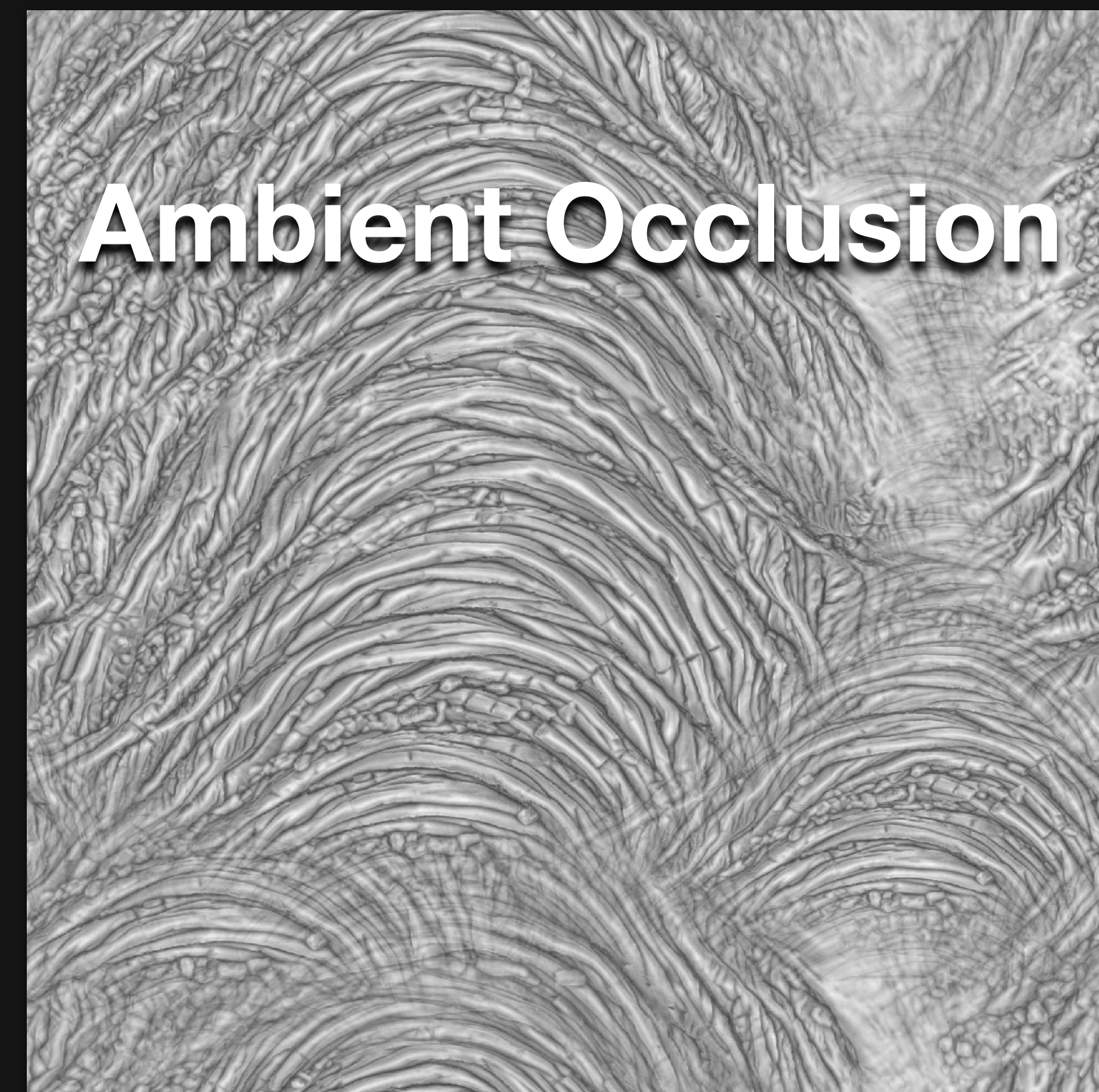
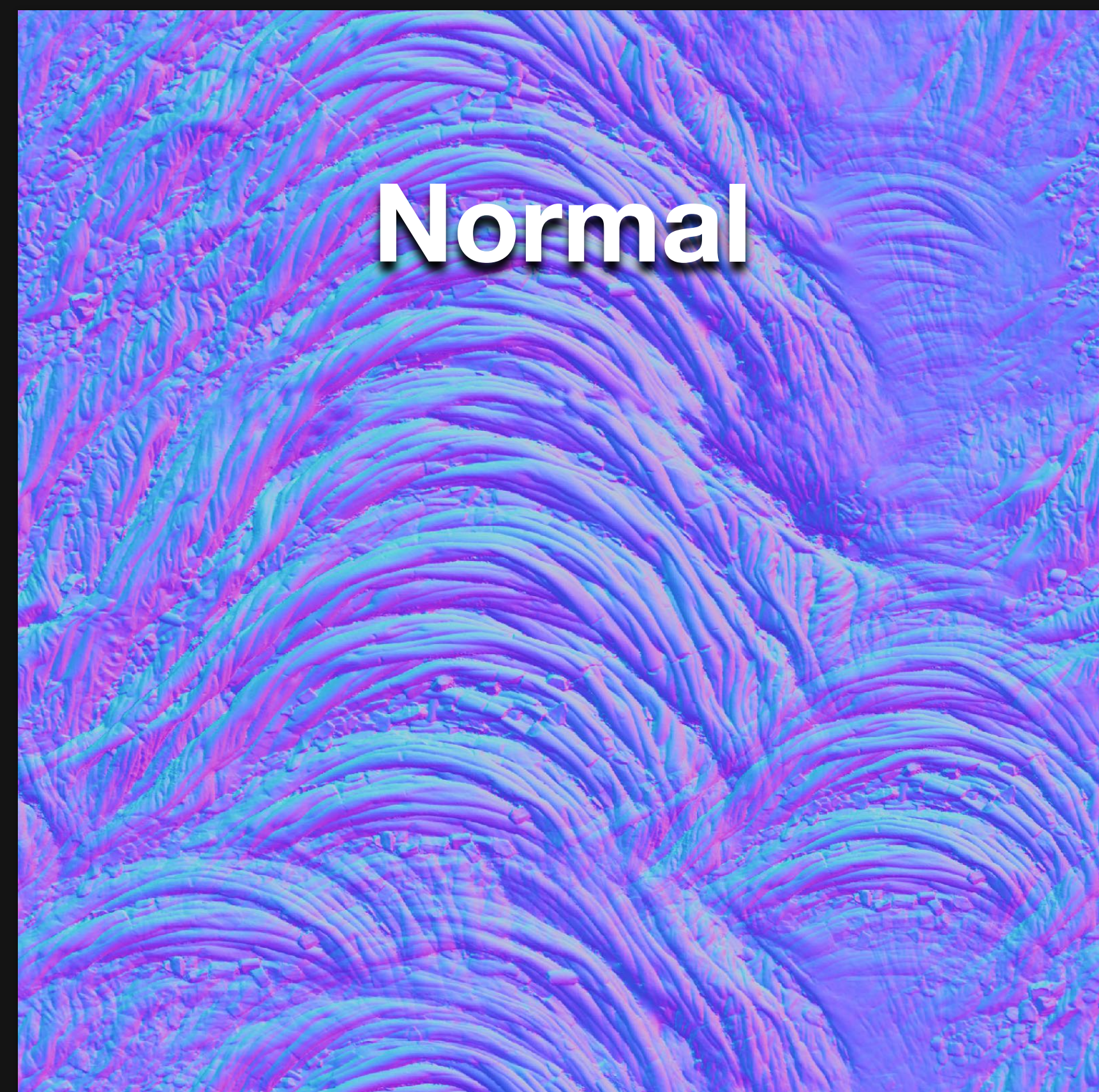
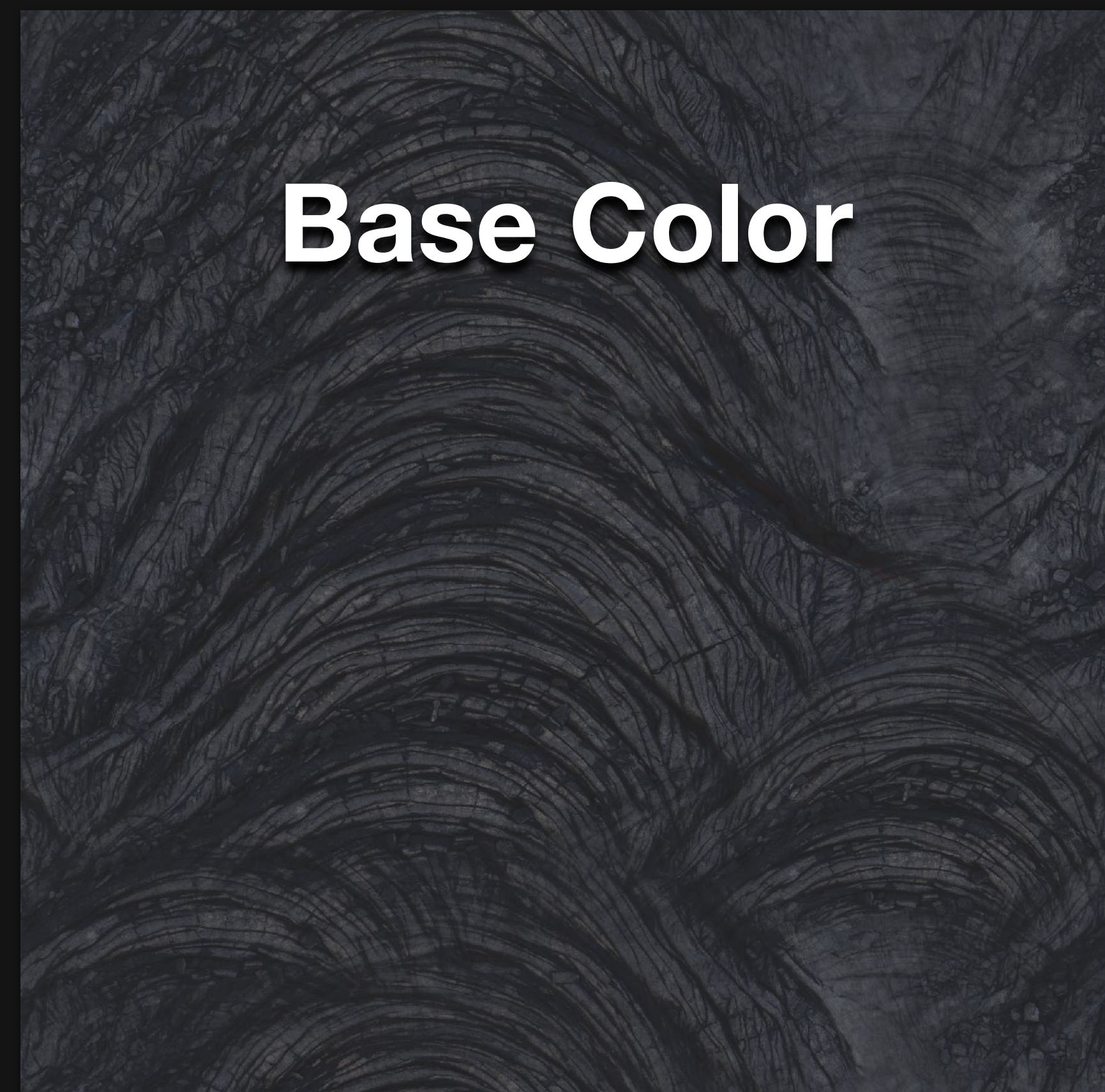
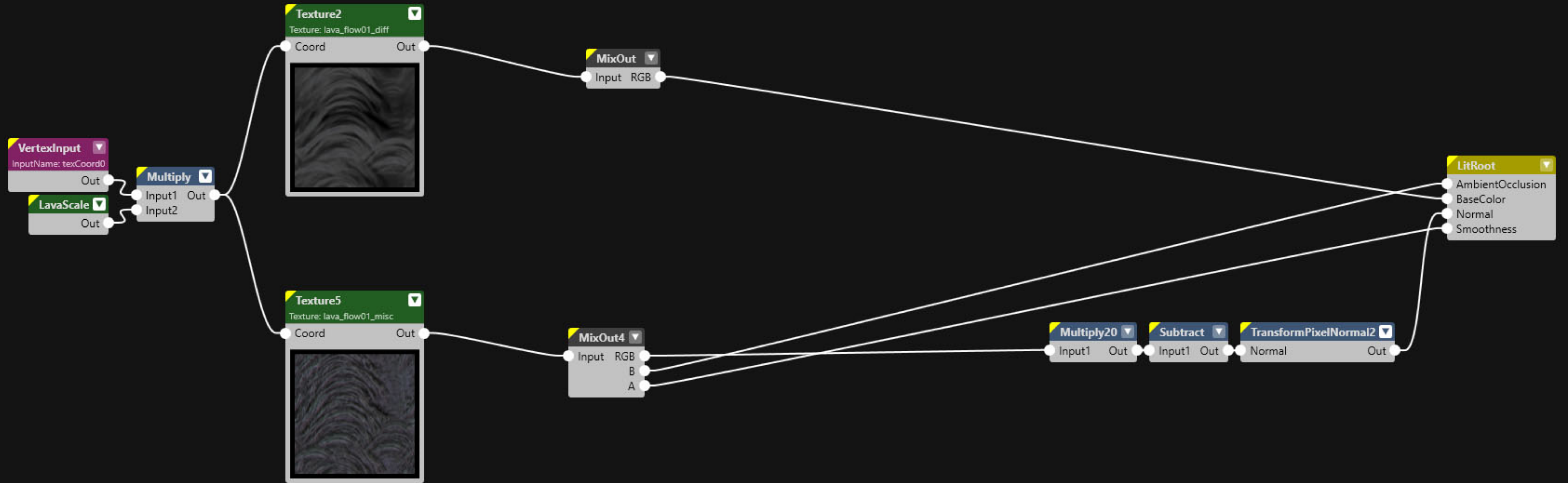
**Ambient Occlusion**



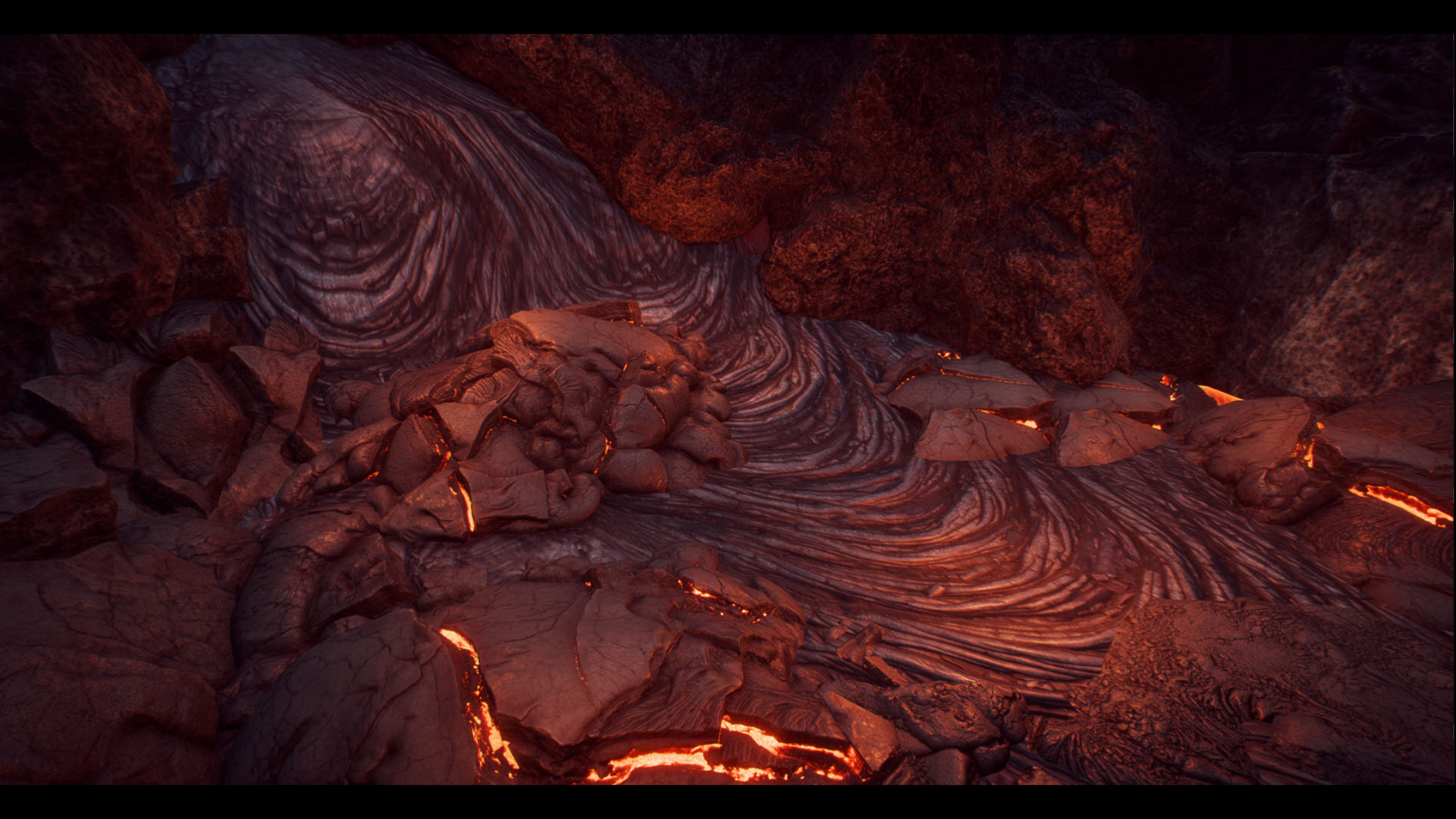
**Smoothness**



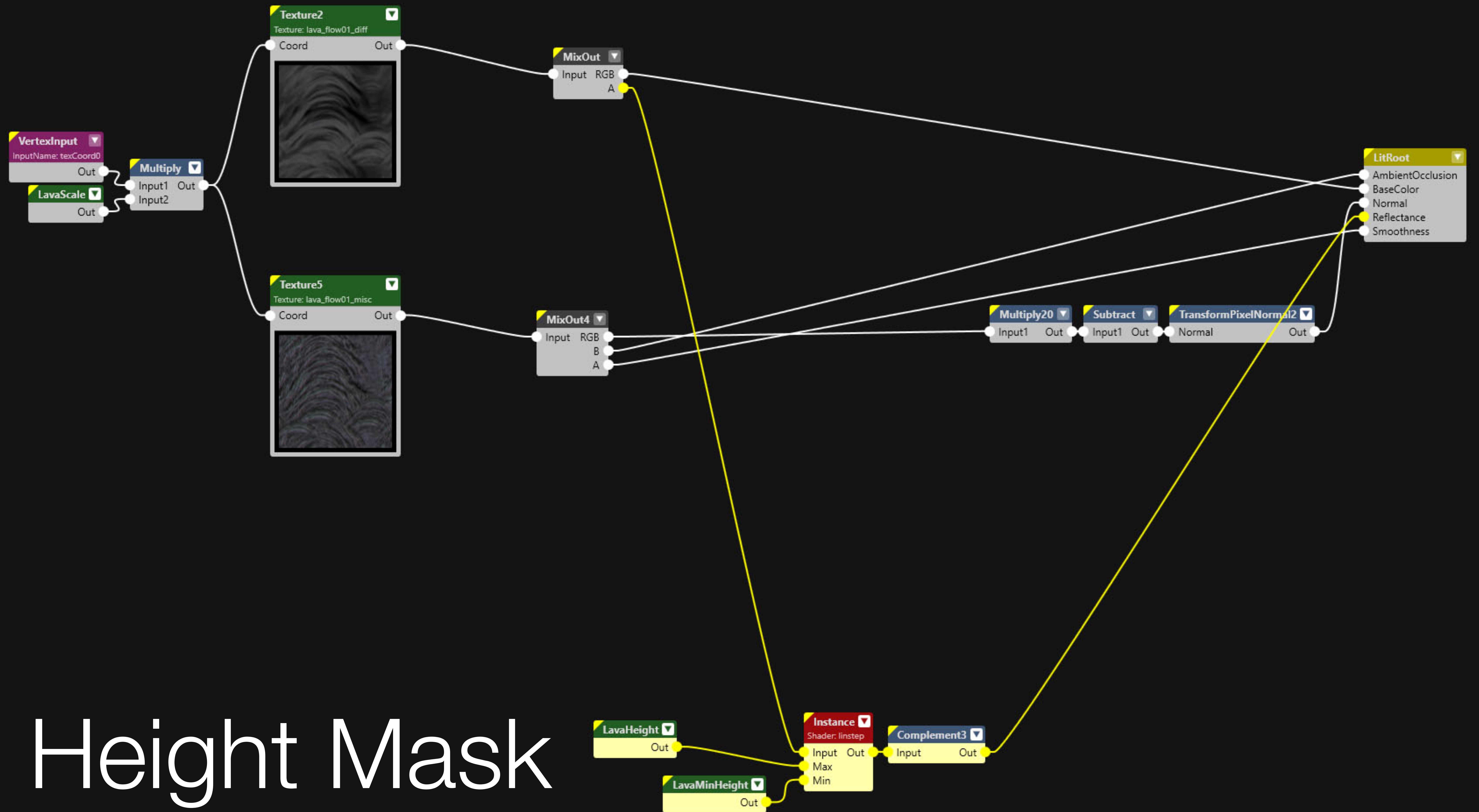




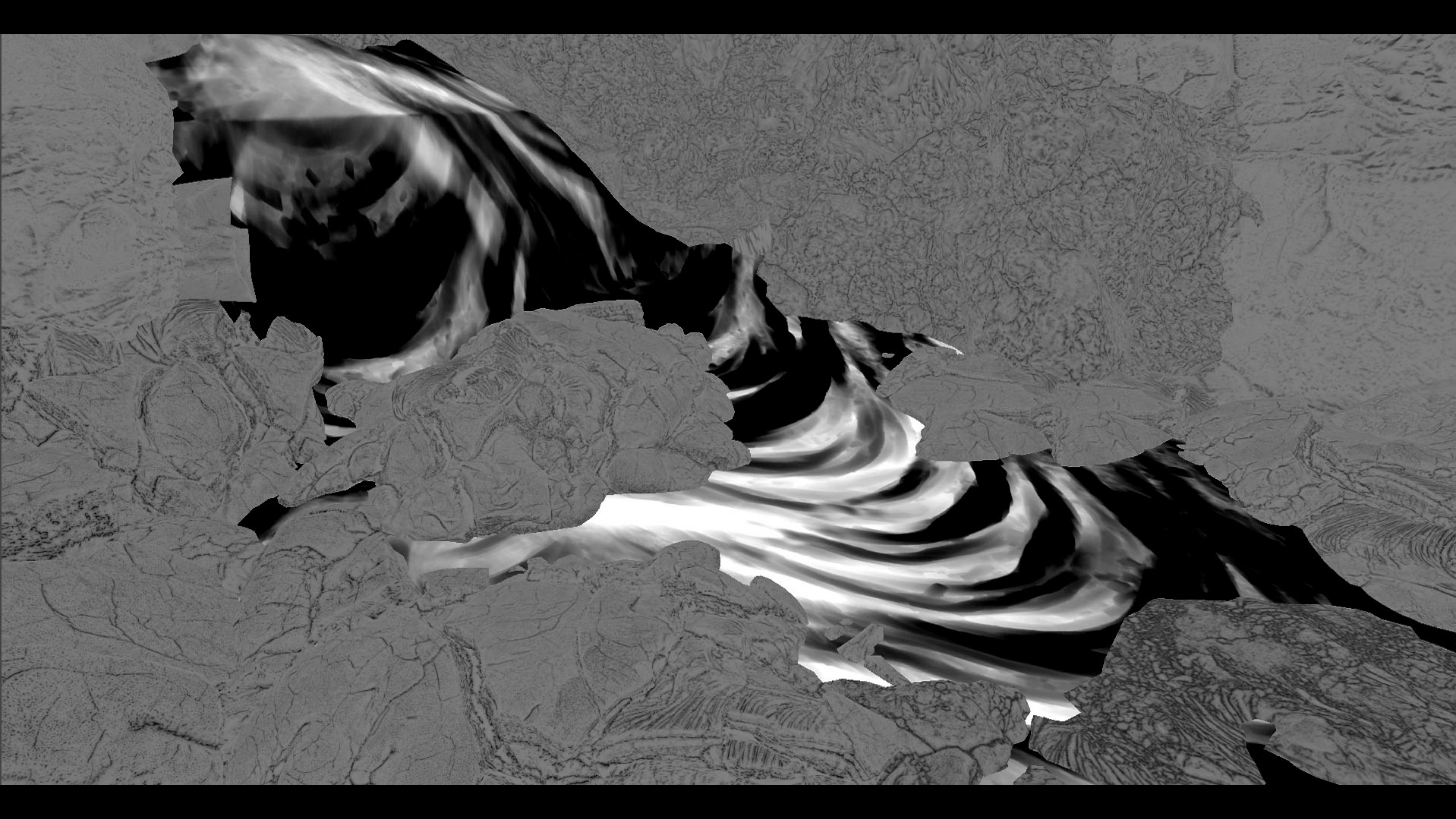




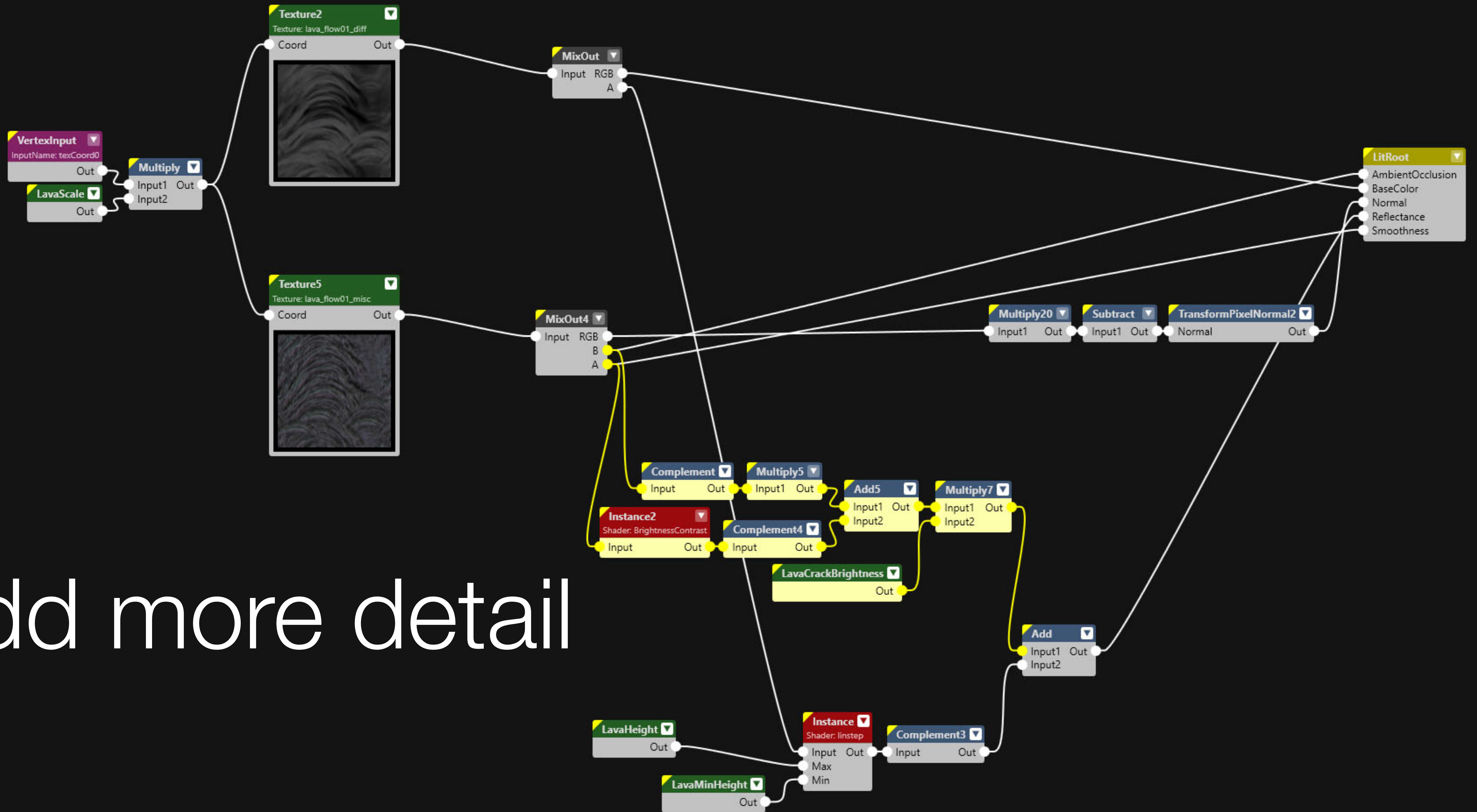






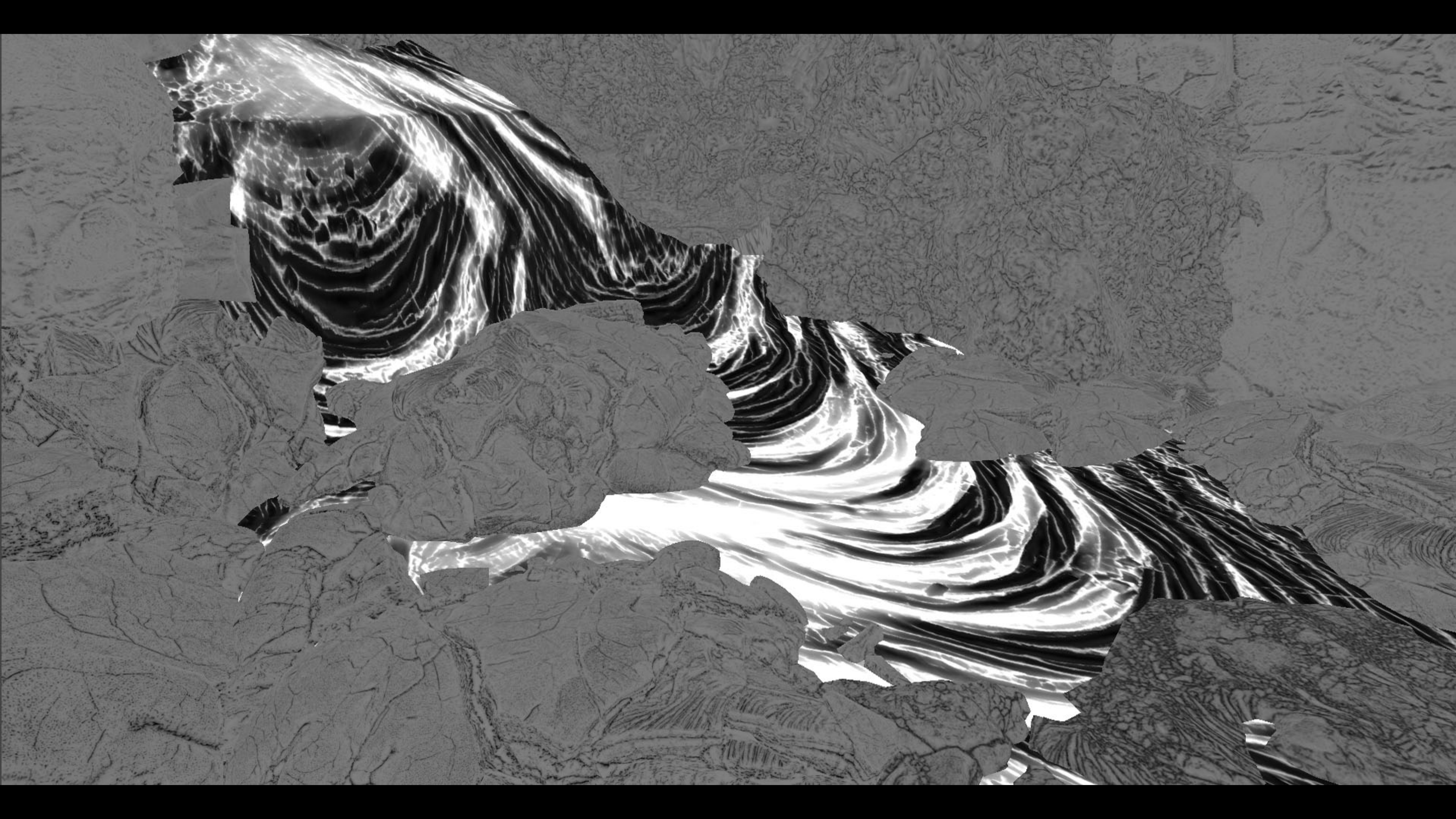






Add more detail





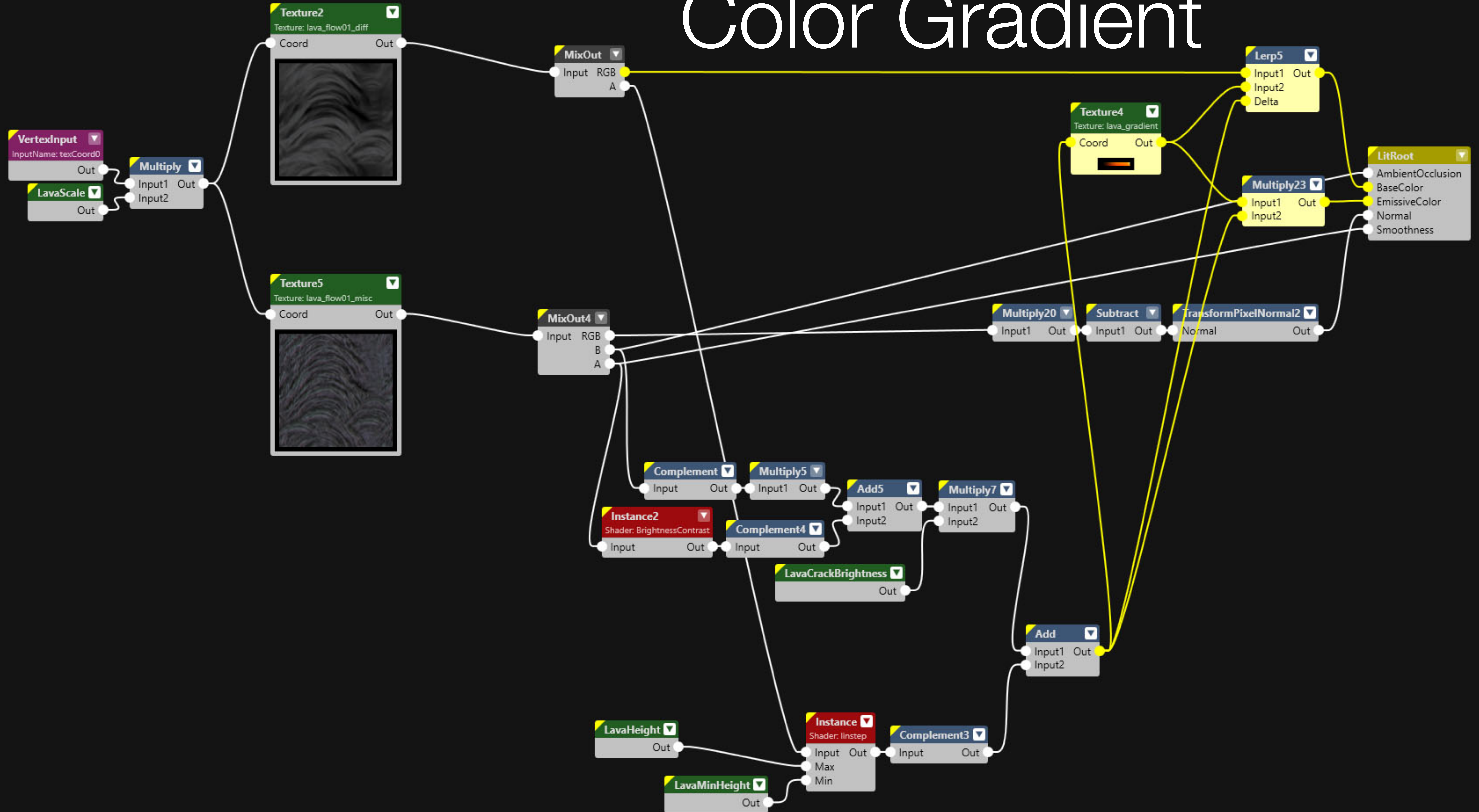


# Lava Color Gradient

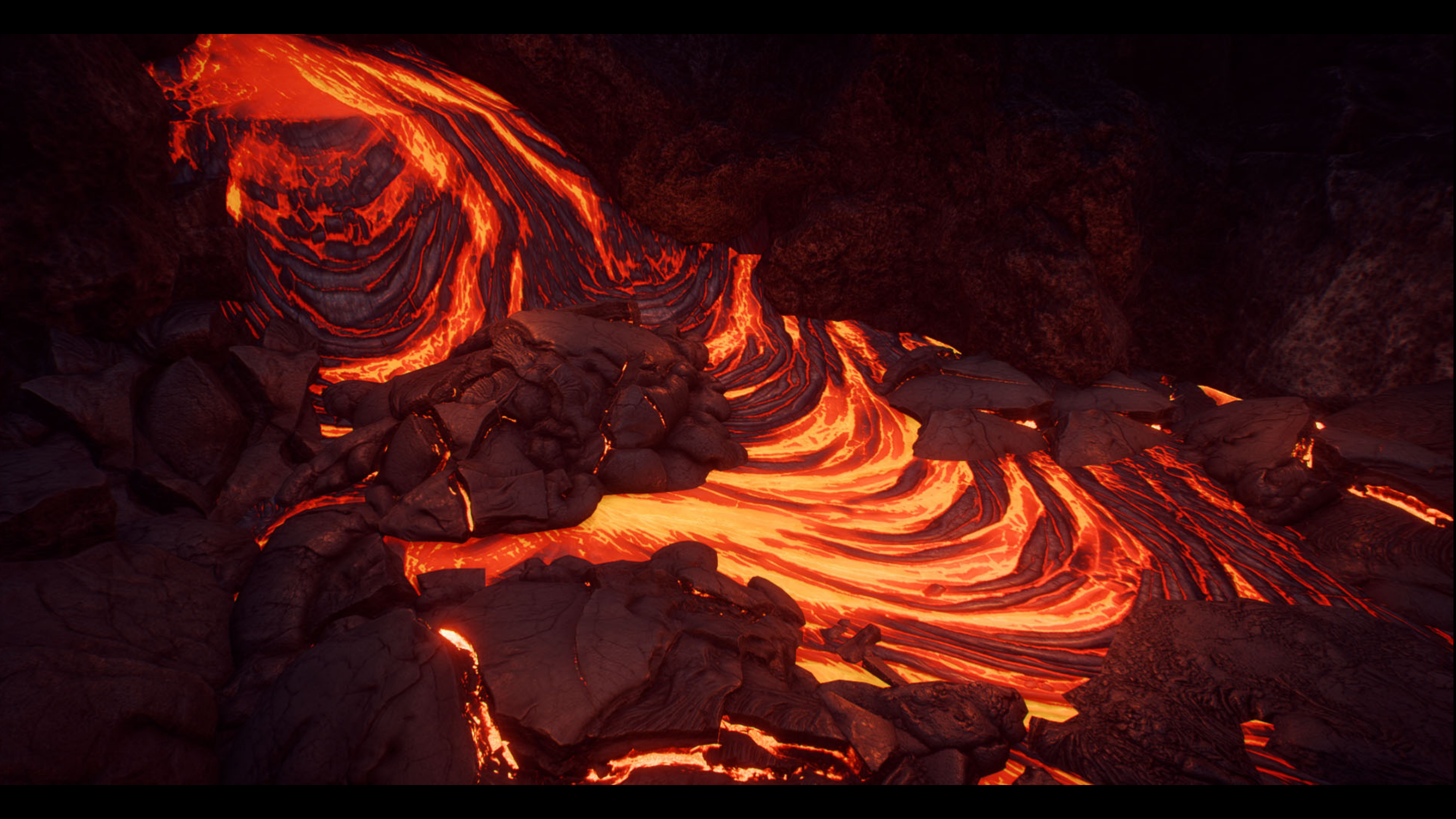




# Color Gradient

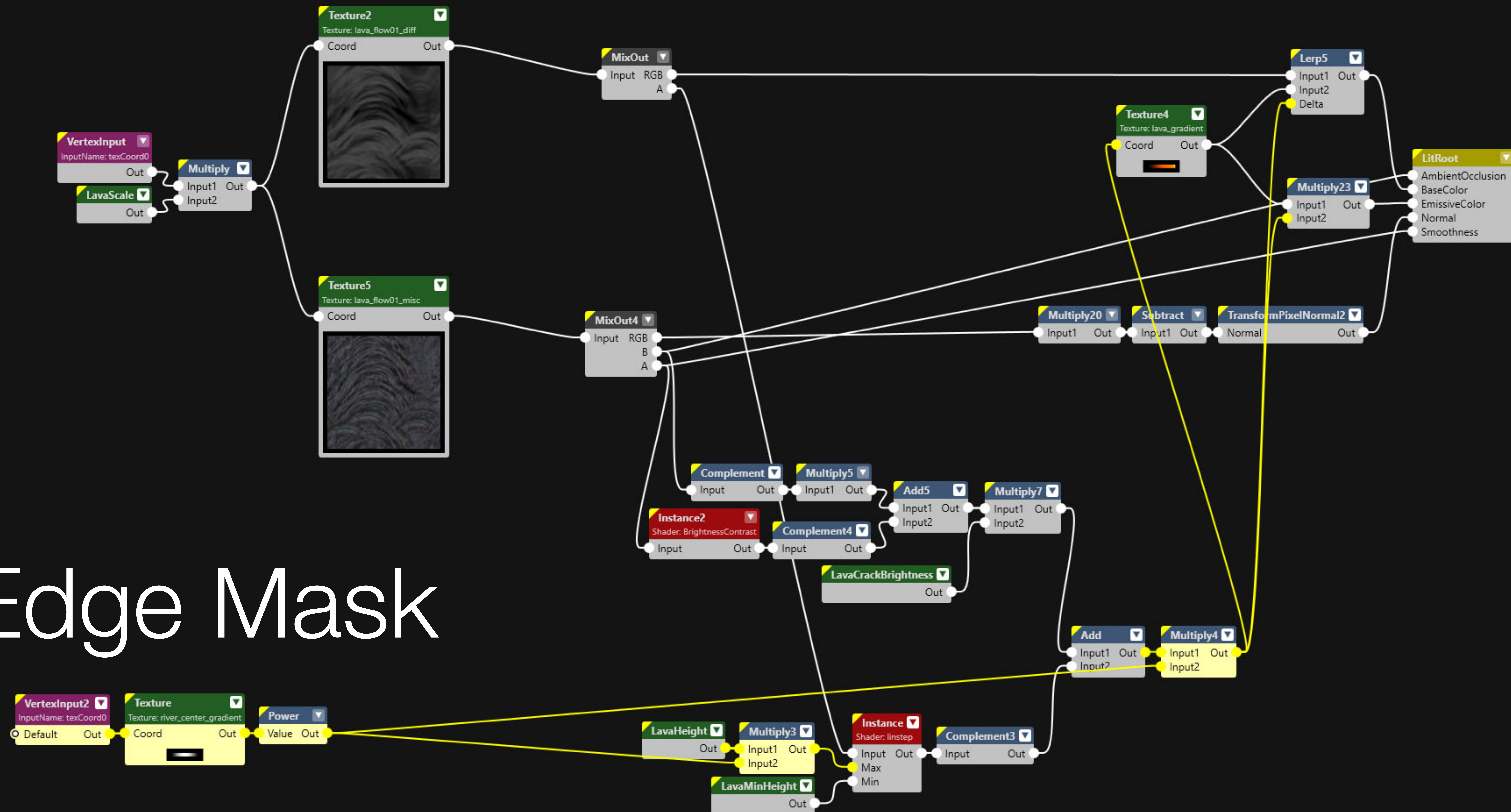




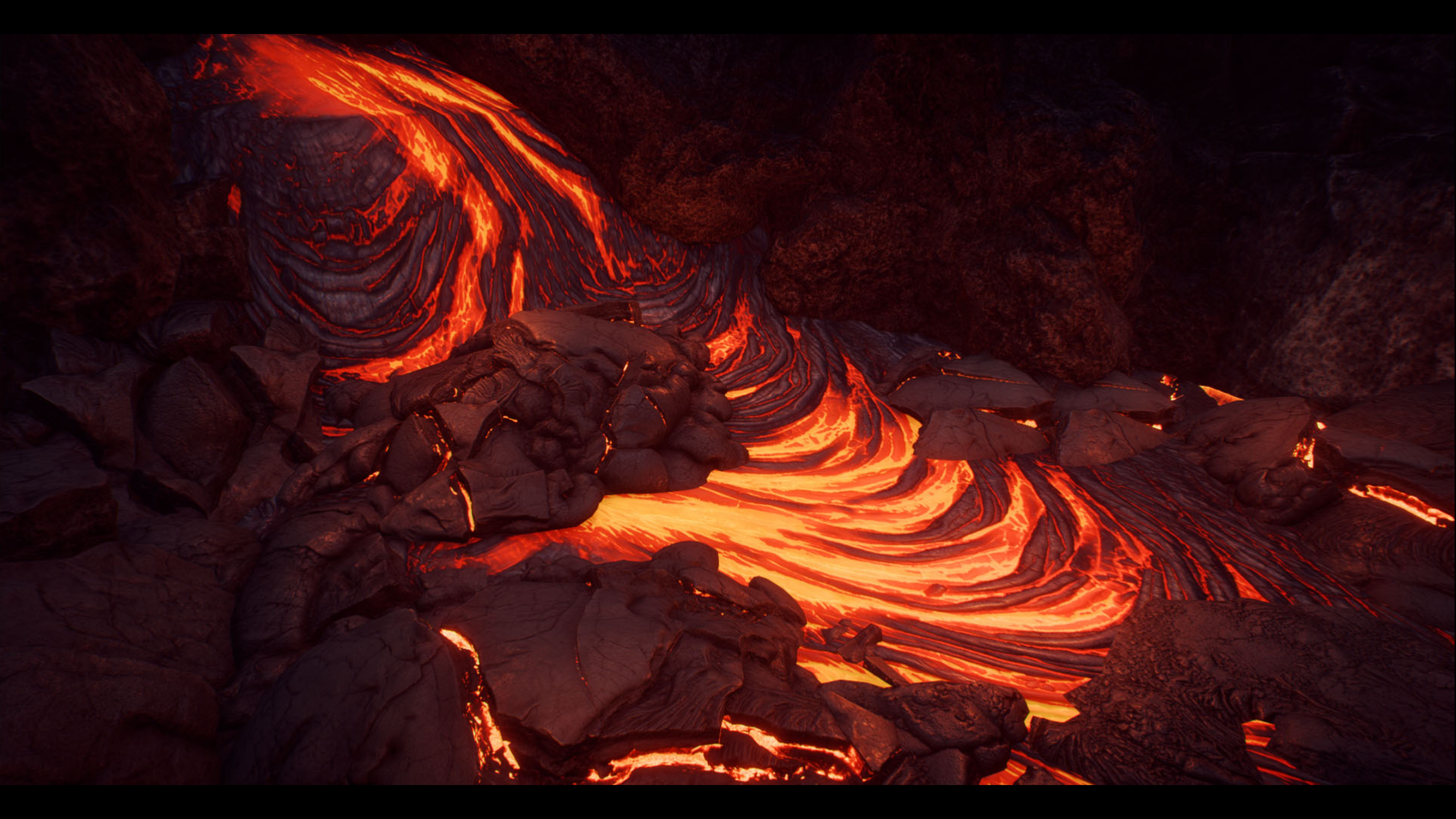




# Edge Mask









# Flow Maps!

张少勇1

# GDC

## Applying AAA techniques to mobile games

Understanding the flow-map and its applications

Shaoyong (Abel) Zhang  
VFX Artist - NetEase Games

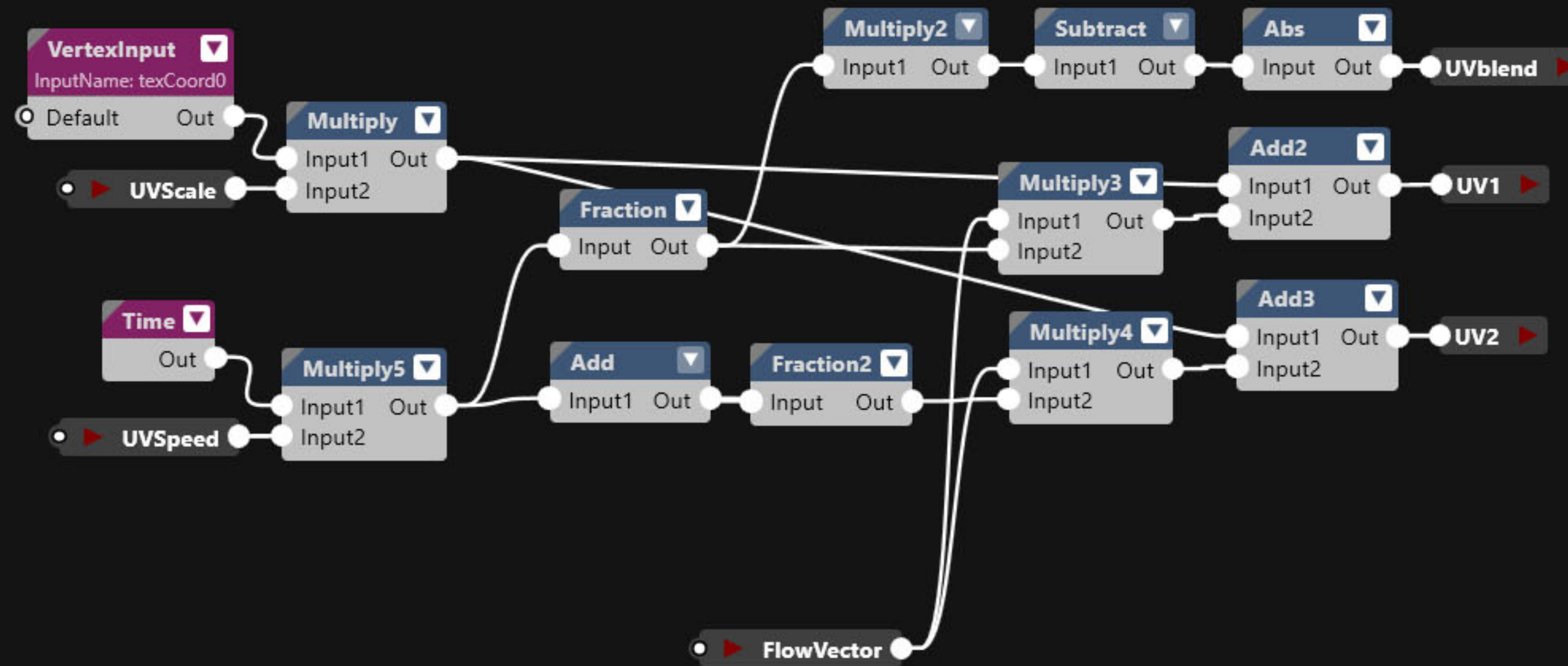
GAME DEVELOPERS CONFERENCE\* | MARCH 19-23, 2018 | EXPO: MARCH 21-23, 2018 #GDC18



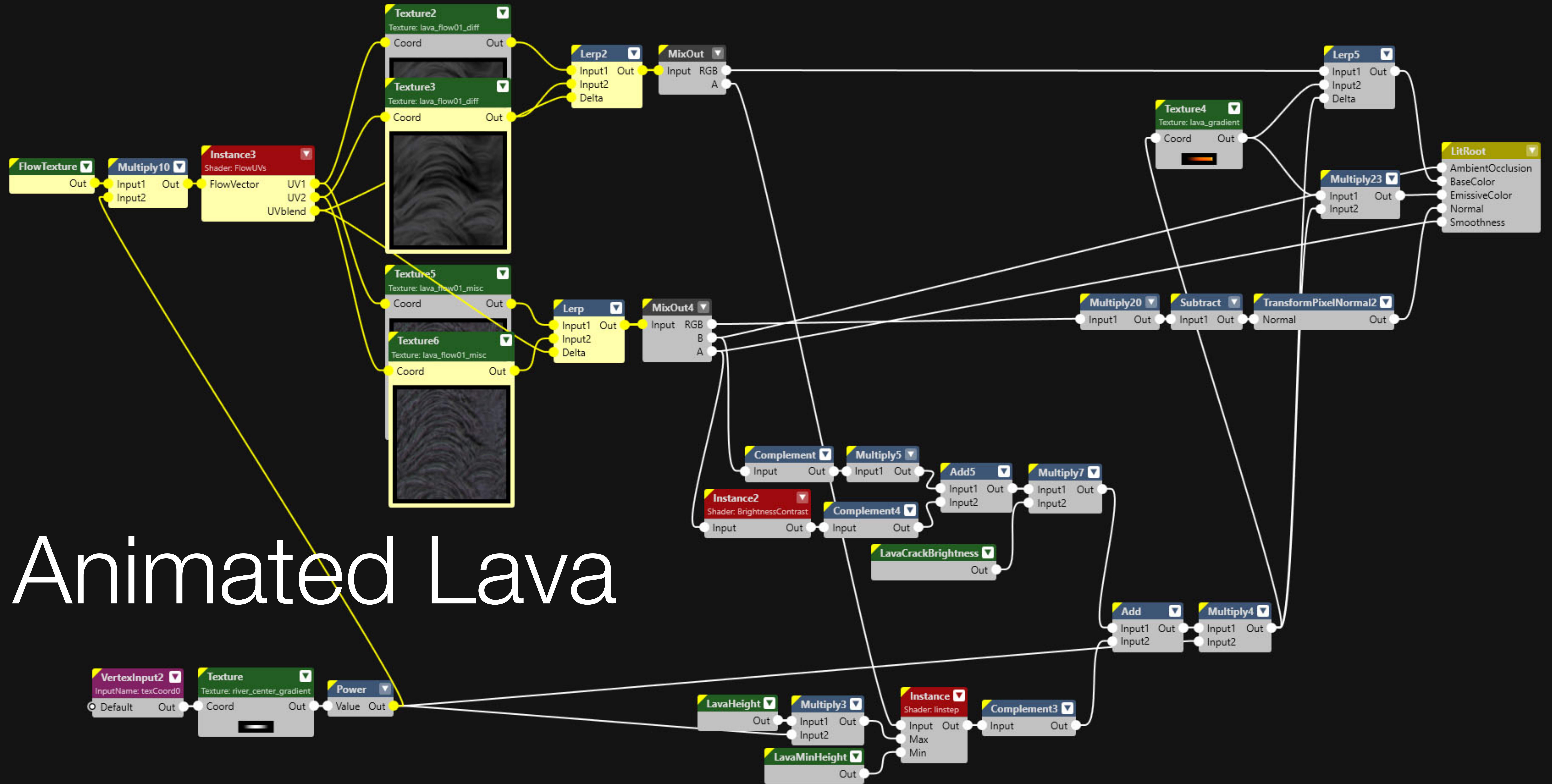
“The basic concept is to use an image, the flow image, to push around the UV values of a source image. We can think of the flow map as a mapping of the different vectors, such as direction and magnitude, and then use them intelligently to create the desired motion.”



# Flow Map UVs







# Animated Lava









Video showing various lava flows





# Dynamic Weather





Video showing weather reference material



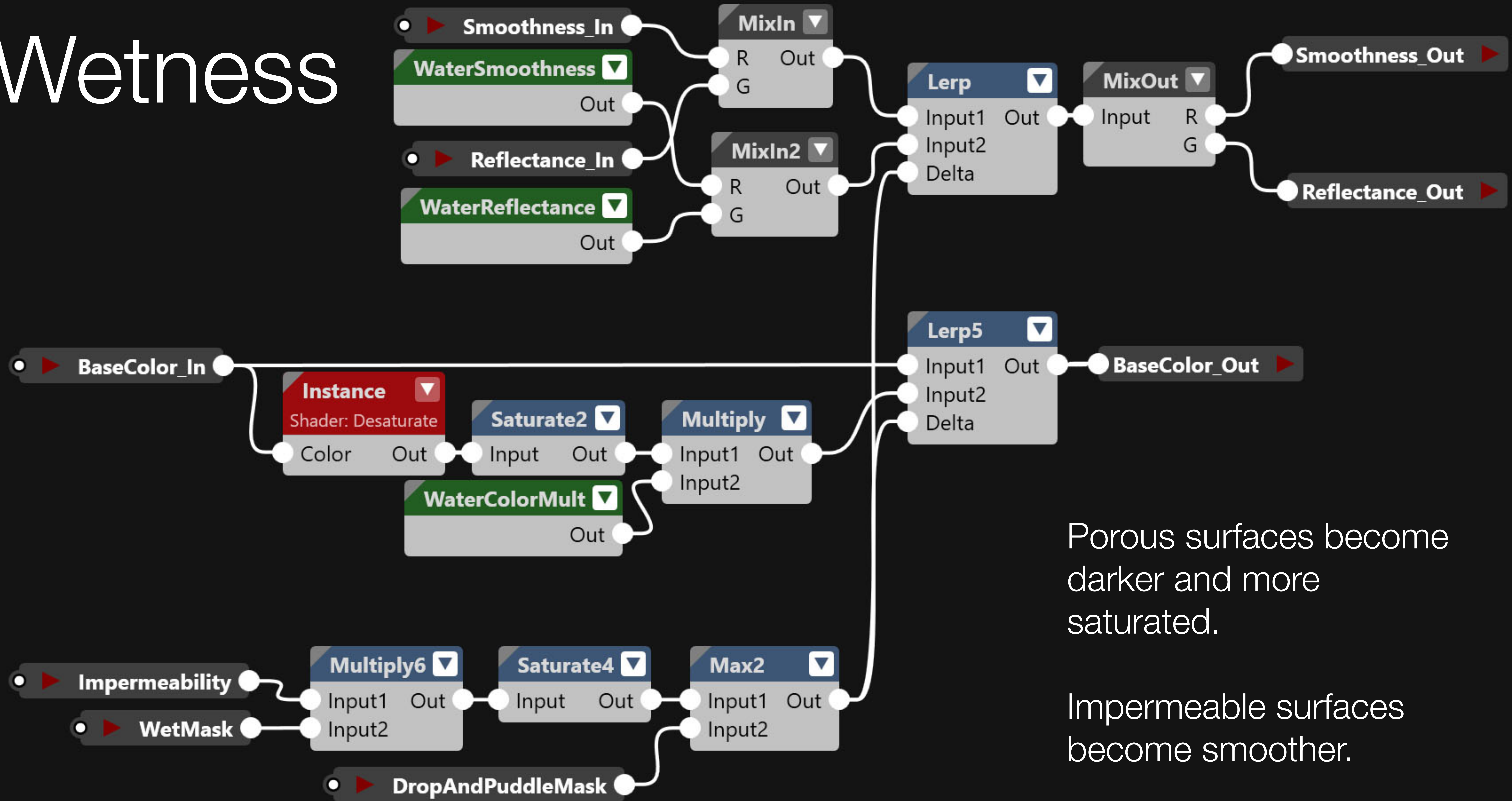
# Dynamic Weather Key Elements



- Wetness - darken or smooth
- Rain drops on horizontal surfaces
- Rain drips on vertical surfaces
- Puddles - Wind and drop ripples



# Wetness

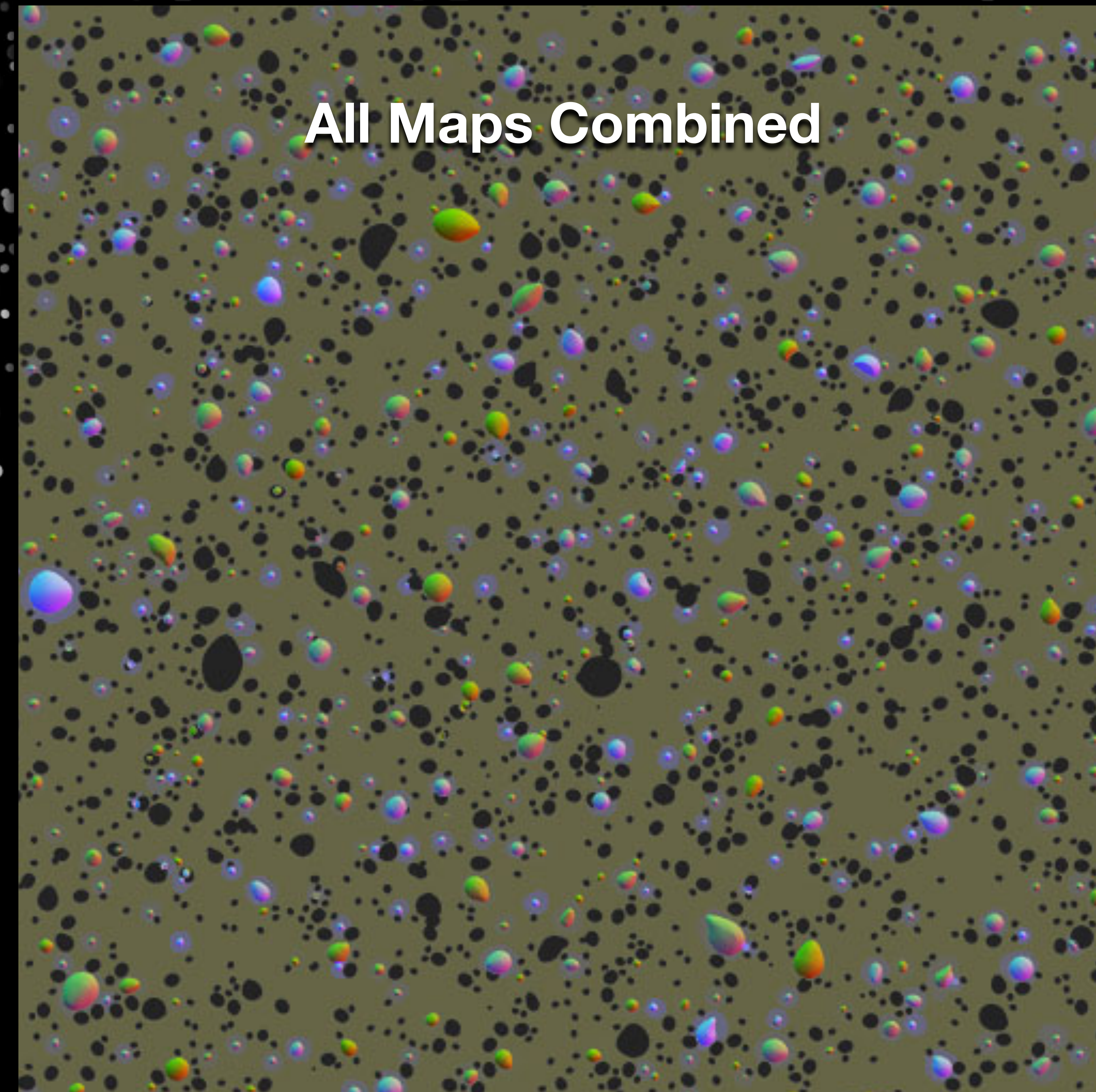
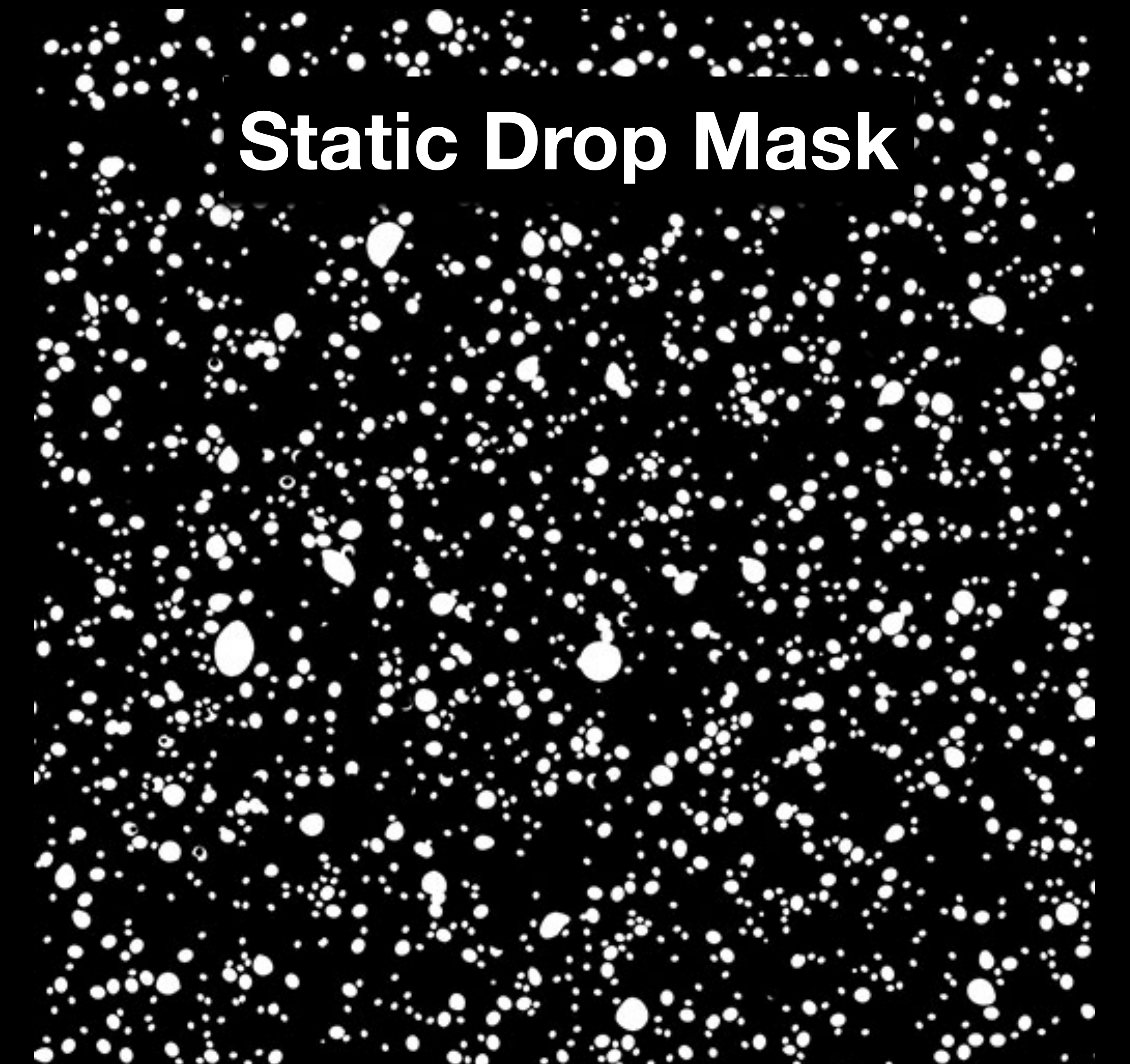
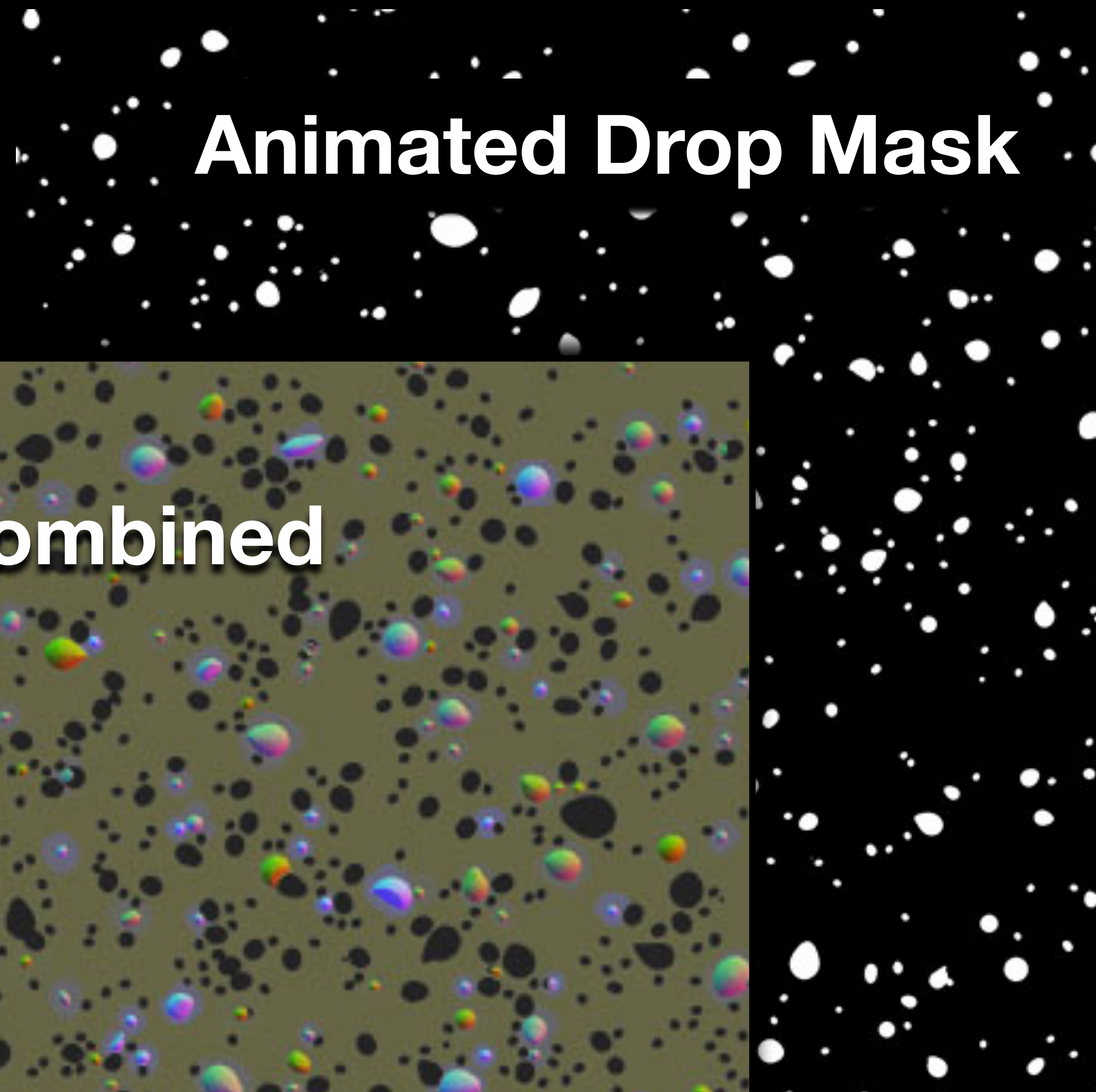
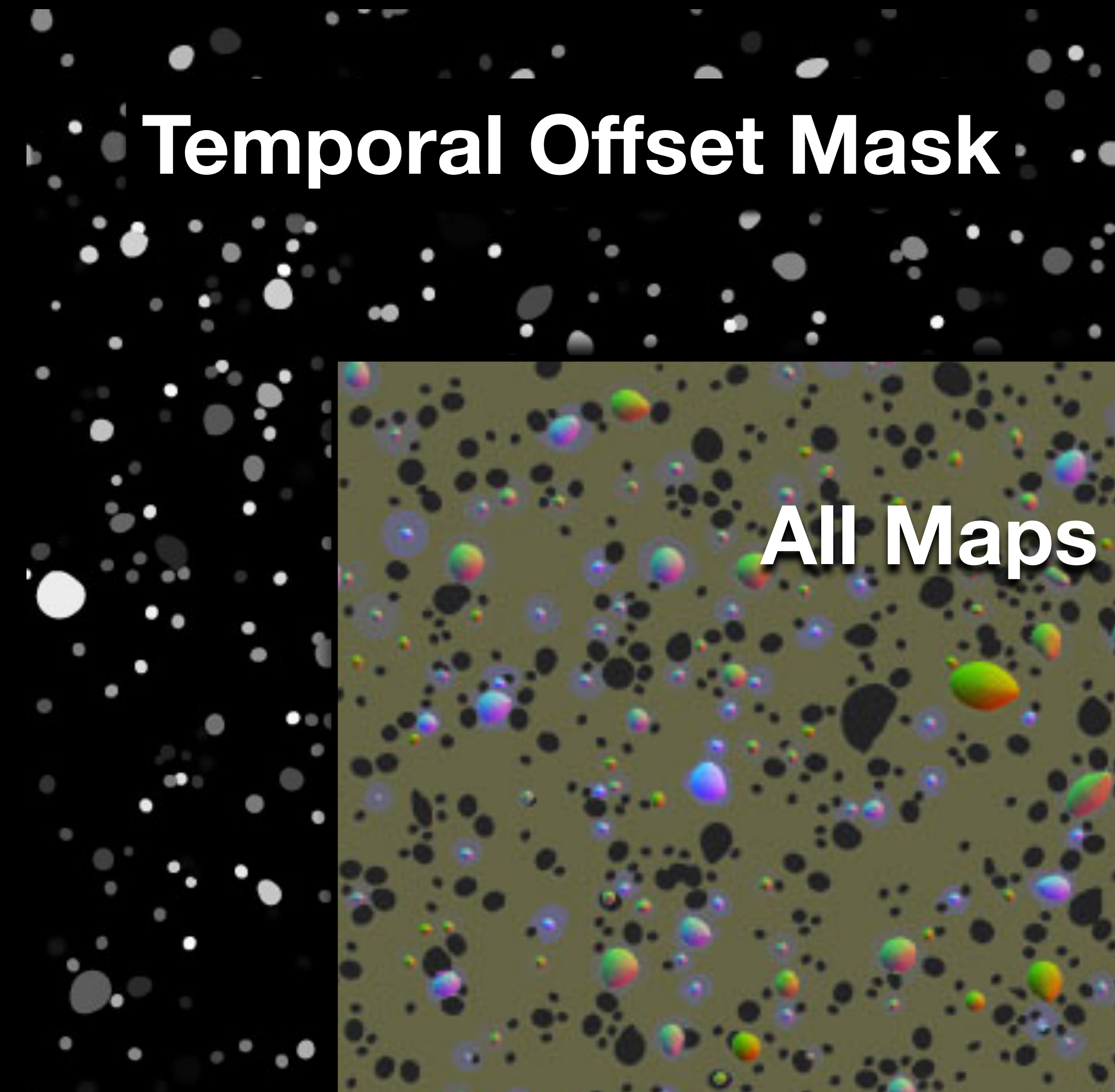
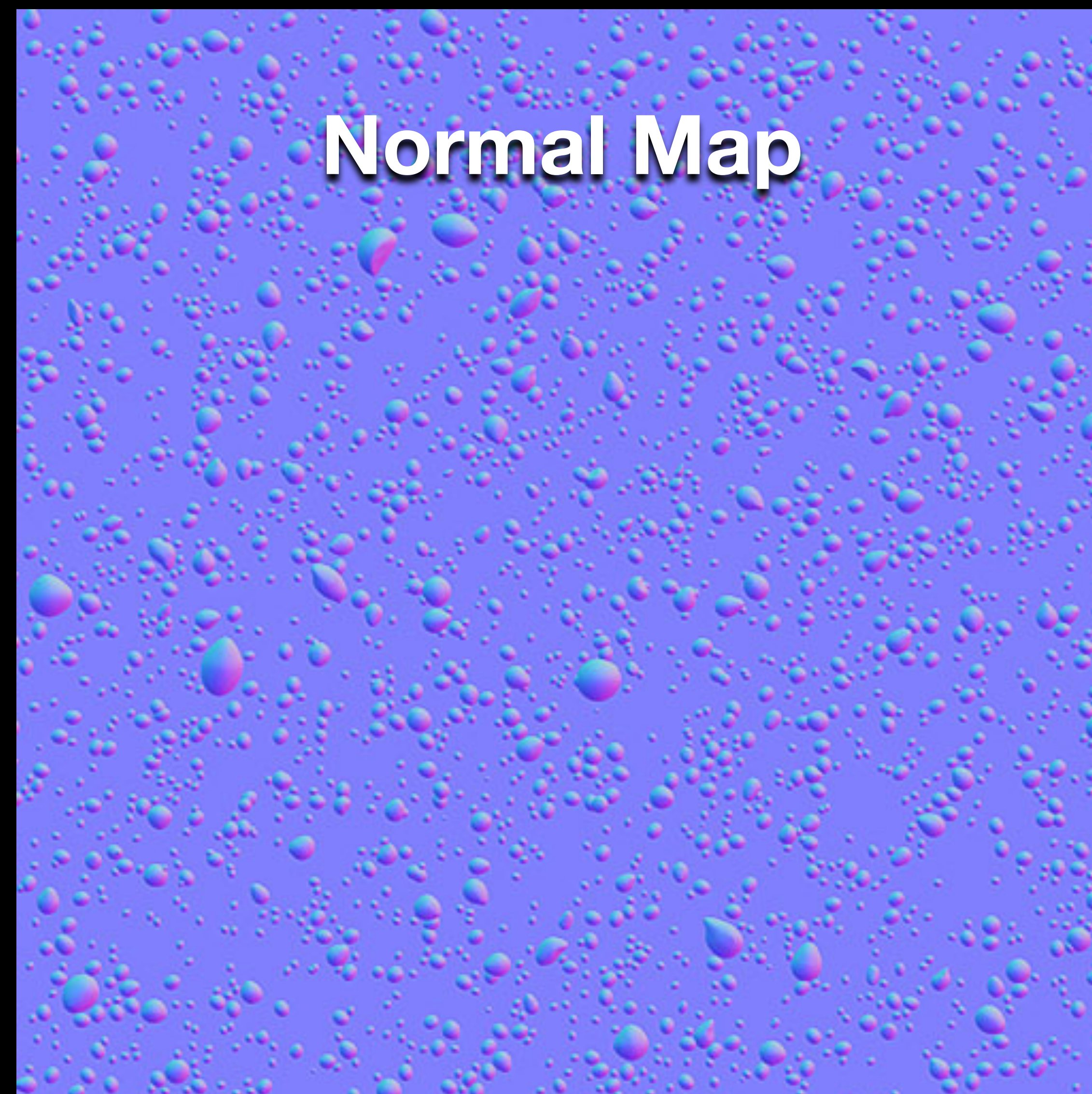


Porous surfaces become darker and more saturated.

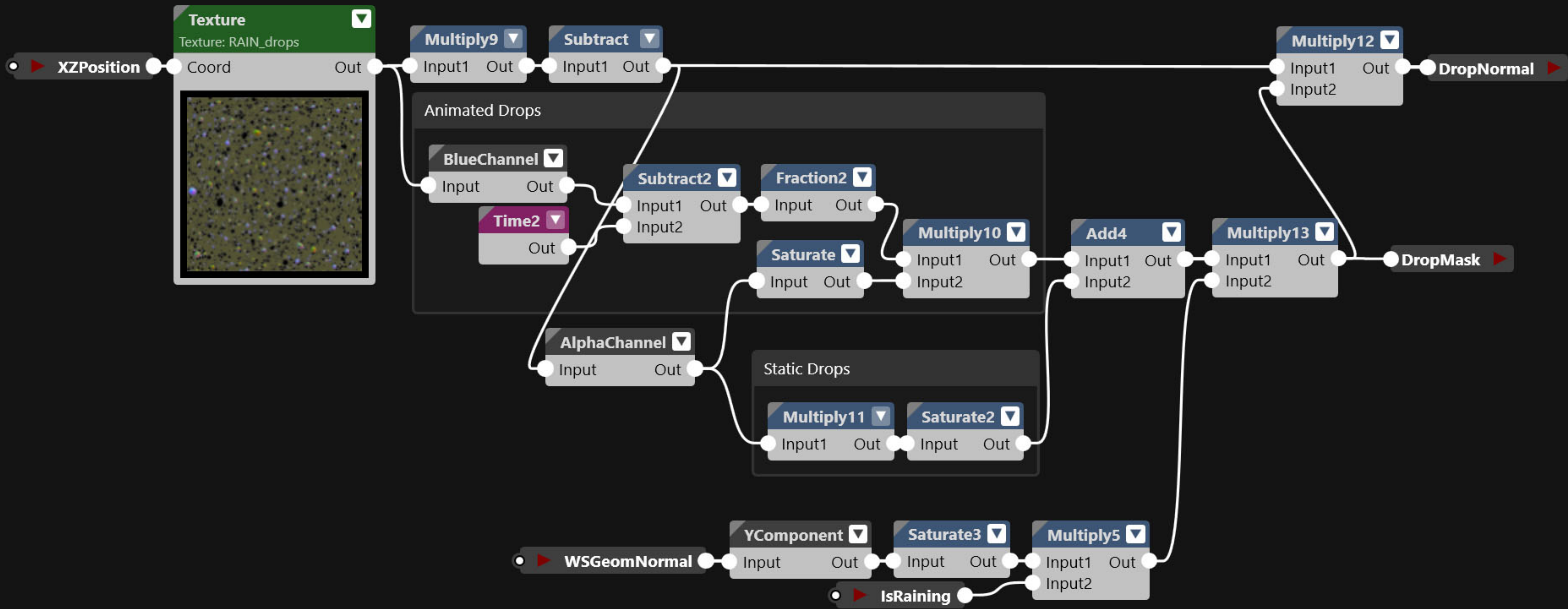
Impermeable surfaces become smoother.



# Rain Drops





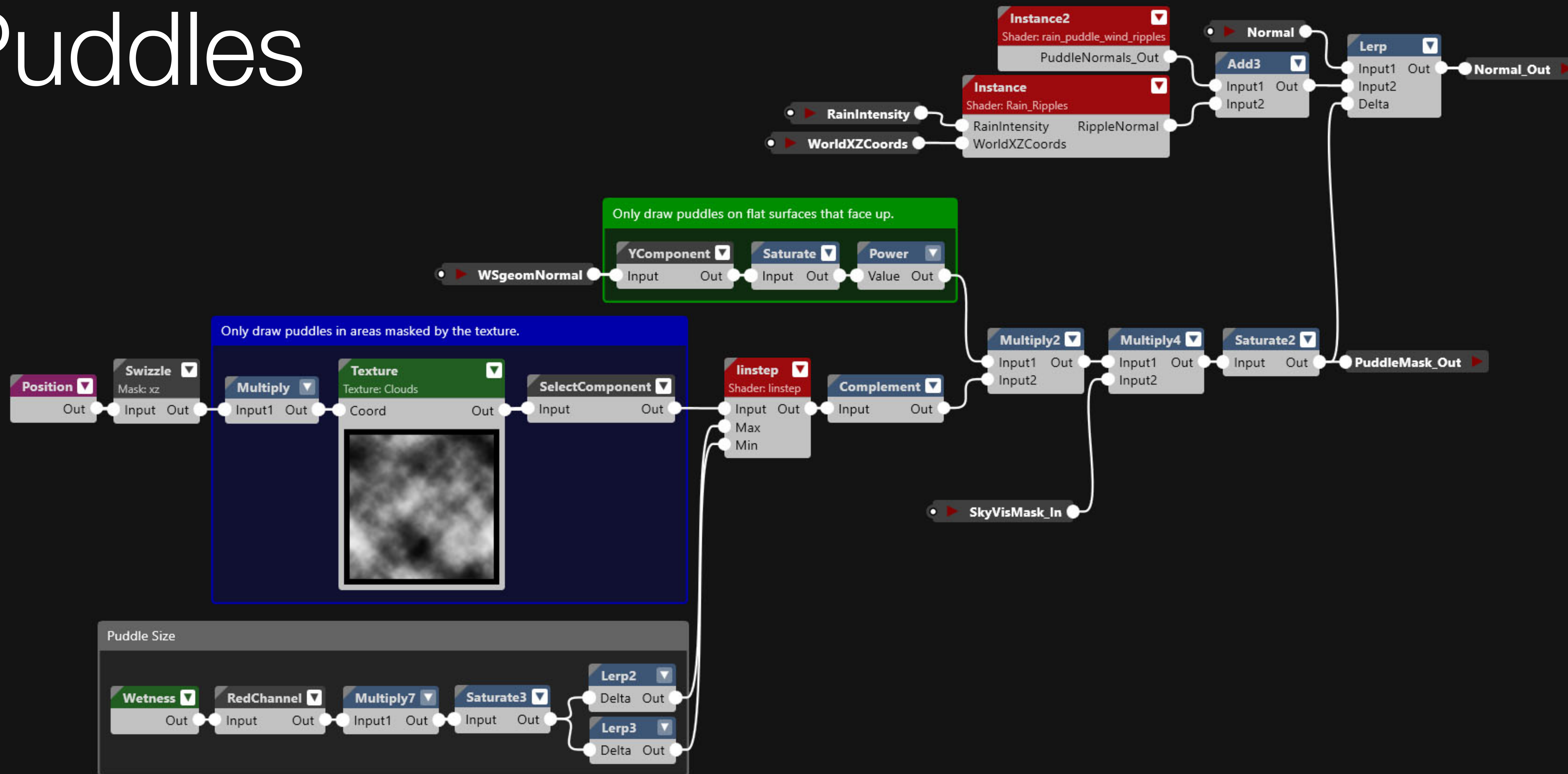






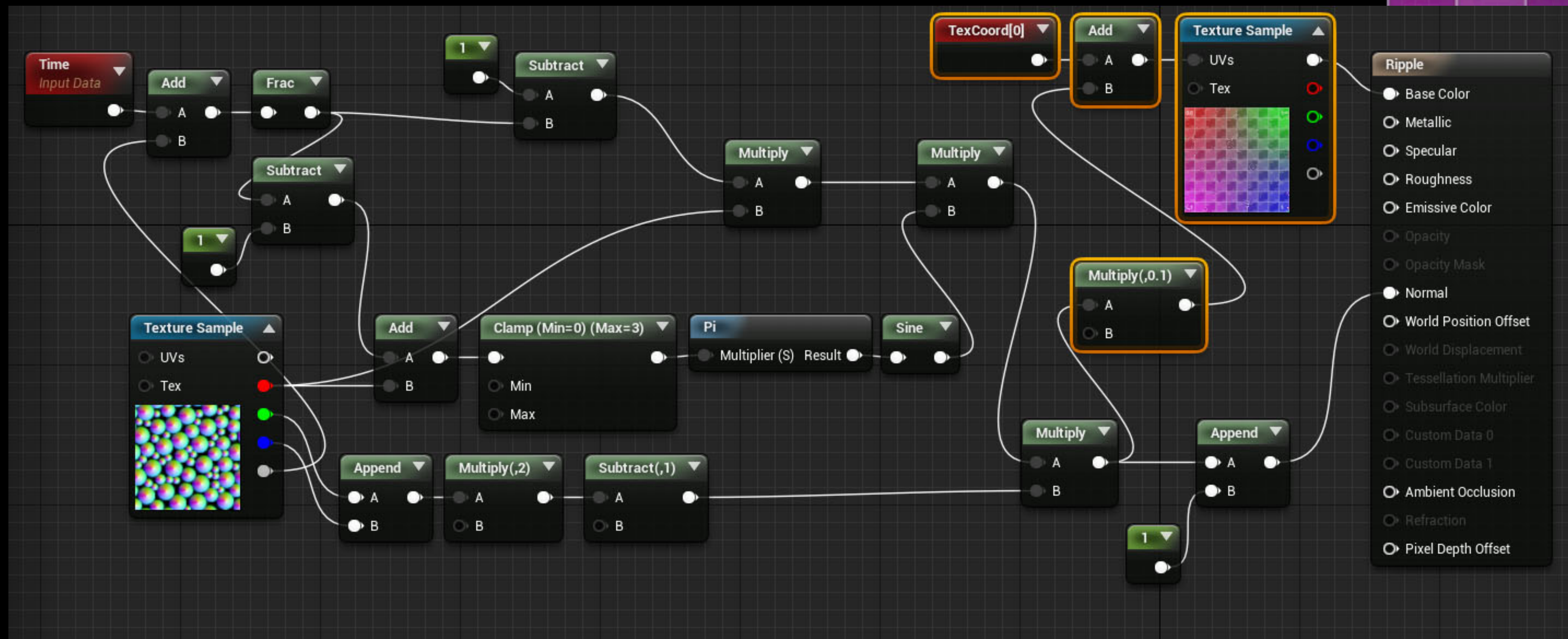


# Puddles





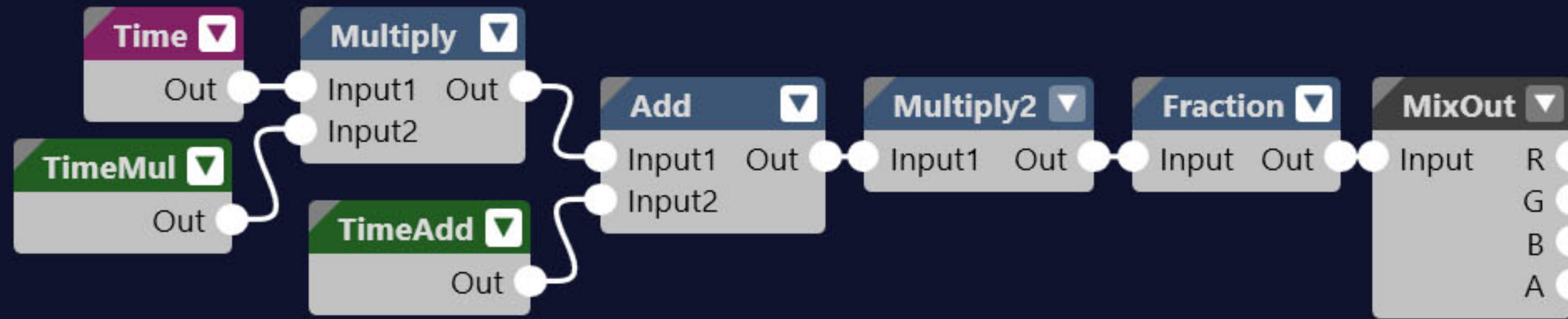
# Rain Ripples



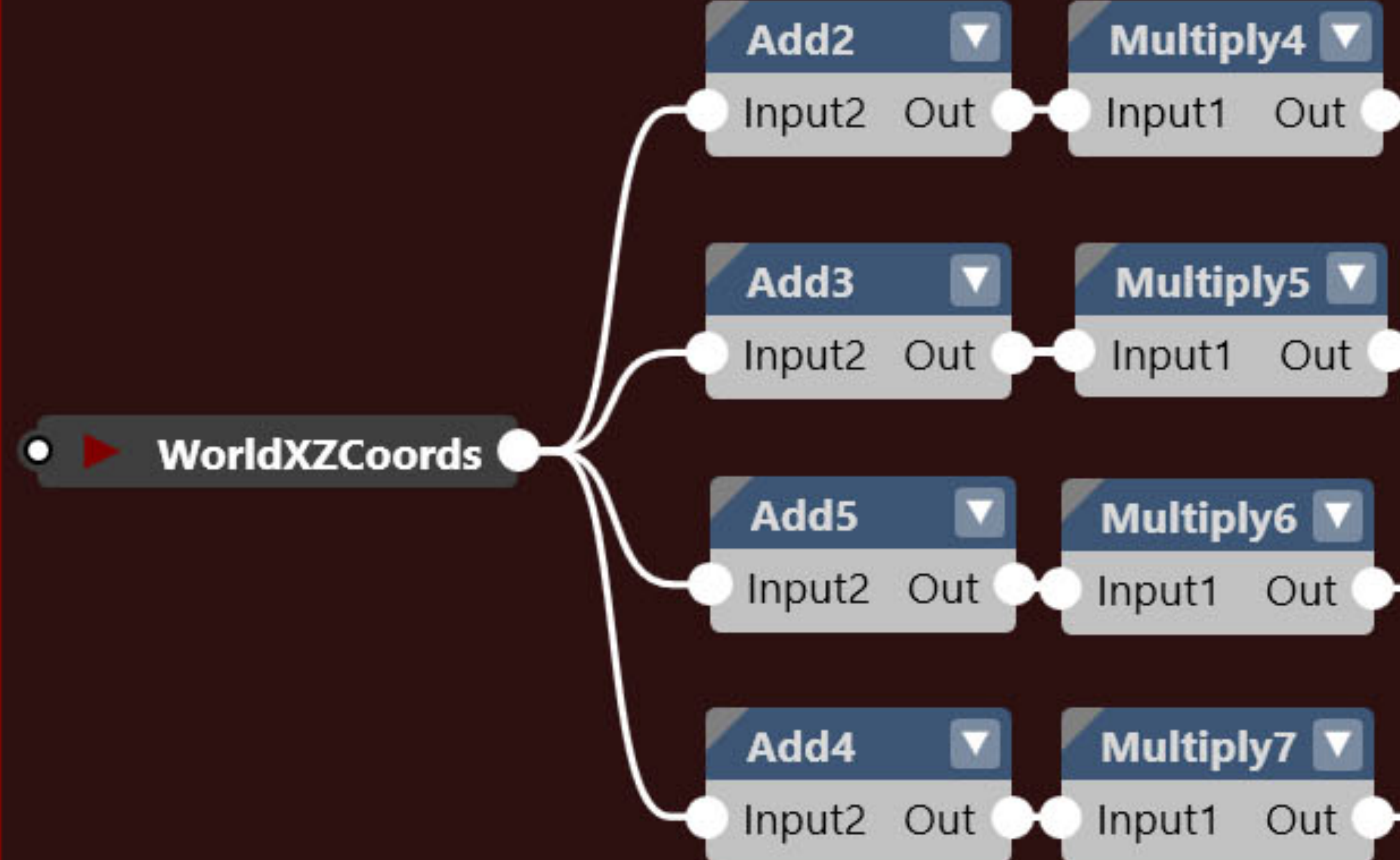


# Ripples

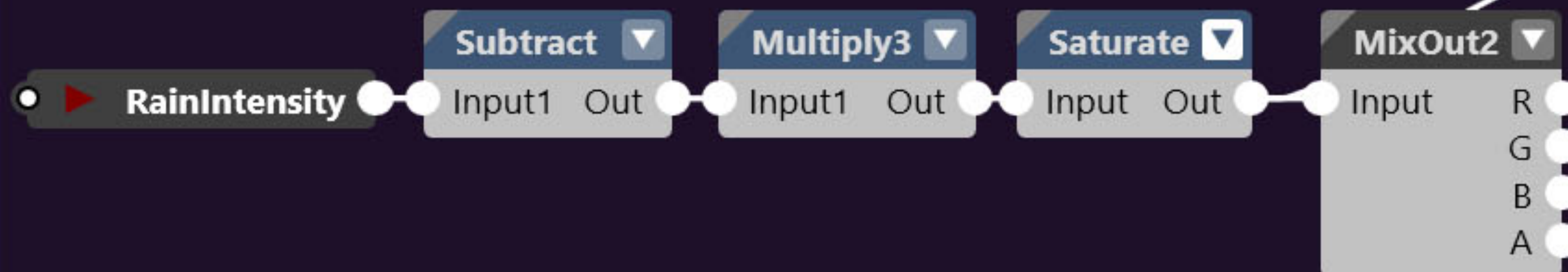
Create four unique time offsets so that ripples happen at different times.



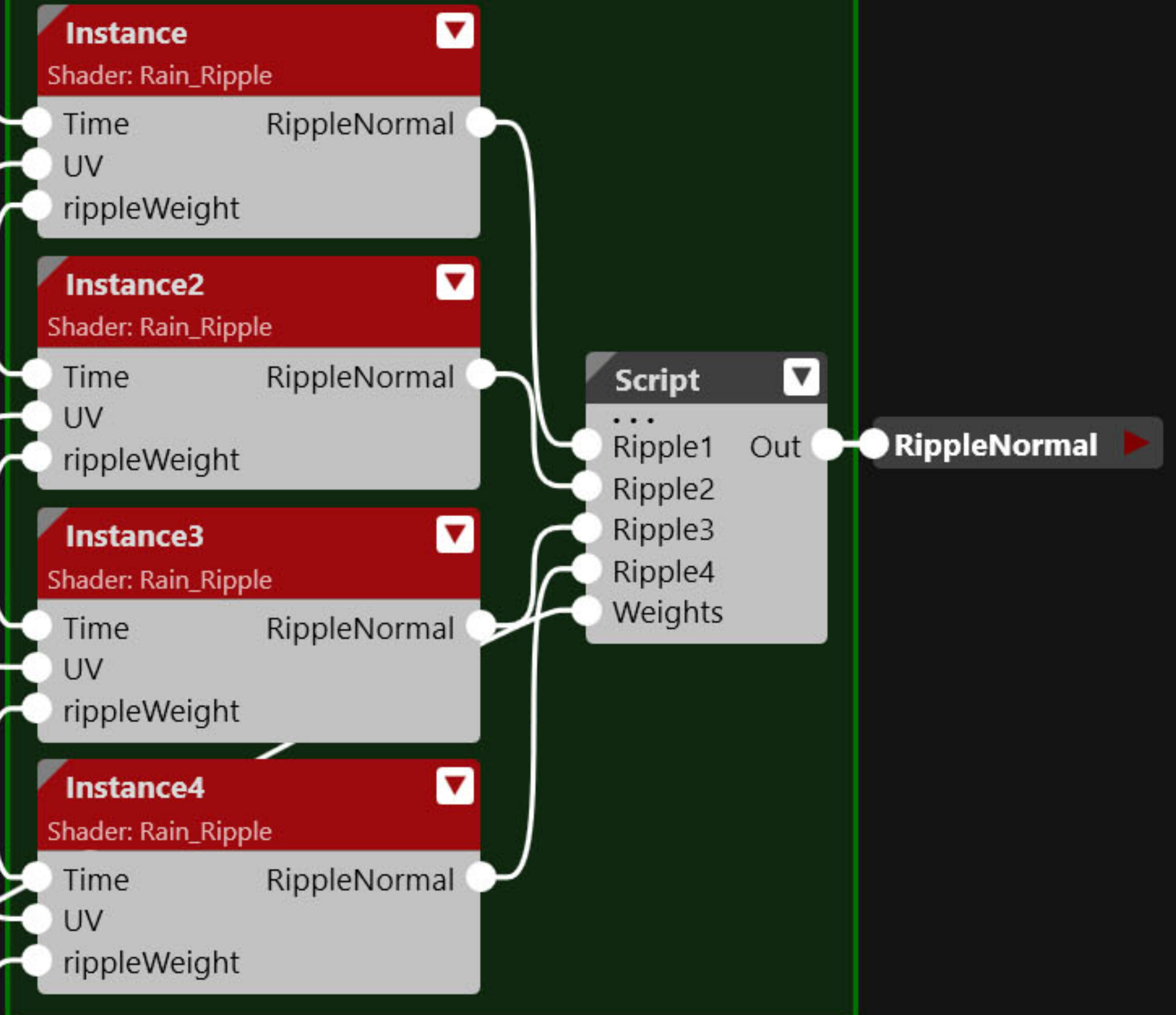
Create four unique texture coord offsets so that the ripples are randomly placed and sized.



Create four intensity variations so each ripple group's weight depends on the overall intensity.



Sample the ripple texture four times using the unique times, texture coords, and weights.



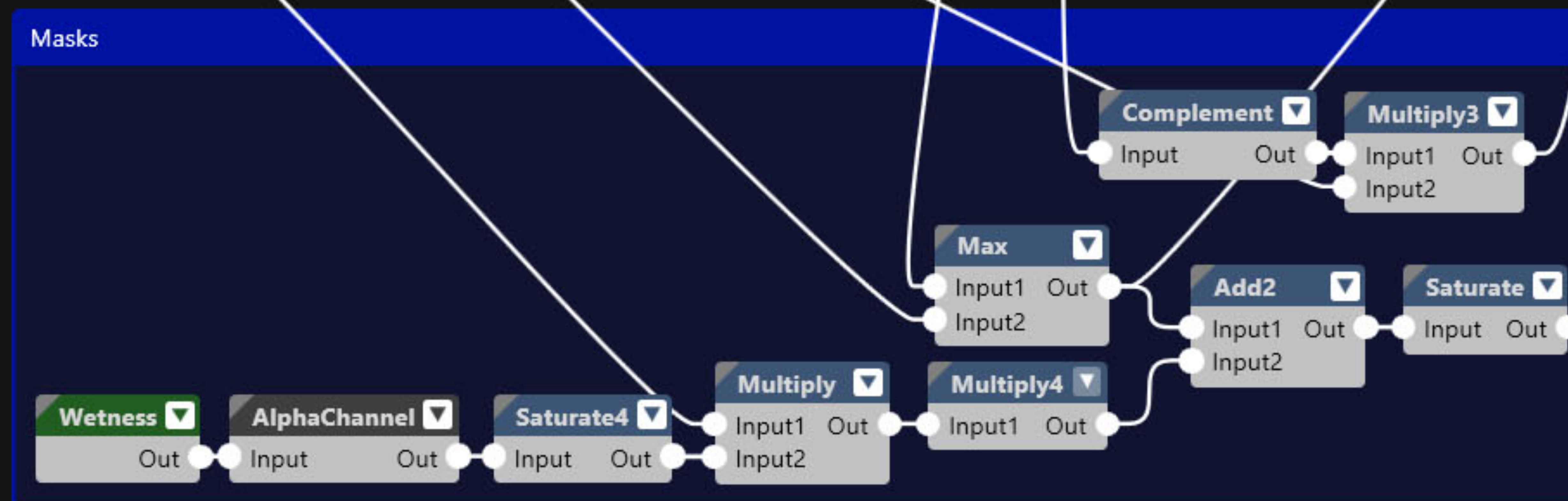
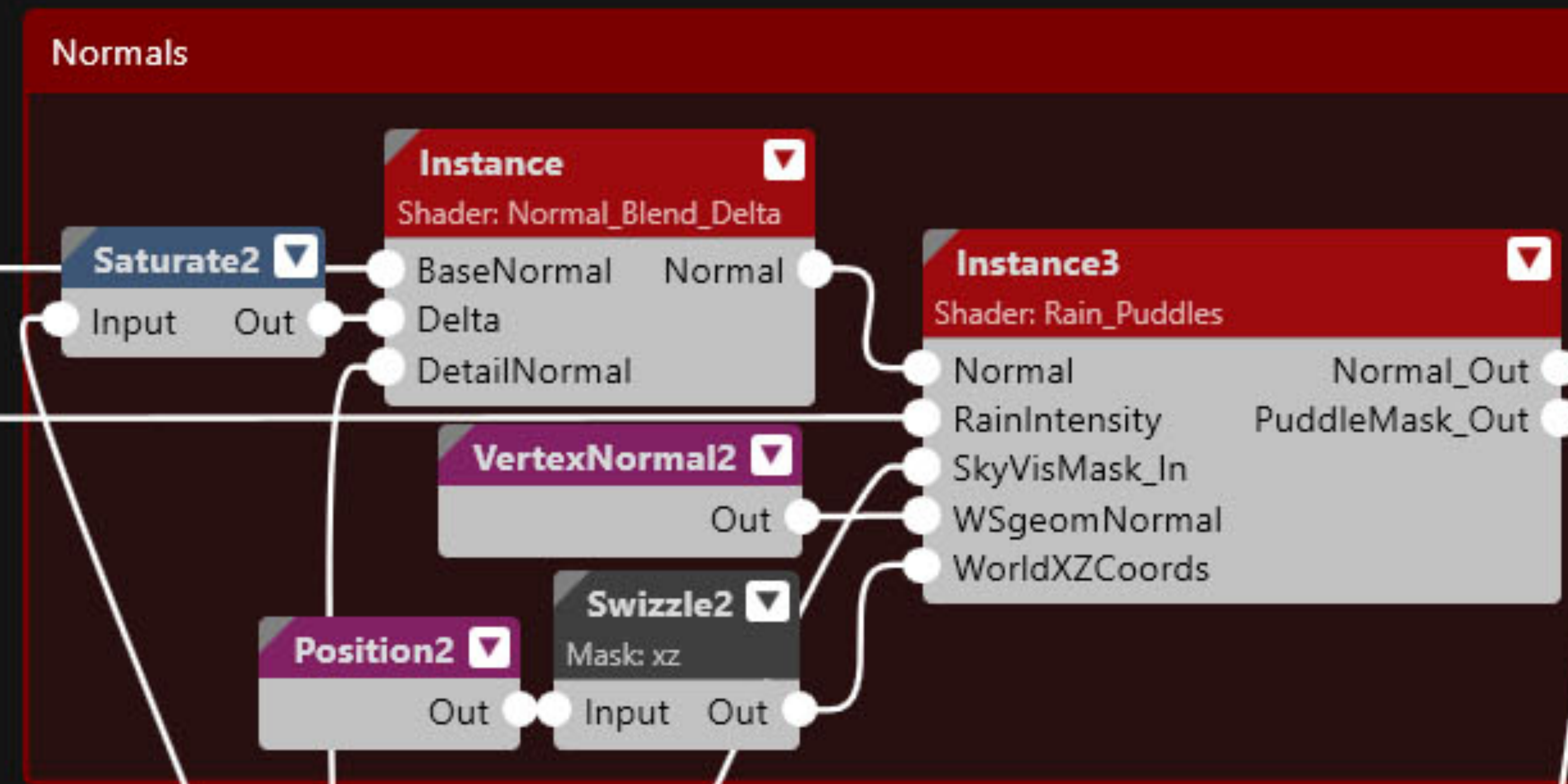
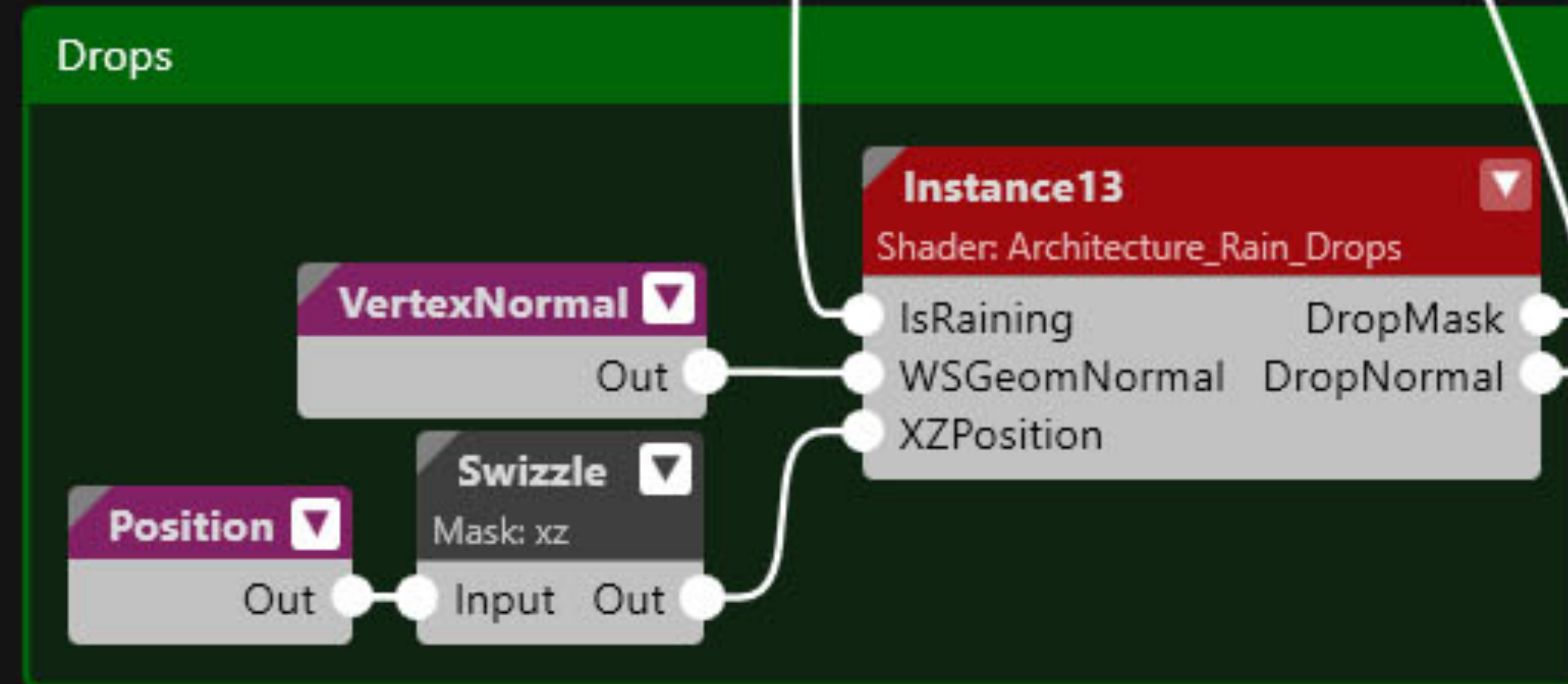
See Sébastien Lagarde's blog for TONS of details!







# Puddles



# Drops

# Wetness



Video showing various rain effects





# Water Surfaces

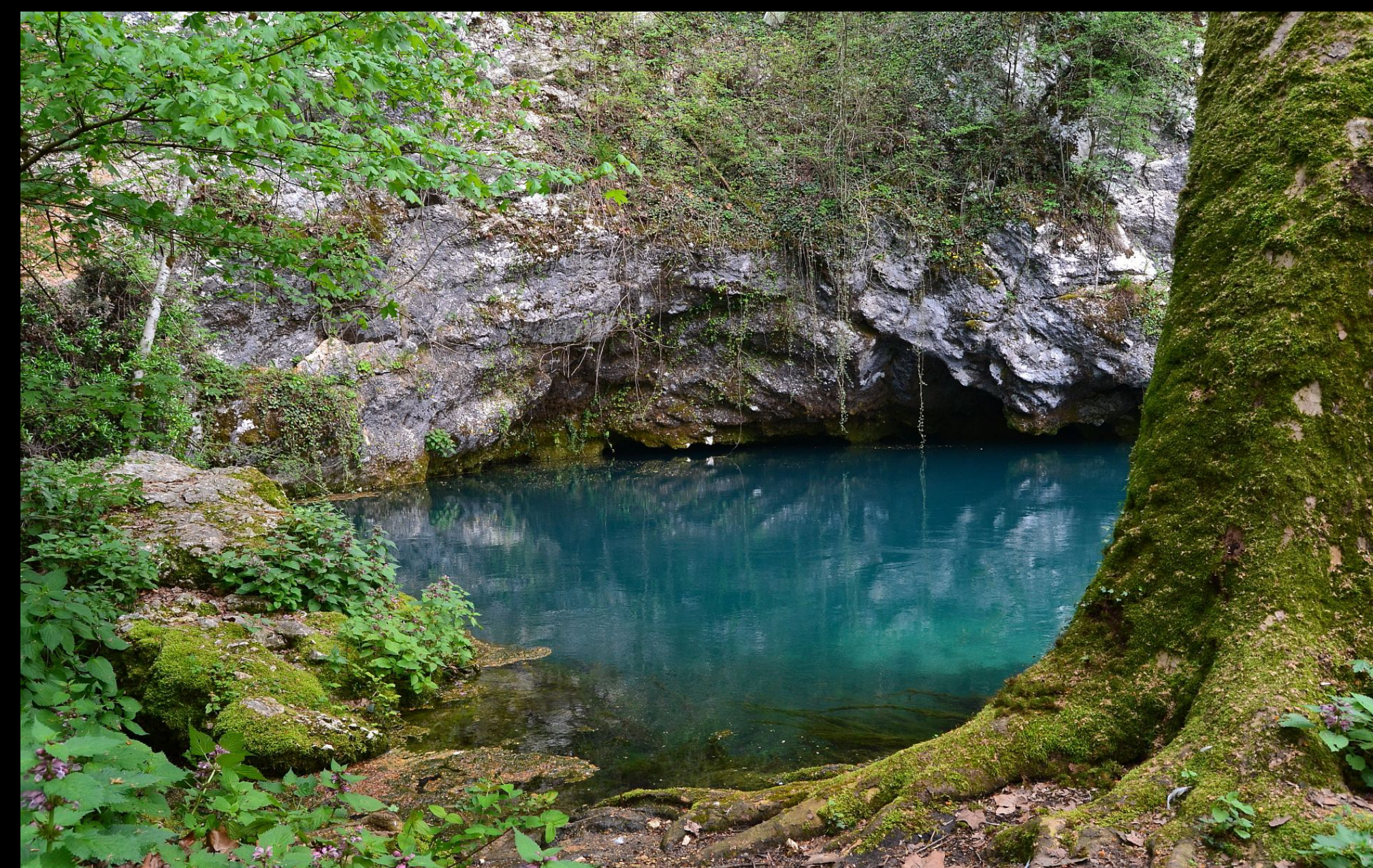


# Water Surface Reference



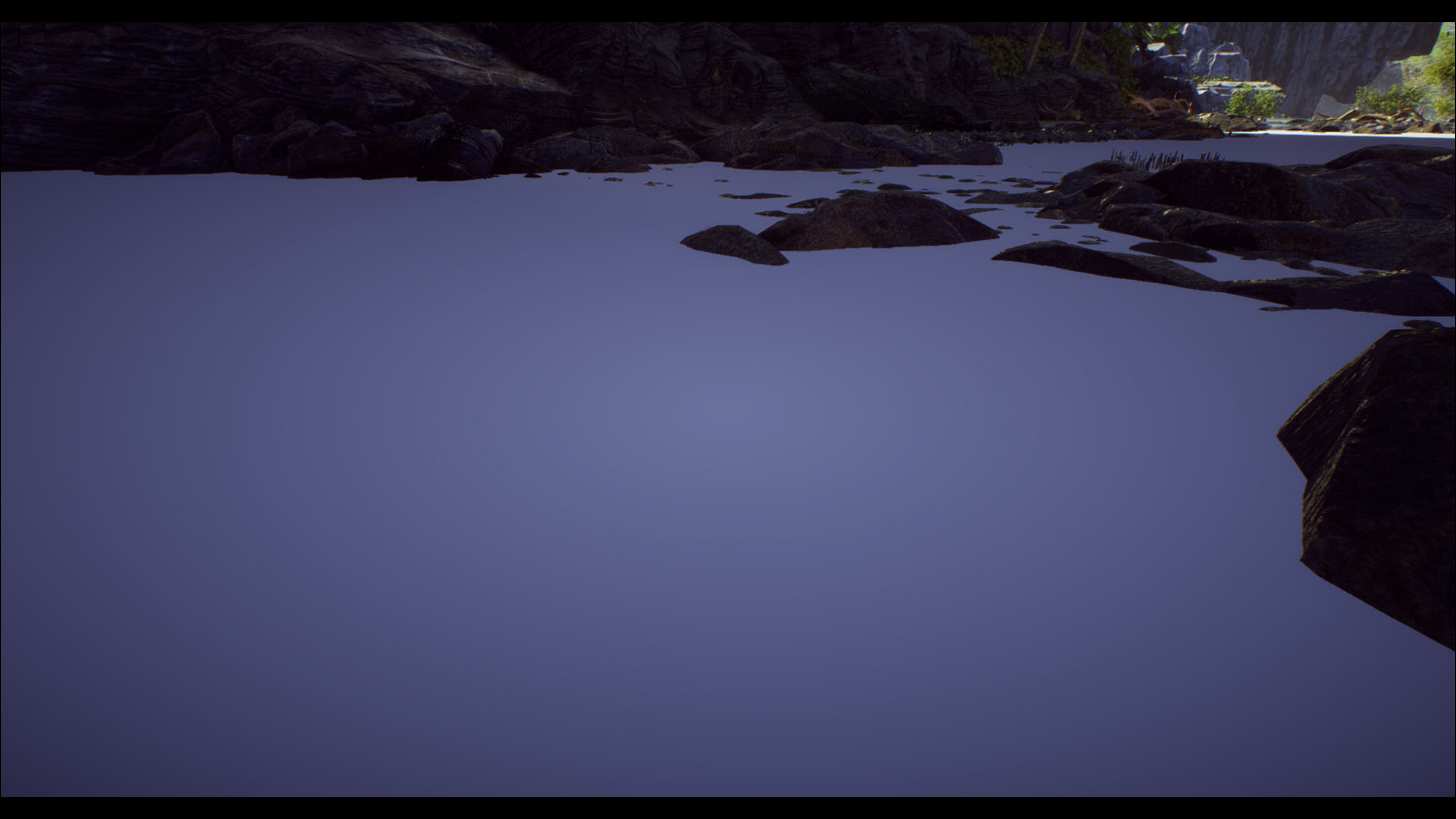


# Water Surface Key Elements



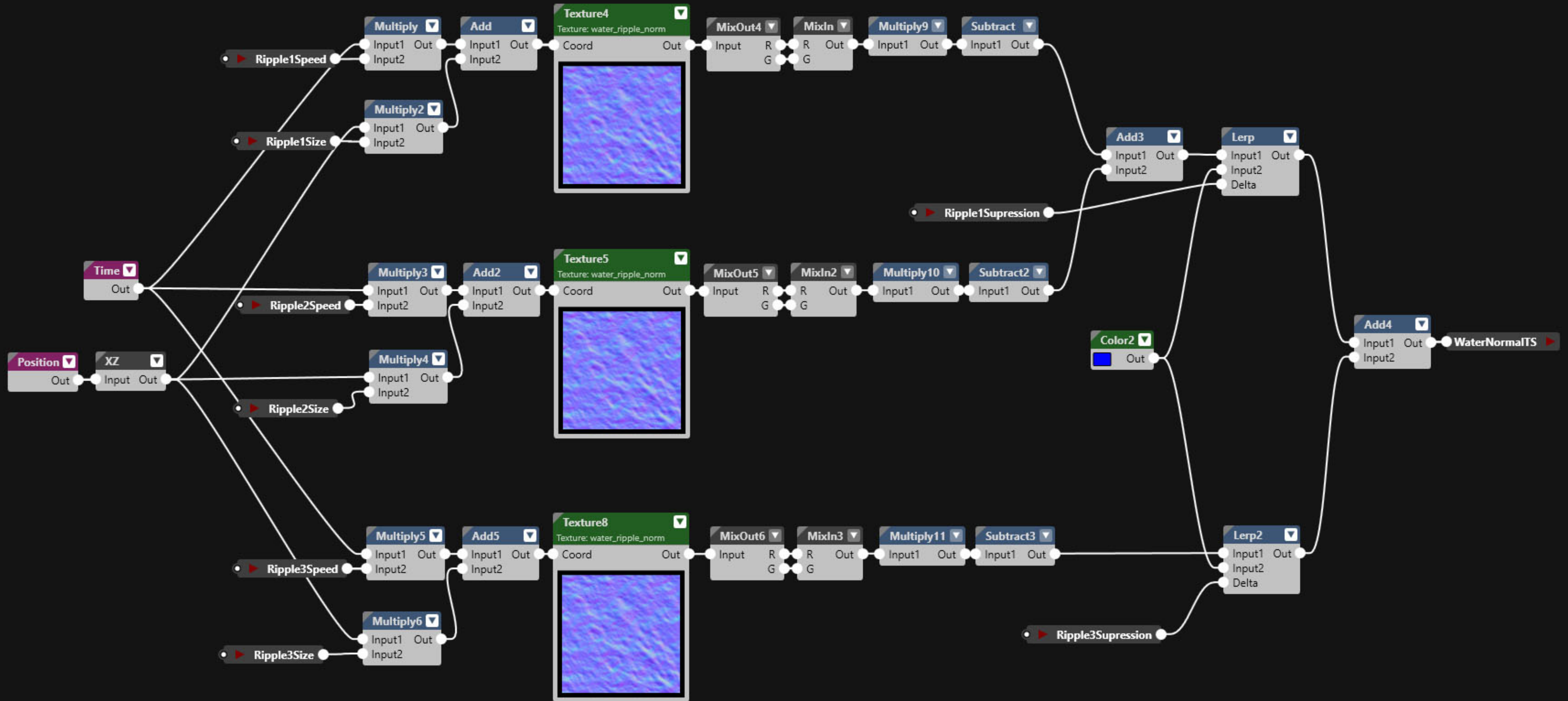
- Surface ripples
- Depth Color gradient
- Depth opacity
- Reflections
- Refraction







# Surface Ripples

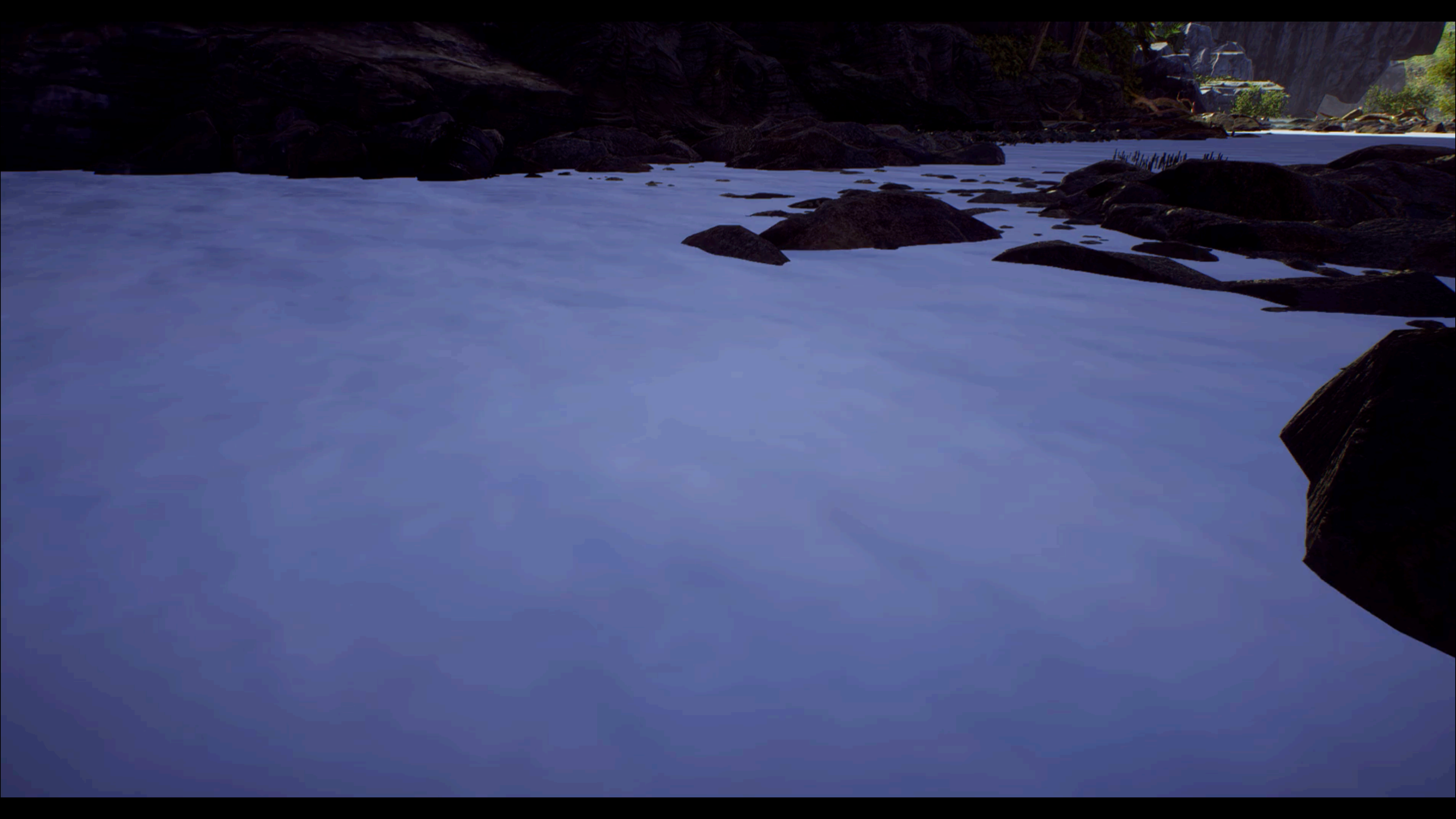




# Surface Ripples

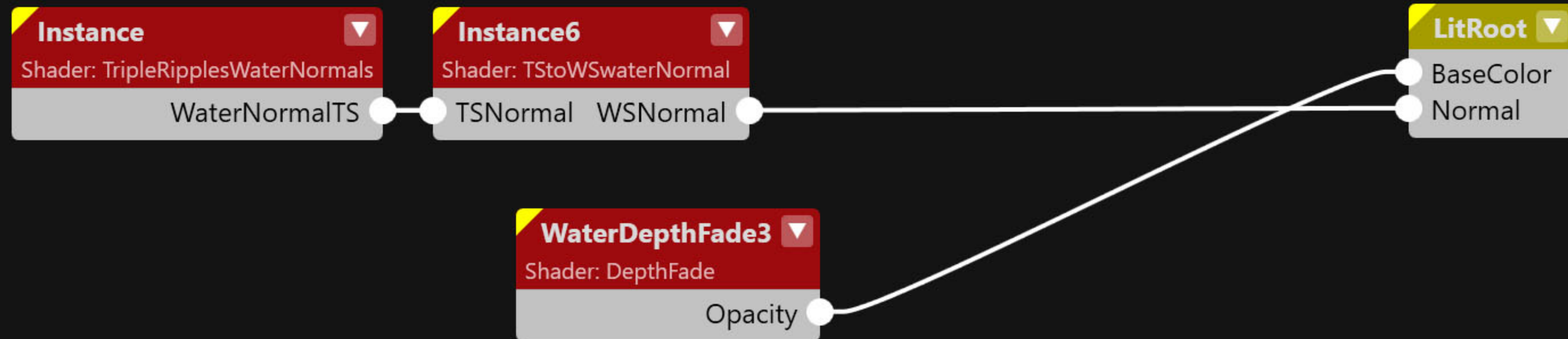








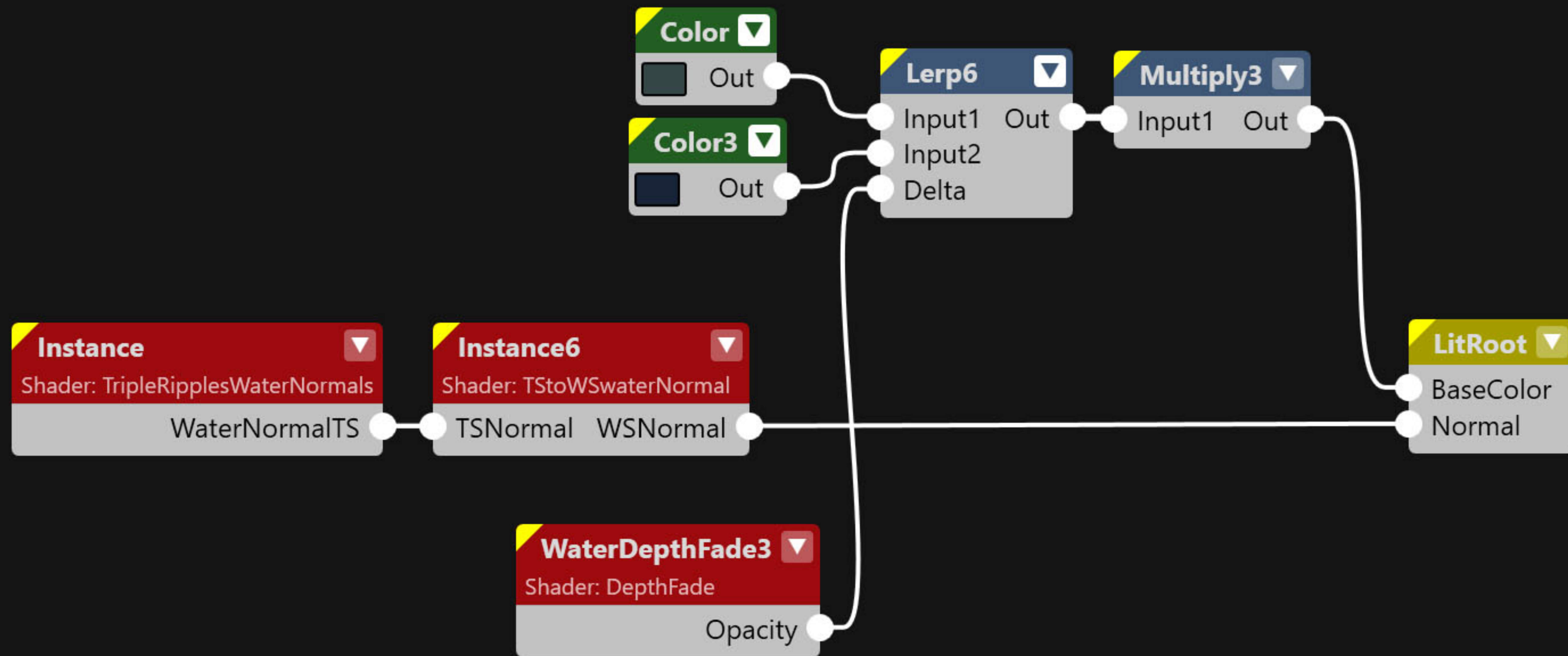
# Depth









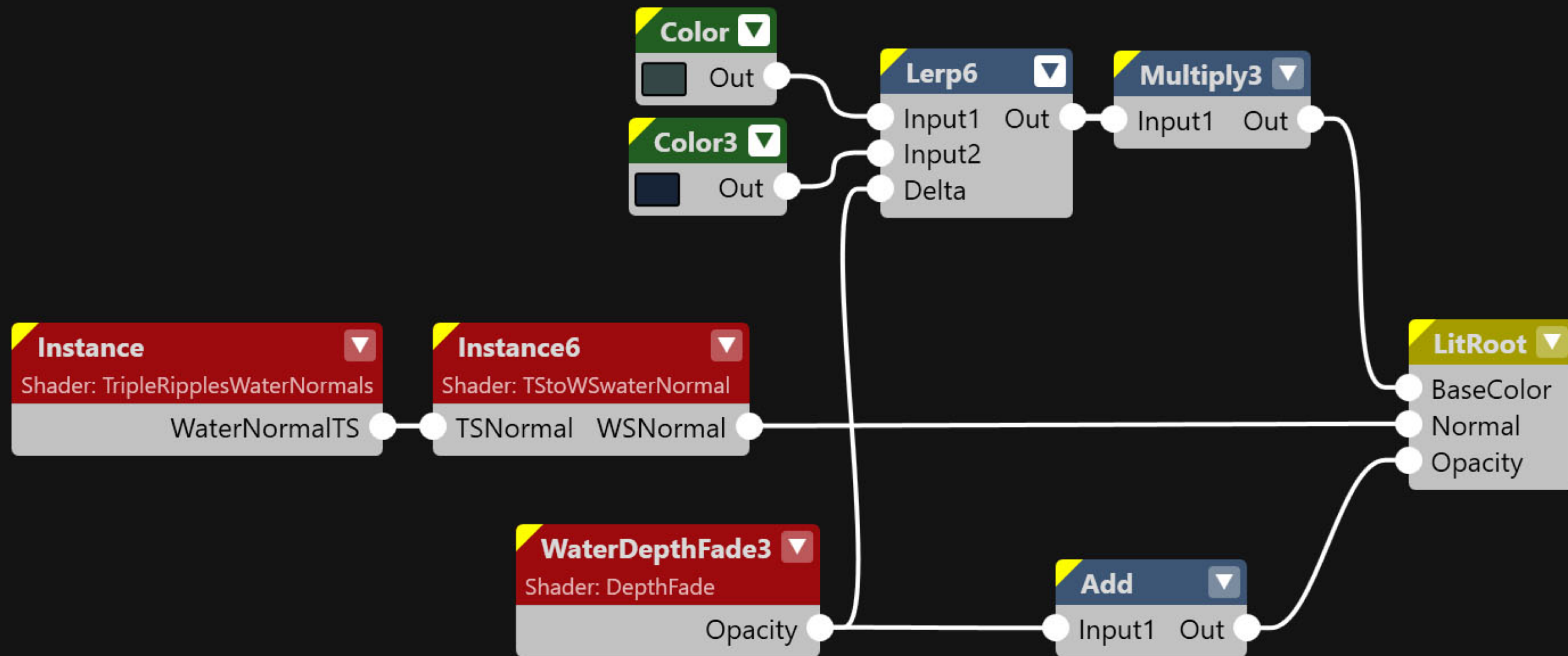


# Depth Color Gradient









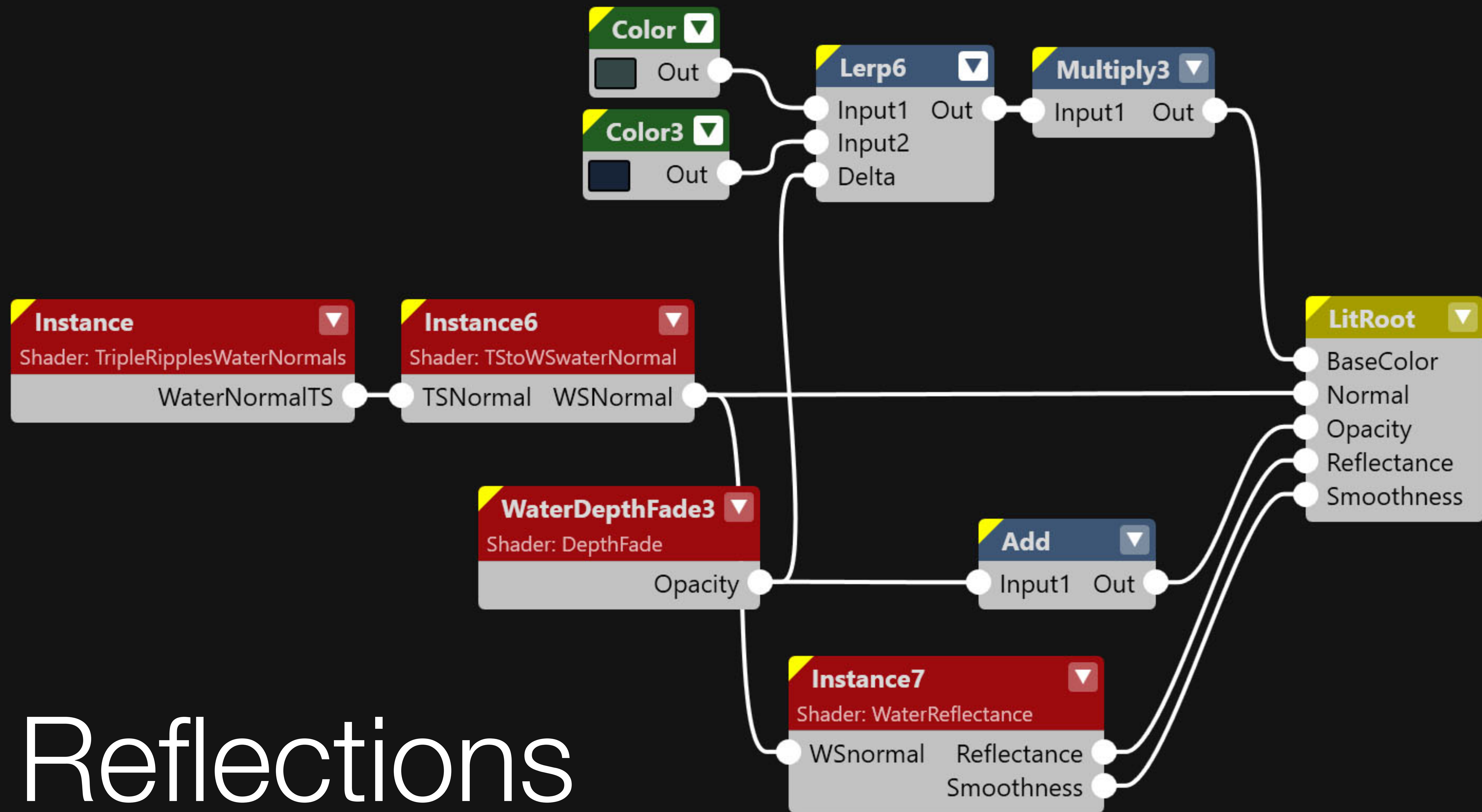
# Depth Opacity







# Reflections

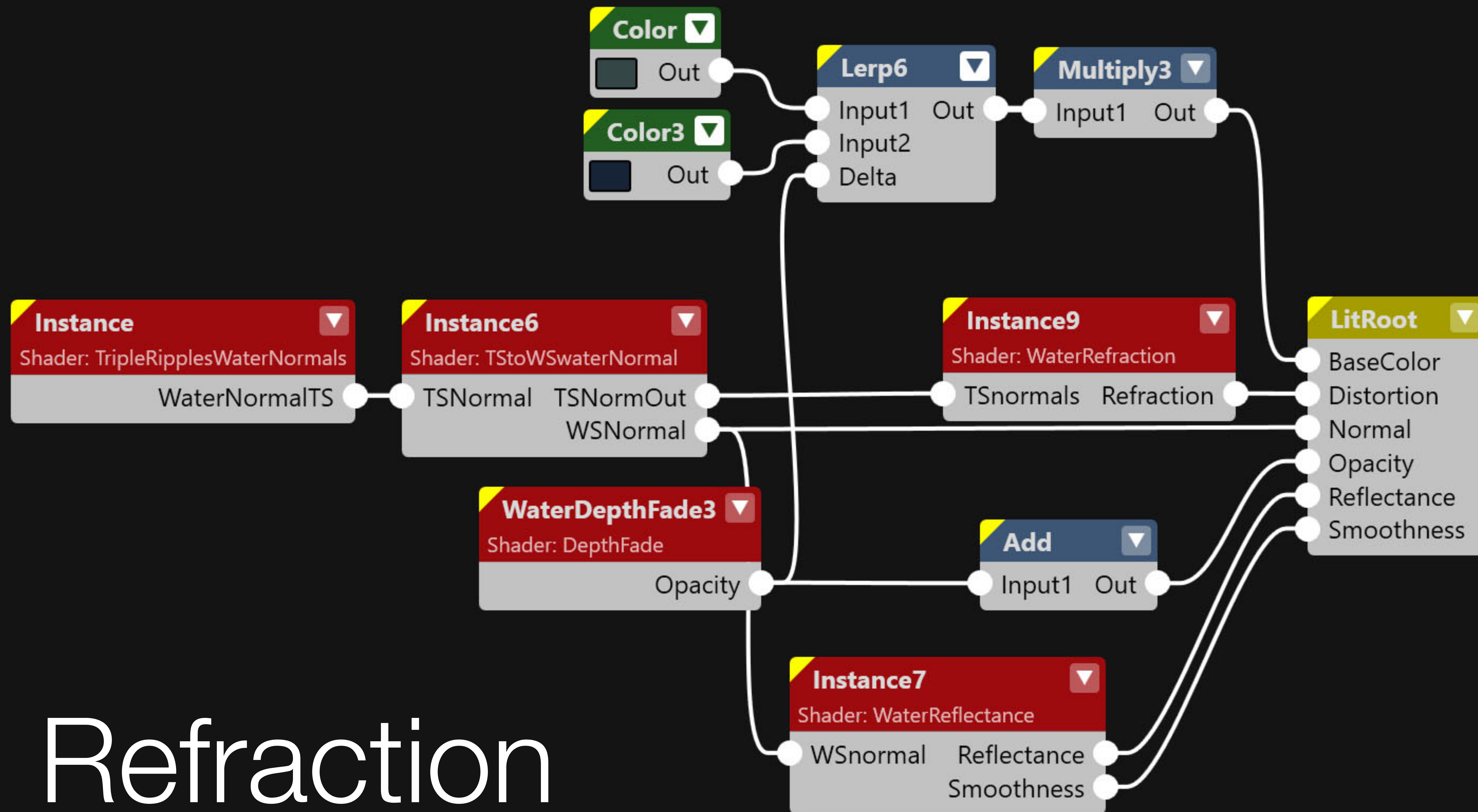








# Refraction









Video showing variety of water shaders





# Take-Aways

- Good reference is critical
- Break challenges into key elements
- Efficiency - what you leave out is just as important as what's there



# Learning Shaders

- Study what other games are doing
- Grab a book
- Google and YouTube Search
- Download Unreal or use ShaderFX in Max or Maya
- Write shaders!



# Books!

- The Cg Tutorial: The Definitive Guide to Programmable Real-Time Graphics - Randima Fernando
- Shaders for Game Programmers and Artists - Sebastien St-Laurent
- The COMPLETE Effect and HLSL Guide - Sebastien St-Laurent
- GPU Gems Series edited by Matt Pharr and Randima Fernando
- Shader X Series by Wolfgang Engel
- Advanced Lighting and Materials with Shaders - Kelly Dempski and Emmanuel Viale



# Thanks!

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[@BenCloward](#)