Ouachita Baptist University

Scholarly Commons @ Ouachita

Apr 27th, 3:10 PM - 3:25 PM

A Fractal Geometry for Hydrodynamics

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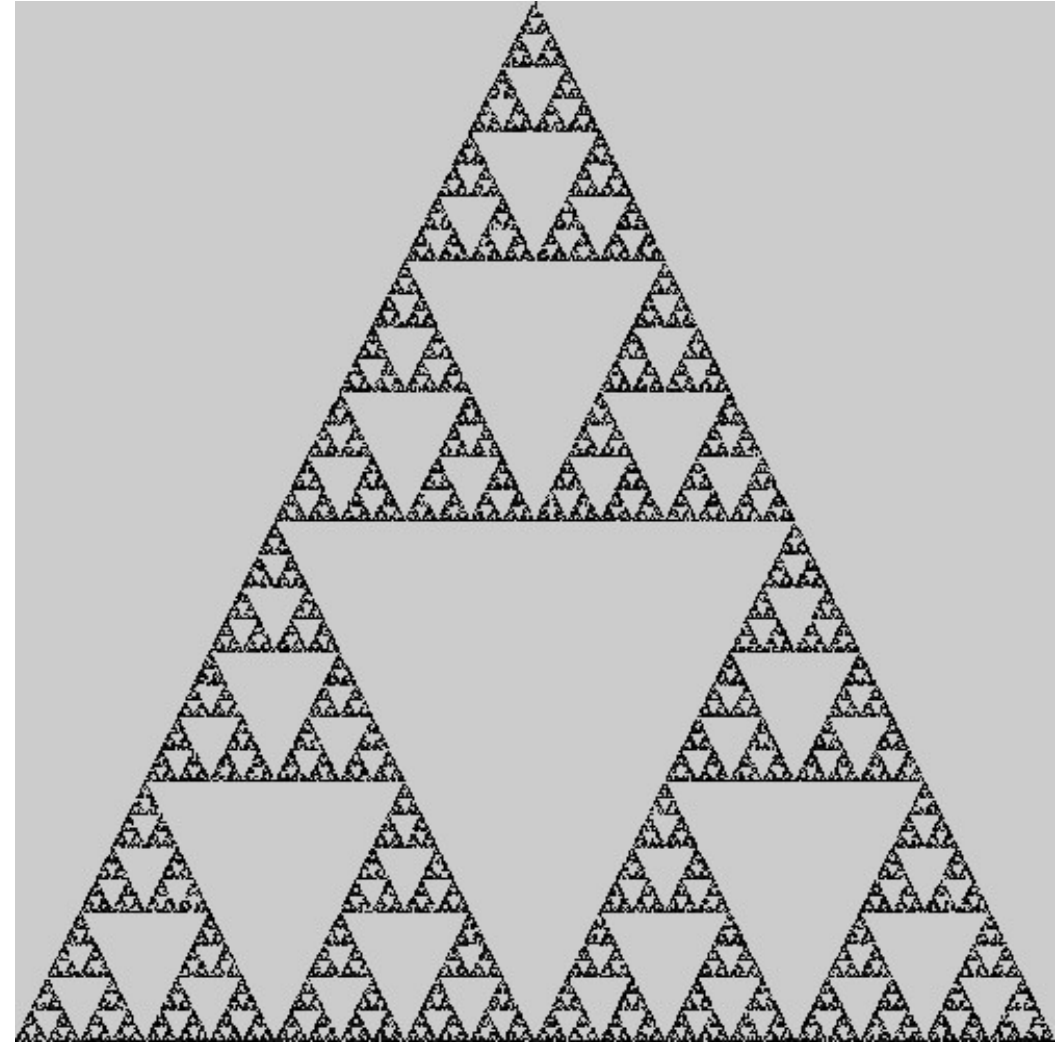# A Fractal Geometry for Hydrodynamics

OBU Scholars Day

April 27, 2022

Jonah Mears

Fractals and Hydrodynamics

- Self-Similarity

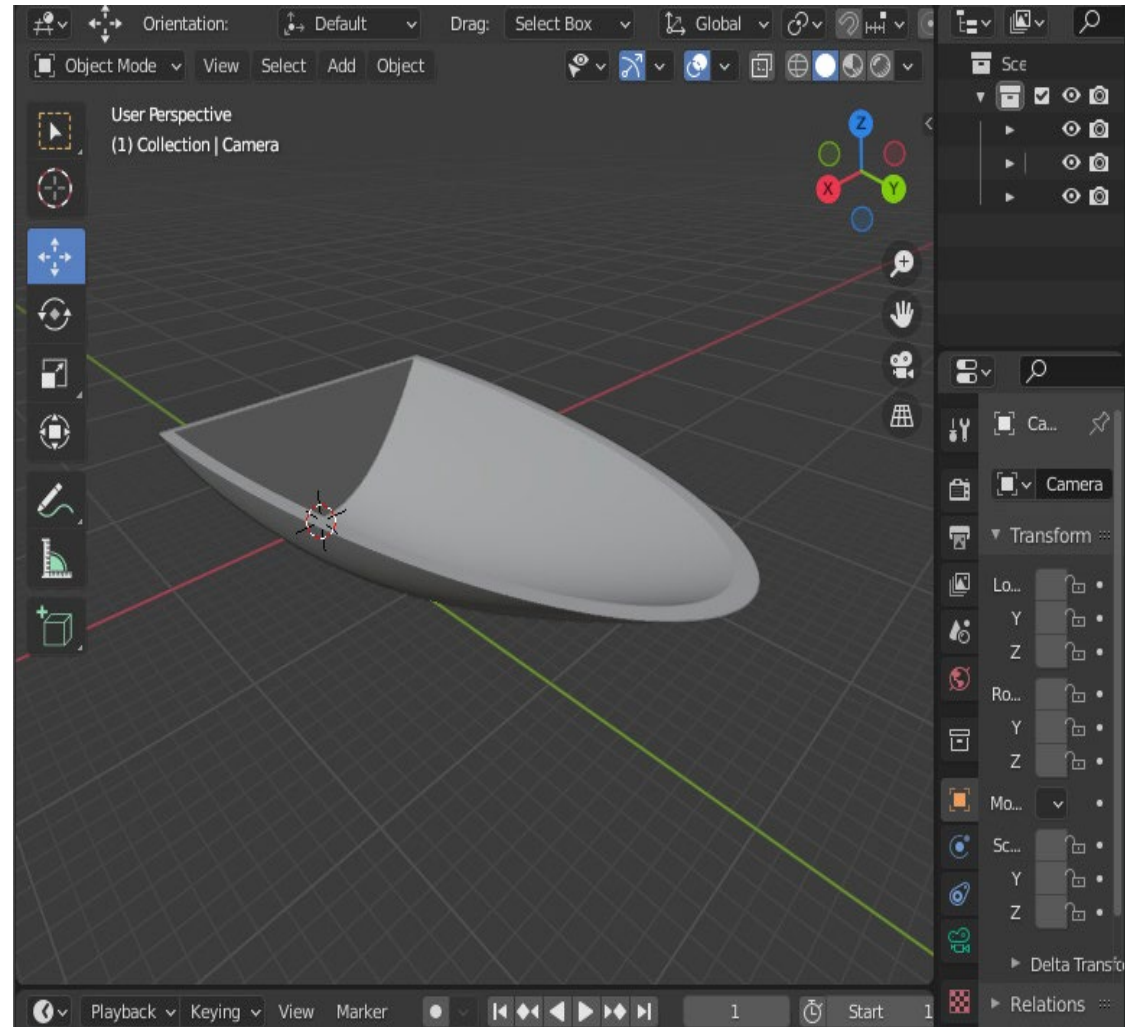- Fractal Dimension

- Hydrodynamics

Romanesco

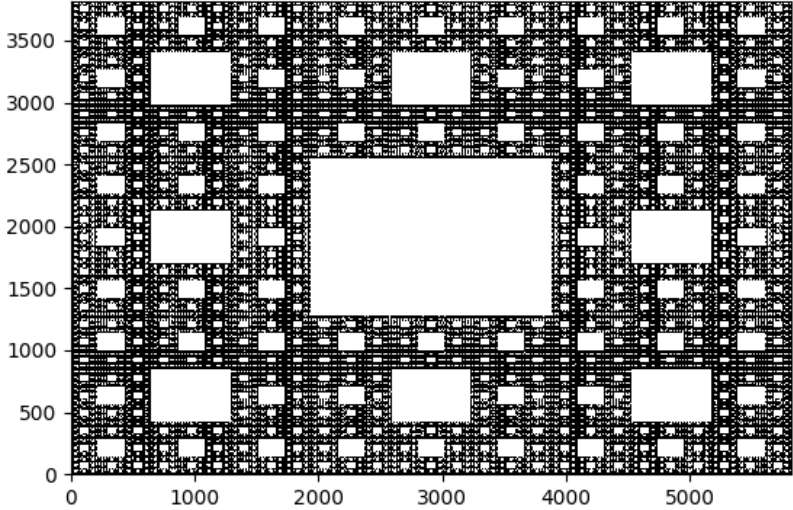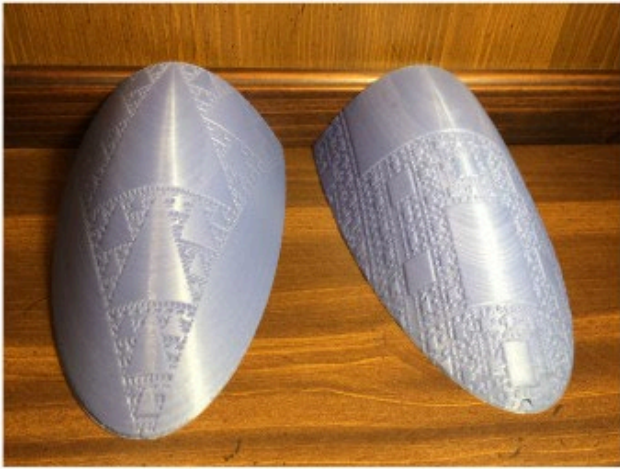# Design and Printing
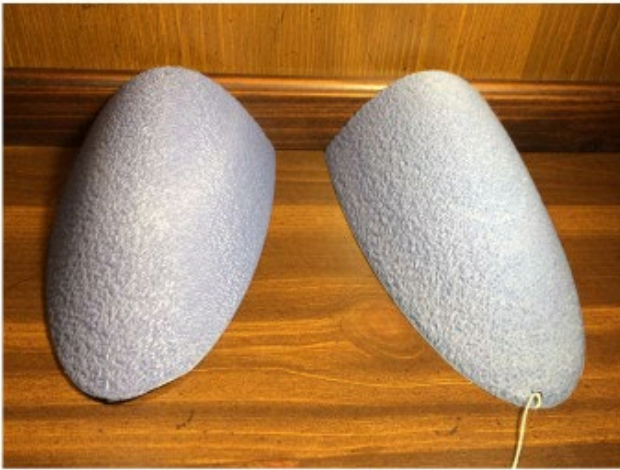
- Autodesk Inventor

- Python

- The Chaos Game:

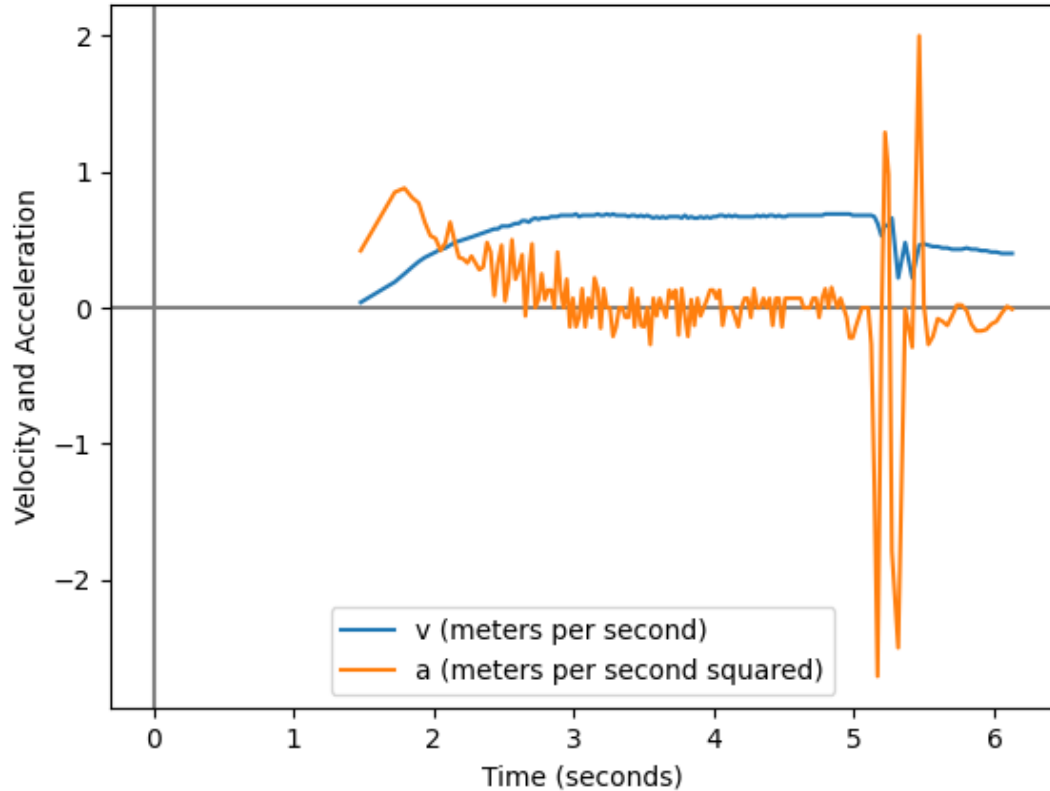$$f(x, y) = (ax + bx + c, dx + gy + h)$$

Hull Designs

Sierpinski Carpet

The Towing Tank

Data

Simple Parabola	Simple Spline	Spline With Holes	Noise Hull (With Hole)	Noise Hull (No Hole)	Sierpinski Carpet	Sierpinski Gasket
0.6761	0.6996	0.6967	0.6783	0.6671	0.6811	0.6746
0.6754	0.7046	0.7063	0.6720	0.6547	0.6856	0.6736
0.3493	0.6978	0.6864	0.6652	0.6625	0.6631	0.6732
0.6762	0.7015	0.6948	0.6824	0.6560	0.6927	0.6925
0.6831	0.6885	0.6843	0.6609	0.6589	0.6751	0.6876
0.6718	0.7101					
0.5975	0.7283					
0.6998						
Average: 0.6804	Average: 0.7044	Average: 0.6937	Average: 0.6717	Average: 0.6598	Average: 0.6795	Average: 0.6803

Average Speeds (m/s)

Drag Coefficients

$$C_n = \frac{2\mathcal{D}}{\rho U^2 A}$$

Simple Parabola	Simple Spline	Spline With Holes	Noise Hull (With Hole)	Noise Hull (No Hole)	Sierpinski Carpet	Sierpinski Gasket
0.4825	0.4665	0.4809	0.4573	0.5067	0.4817	0.4806

Any Questions?