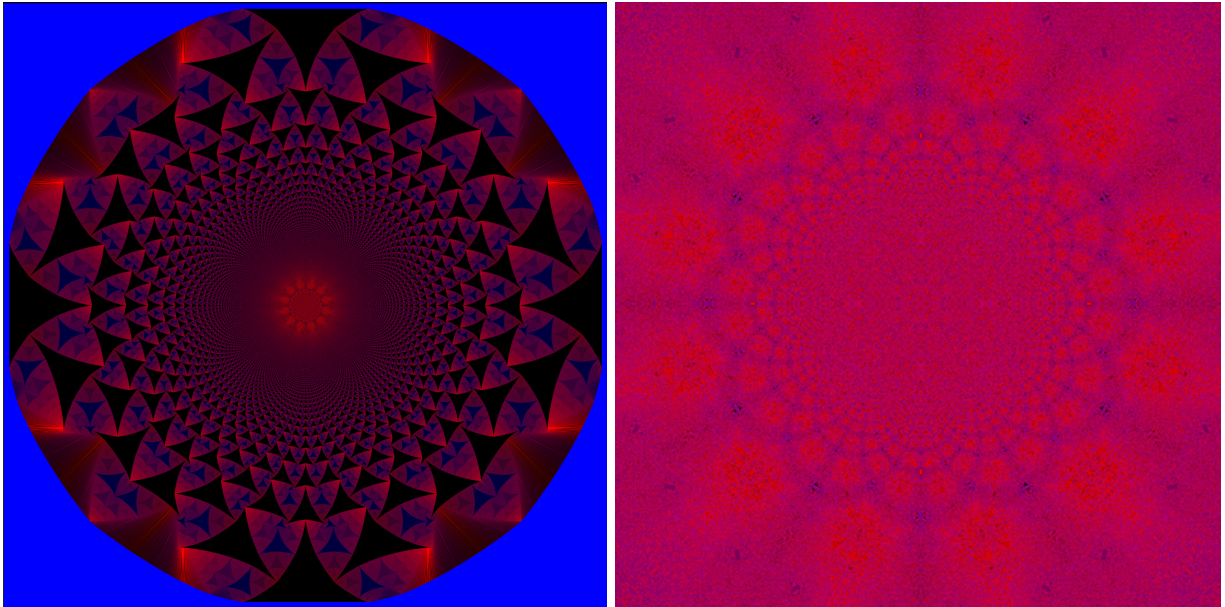


The Sand Reckoner

Andy Huchala



What’s the biggest number you can think of? This question and others like it led Archimedes to publish a work known as *The Sand Reckoner*, in which he attempted to approximate the number of grains of sand needed to fill the whole universe. This art piece attempts to capture the spirit of the infinite and print it on a single page. It uses what’s called an Abelian Sandpile model, which is a fractal that colors “grains of sand” by their slope. A fractal is a kind of mathematical picture with a repeated motif no matter how far in or out you zoom. The Abelian Sandpile model achieves this by stacking a large number of grains of sand in the center of a grid, and then “topples” it onto the adjacent 4 tiles. The taller the pile of sand at the start, the more times you can topple, and the closer to the illusion of infinity you get. At some point you can no longer perceive the individual grains, but instead see a smooth and complicated structure with rich detail no matter the scale—something mathematicians call self-similarity. Adding color depicting the different heights of sand helps us visualize the resulting fractal structure.

