

# Stochastic Fractals

- The Chaos Game

● *base point*

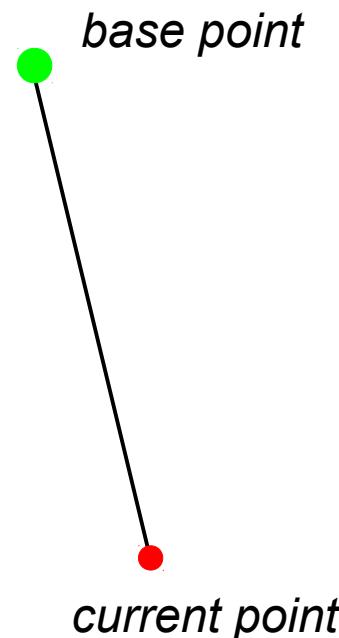
●  
*current point*

● *base point*

● *base point*

# Stochastic Fractals

- The Chaos Game

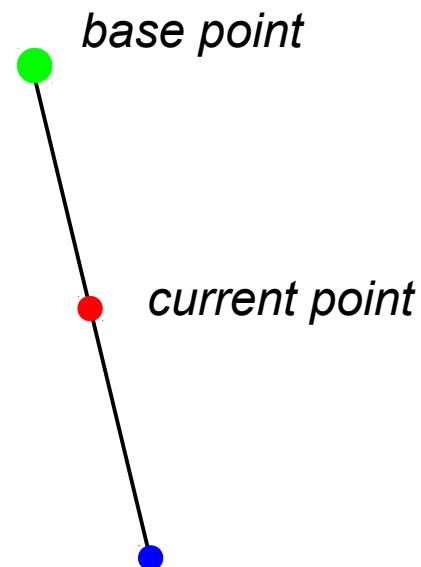


● *base point*

● *base point*

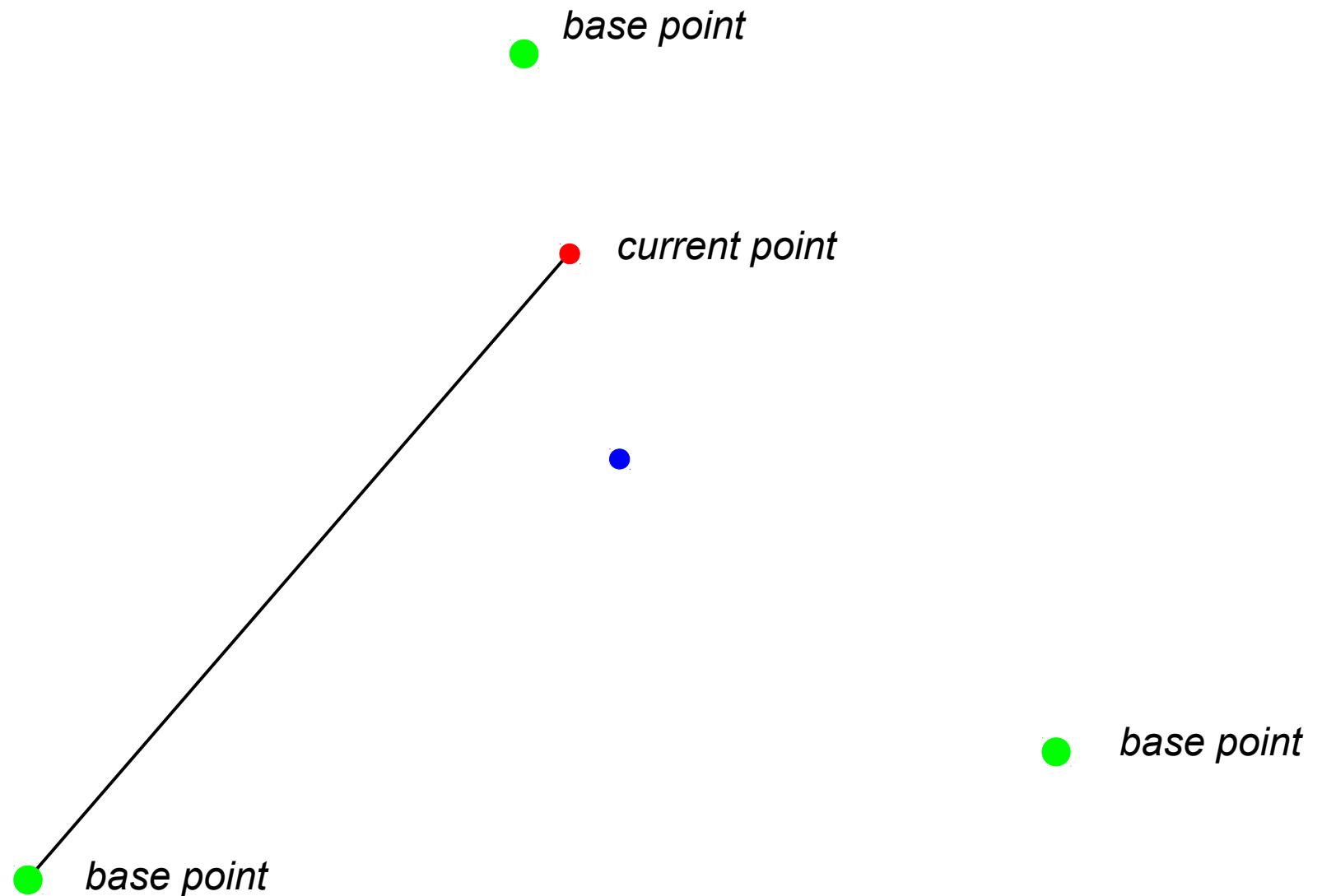
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- The Chaos Game



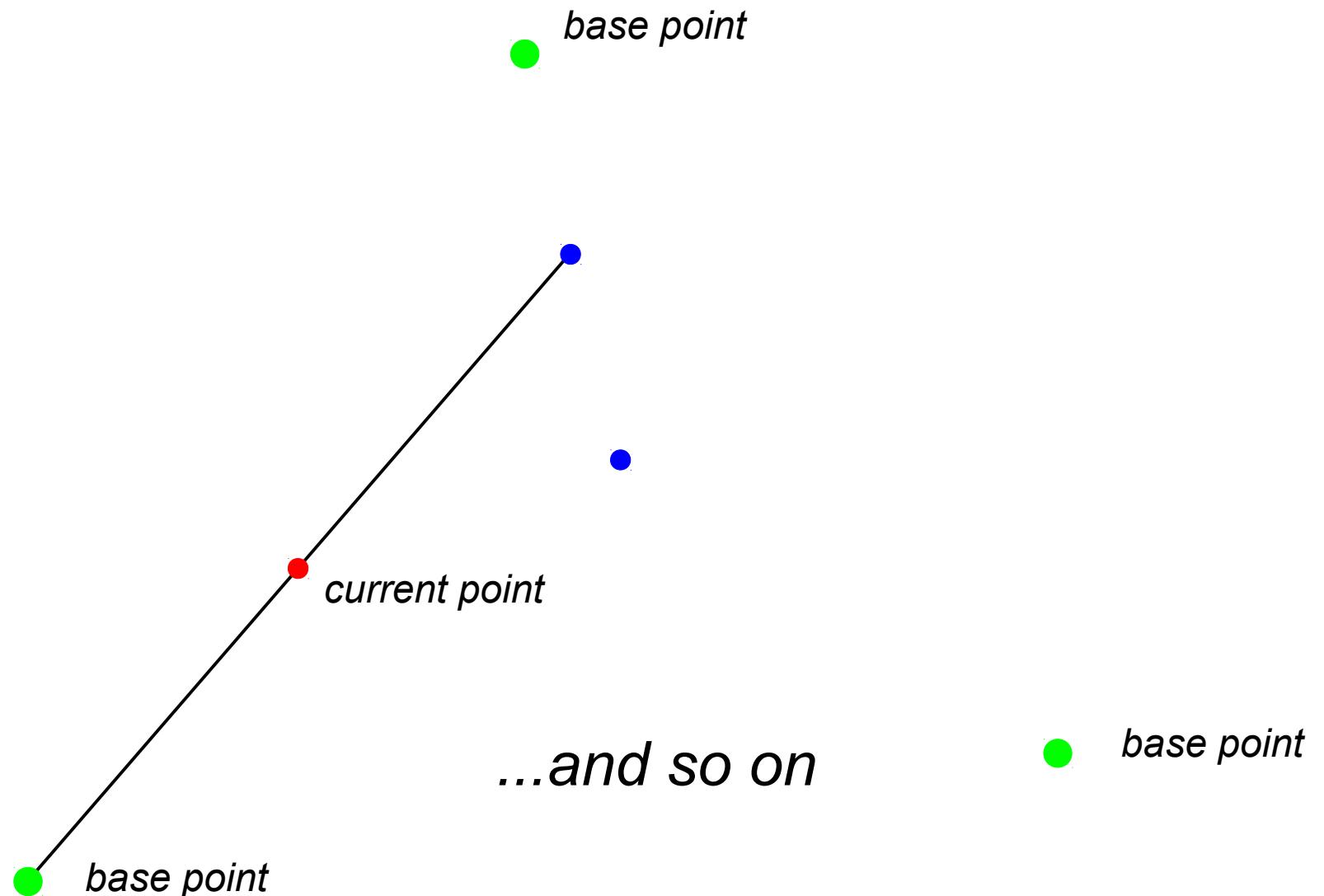
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- The Chaos Game



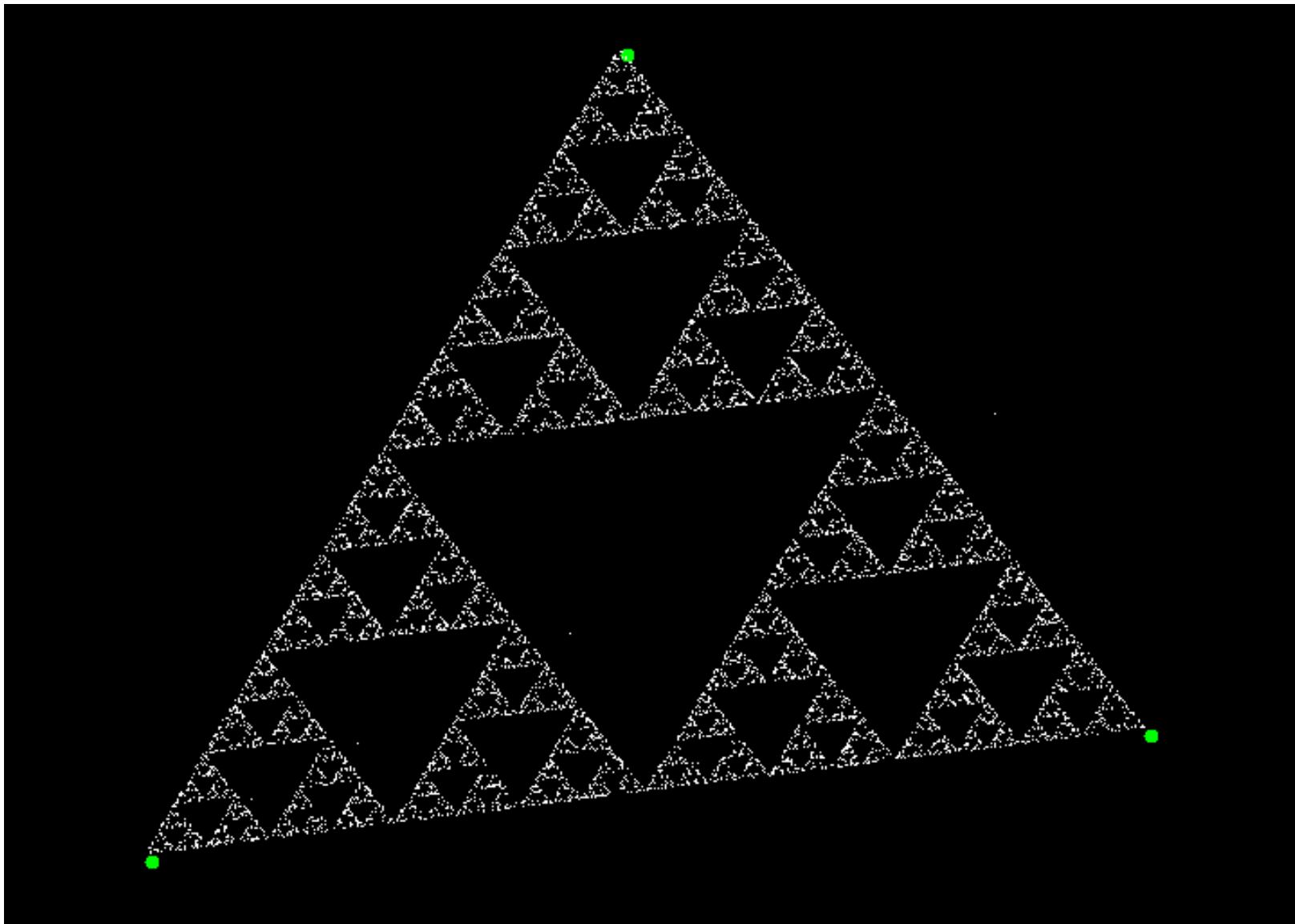
# Stochastic Fractals

- The Chaos Game



# Stochastic Fractals

- The Chaos Game



# Iterated Function Systems

$$x = 0$$

$$y = 0$$

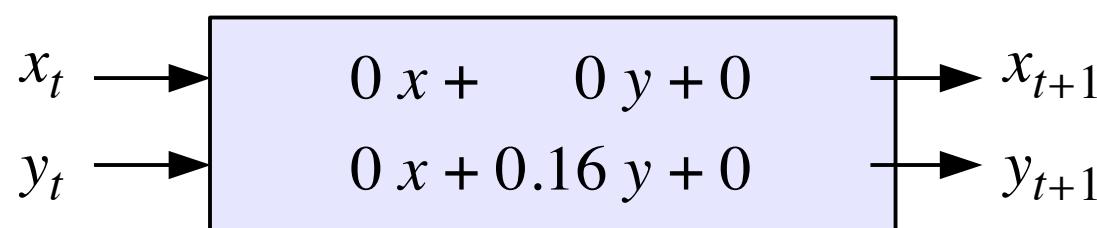
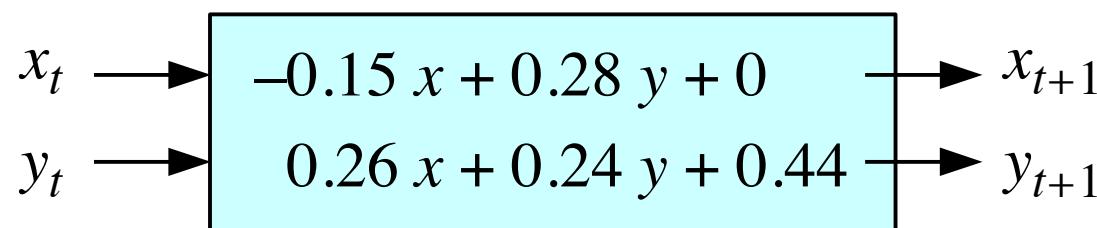
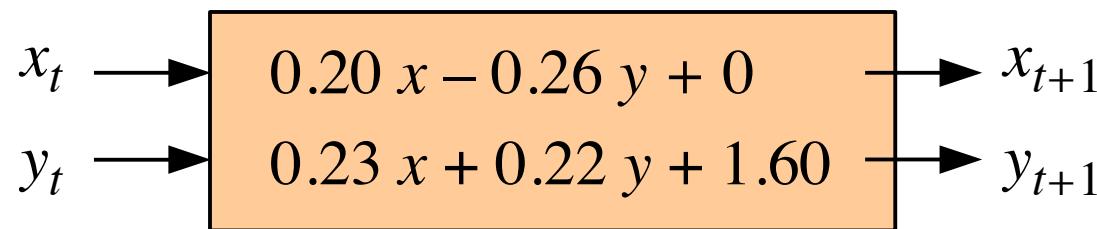
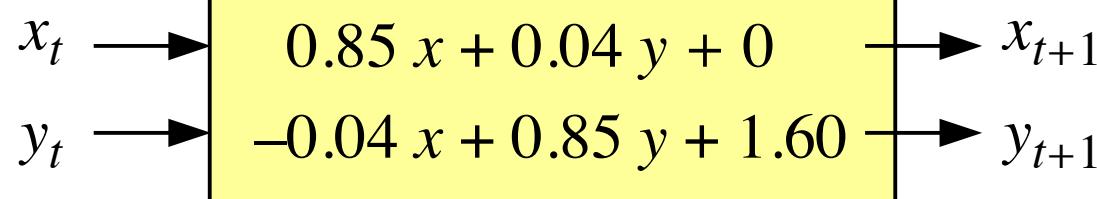


85%

7%

7%

1%



# Iterated Function Systems



# Iterated Function Systems

$$x = 0$$

$$y = 0$$

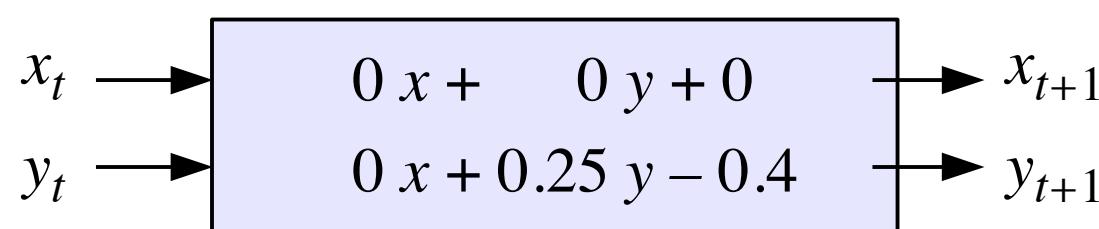
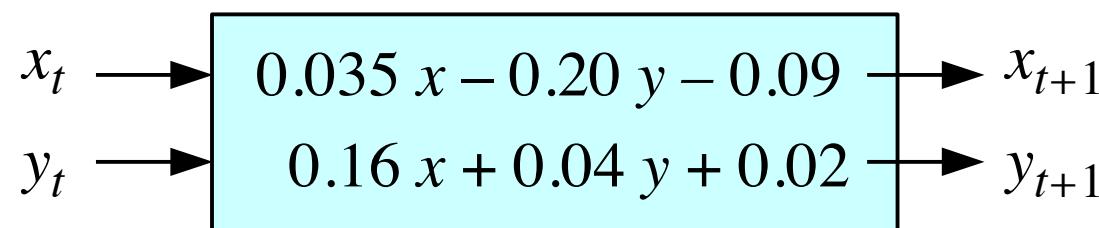
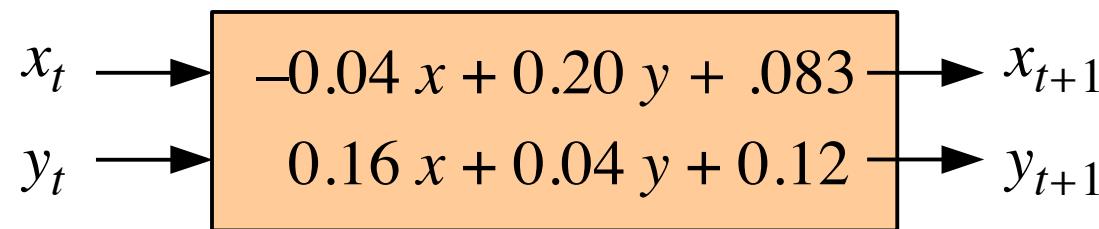
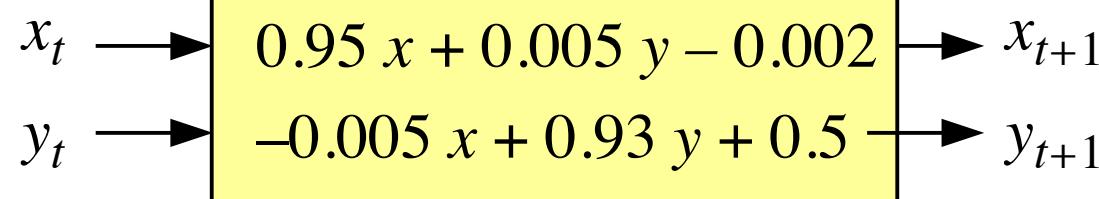


84%

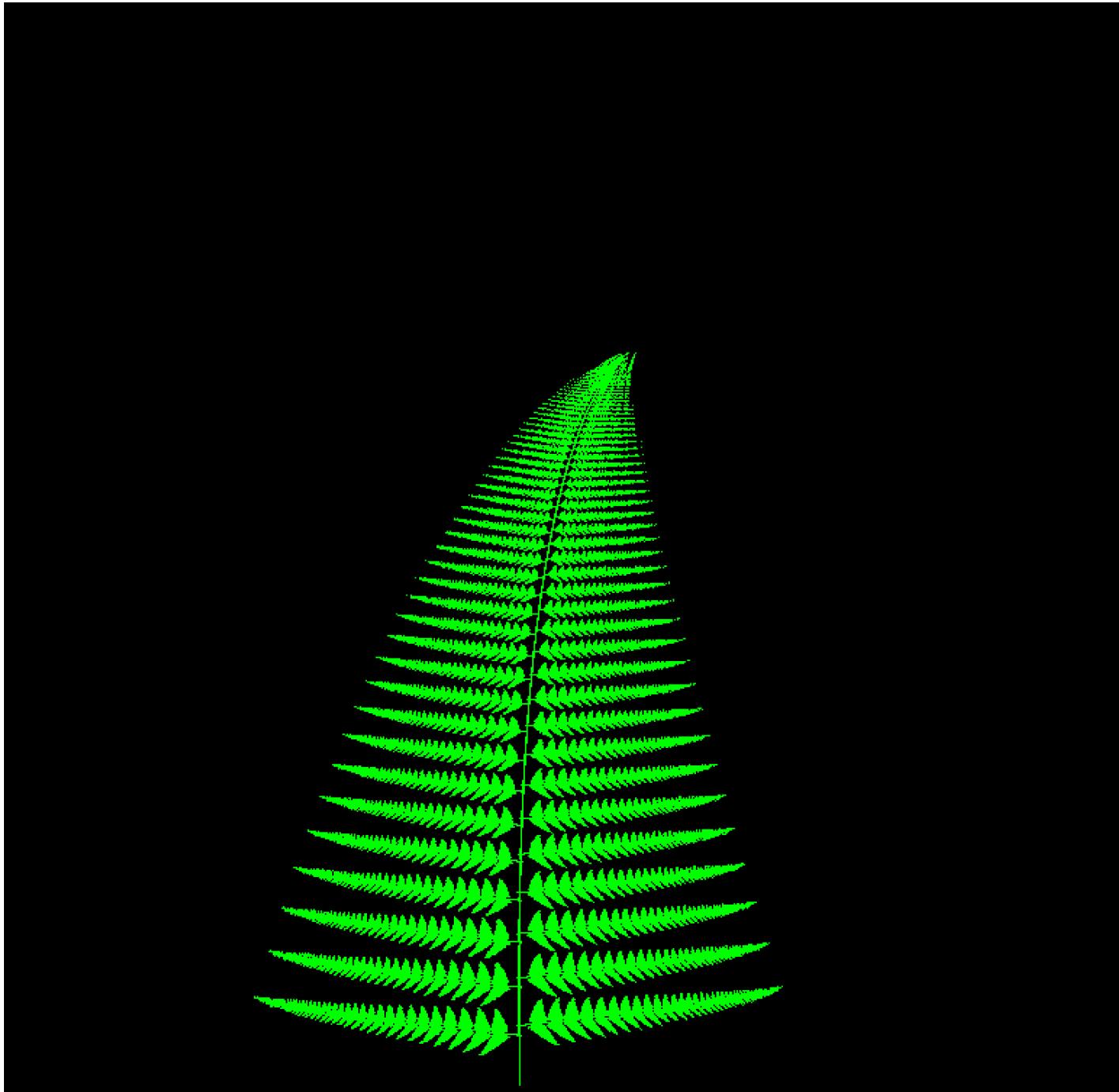
7%

7%

2%



# Iterated Function Systems



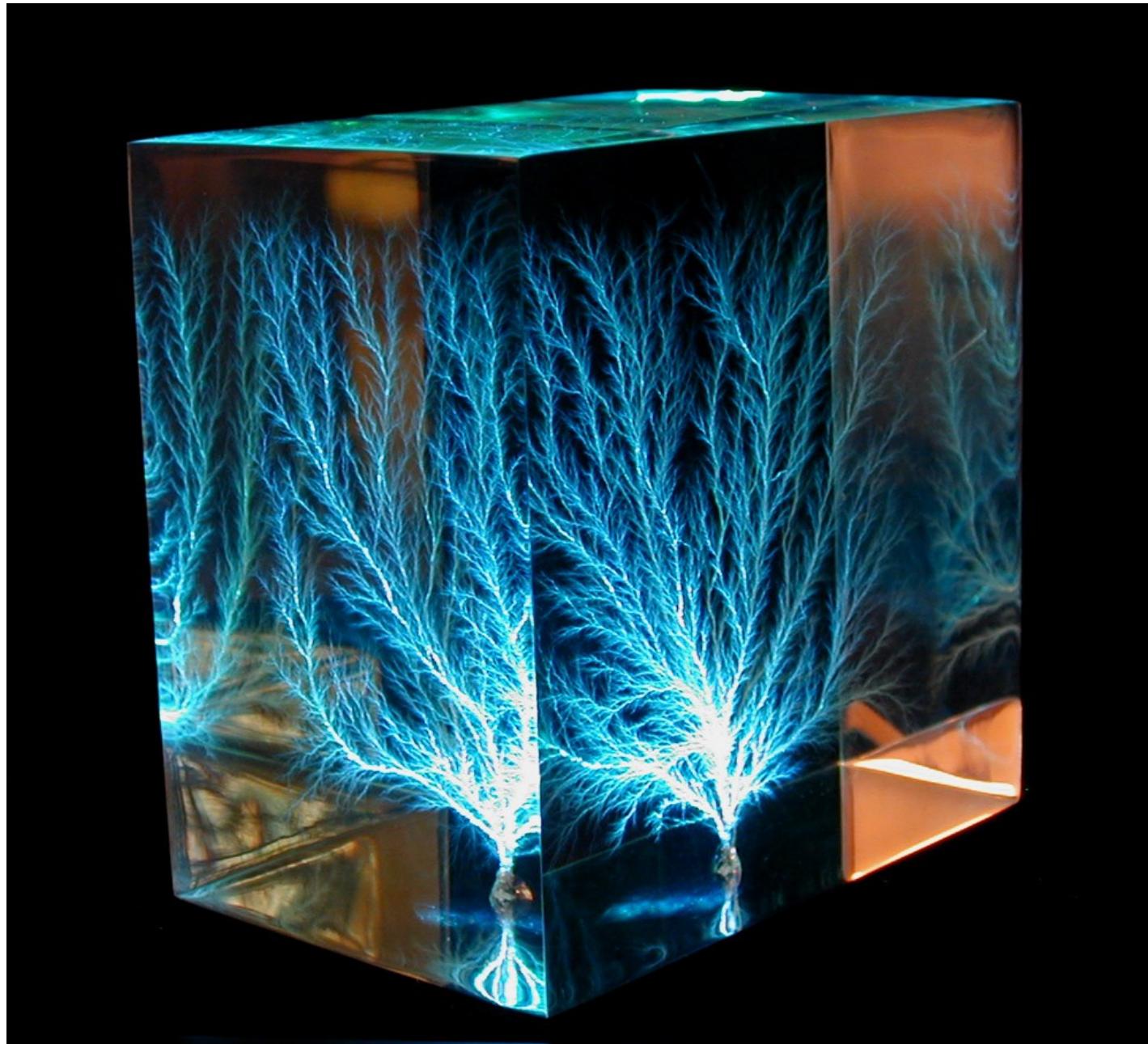
# Natural Fractals



# Natural Fractals



# Natural Fractals



# William George Armstrong (1899)



Plate I.

POSITIVE DISCHARGE FROM A WIRE.

# William George Armstrong (1899)



Plate II.

POSITIVE INDUCTION DISCHARGE BETWEEN SMALL (POSITIVE) AND LARGE (NEGATIVE) DISCS.

# William George Armstrong (1899)



Plate V.

NEGATIVE DISCHARGE BETWEEN CENTRAL WIRE (NEGATIVE) ABOVE,  
AND METAL RING (POSITIVE) BELOW THE VARNISHED PLATE.

# William George Armstrong (1899)

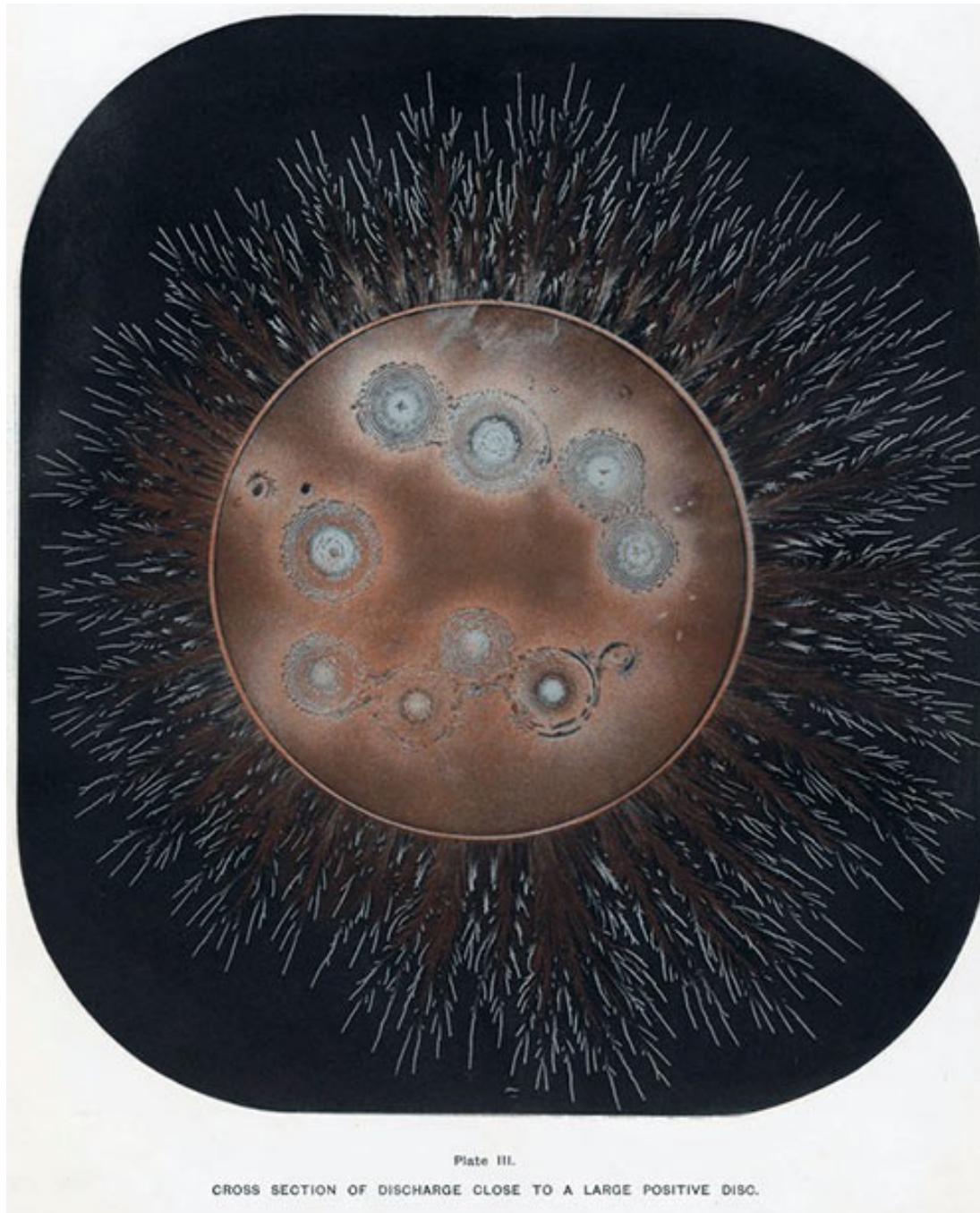


Plate III.

CROSS SECTION OF DISCHARGE CLOSE TO A LARGE POSITIVE DISC.

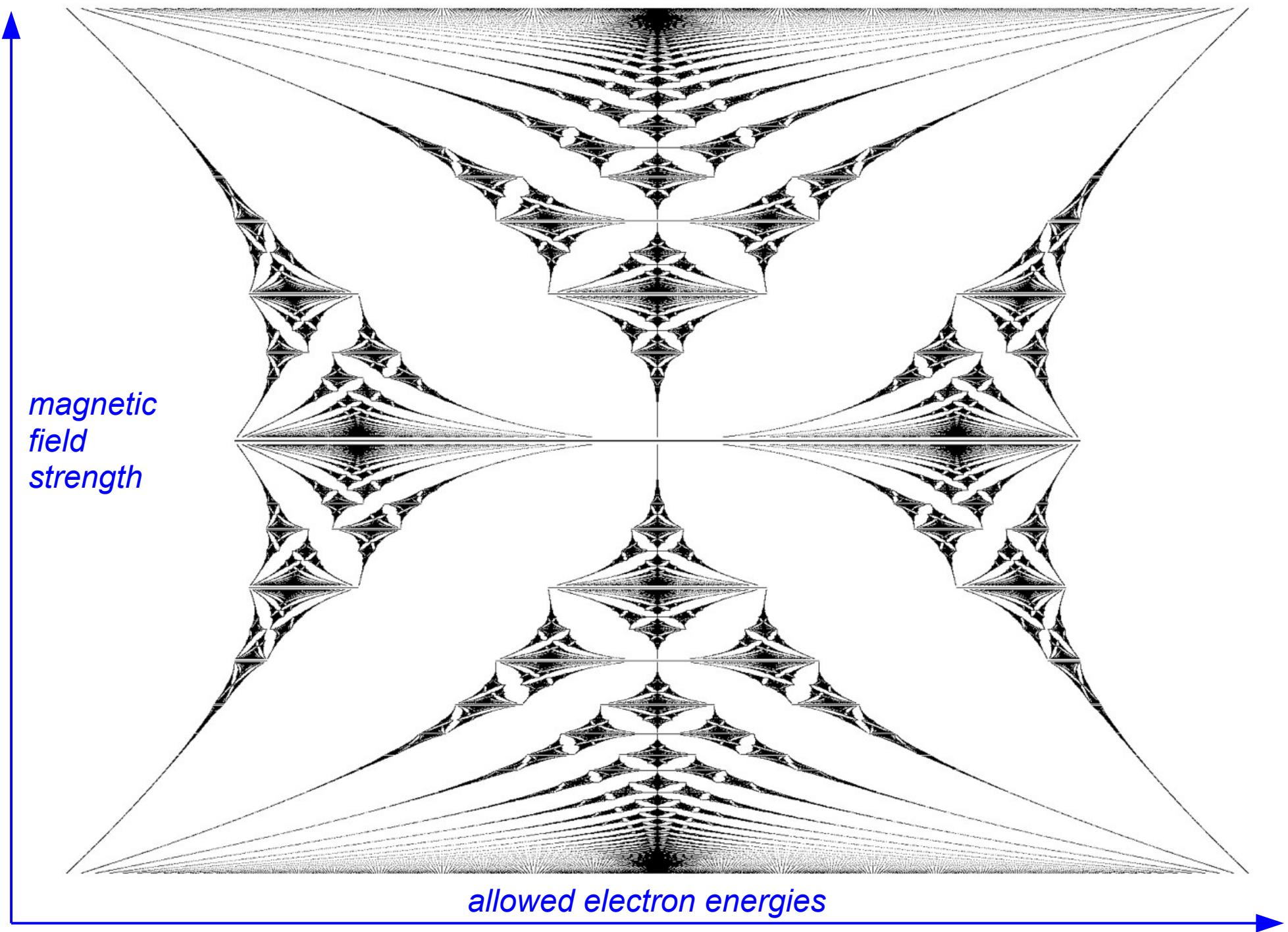
# Hofstadter's Butterfly (1976)

magnetic  
field  
strength

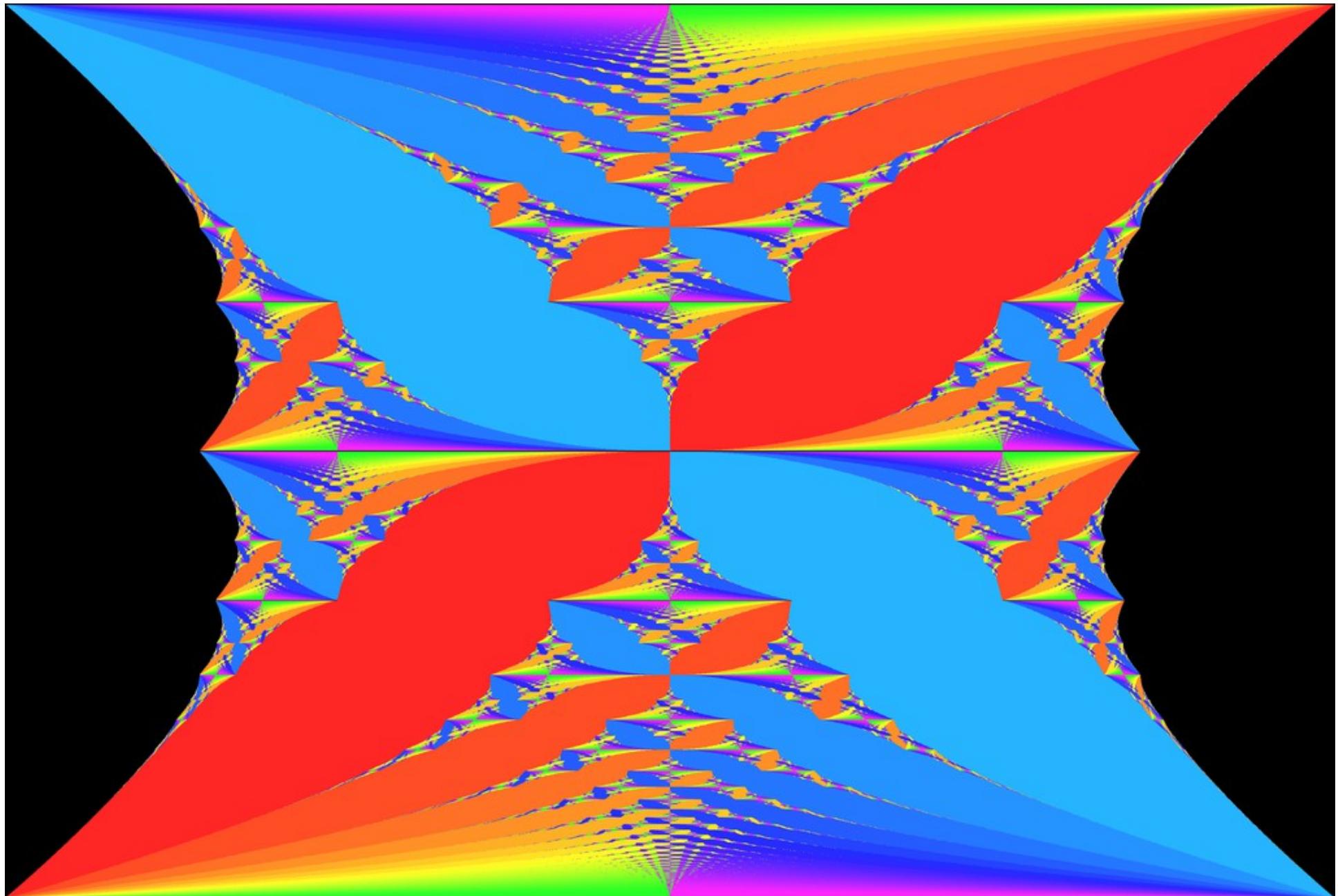
*What are the allowed  
energies of electrons  
in a crystal in a magnetic  
field?*

allowed electron energies

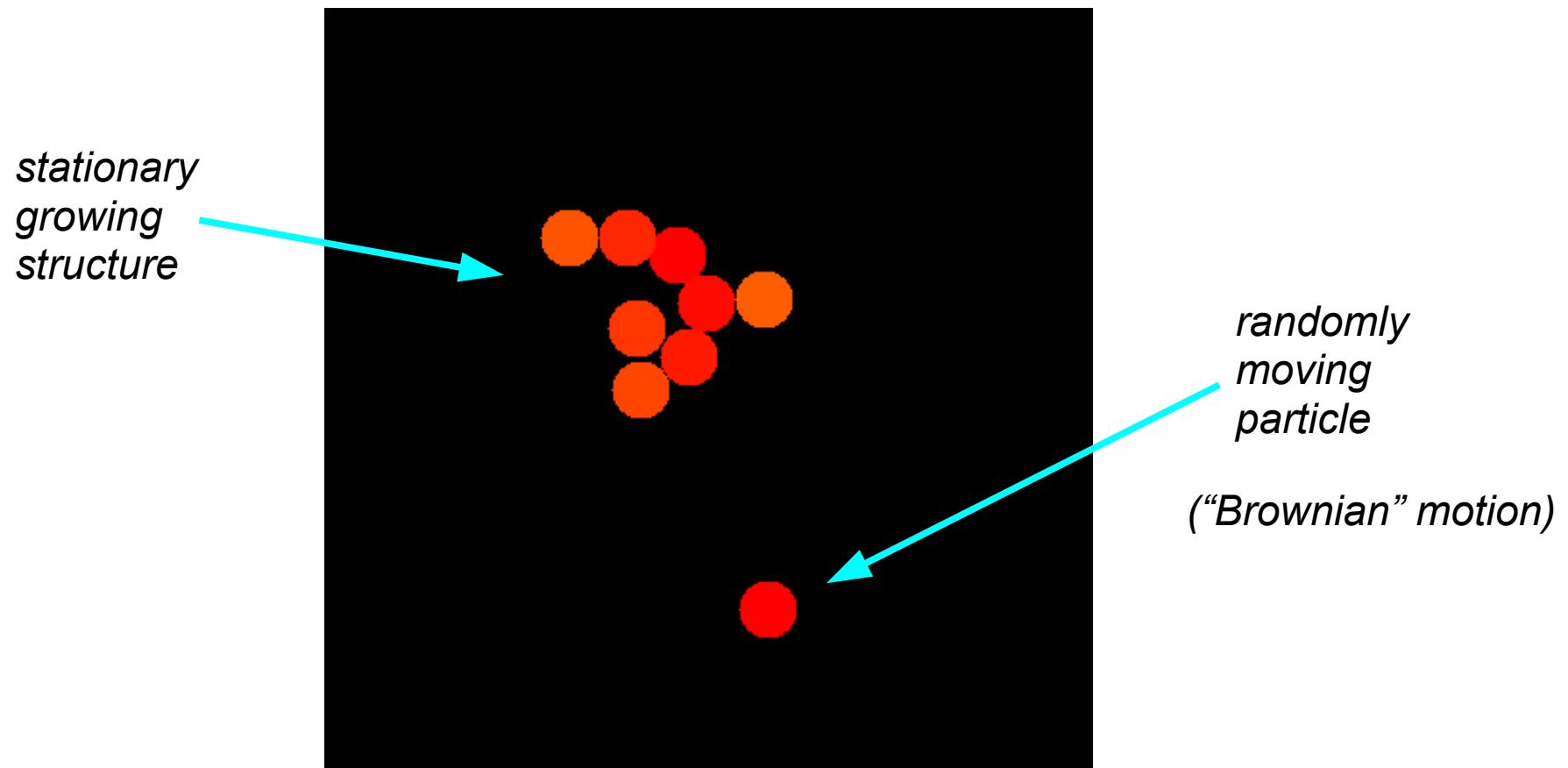
# Hofstadter's Butterfly (1976 theory)



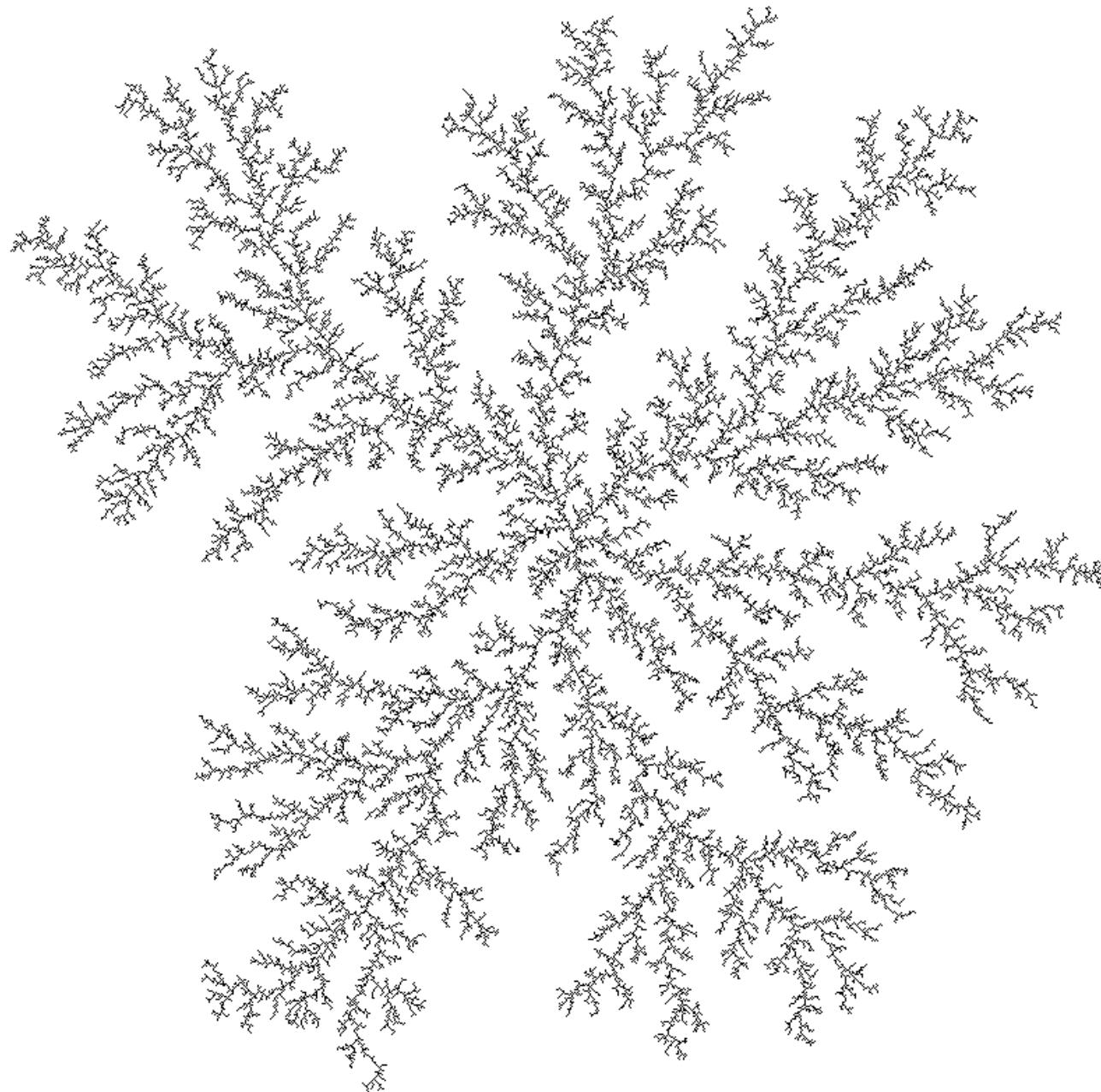
# Hofstadter's Butterfly (2013 data)



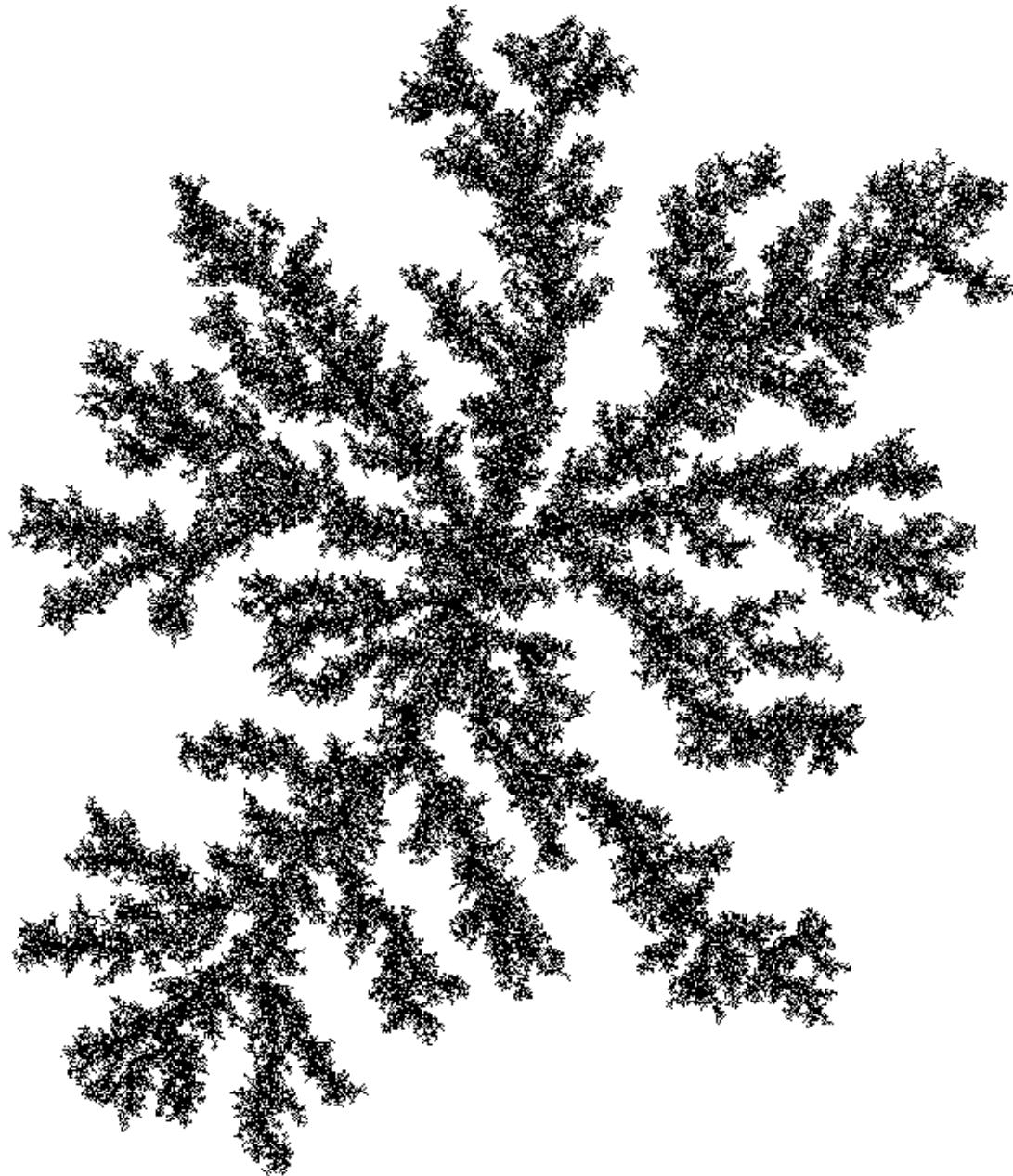
# Diffusion Limited Aggregation



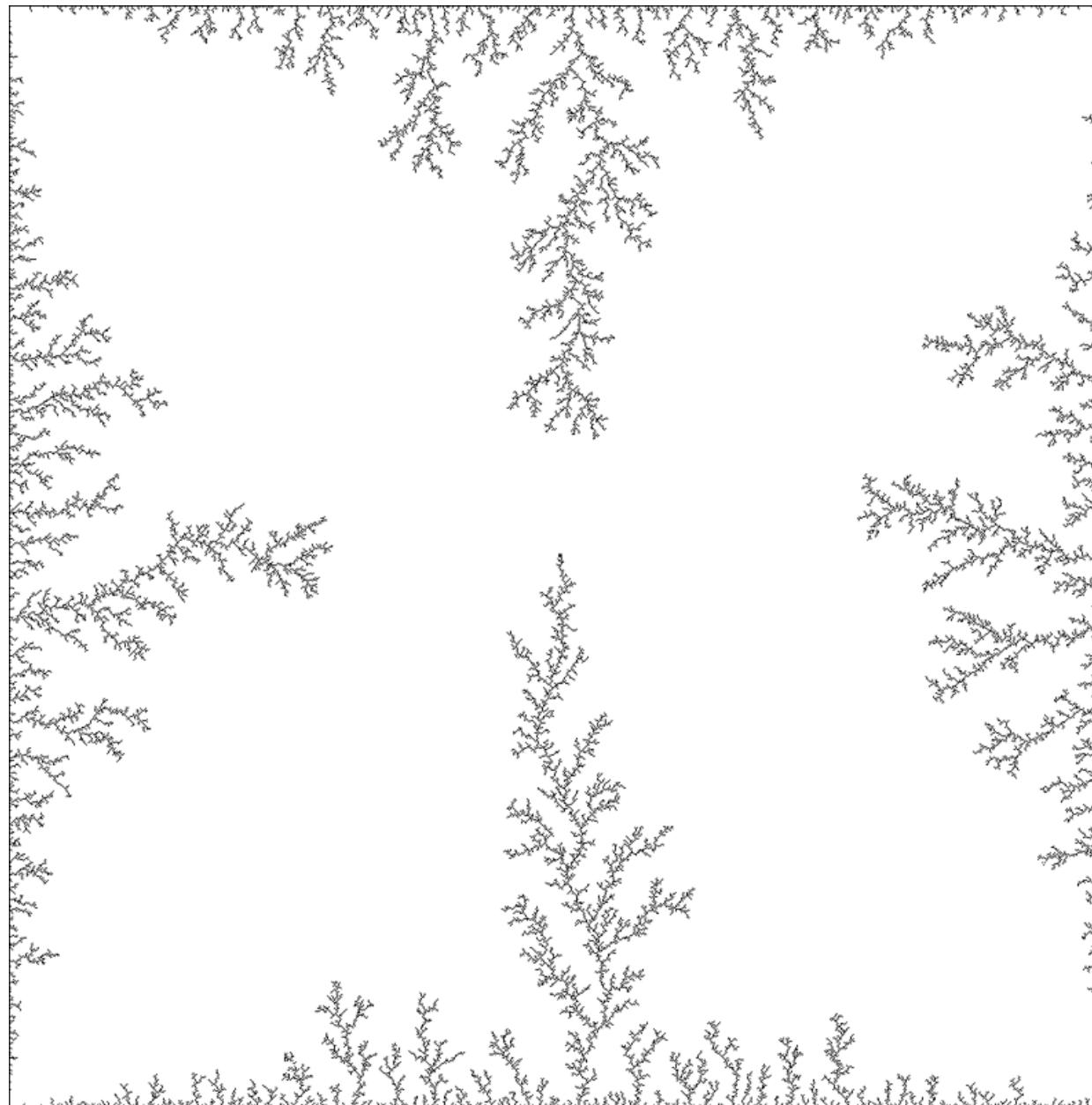
# Diffusion Limited Aggregation



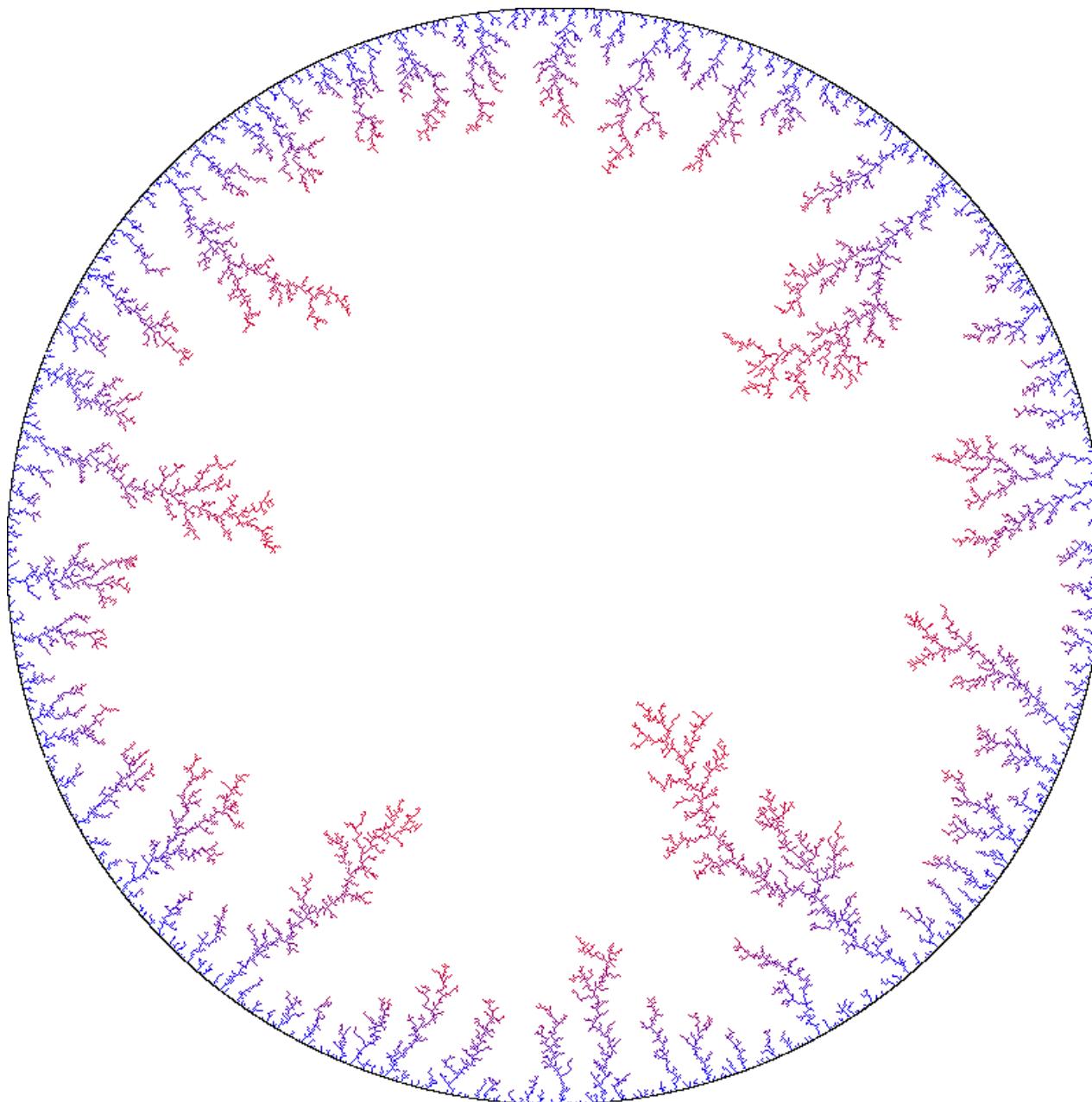
# Diffusion Limited Aggregation



# Diffusion Limited Aggregation



# Diffusion Limited Aggregation



# Further Information and Images

- William George Armstrong's electrical discharge experiments  
<https://www.dataisnature.com/?p=2081>
- Diffusion Limited Aggregation images by Paul Bourke  
<http://paulbourke.net/fractals/dla>
- Andy Lomas' aggregation images and videos  
<http://www.andylomas.com/index.html>