Using Random Numbers to Create Art

Christopher R. H. Hanusa

Queens College

That's Random

A **random number** is a number chosen by chance.

Key property: Each choice is independent of previous choices.

That's Random

A **random number** is a number chosen by chance.

Key property: Each choice is independent of previous choices.

Which feels more random?

List A:

4, 3, 2, 2, 3, 3, 3, 3, 2, 4, 3, 4, 4, 4, 1, 3, 3, 4, 3, 3, 1, 3,
1, 4, 1, 1, 1, 1, 3, 3, 1, 1, 4, 3, 3, 2, 3, 1, 1, 1, 3, 4, 3, 1

List B:

1, 3, 4, 2, 1, 1, 3, 3, 2, 4, 1, 2, 3, 1, 3, 4, 4, 2, 1, 4, 2, 3,
4, 1, 3, 1, 2, 3, 4, 1, 3, 4, 2, 2, 3, 1, 3, 1, 4, 2, 3, 1, 4, 2

Generating Random Numbers

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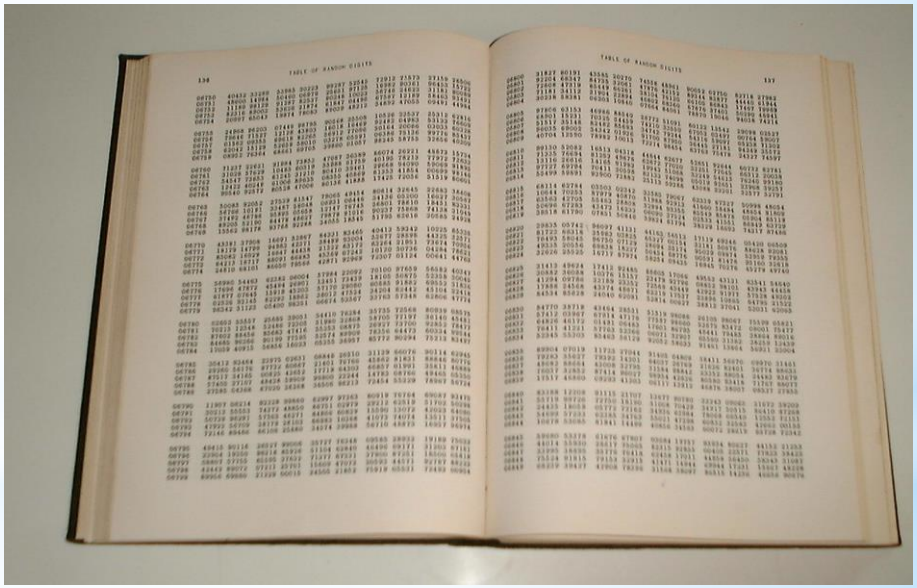
- Flip a coin
- Roll a die

Generating Random Numbers

- Flip a coin
- Roll a die
- Tables in books



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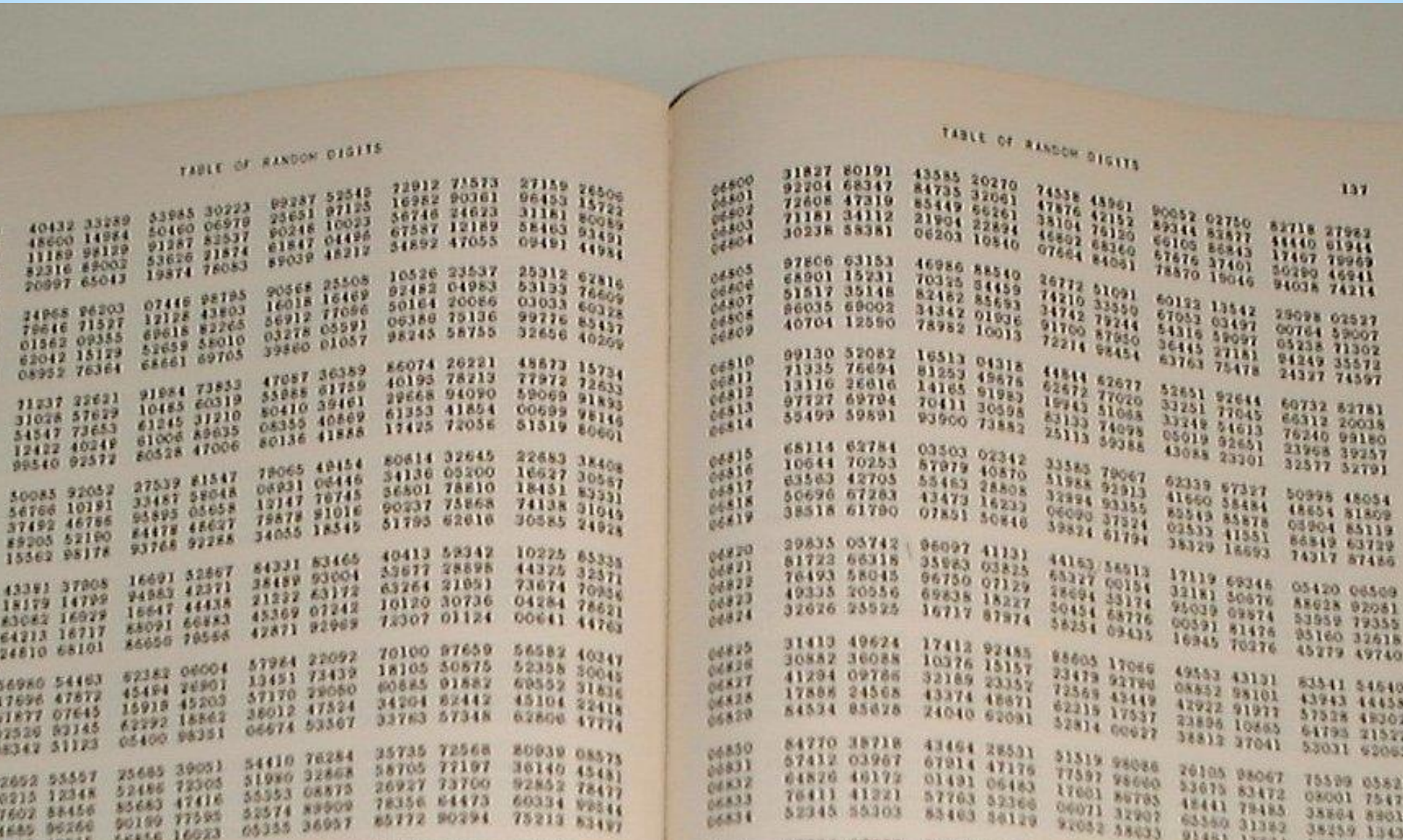

Generating Random Numbers

- Flip a coin
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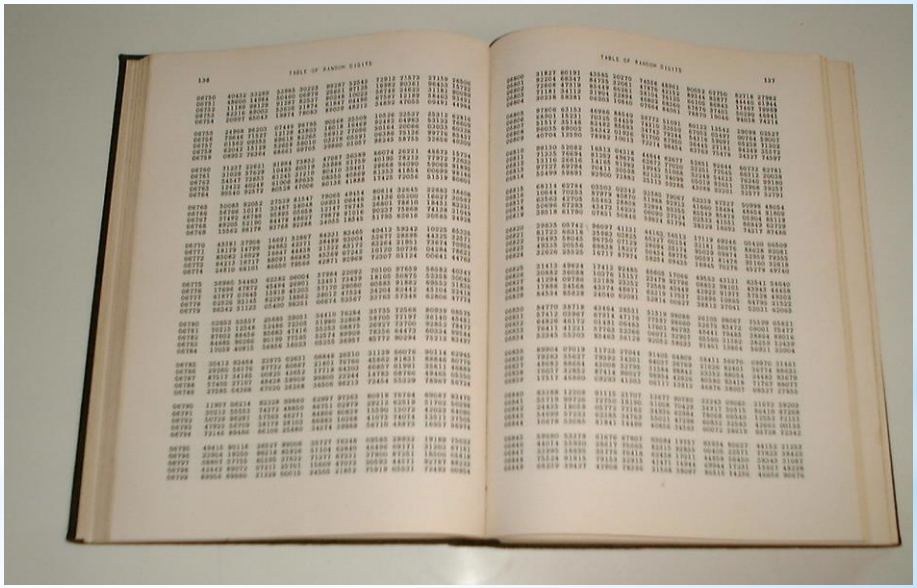

Generating Random Numbers

- Flip a coin
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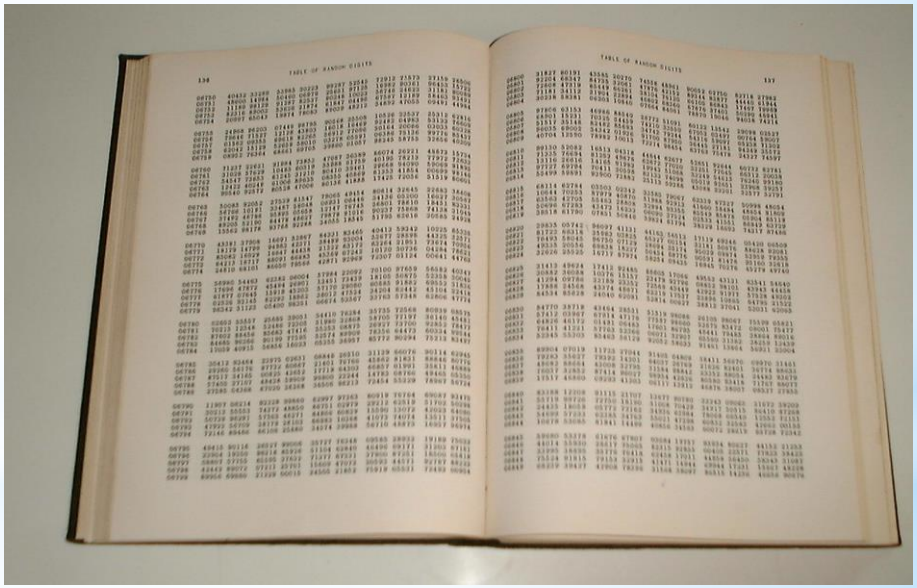
- Tables in books
- Noise from outer space (random.org)
- Use a computer?



Mathematics + Art ?

Bathsheba Sculpture

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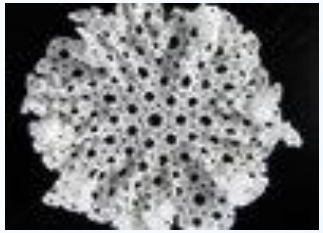
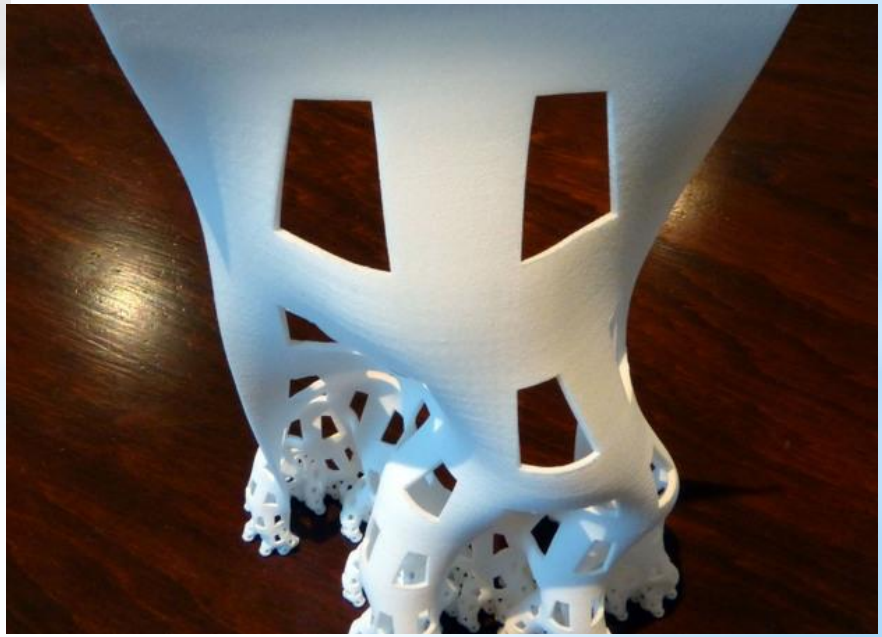
Henry Segerman





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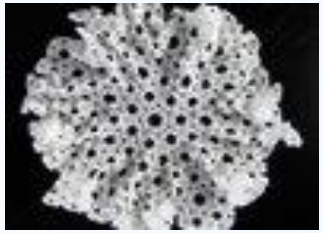
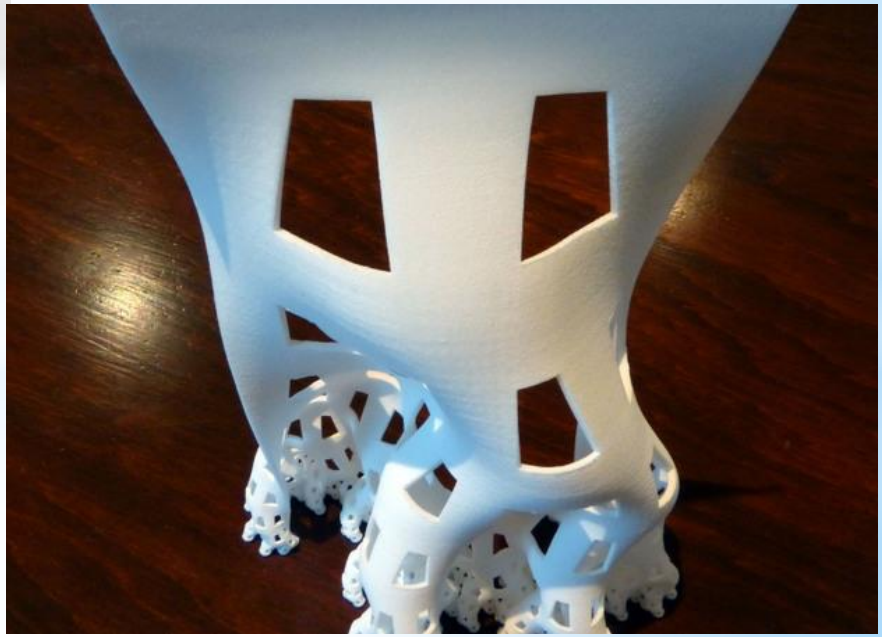


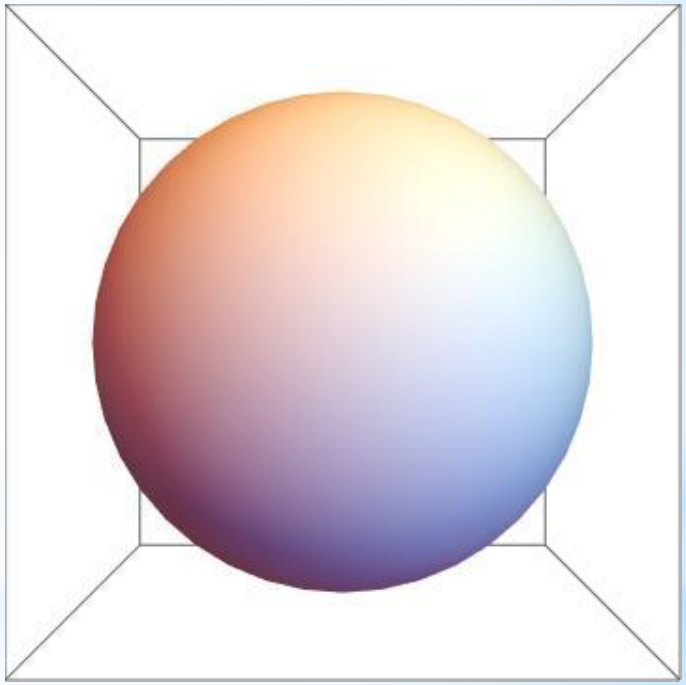


- Repetition
- Symmetry
- Geometry
- Higher Dimensions

Generative Art / Creative Coding

Use a computer to program an **algorithm**:

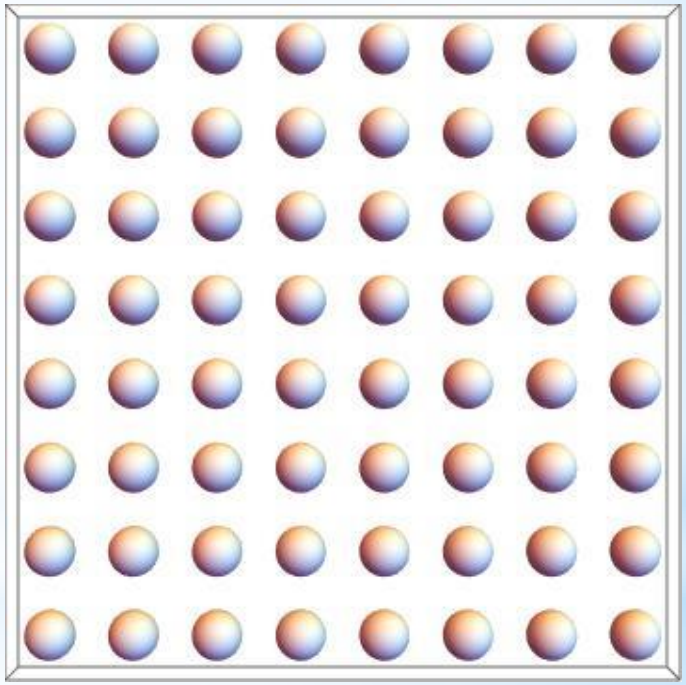
- Specify **objects**



Generative Art / Creative Coding

Use a computer to program an **algorithm**:

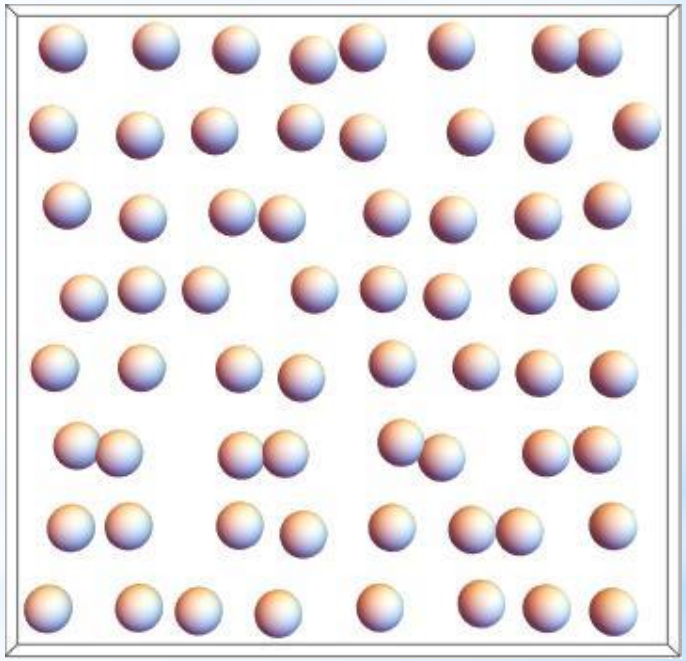
- Specify **objects**
- Give **rules** for placement



Generative Art / Creative Coding

Use a computer to program an **algorithm**:

- Specify **objects**
- Give **rules** for placement
- Add **randomness**



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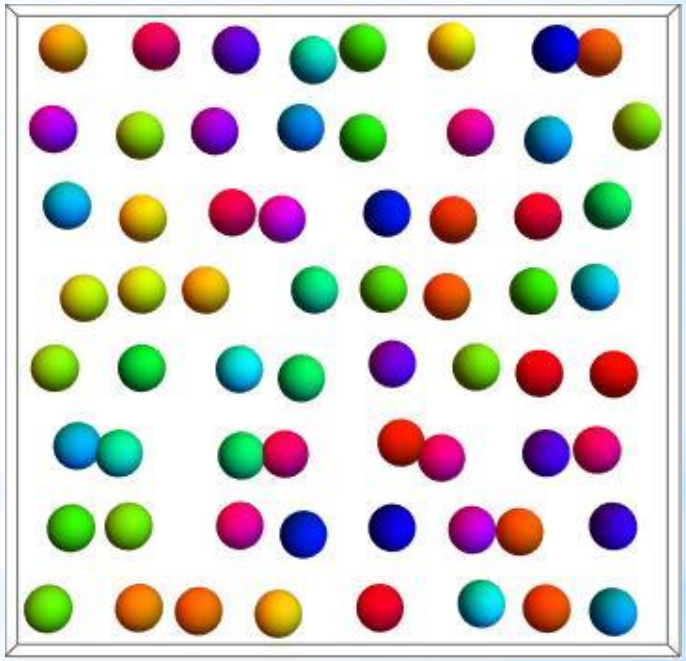

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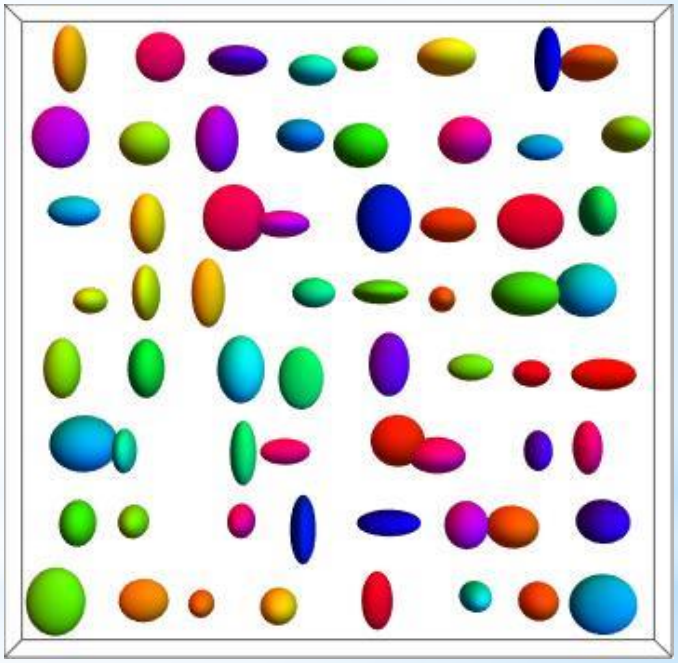
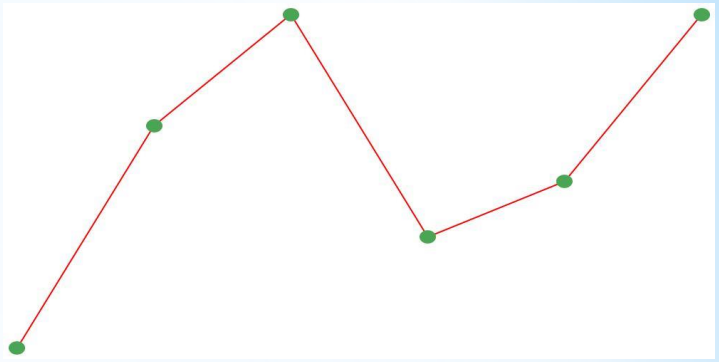


Random Splines

A **spline** is a piecewise function that is a smooth curve and approximates given data points.



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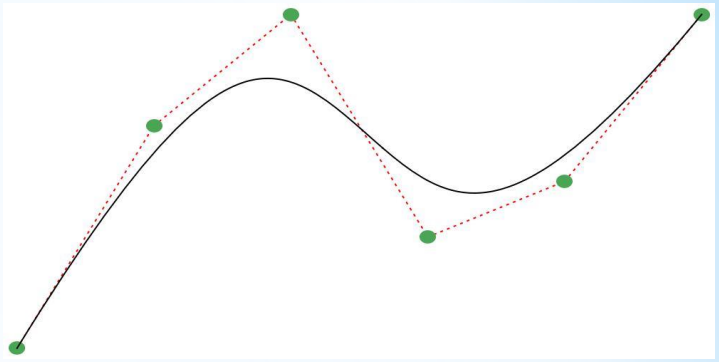

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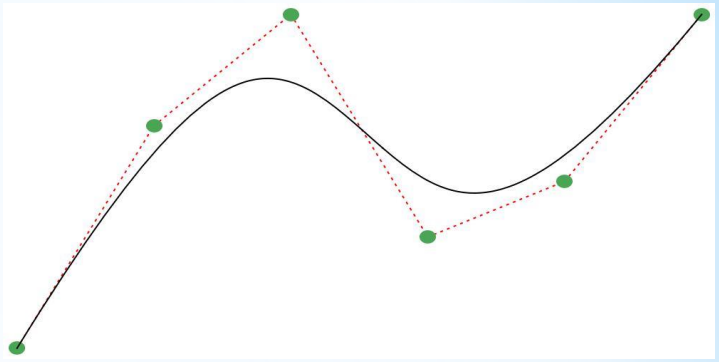

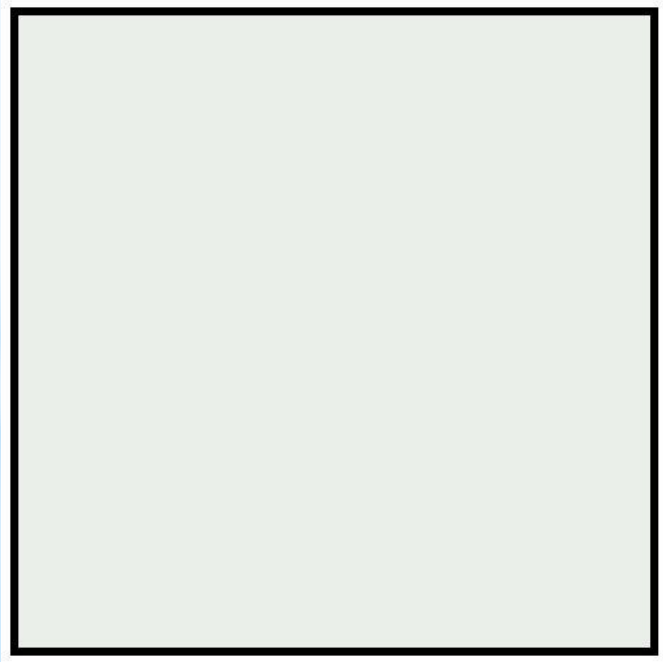

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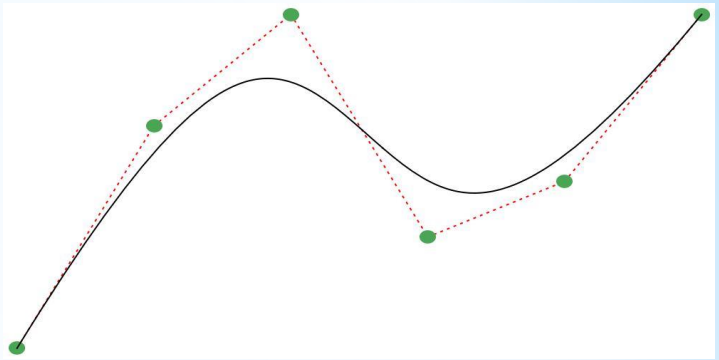

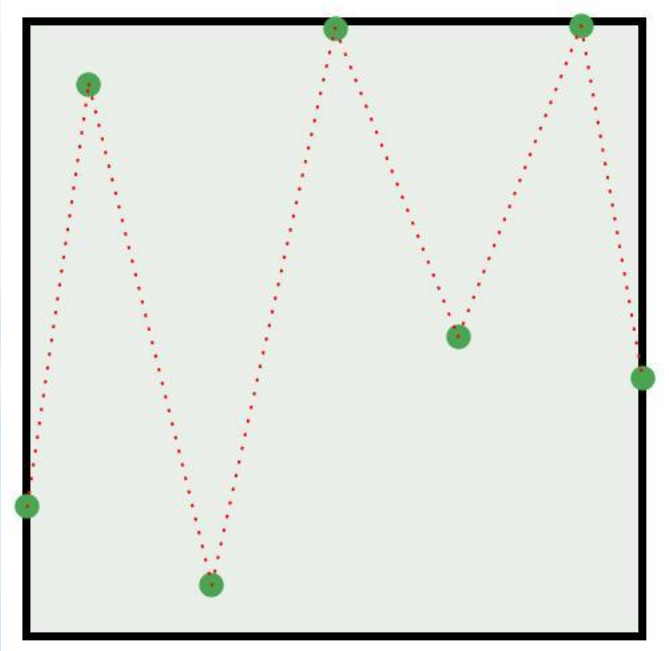

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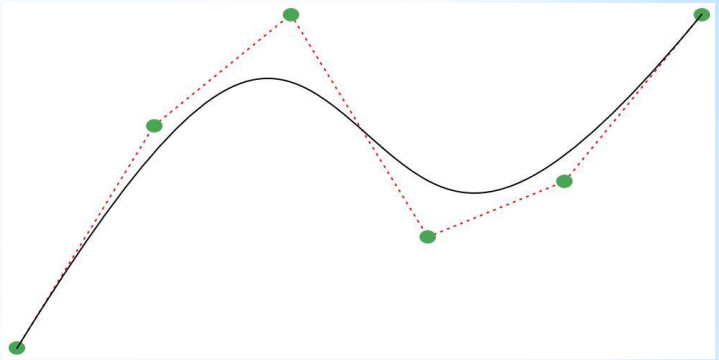

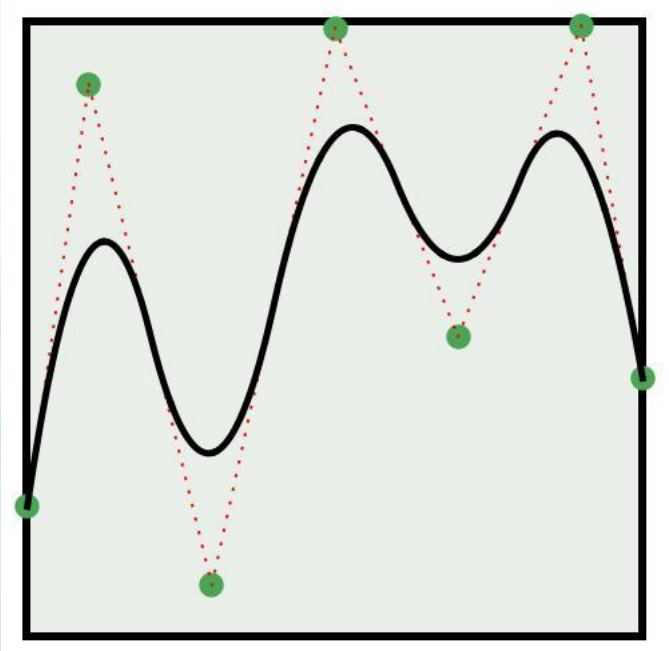

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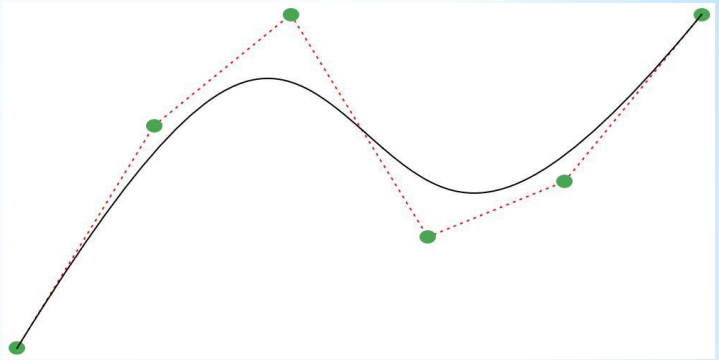

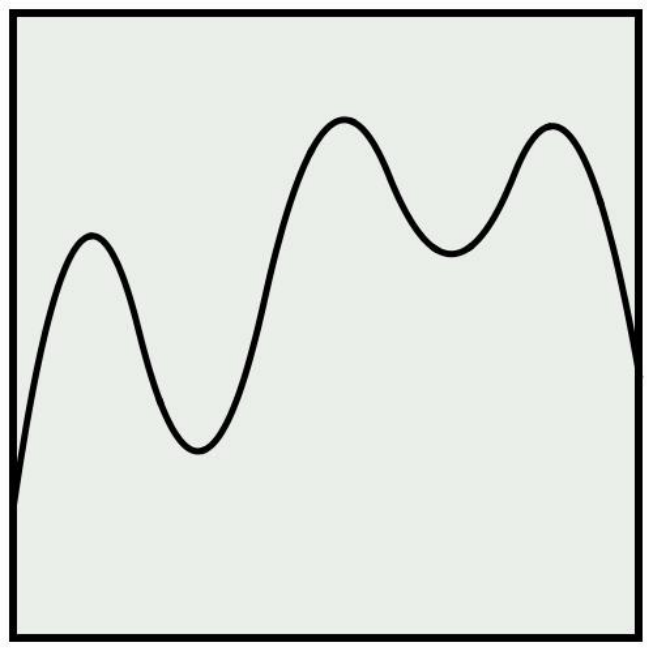

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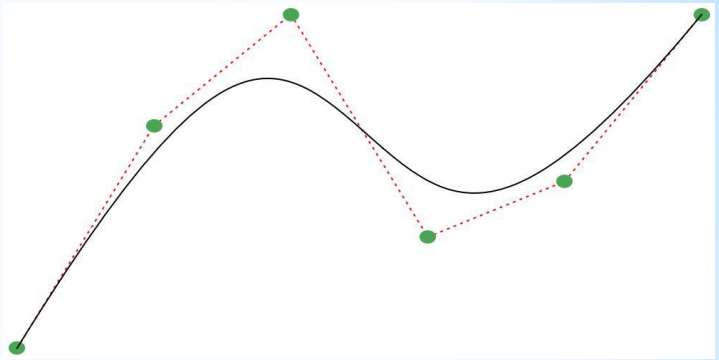

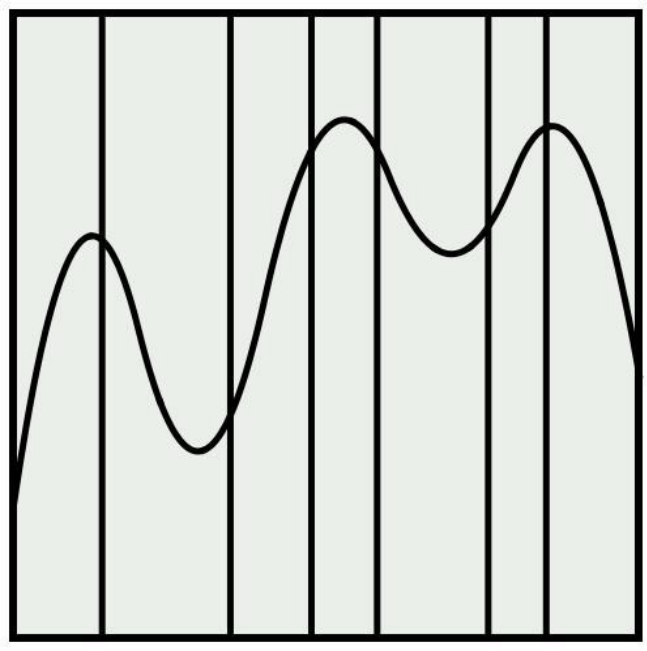

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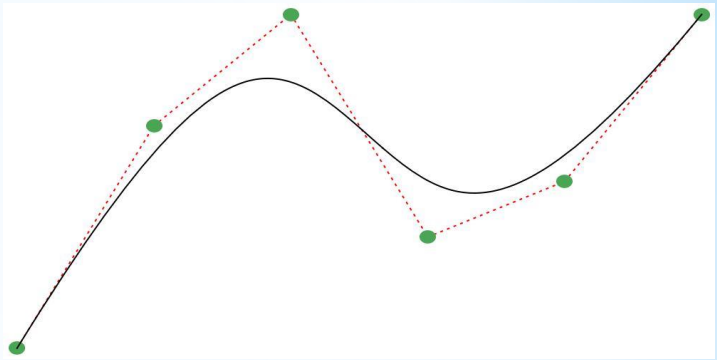

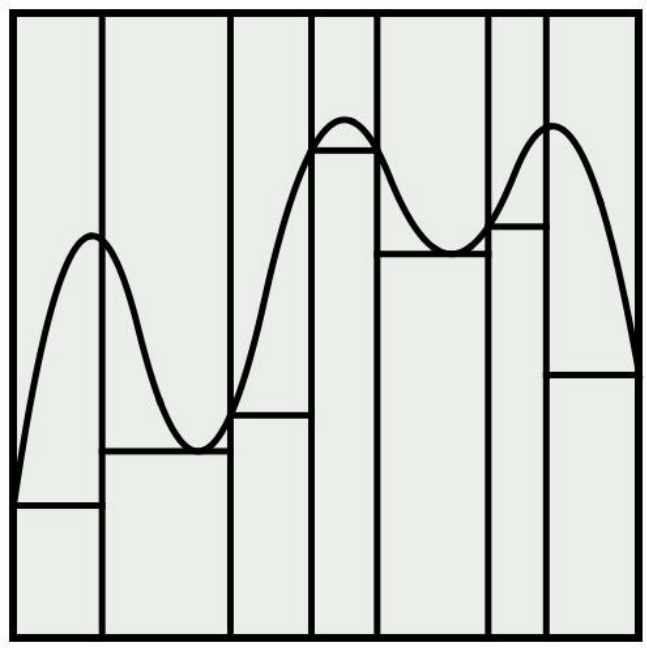

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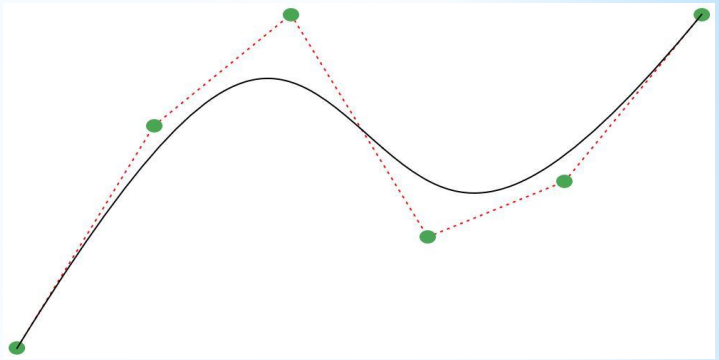

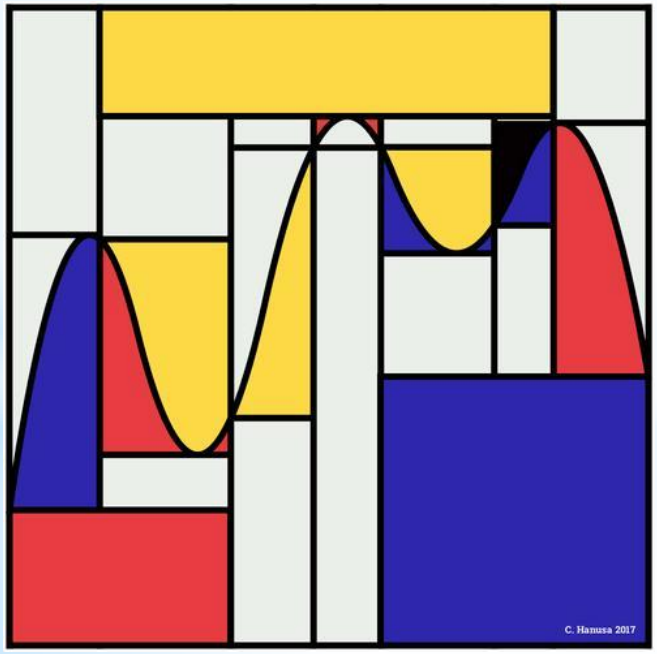

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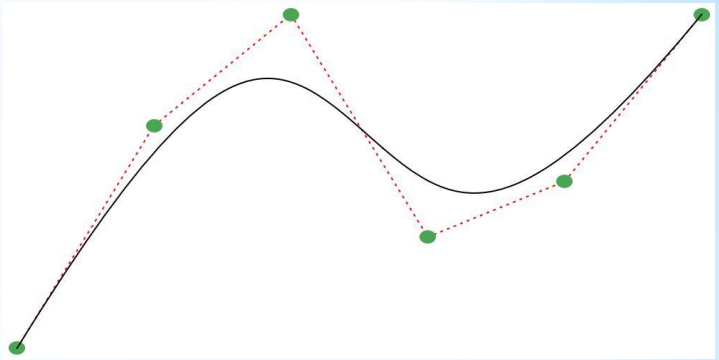

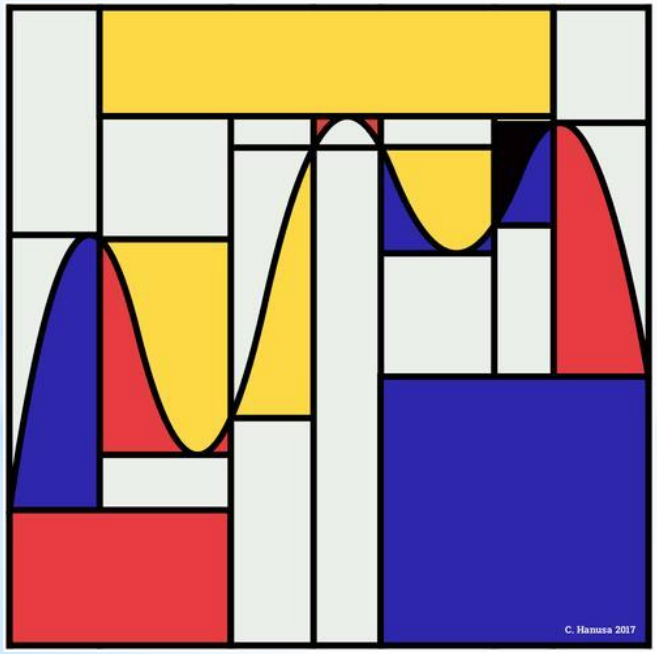

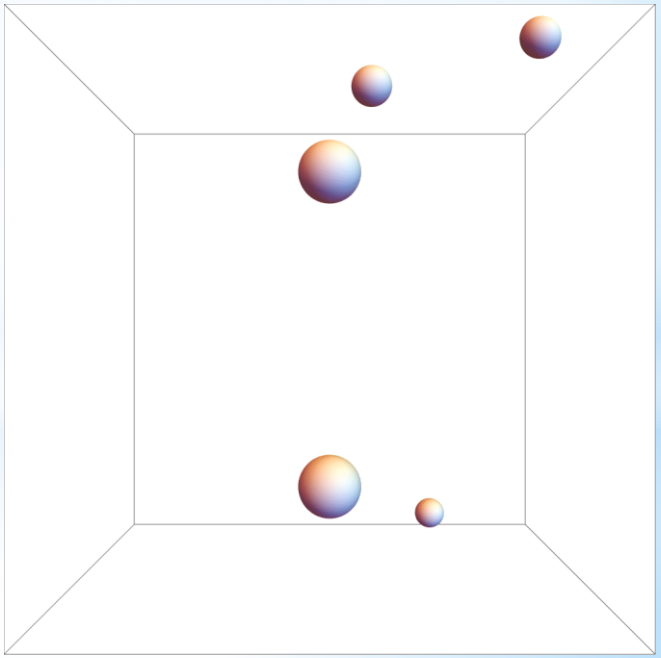

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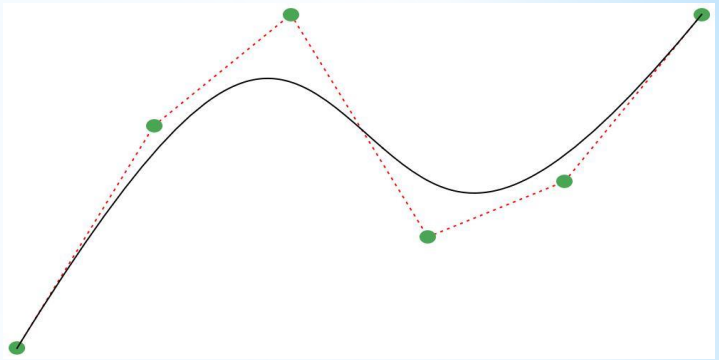
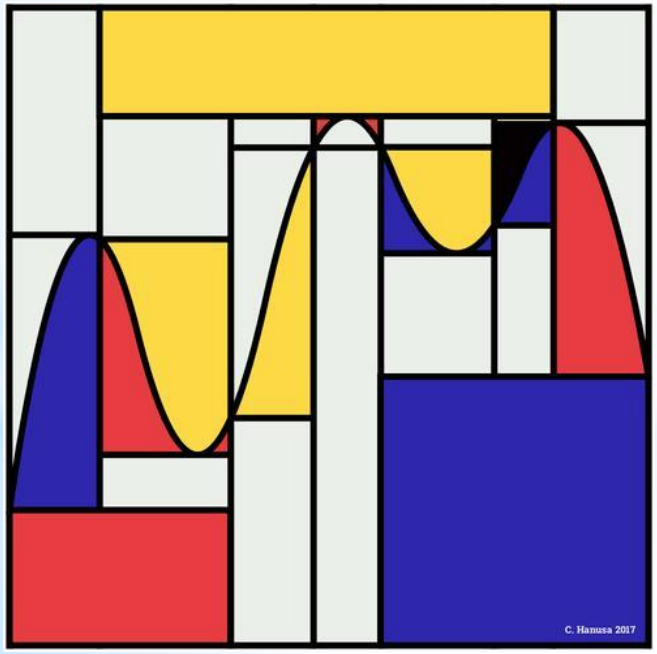
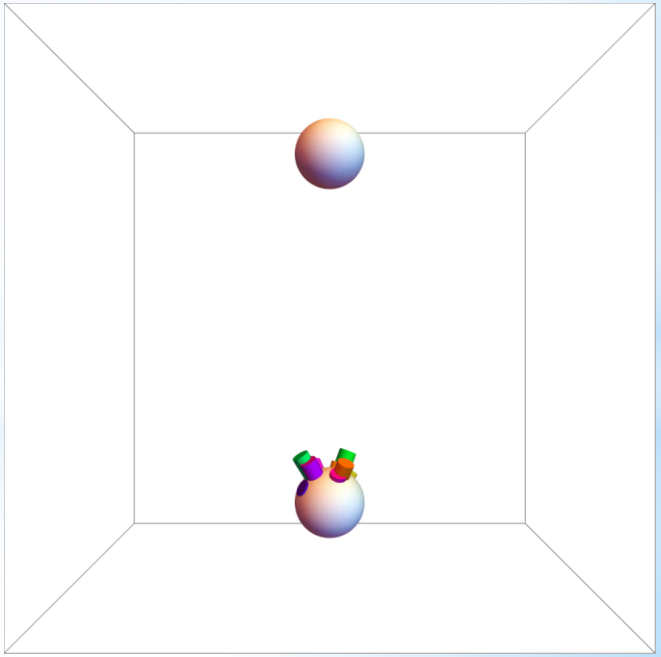
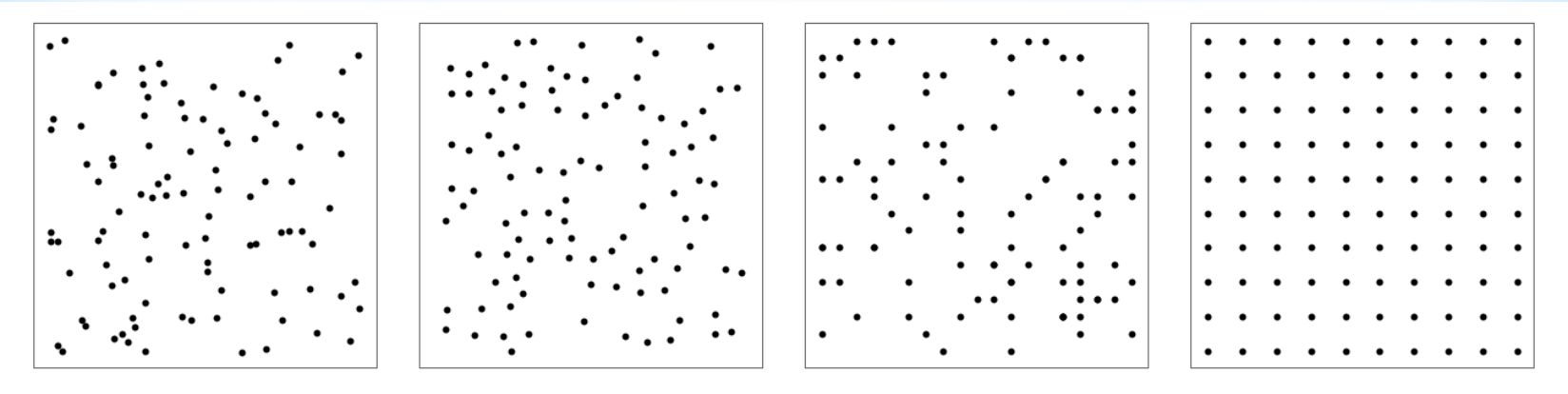






Random Points

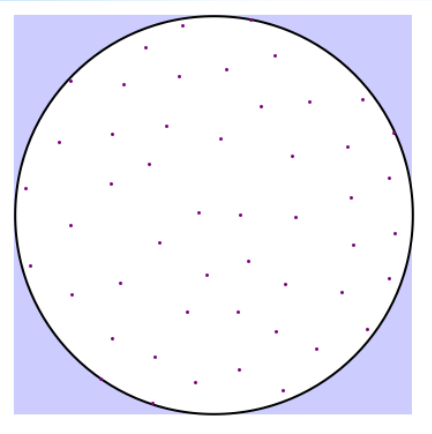
These points were generated
using different randomization techniques.

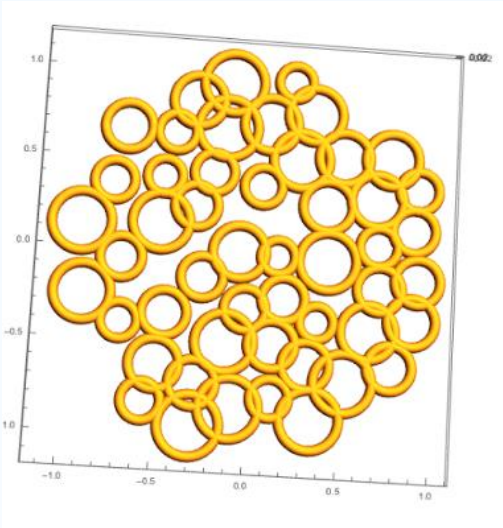


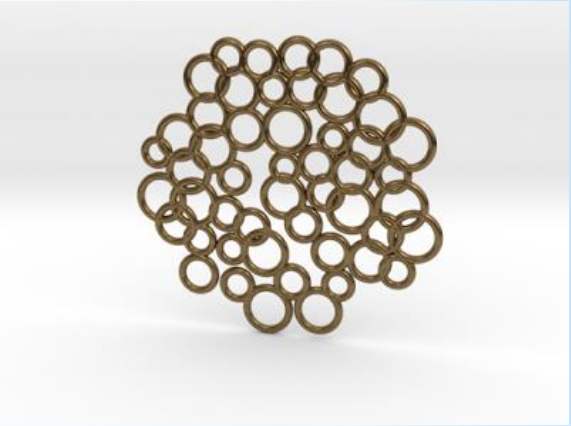
Which is the most random?

Which is the most beautiful?

Random Jewelry



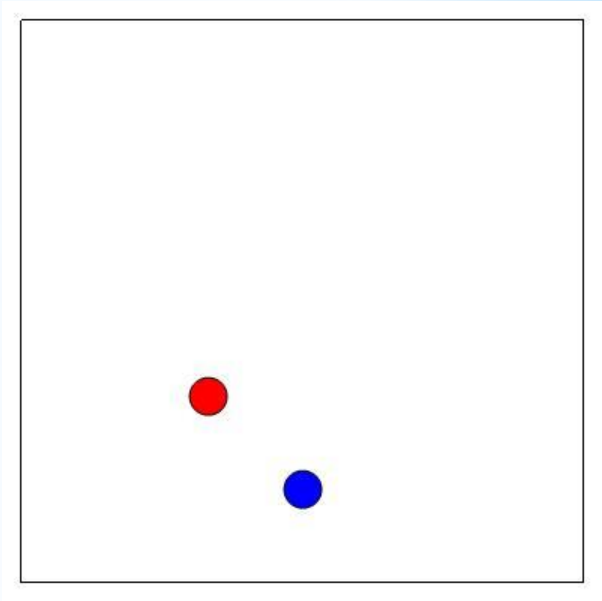




- Choose random points that are not too close
- Choose random size tori
- Export and print on a 3D printer

Voronoi Diagrams

The **Voronoi Diagram** for a set of points is the division of the region into pieces based on closeness.



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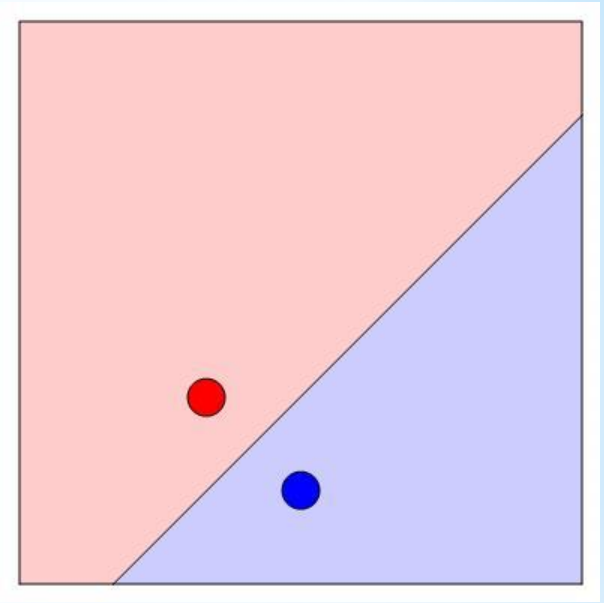

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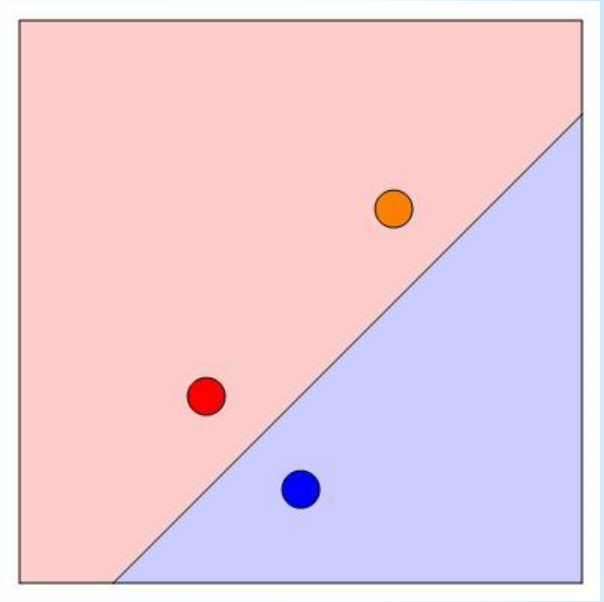

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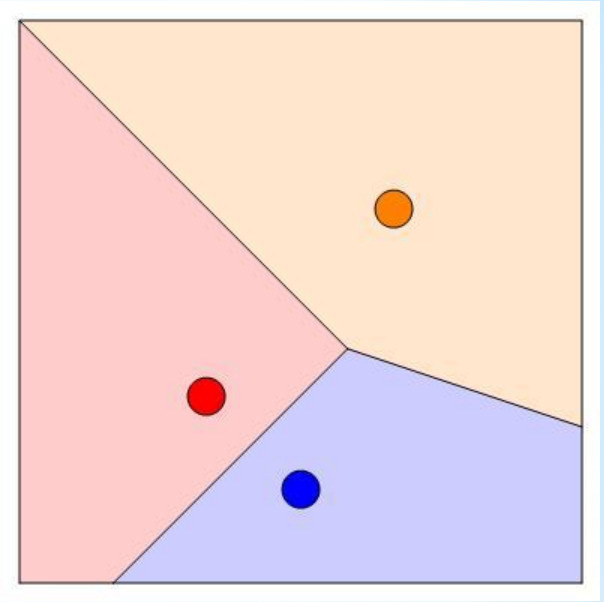

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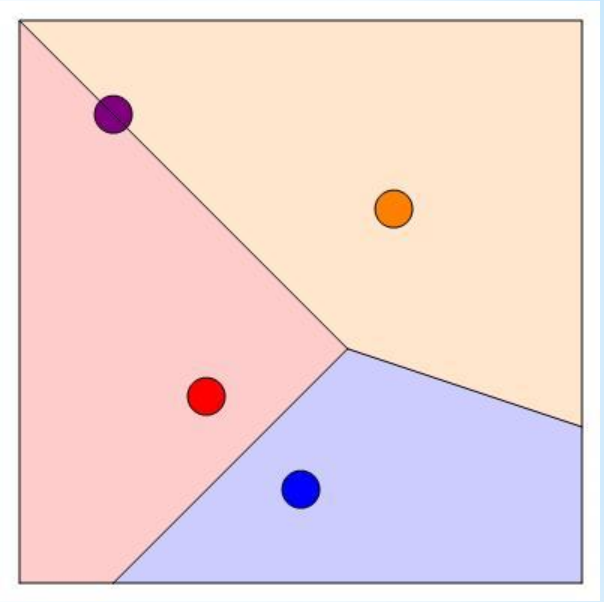

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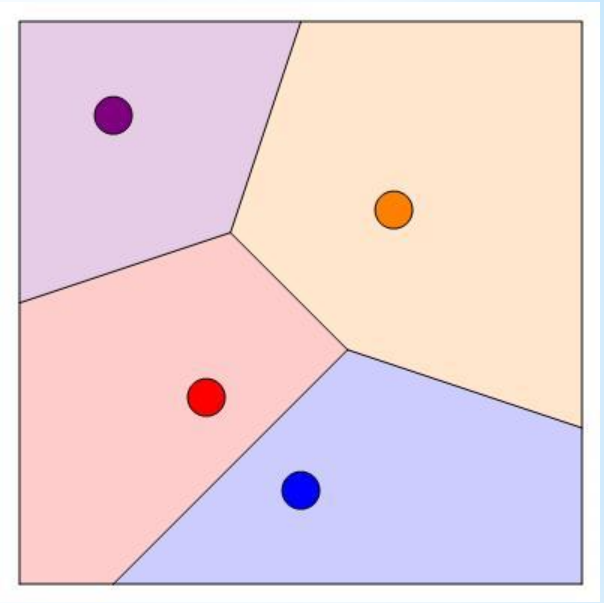

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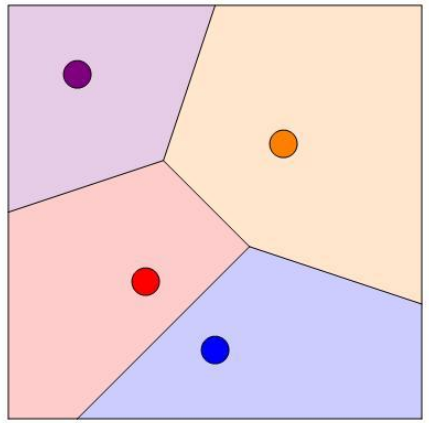
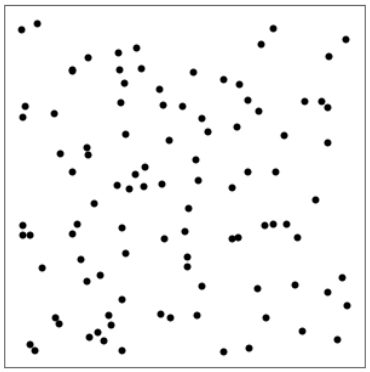
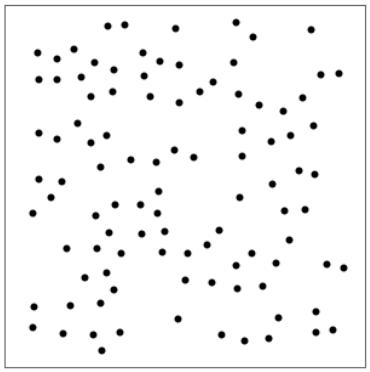
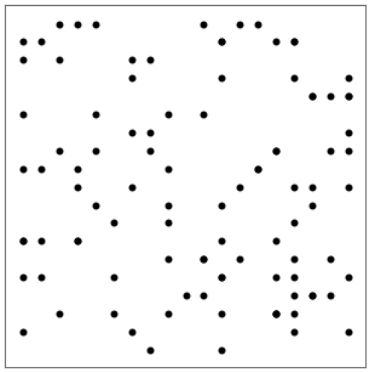
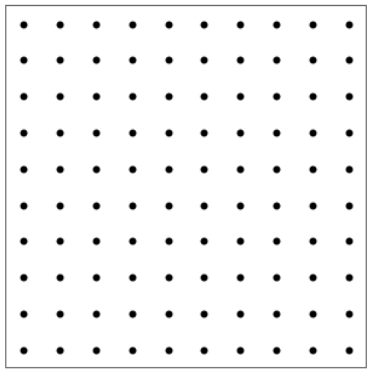


Beautiful things happen when the set of points is random.

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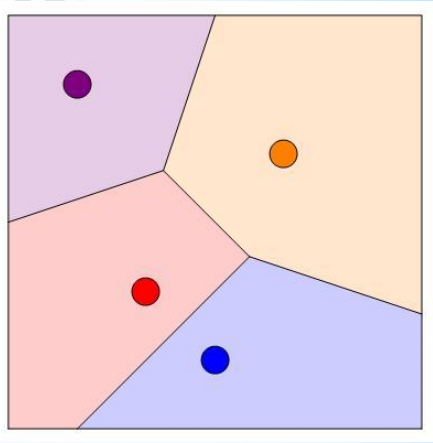

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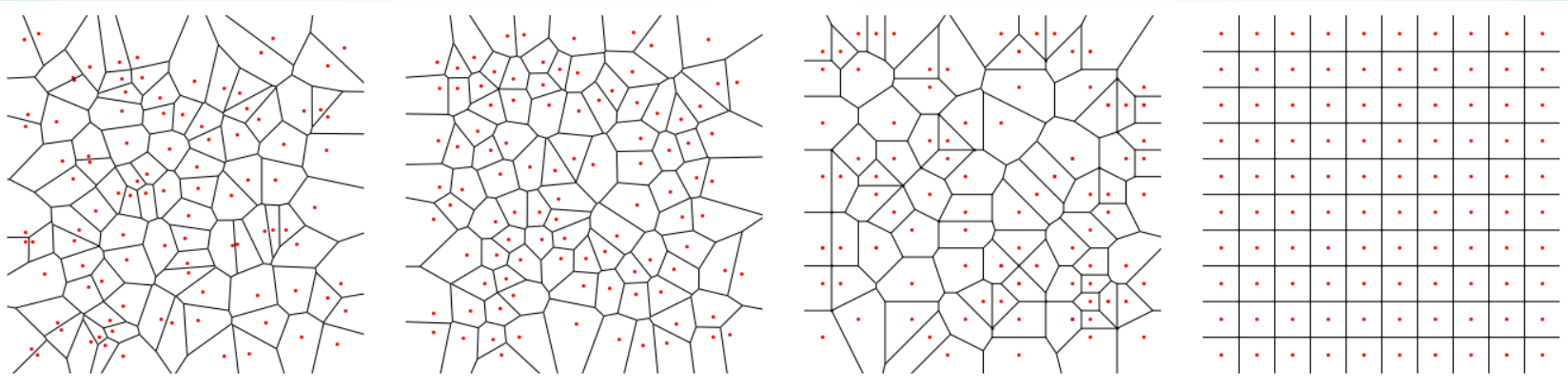
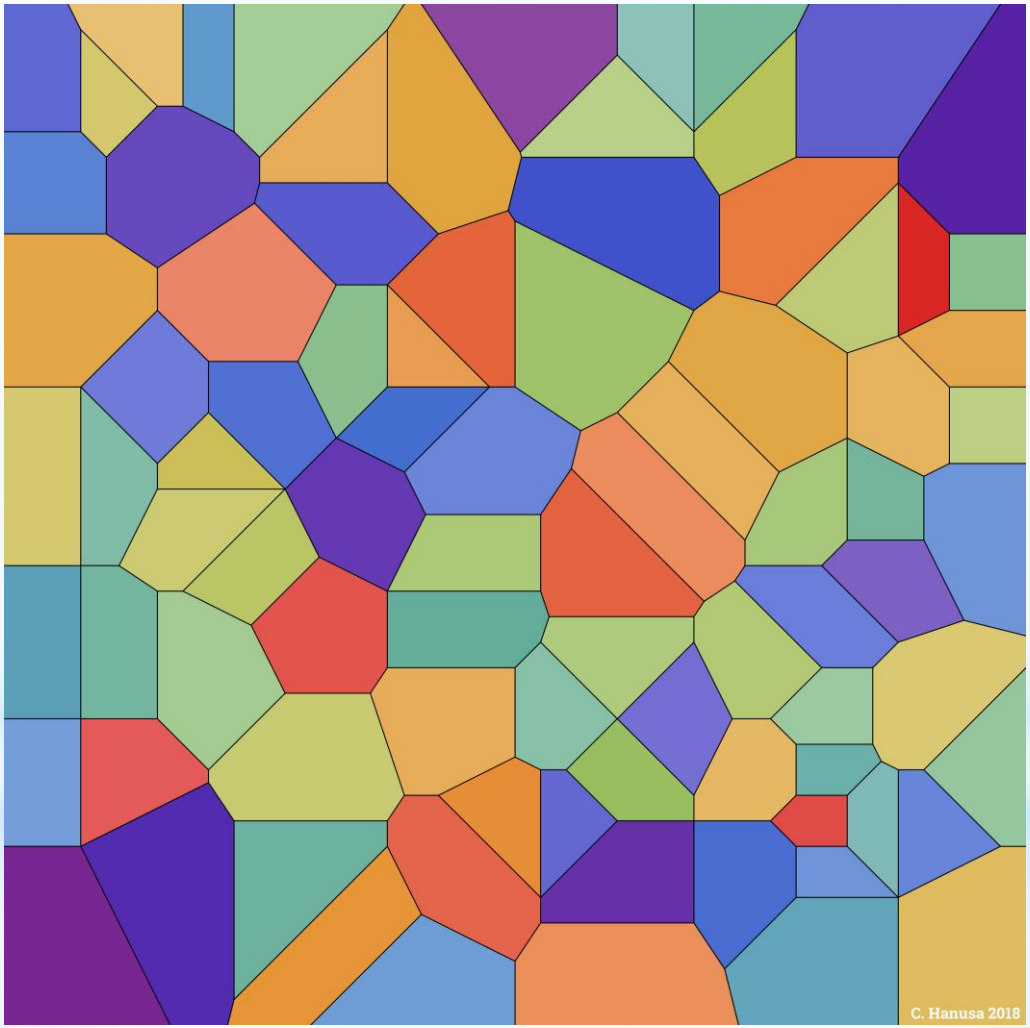
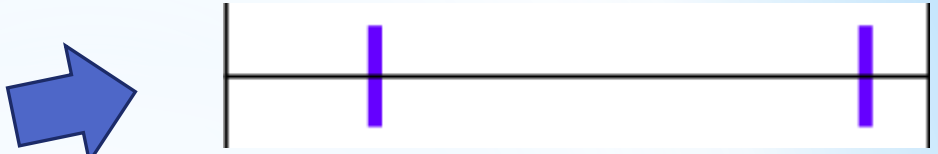


Voronoi Diagrams



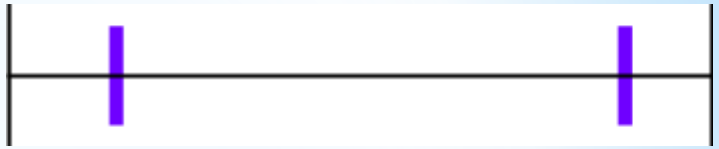
Random Growth

Create blips at random places



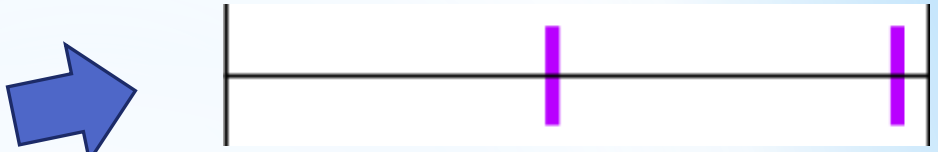
Random Growth

Create blips at random places



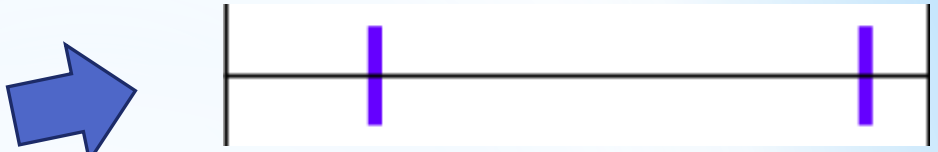
Random Growth

Create blips at random places



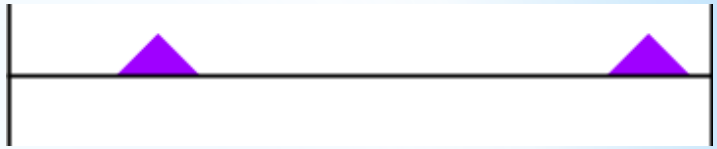
Random Growth

Create blips at random places



Random Growth

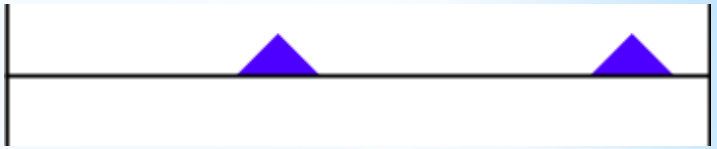
Create bumps at random places

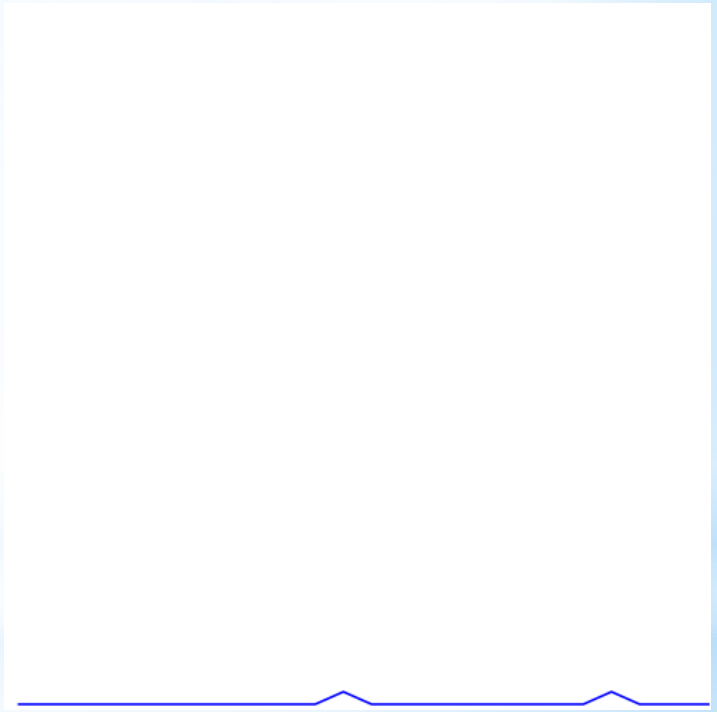


Random Growth

Create bumps at random places

Add bumps together



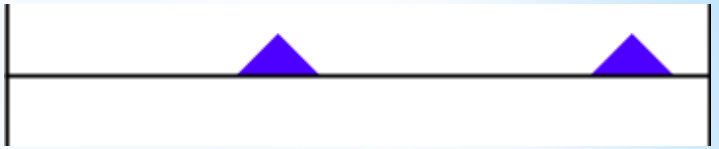


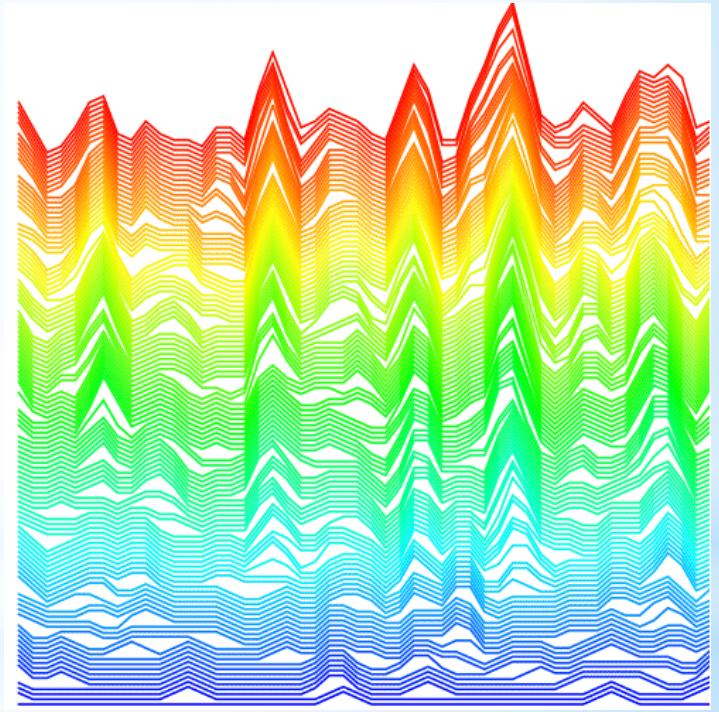
Random Growth

Create bumps at random places

Add bumps together

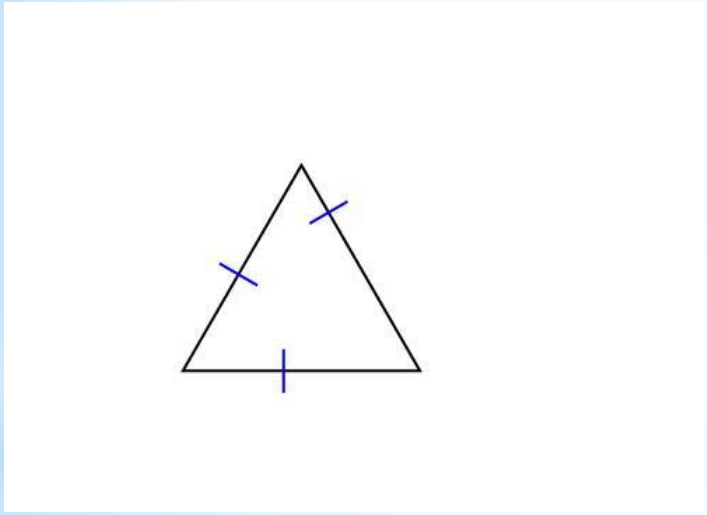
Wrap around a cylinder





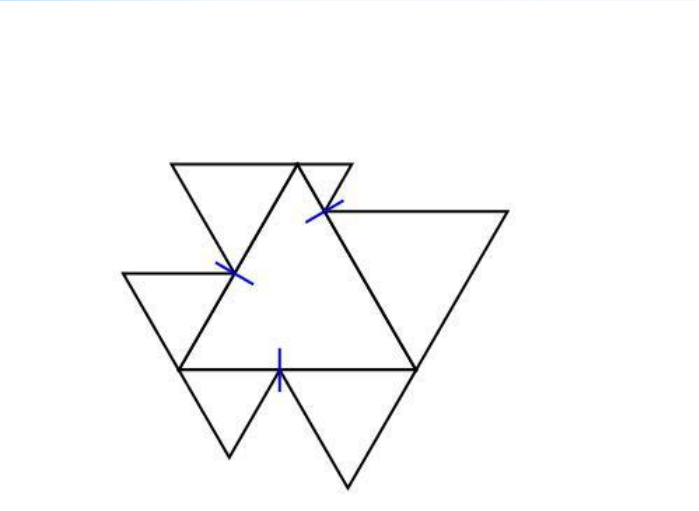
Random Partitioning

Choose random partitions of a triangle's boundary:



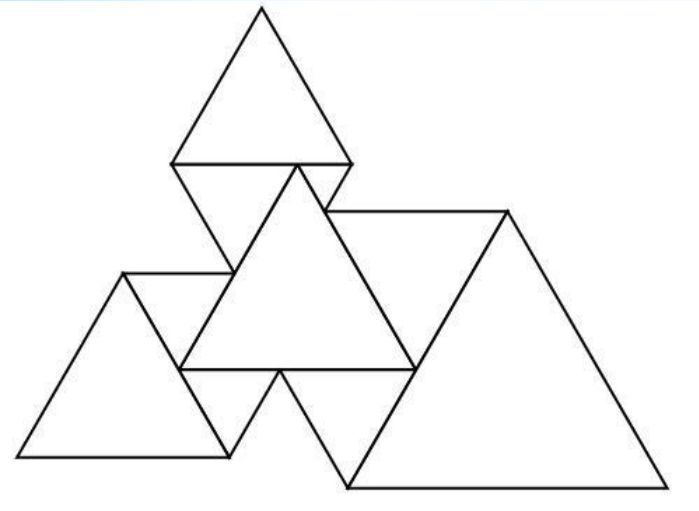
Random Partitioning

Choose random partitions of a triangle's boundary:



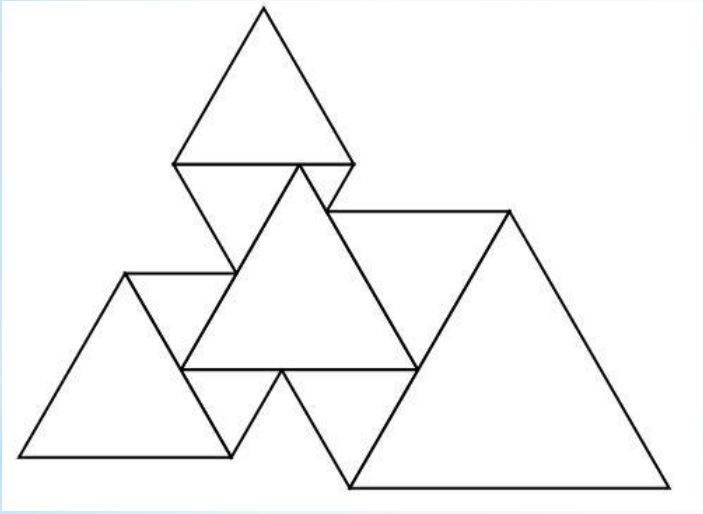
Random Partitioning

Choose random partitions of a triangle's boundary:

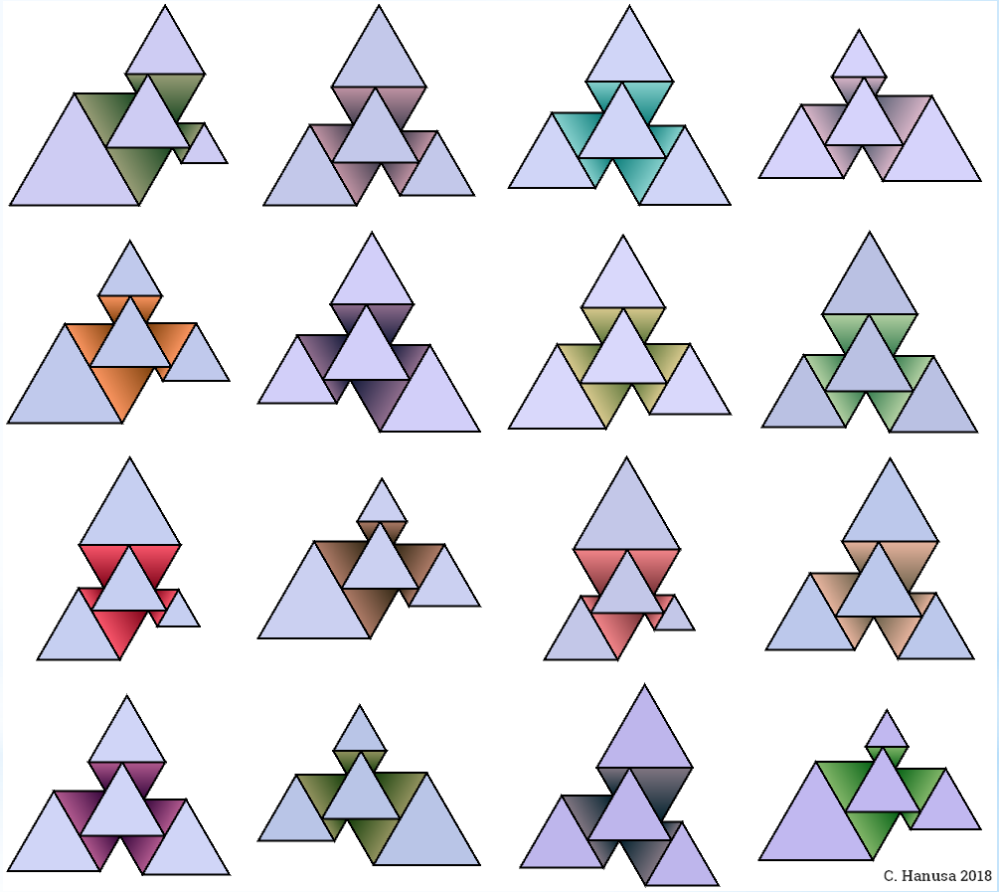


Random Partitioning

Choose random partitions of a triangle's boundary:

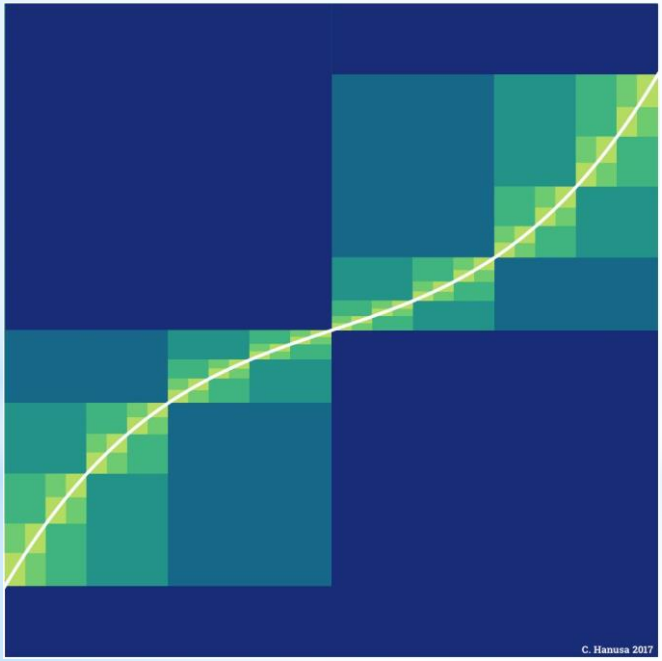


Do it many times:



Thanks! Questions?
Real-time Art!?

qc.edu/~chanusa
> Research > Talks



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Real-time Art

Art that's never been seen before