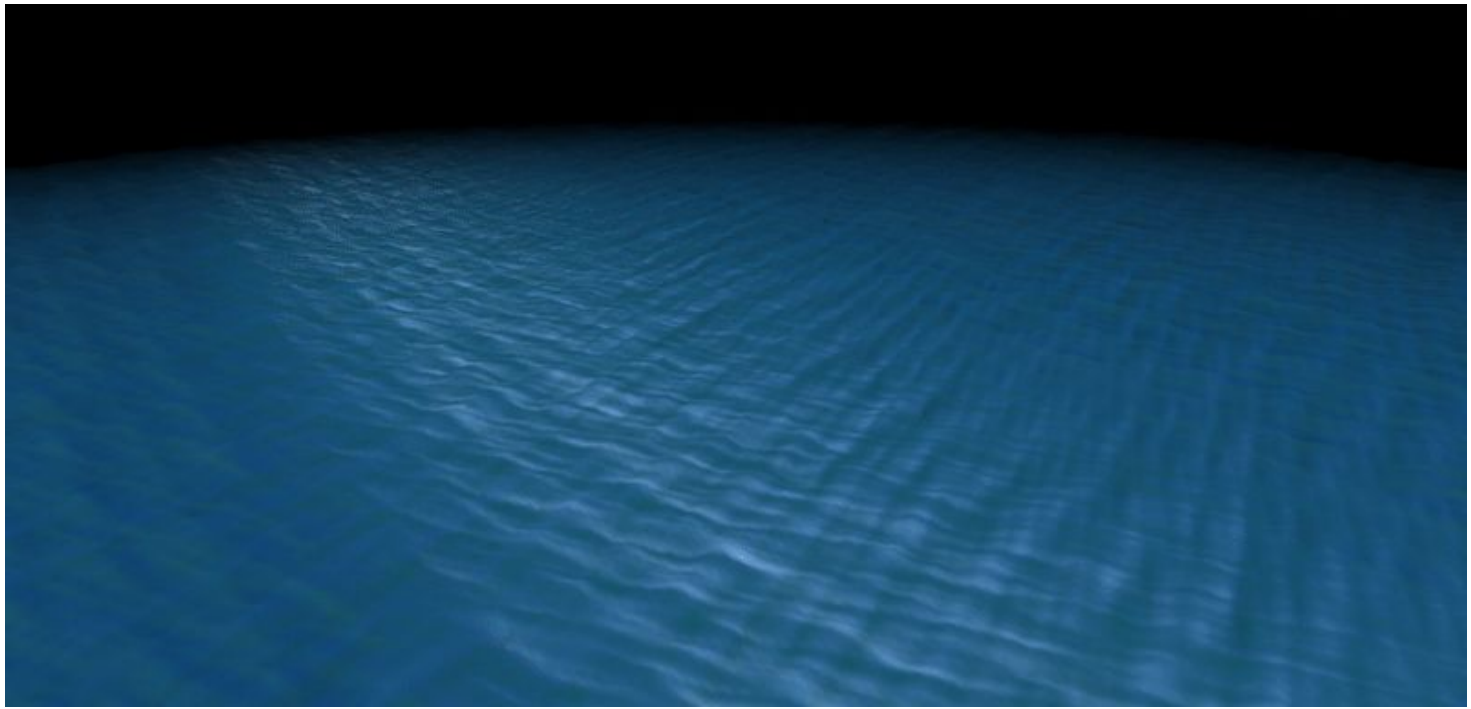
Under the Sea: *Milestone 2*

Joanna Fisch, Nick Liu, Yuhan Liu

Progress Update: Ocean Surface Tiling & Blending, WebGPU Compute Shader

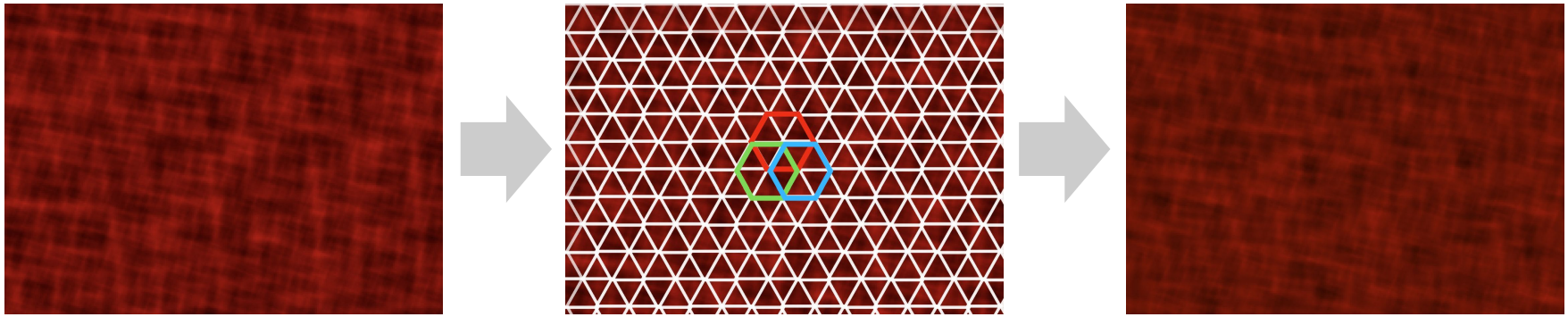
Reference Paper: Fast orientable aperiodic ocean synthesis using tiling & blending (HPG ‘24)



Progress Update: Ocean Surface Tiling & Blending, WebGPU Compute Shader

Reference Paper: Fast orientable aperiodic ocean synthesis using tiling & blending (HPG ‘24)

- Author Outreach, Q&A
- Layered Sinusoidal Ocean Surface
- Hexagonal Tiling & Blending Implementation to Achieve Aperiodicity



Periodic Exemplar Texture

Hexagonal Tiling & Blending

Aperiodic Blend

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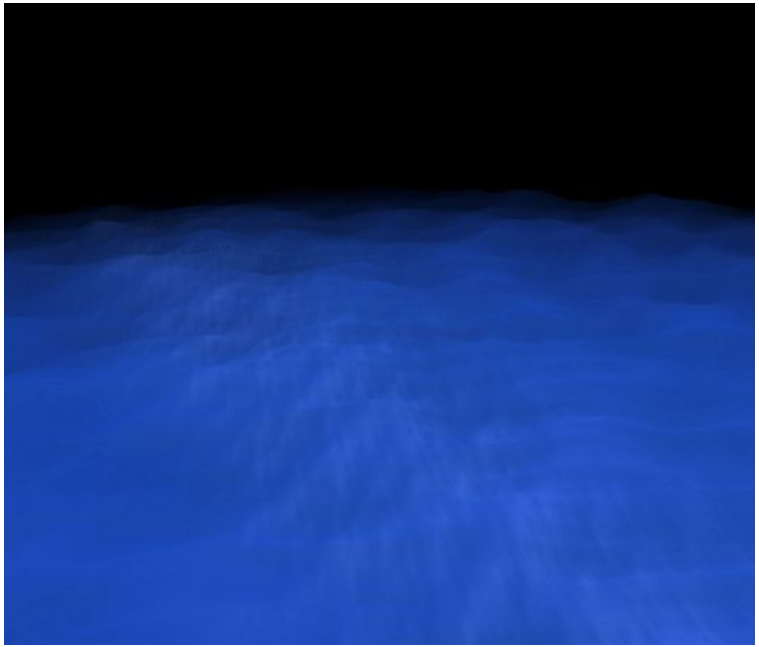
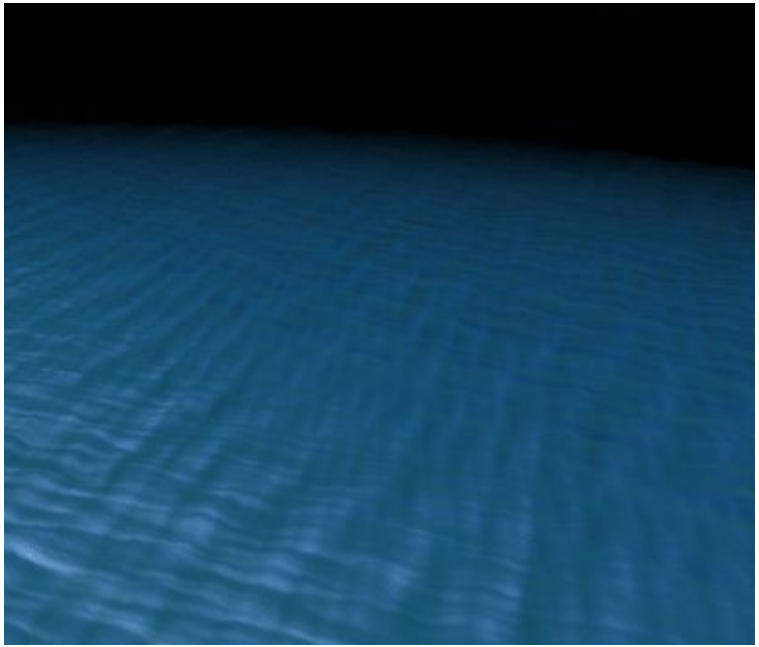


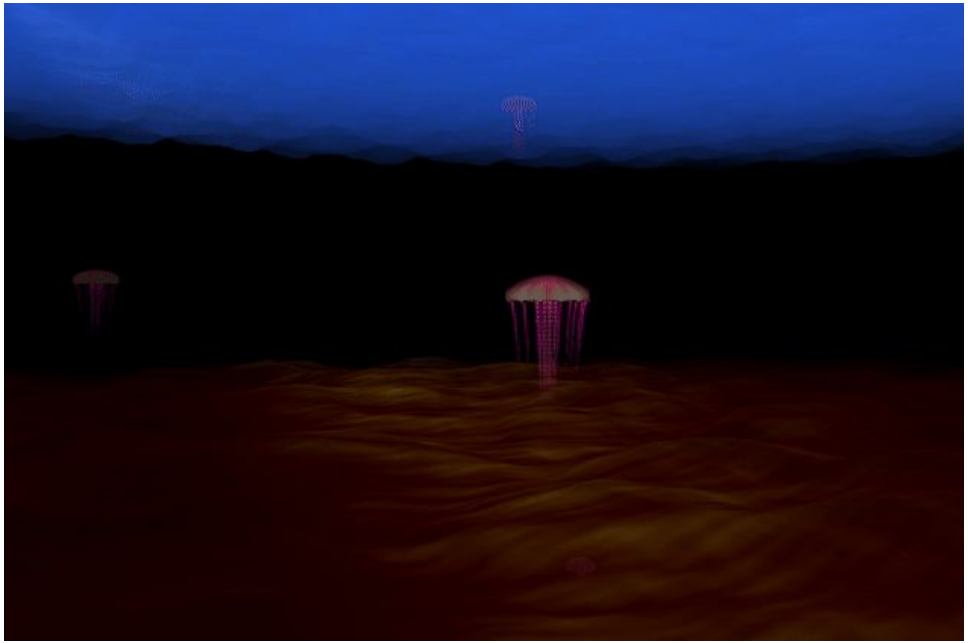
Exemplar Texture with Blended Perlin Noise



Tiling & Blended Surface

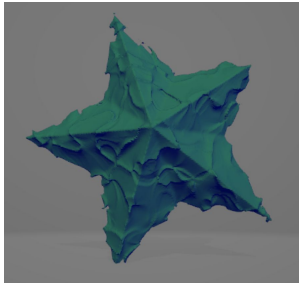
Progress Update: Ray-Marched SDF Jellyfish, WebGPU Fragment Shader

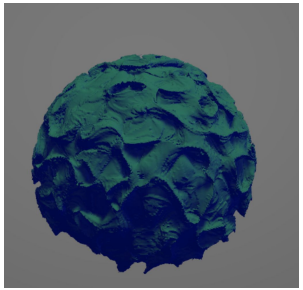
New Feature: Referencing this Shadertoy, we added a fragment shader that renders an animated jellyfish scene using ray marching, procedural noise, and volumetric effects to simulate movement and appearance.

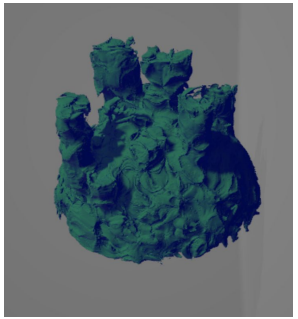


Looking Ahead: Procedural Fractal Reef Pipeline

Task	Status	Next Steps
Into the Portal: Paper Implementation for Coral Generation	Naive implementation Author outreach Multiple coral types generated	CUDA acceleration of generation pipeline
WebGPU GLTF Loading & Placement	Ocean Floor complete (similar technique as ocean surface) Issues with GLTF Separate Loading, new reference	Procedural placement & reef generation, texturing Binary GLTF Loading

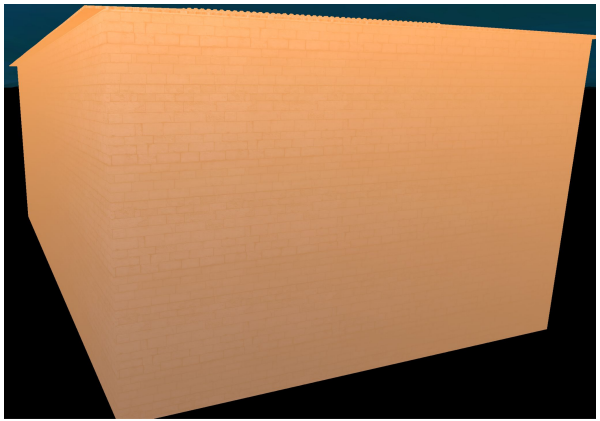






Looking Ahead: Scattering for Underwater Spectral Rendering

Task	Status	Next Steps
Scattering	Multiple Scattering is fully implemented –but currently broken :(	Paper implementation of single scattering (for god rays) with froxel lighting Physically-motivated caustics



Looking Ahead: Procedural Fractal Reef Pipeline