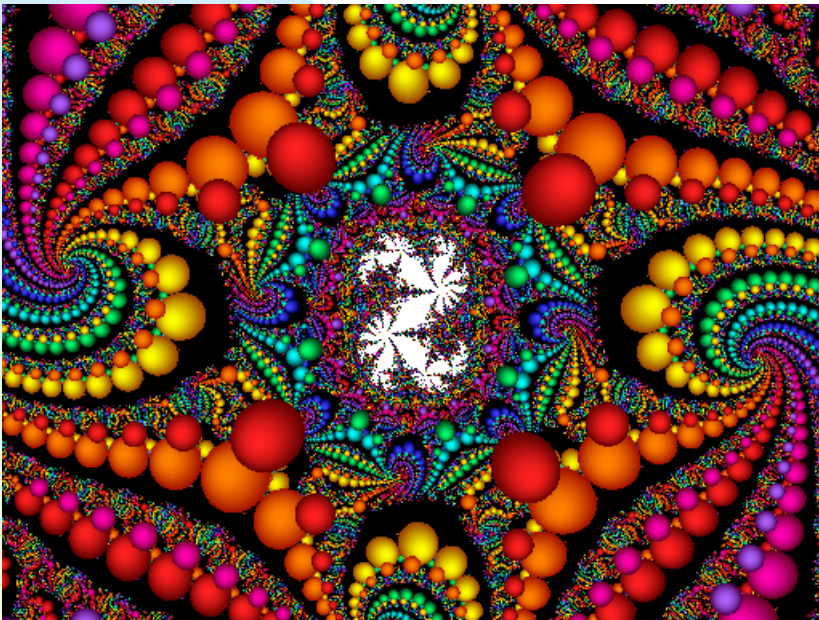


# Session overview



- Randomized Koch curves
- The Chaos Game
- Announcements:
- Pass in HW1 now, and show me your Koch IFS
- HW2 (contraction mappings) posted, due Tuesday.

# Koch snowflake via IFS

- How can the Koch curve be extended to the **snowflake** with an IFS?
- Apply a rotation and translation transformation to each generated point
- Program code is in `Kochifs.cpp`
- Contains the solution to yesterday's quiz

# Adding randomization to the Koch snowflake

- Rather than going up on the middle segments, consider going down
- Choose either up or down with equal probability
- Results look more realistic from a geographical perspective



# Random Koch curves

- Recognize that you can't do random systems with IFS, since the attractor would not be fixed
- An alternate approach uses recursion
- Program code is in `Kochlines.cpp`

# And now for something completely different

- A different use of randomization, at least
- Koch lines used it to choose segments to generate
- Now we'll use random points to generate fractals...

# The Chaos Game

- Label the three vertices of an equilateral triangle L, T, and R for left, top, and right, respectively
- Let a random roll of a die determine the direction, L, T, or R, for each move
- Start at any point inside the triangle
- Move halfway to the vertex identified by the roll, and mark the new point
- From there, move in a similar fashion for subsequent rolls, marking each point

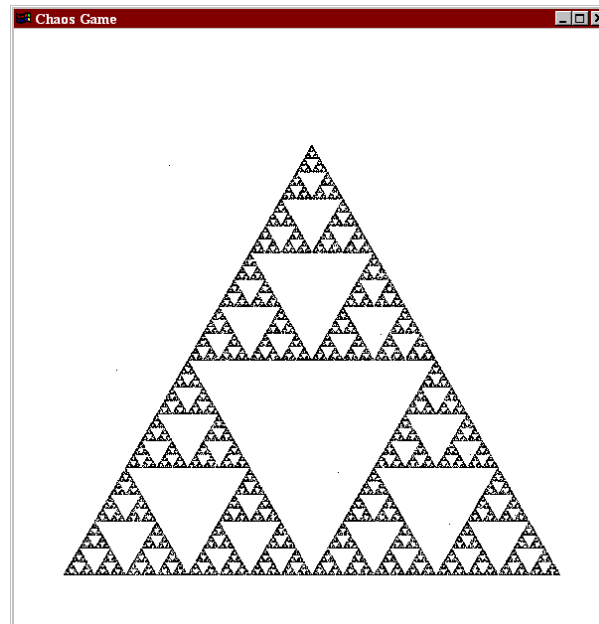


# Results of the chaos game

- Repeating the random process of the chaos game *ad infinitum* produces a surprising result:

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# Observation

- It seems amazing that a random process could generate an image that we developed previously from a deterministic approach

# We randomly choose which mapping to apply

- Show that this process eventually generates (with probability = 1) the same points as the IFS
- p. 285 has an argument
- We'll show that it works for the Sierpinski gasket



# In class programming exercise

- In-class: write a program that plays the chaos game
- Project 2 extends this