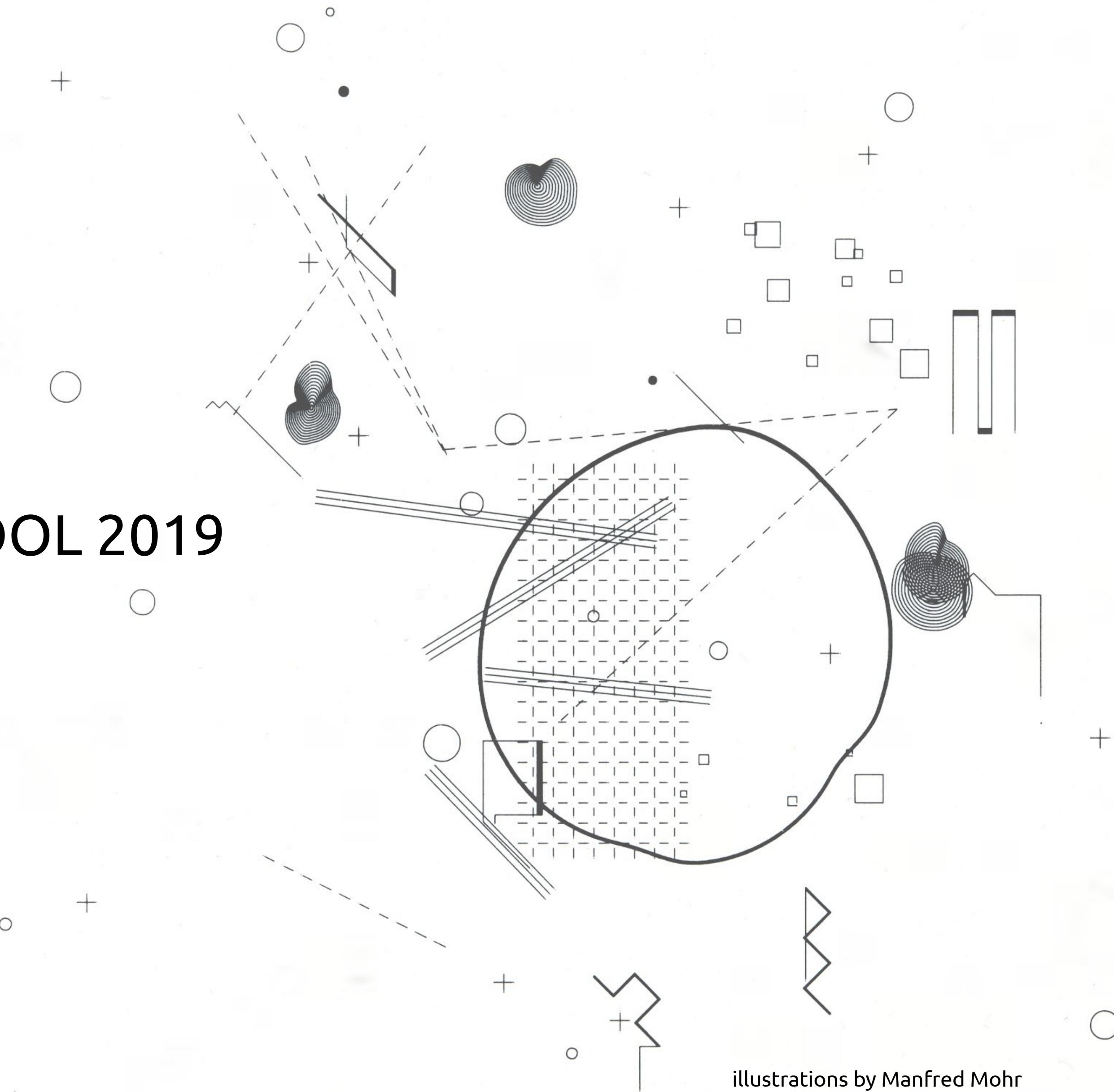


# CREATIVE COMPUTING SUMMER SCHOOL 2019

Introduction to graphics coding

August 2019

**Lior Ben-Gai**



illustrations by Manfred Mohr

# GOALS

- 1. Improve our **visual communication** skills through computer programming.**
- 2. Improve our **computer programming** skills through visual communication.**

# PROGRAMMING SKILLS

1. **Beginner** - Little to no experience in computer programming and/or graphics
2. **Intermediate** - Basic programming and familiarity with computer graphics
3. **Pro** - Full proficiency in programming computer graphics, animation and human interaction.

## GENERAL TOPICS:

1. Introduction to programming and procedural drawing
2. Variables, Functions, Conditions and Loops
3. Basic interaction: (Mouse / Keyboard )
4. Data structures (Array, Object)
5. Transformations and number generators
6. Sound and data Visualization

# SESSIONS (4 OUT OF 6)

	<b>title</b>	<b>topics</b>	<b>study</b>
<b>1</b>	introduction	procedural drawing, visual expression	self portrait
<b>2</b>	building clocks	variables, conditions, functions, loops	clocks
<b>3</b>	generators	random, noise, sine	generative drawing app
<b>4</b>	data visualization	external data, objects, arrays	world views
<b>5</b>	visuals of earth	FFT analysis, sound visualization	VOE
<b>6</b>	digital audio synthesis	digital sound, interactive apps	sound toy

## COURSE INDEX

<https://soogbet.github.io/goldsmiths-summer19/>

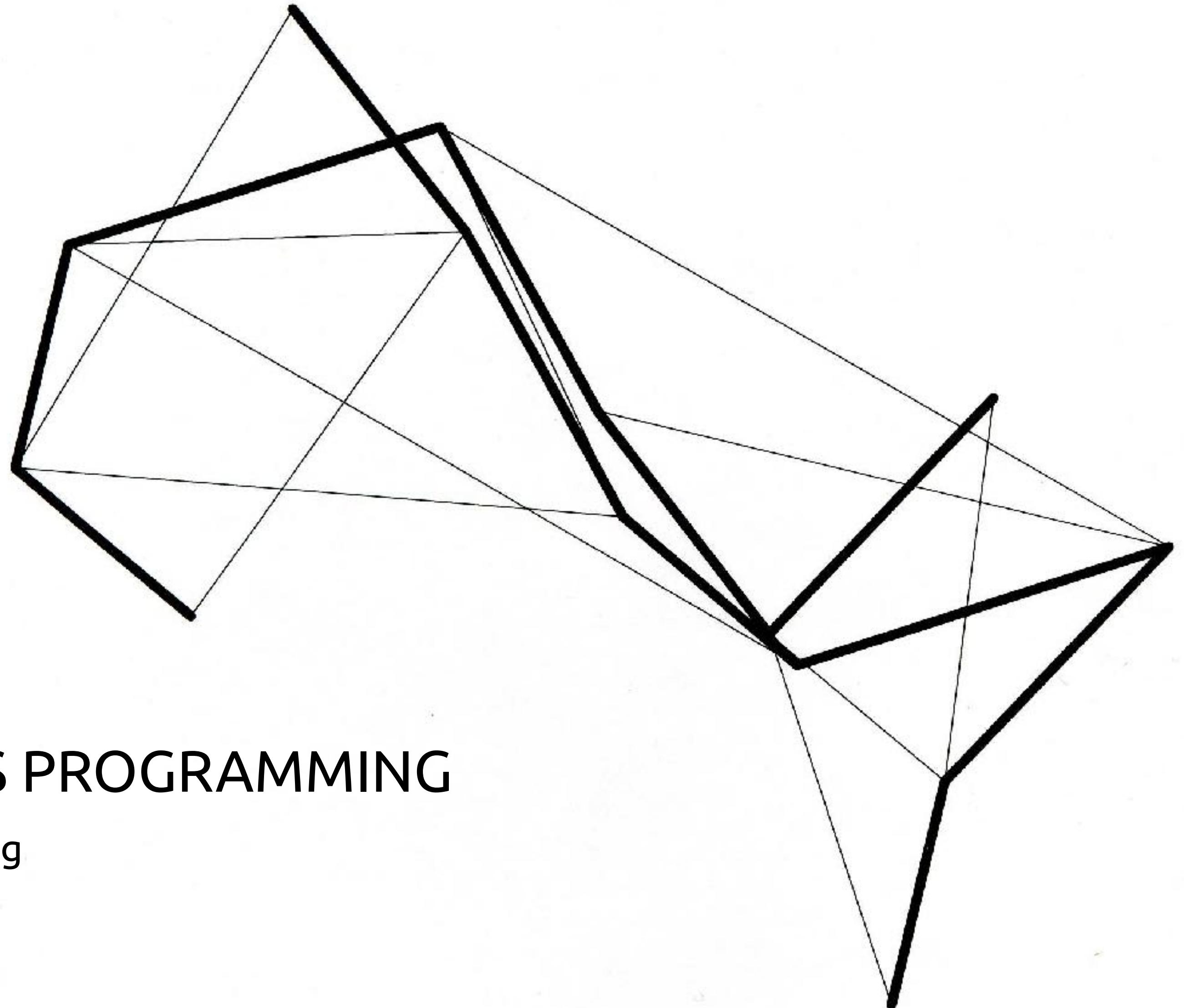
# SCHEDULE FOR THIS WEEK

9:00 - 12:30

Graphics workshop (Group1) LIOR VALERIO ALEX	Graphics workshop (Group1) LIOR VALERIO ALEX	Graphics workshop (Group1) LIOR VALERIO ALEX	Graphics workshop (Group1) LIOR VALERIO ALEX
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13:30 - 16:00

Tutorial Study (2.5 HOURS)  LIOR MEGAN ROB VALERIO ALEX	Tutorial Study (2.5 HOURS)  LIOR and STEPHANIE MEGAN ROB VALERIO ALEX	Presentations 1pm -3pm (2 HOURS)  LIOR ALICE VALERIO ALEX MEGAN ROB
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# INTRODUCTION TO GRAPHICS PROGRAMMING

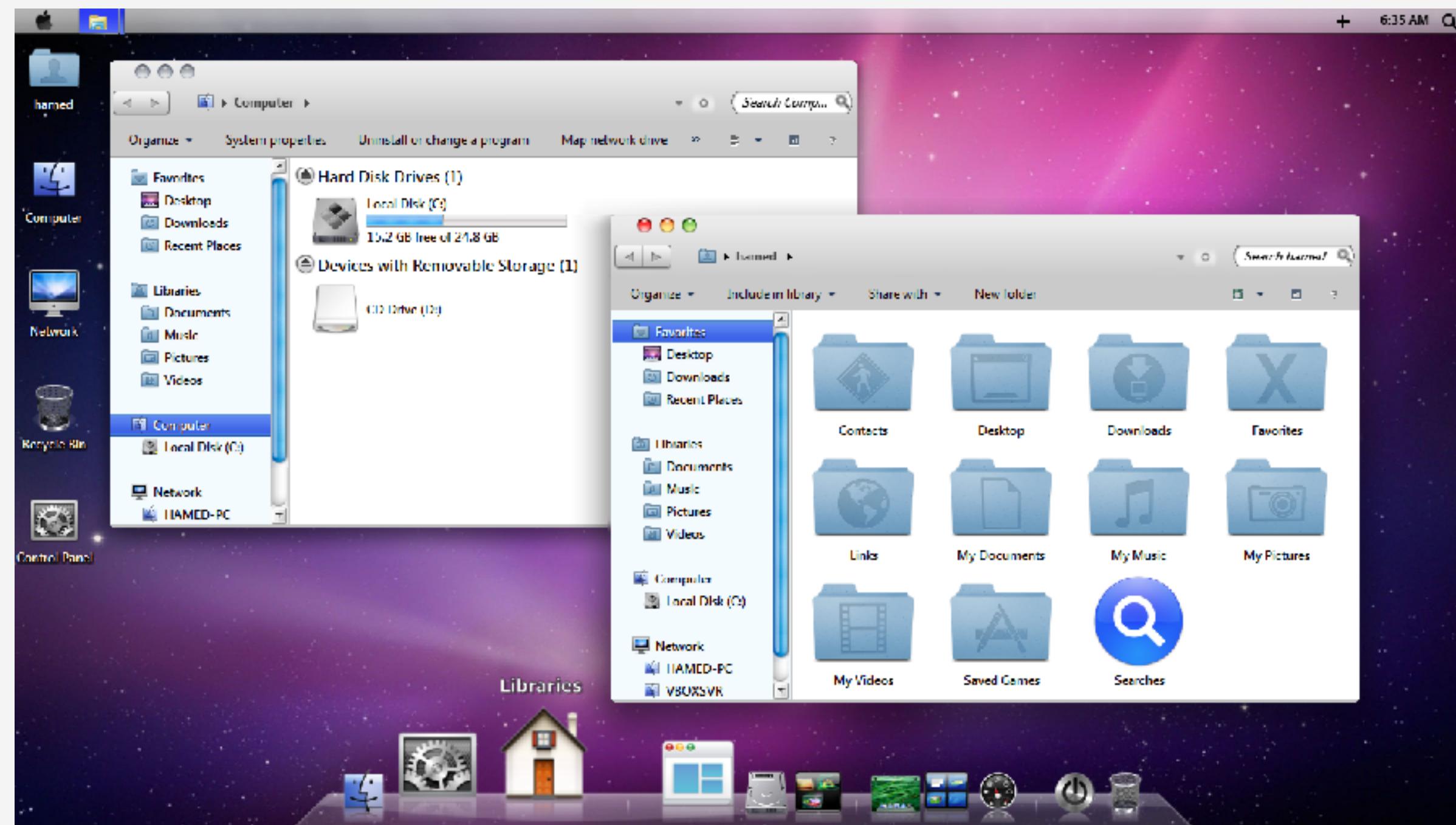
Programming / Language / Procedural drawing

WHAT IS COMPUTER PROGRAMMING ANYWAY?

# IS THIS COMPUTER PROGRAMMING?



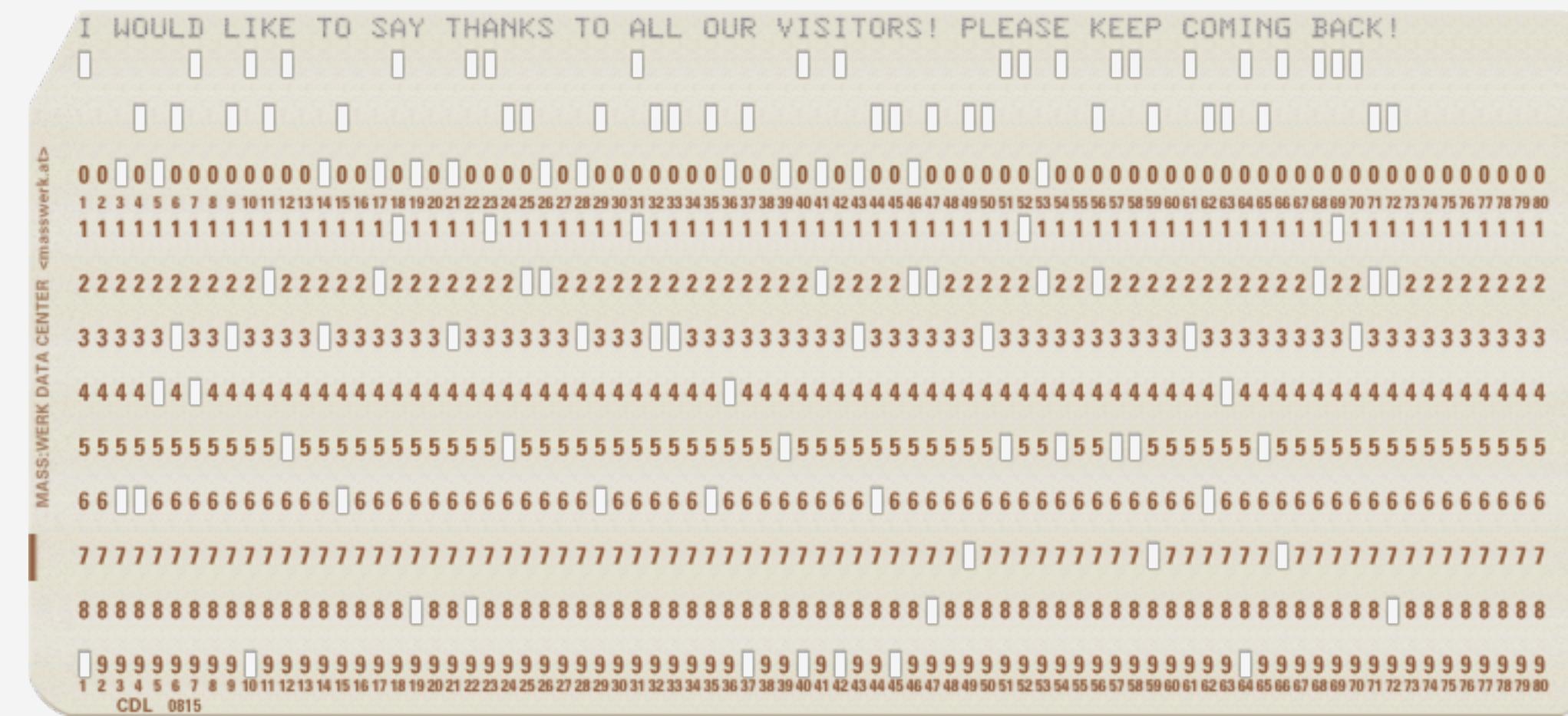
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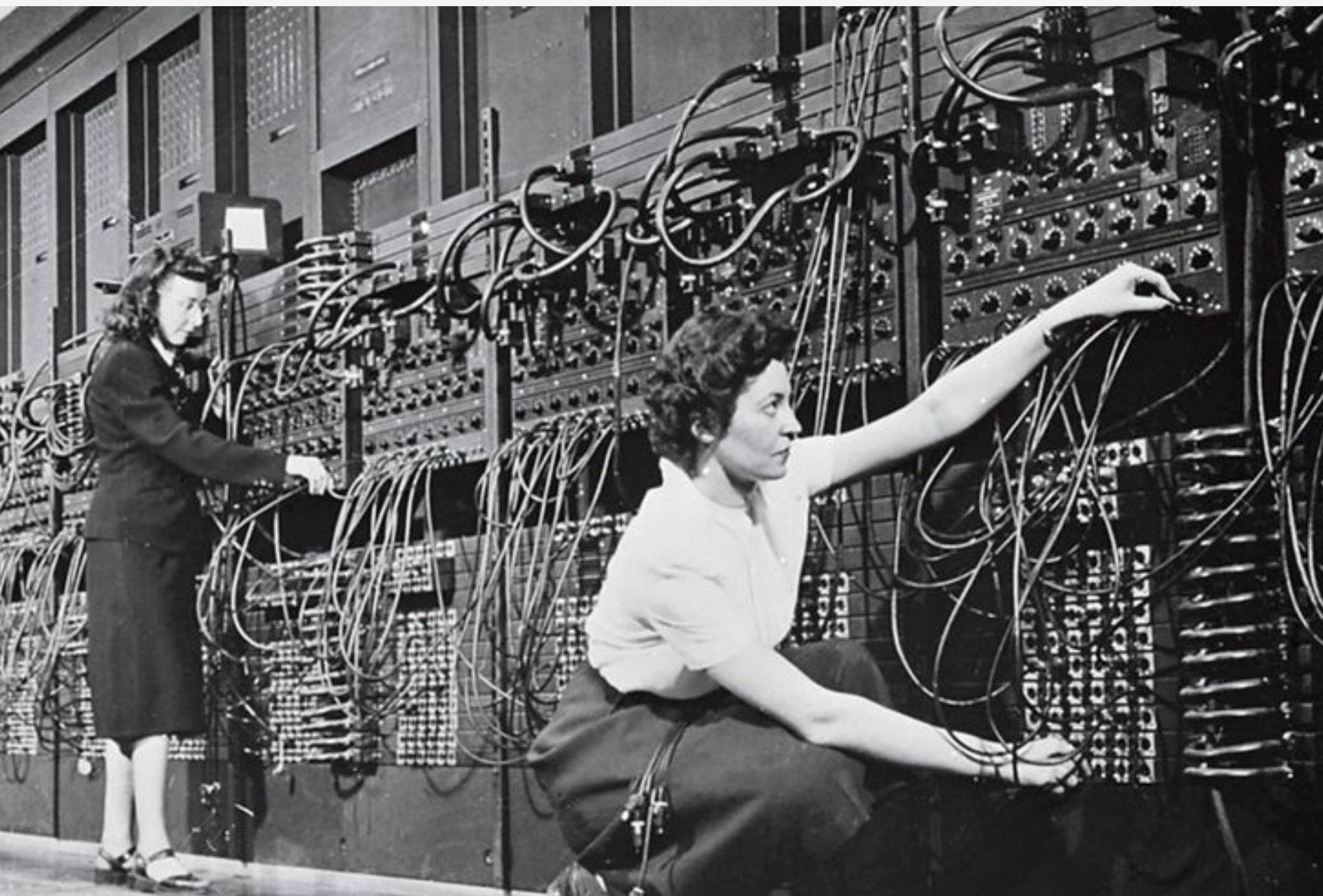
# IS THIS COMPUTER PROGRAMMING?

```
99
100 function GPUComputationRenderer( sizeX, sizeY, renderer ) {
101
102     this.variables = [];
103
104     this.currentTextureIndex = 0;
105
106     var scene = new THREE.Scene();
107
108     var camera = new THREE.Camera();
109     camera.position.z = 1;
110
111     var passThruUniforms = {
112         texture: { value: null }
113     };
114
115     var passThruShader = createShaderMaterial( getPassThroughFragmentShader(), passThruUniforms );
116
117     var mesh = new THREE.Mesh( new THREE.PlaneBufferGeometry( 2, 2 ), passThruShader );
118     scene.add( mesh );
119
120
121     this.addVariable = function( variableName, computeFragmentShader, initialValueTexture ) {
122
123         var material = this.createShaderMaterial( computeFragmentShader );
124
125         var variable = {
126             name: variableName,
127             initialValueTexture: initialValueTexture,
128             material: material,
129             dependencies: null,
130             renderTargets: [],
131             wrapS: null,
132             wrapT: null,
133             minFilter: THREE.NearestFilter,
134             magFilter: THREE.NearestFilter
135         };
136
137         this.variables.push( variable );
138
139     };
140
141     this.render = function() {
142
143         renderer.render( scene, camera );
144
145         if ( this.currentTextureIndex < this.variables.length ) {
146
147             var variable = this.variables[ this.currentTextureIndex ];
148
149             variable.material.uniforms[ "tex" ].value = variable.initialValueTexture;
150
151             renderer.setRenderTarget( variable.renderTargets[ 0 ] );
152             renderer.render( scene, camera );
153
154             variable.material.uniforms[ "tex" ].value = variable.texture;
155
156             renderer.setRenderTarget( null );
157             renderer.render( scene, camera );
158
159             this.currentTextureIndex++;
160
161         }
162
163     };
164
165     this.createShaderMaterial = function( fragmentShader ) {
166
167         var uniforms = fragmentShader.uniforms;
168
169         uniforms[ "tex" ] = { value: null };
170
171         return new THREE.ShaderMaterial( {
172             uniforms: uniforms,
173             fragmentShader: fragmentShader.fragmentShader
174         } );
175
176     };
177
178     this.getPassThroughFragmentShader = function() {
179
180         return "#ifdef GL_ES\nprecision mediump float;\n#endif\n\nvoid main() {\n    gl_FragColor = texture2D( tex, uv );\n}\n";
181
182     };
183
184     this.getPassThroughVertexShader = function() {
185
186         return "#ifdef GL_ES\nprecision mediump float;\n#endif\n\nvoid main() {\n    gl_Position = projectionMatrix * modelViewMatrix * vec4( position, 1.0 );\n}\n";
187
188     };
189
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# IS THIS COMPUTER PROGRAMMING?



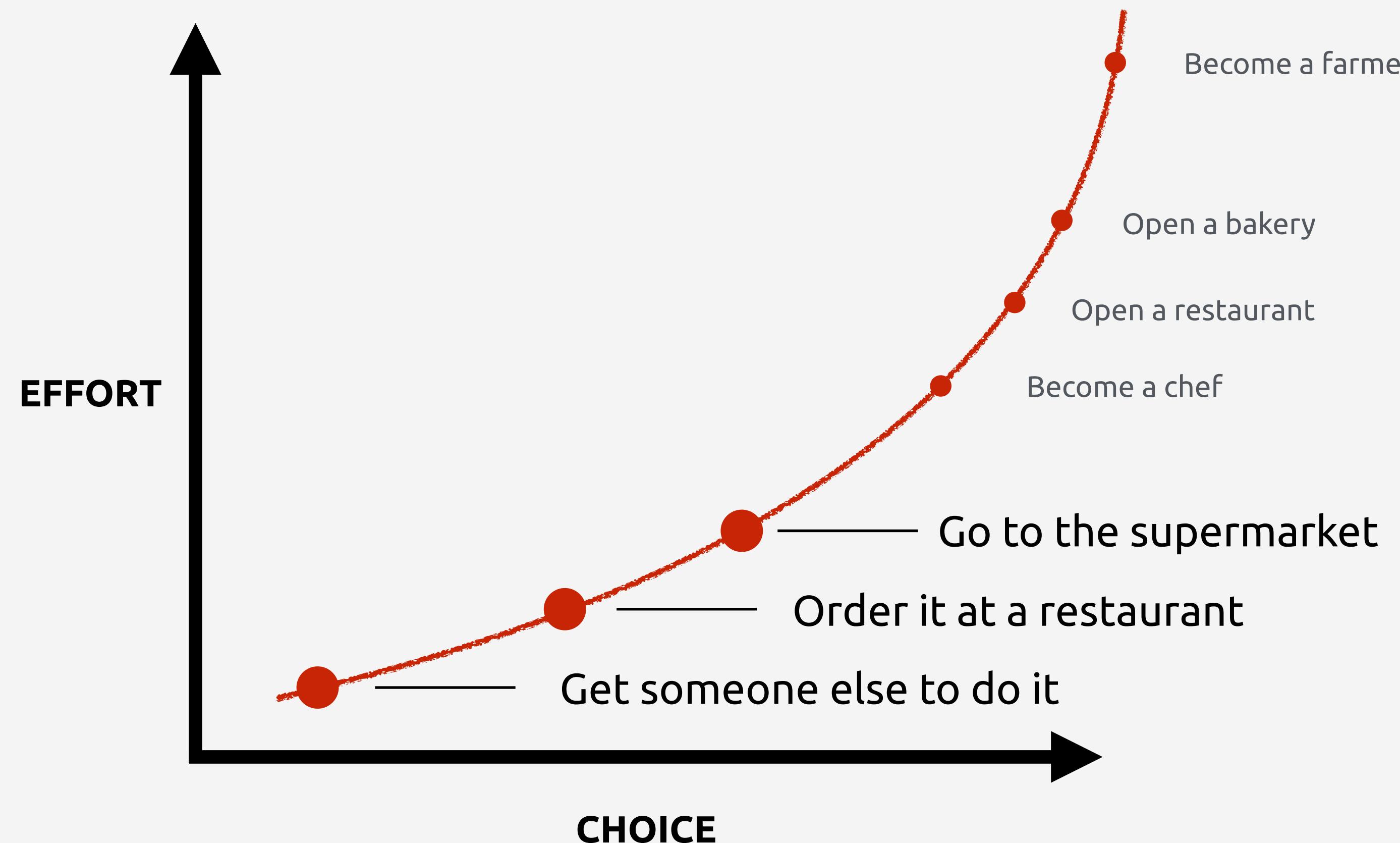
# IS THIS COMPUTER PROGRAMMING?



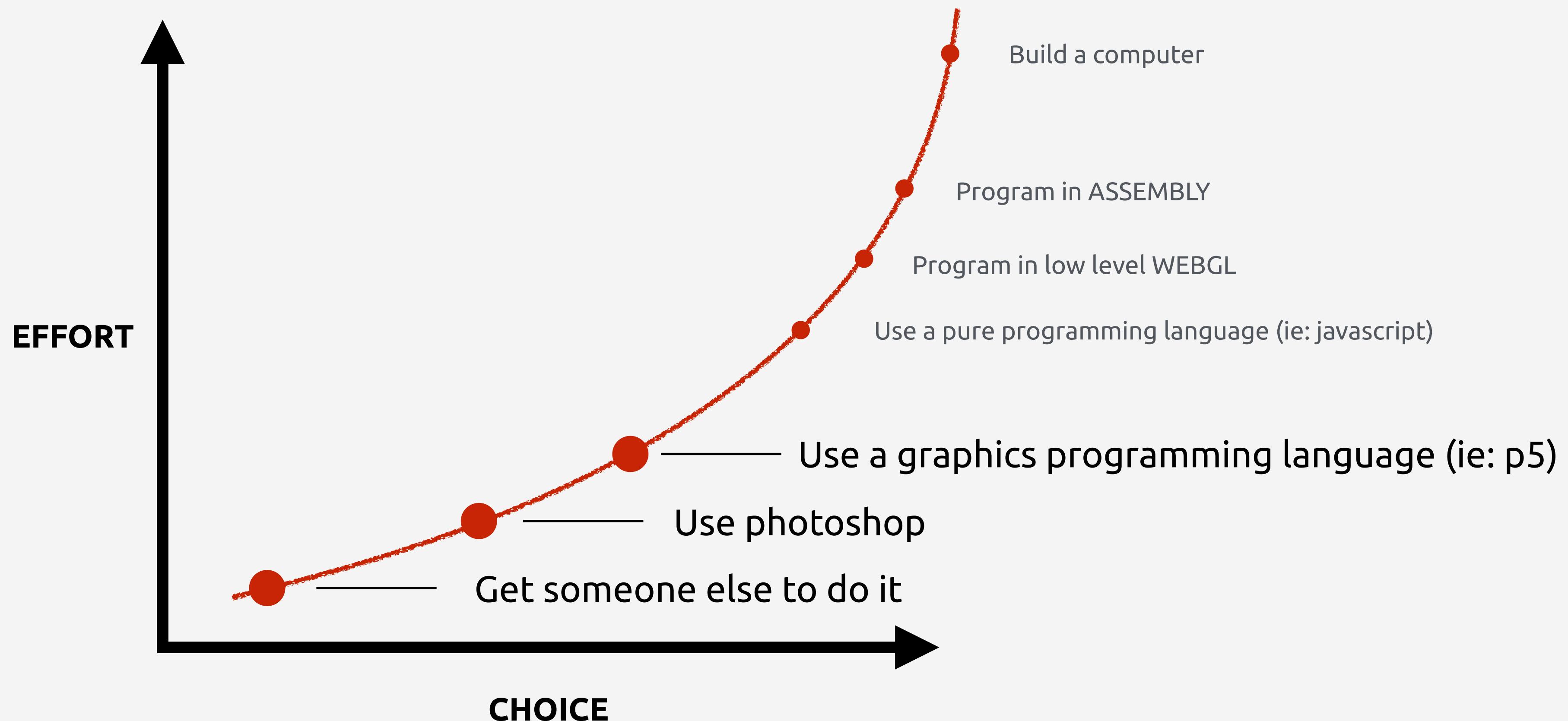
# IS THIS COMPUTER PROGRAMMING?



# MAKING A SANDWICH

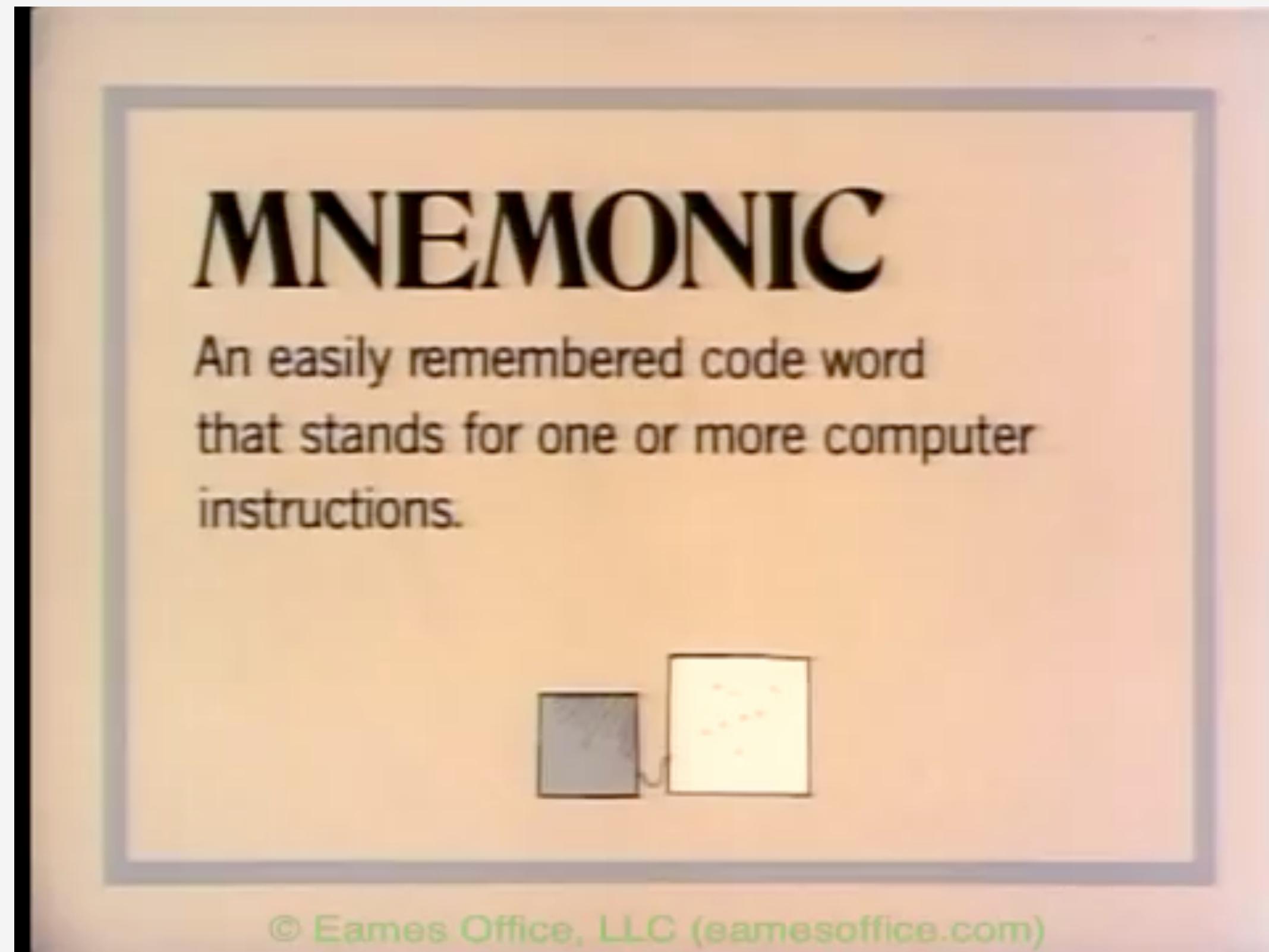


# CREATE A DIGITAL ARTWORK



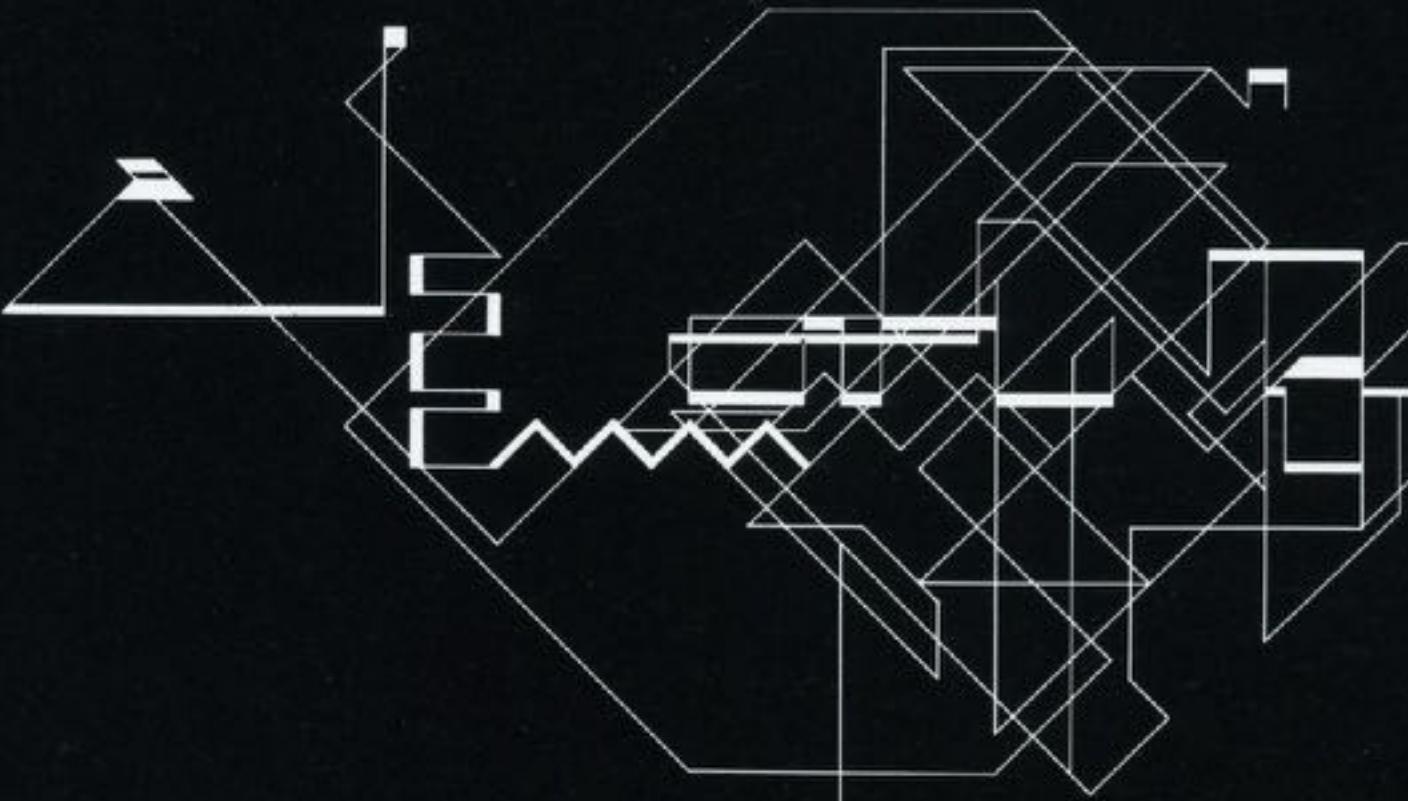
# A COMPUTER GLOSSARY

Charles and Ray Eames 1966

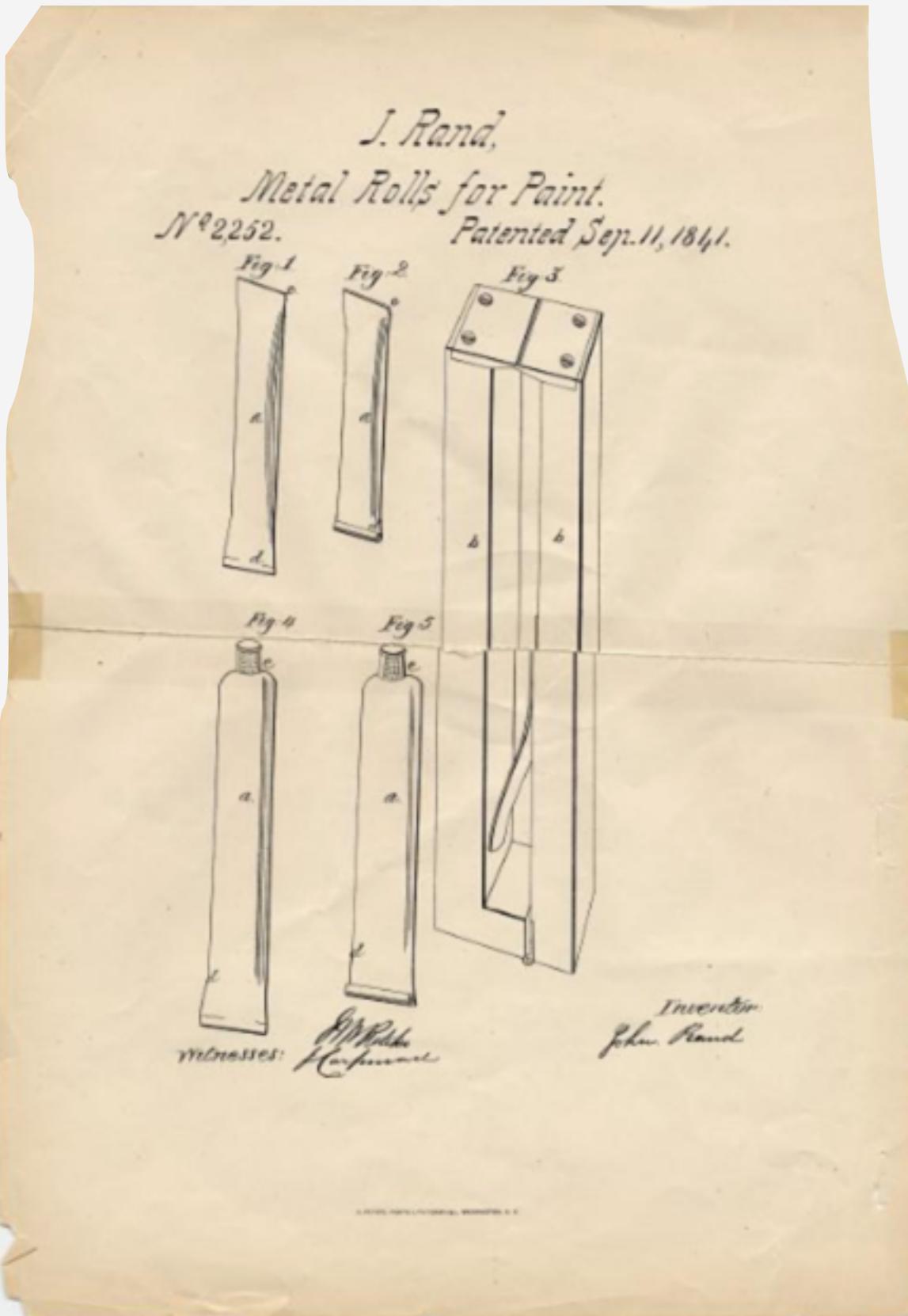


<https://www.youtube.com/watch?v=elgX6sPOqCY>

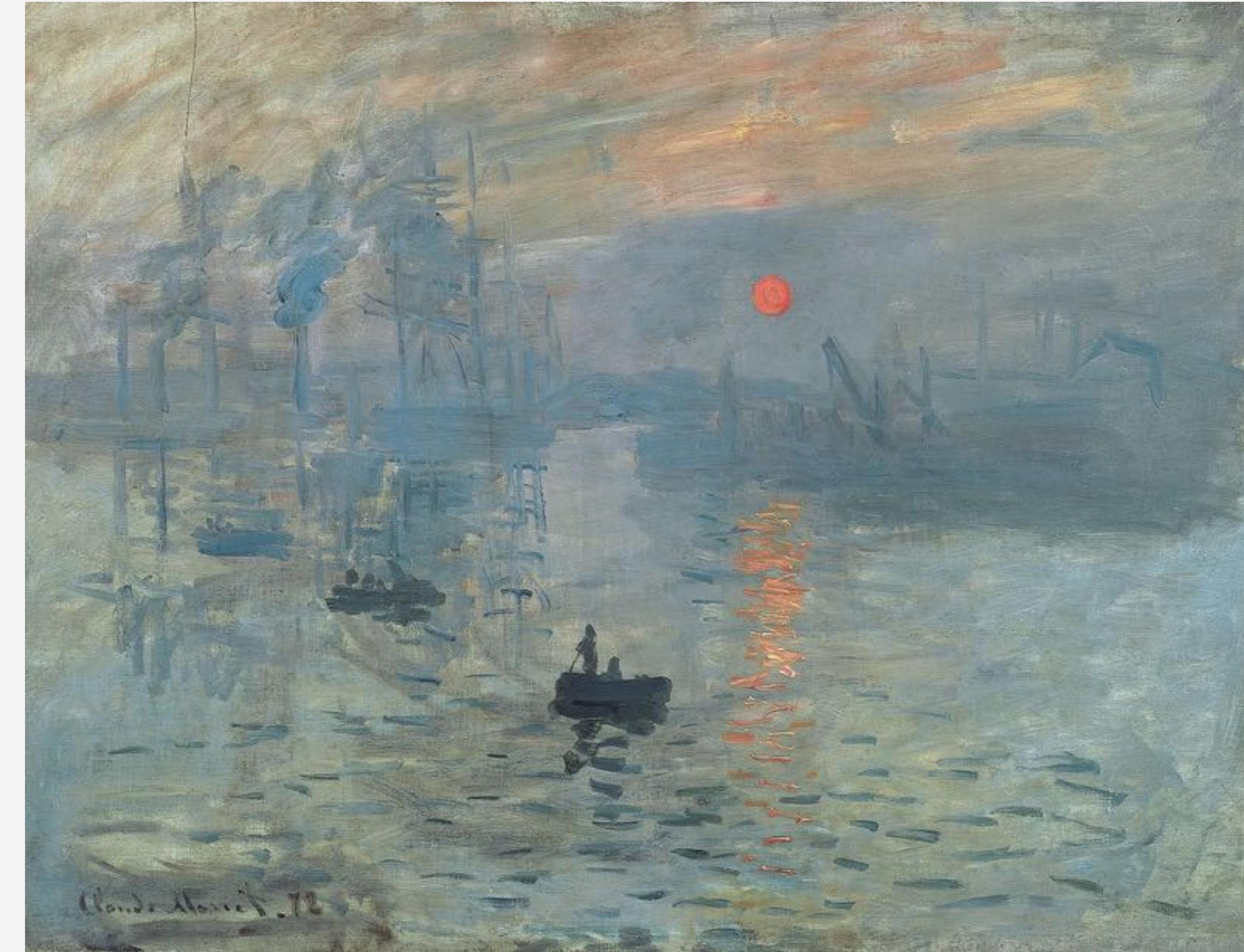
BUT WHAT DOES THAT HAVE TO DO WITH ART?



# ART AND TECHNOLOGY

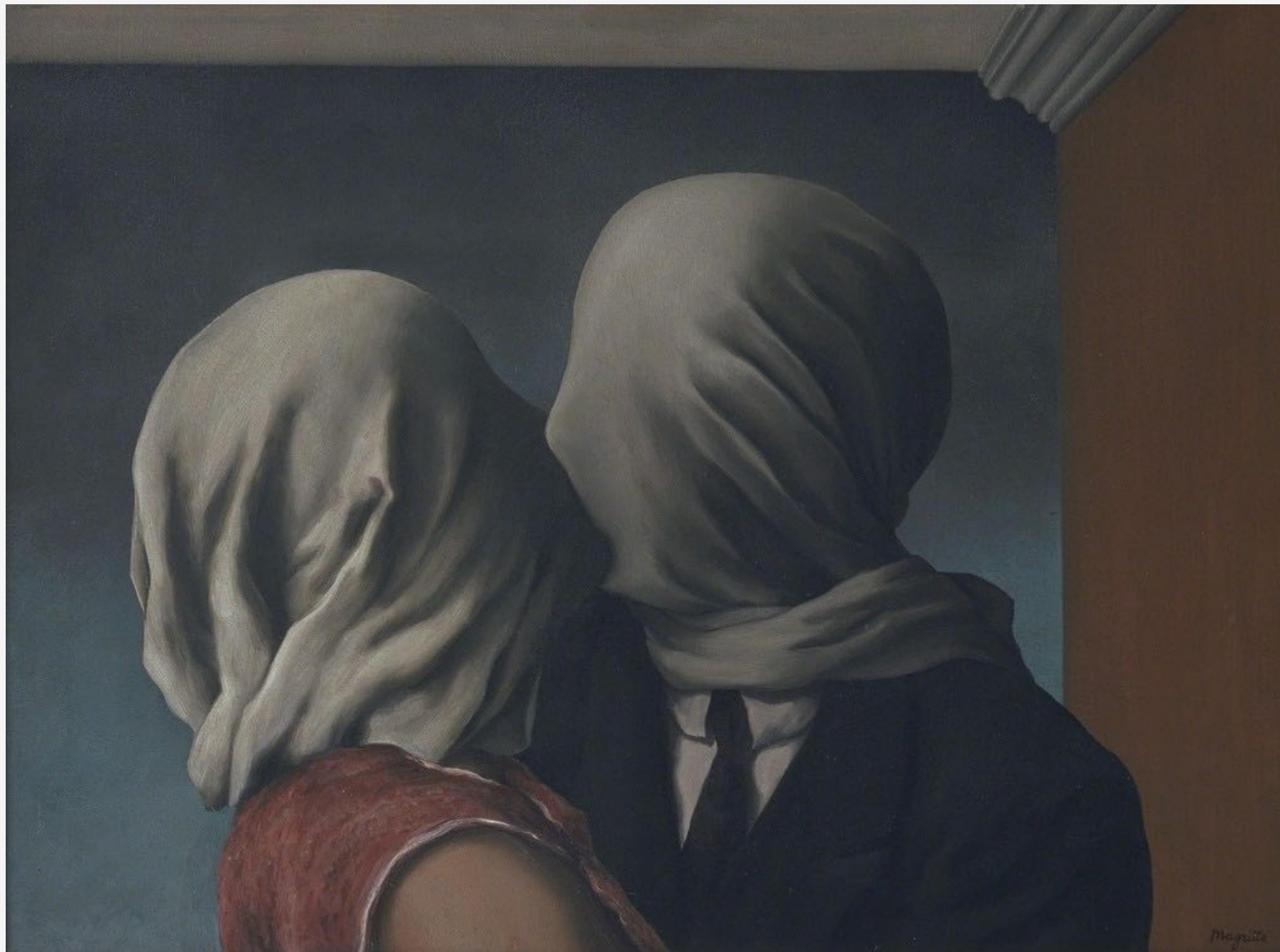


John Goffe Rand, Collapsible metal tube



Claude Monet, Impression, soleil levant

# VISUAL STORY TELLING



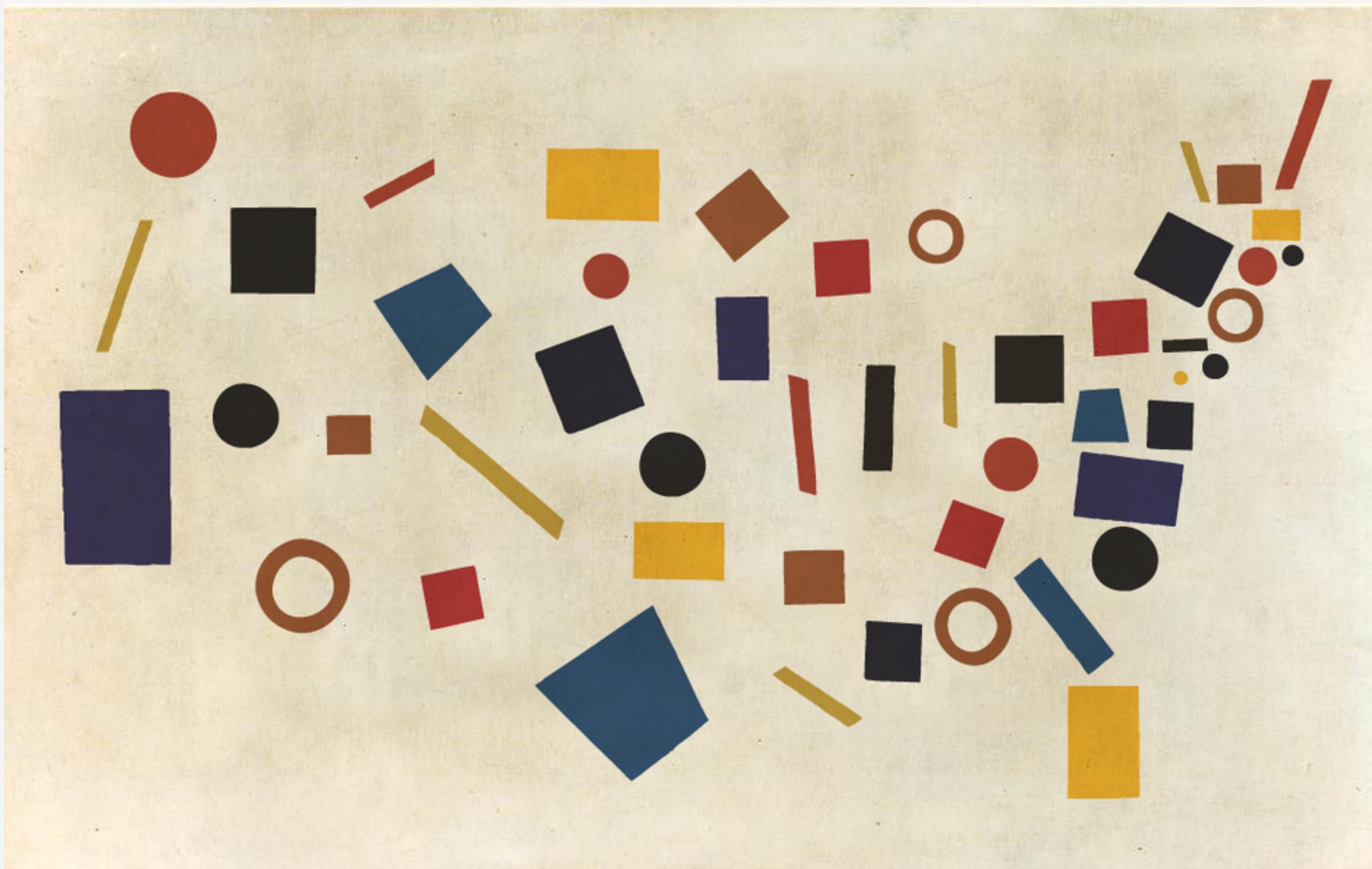
Rene Magritte



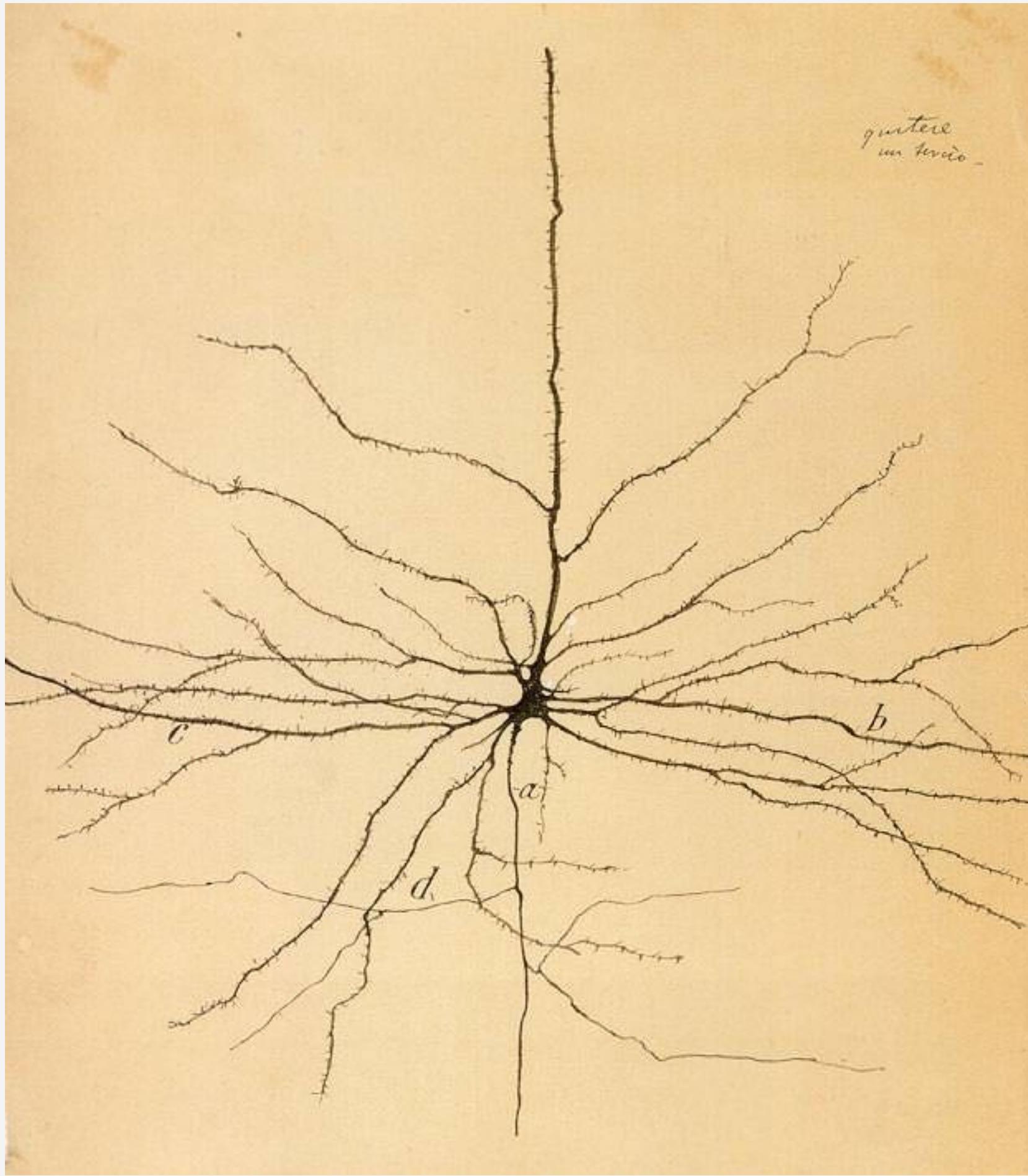
Anselm Kiefer



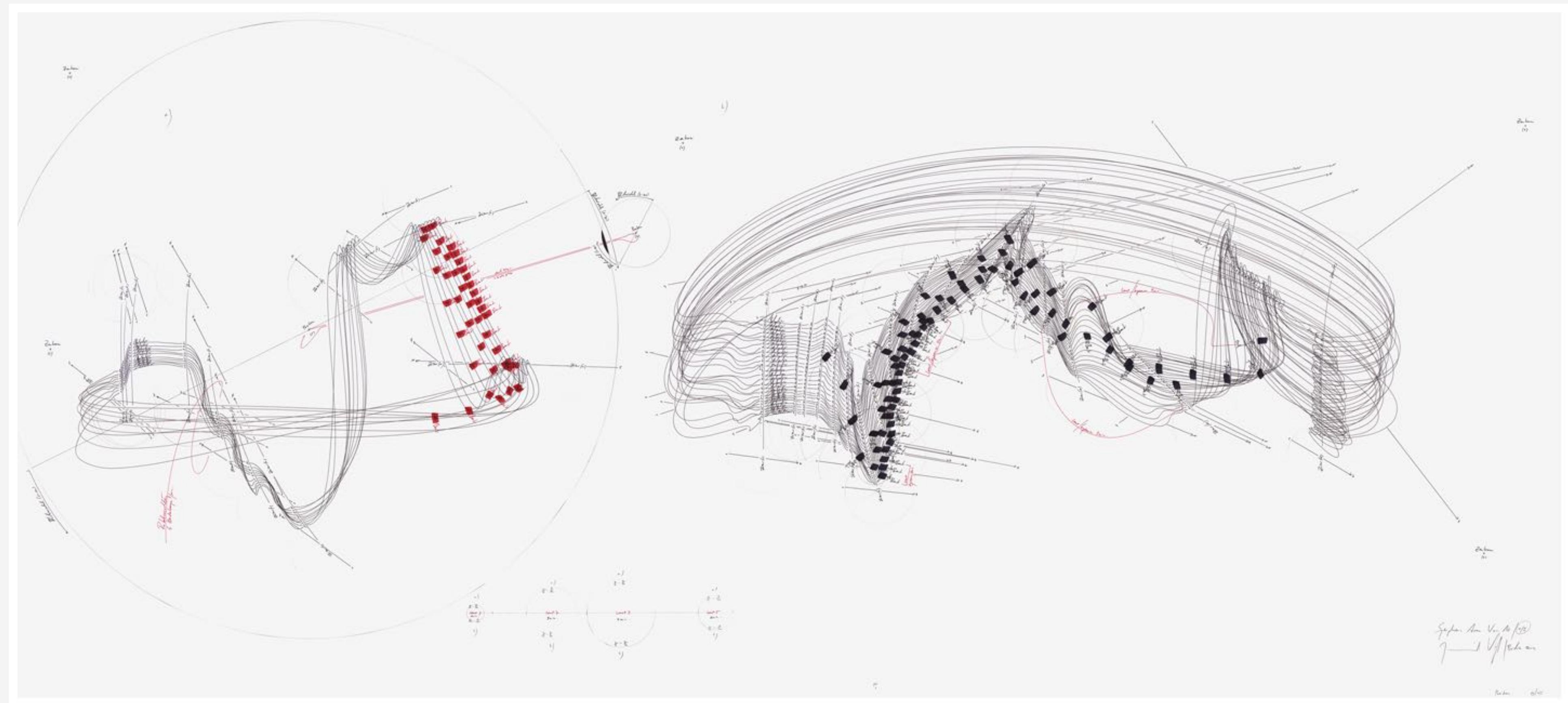
Luigi Serafini



Kazimir Malevich



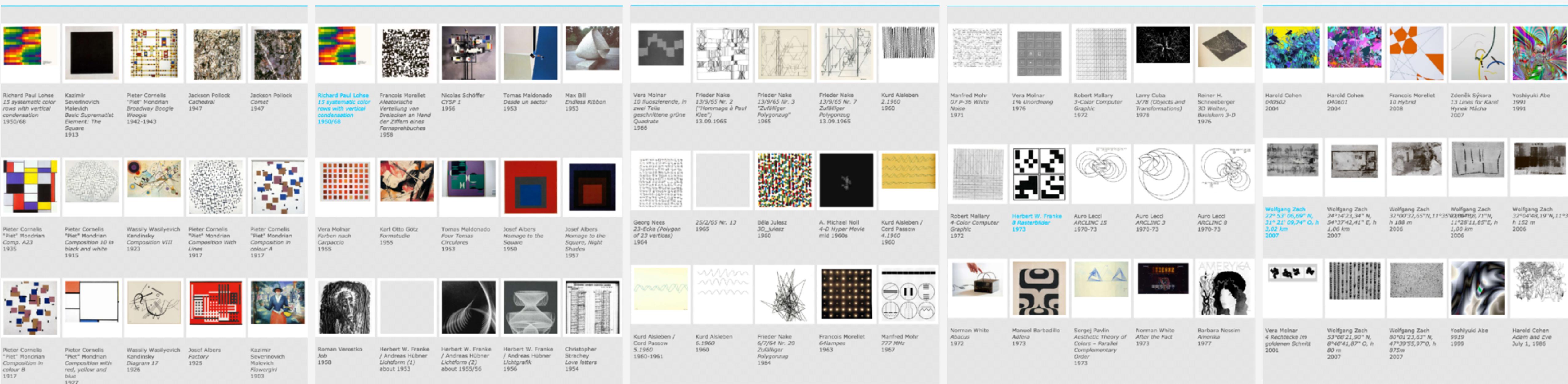
Santiago Ramón y Cajal



Jorinde Voigt

# BRIEF HISTORY OF COMPUTER ART

Computational and algorithmic art during the 20th century



Before 1950

1950 - 1960

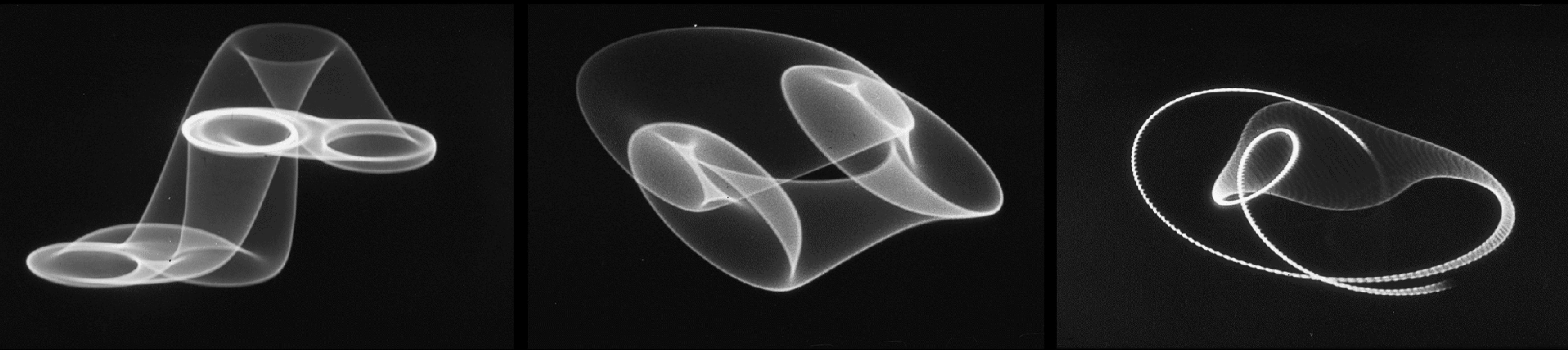
1960 - 1970

1970 - 1980

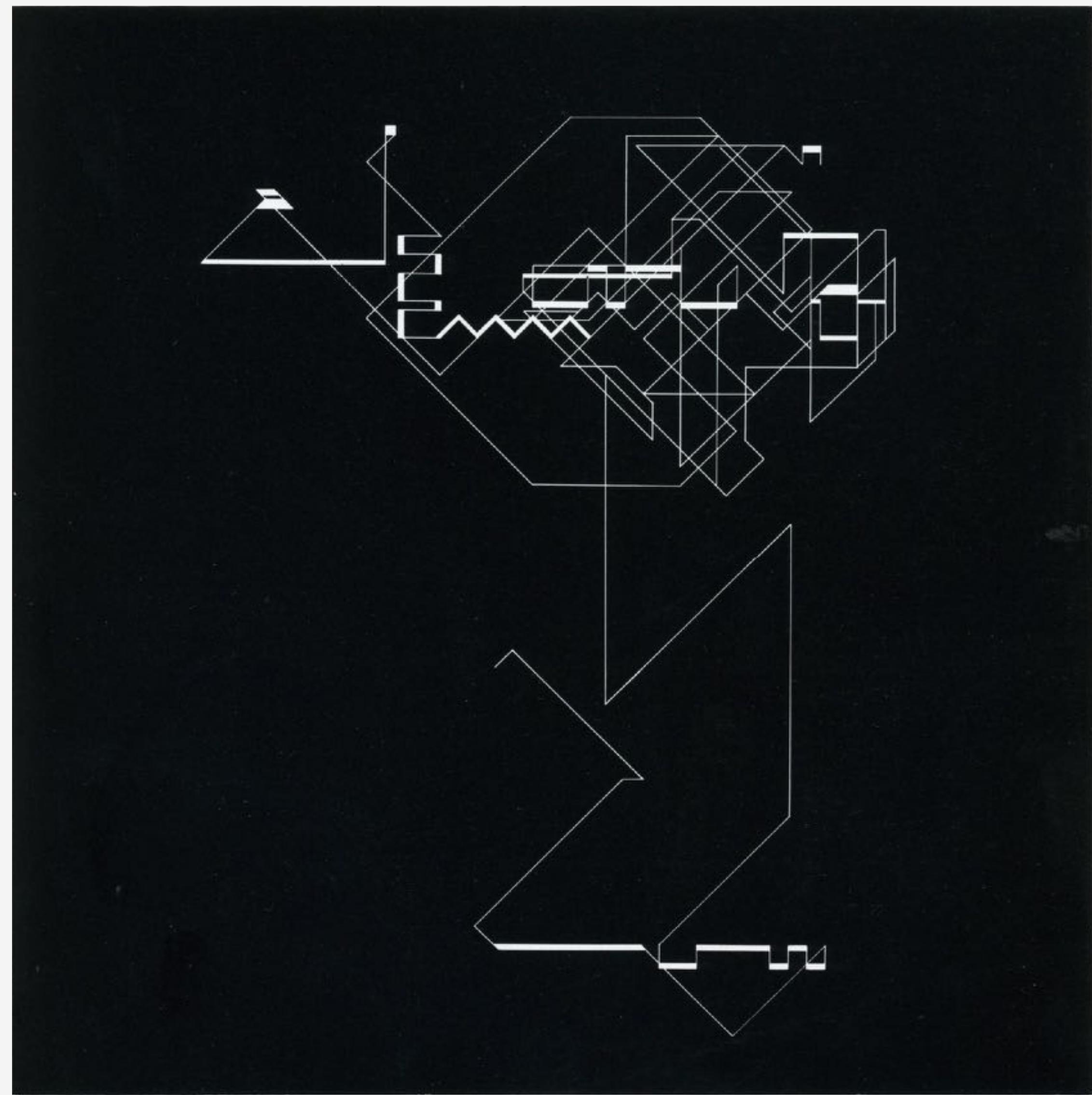
After 1980

<http://dada.compart-bremen.de>

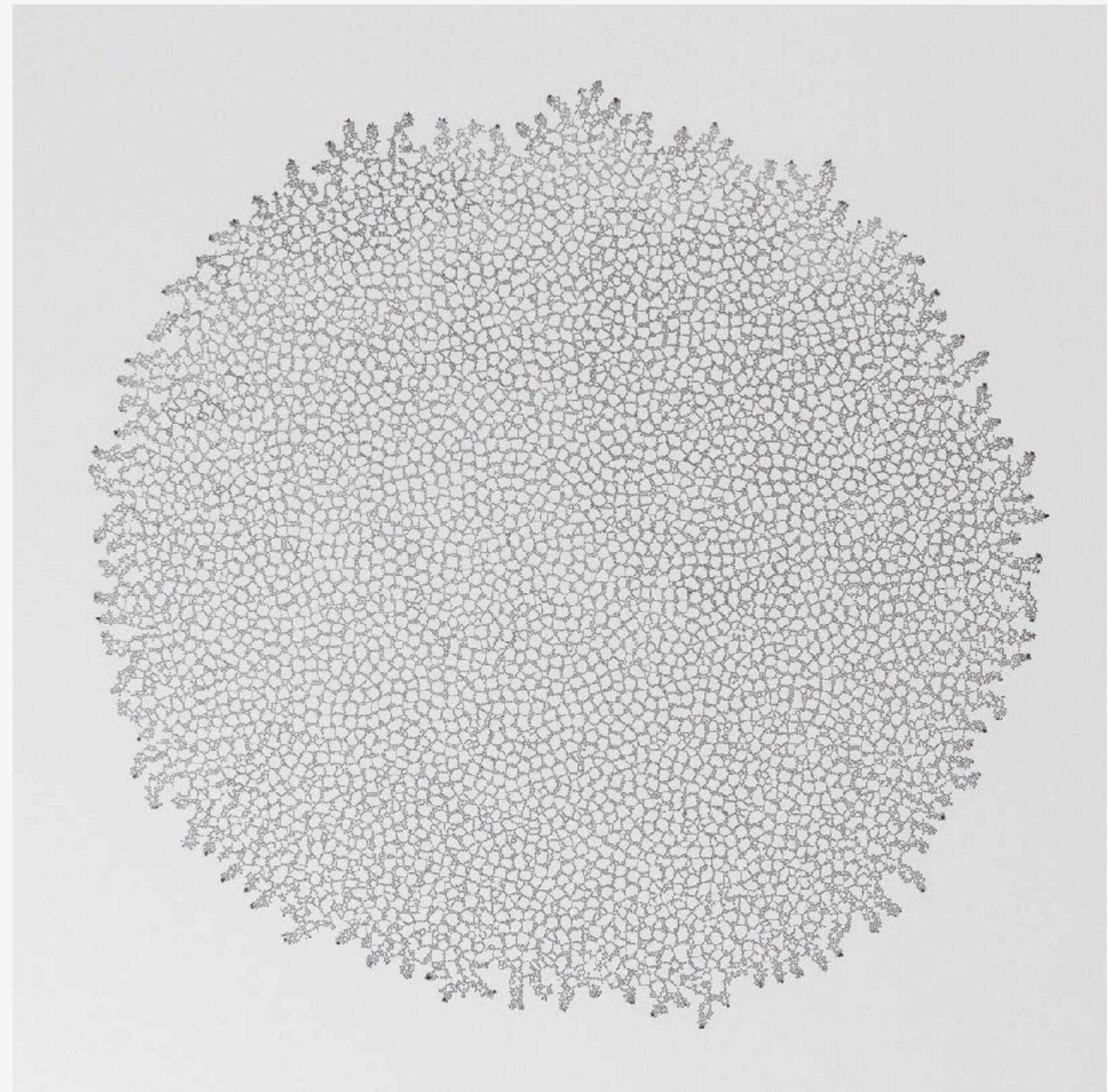
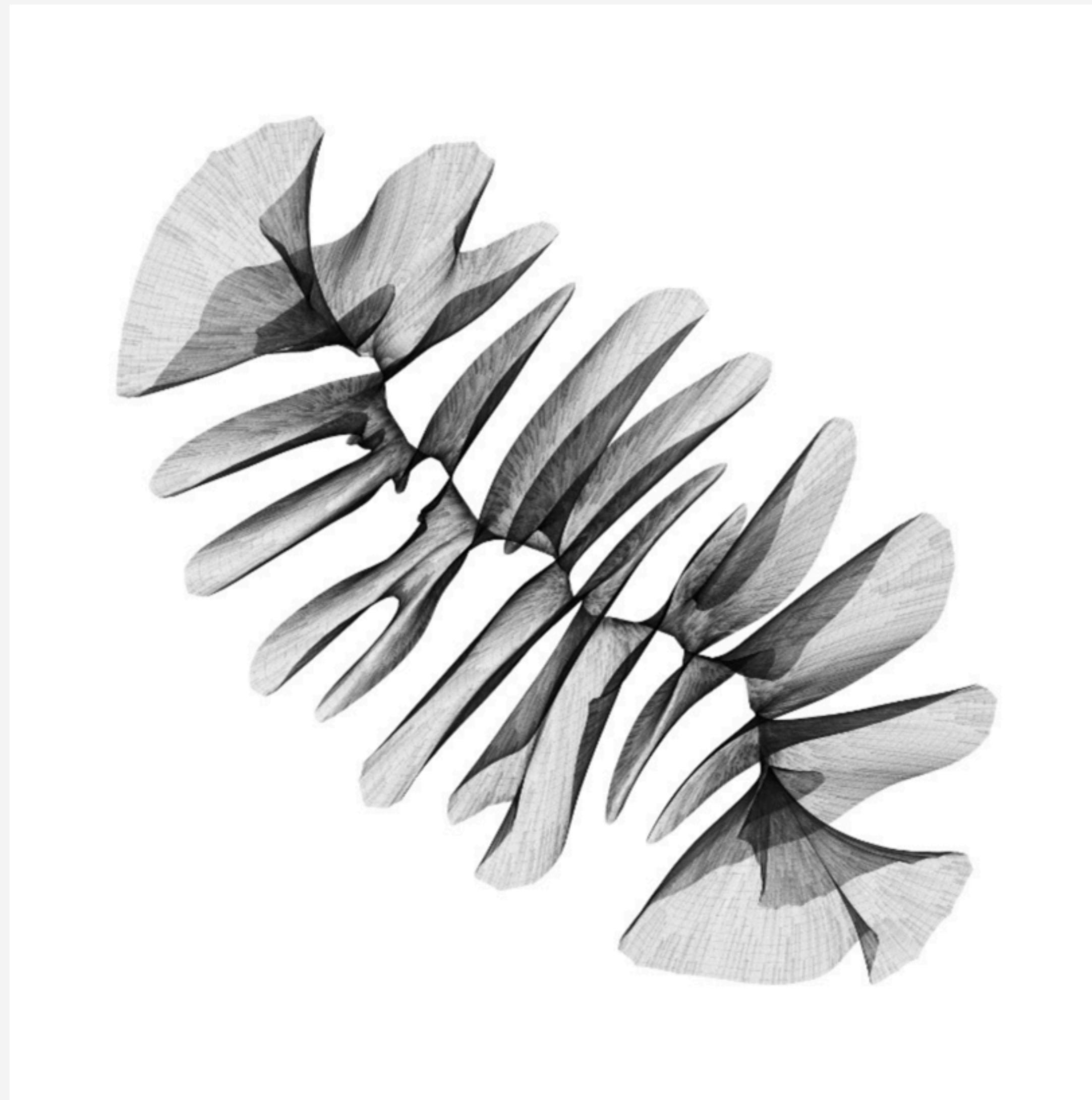
<http://digitalartmuseum.org/history>



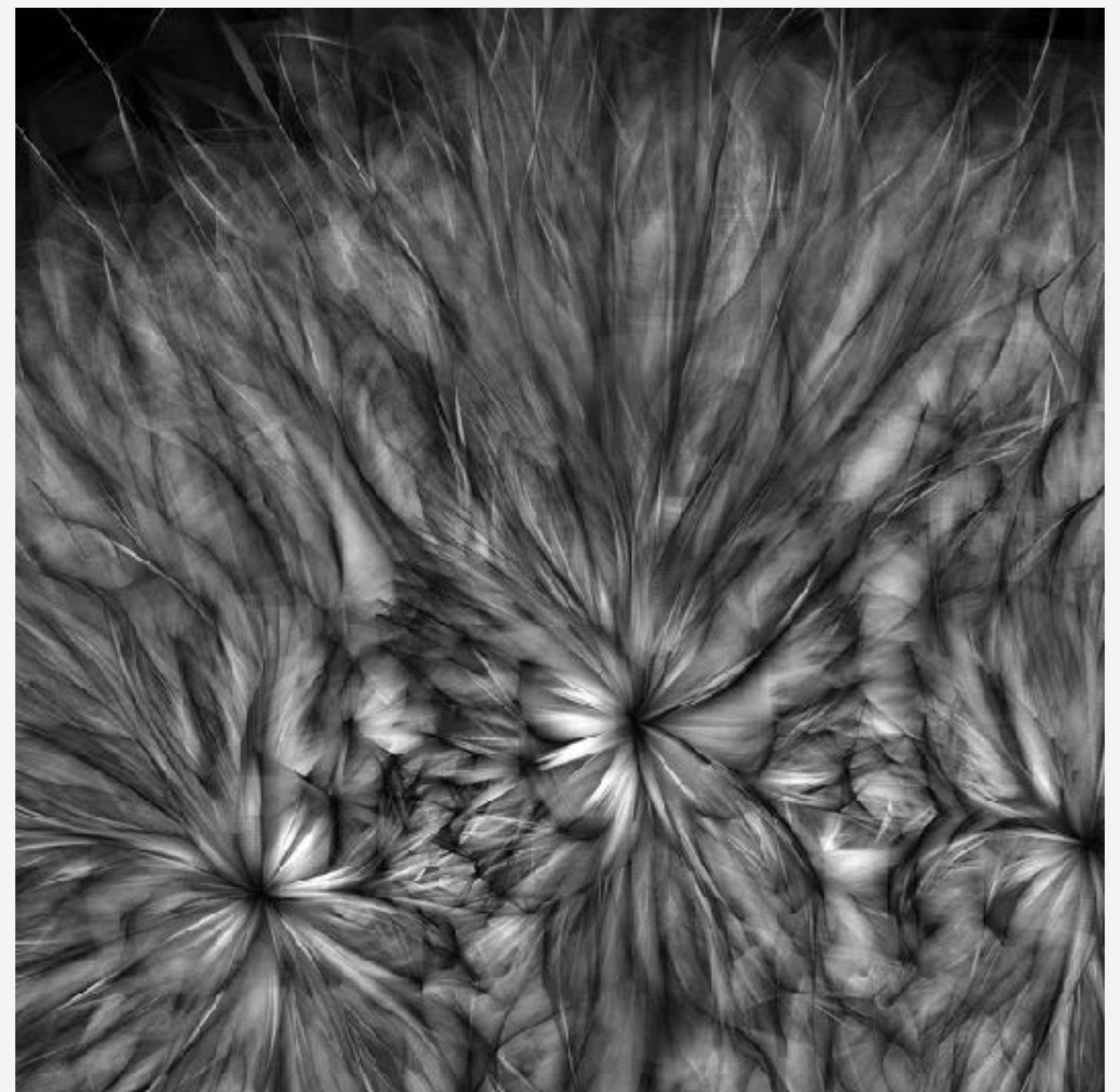
Herbert W. Franke



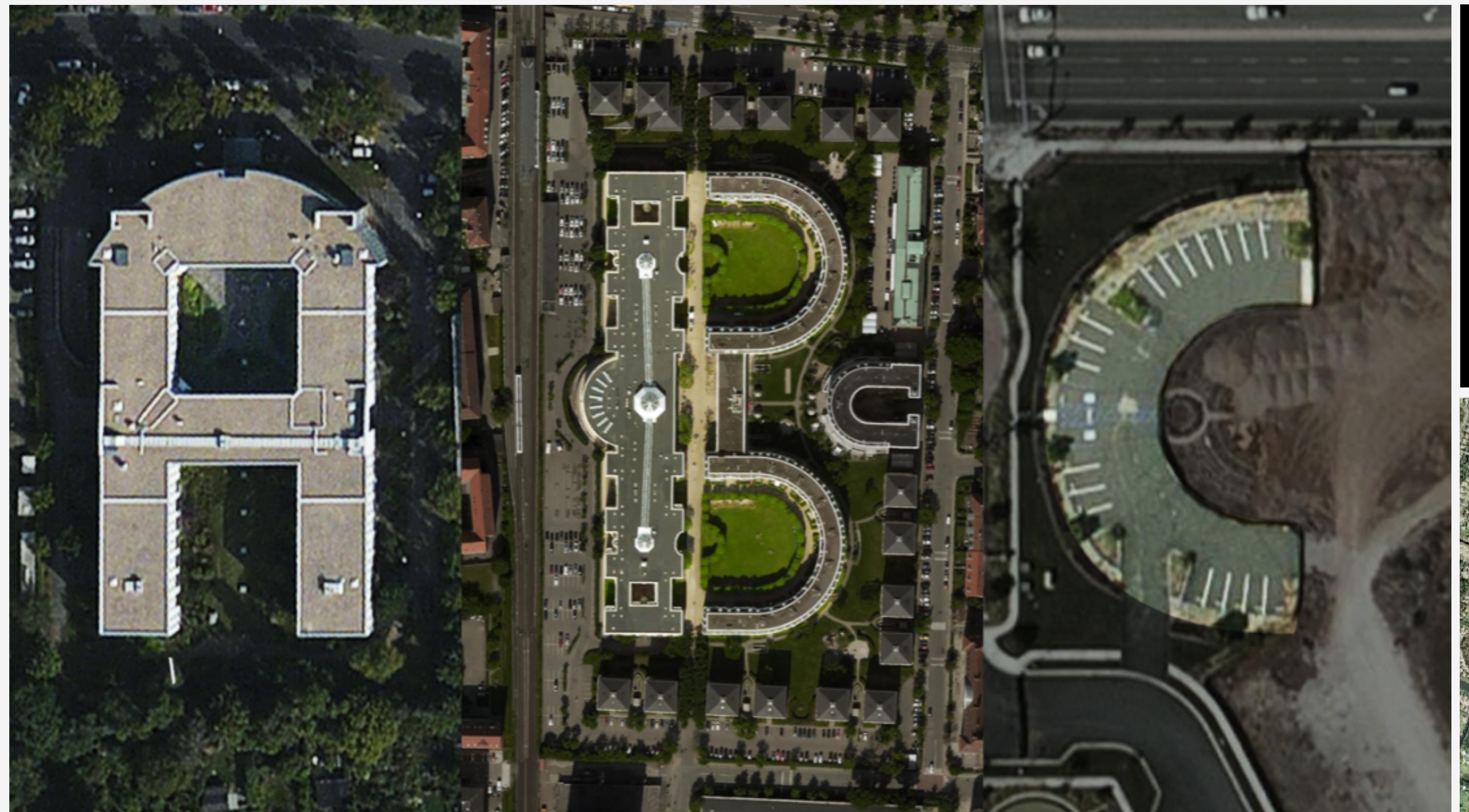
Manfred Mohr



Andreas Hoff



Casey Reas



KICKSTART THE  
PLATETRY SEARCH  
FOR LETTERFORMS



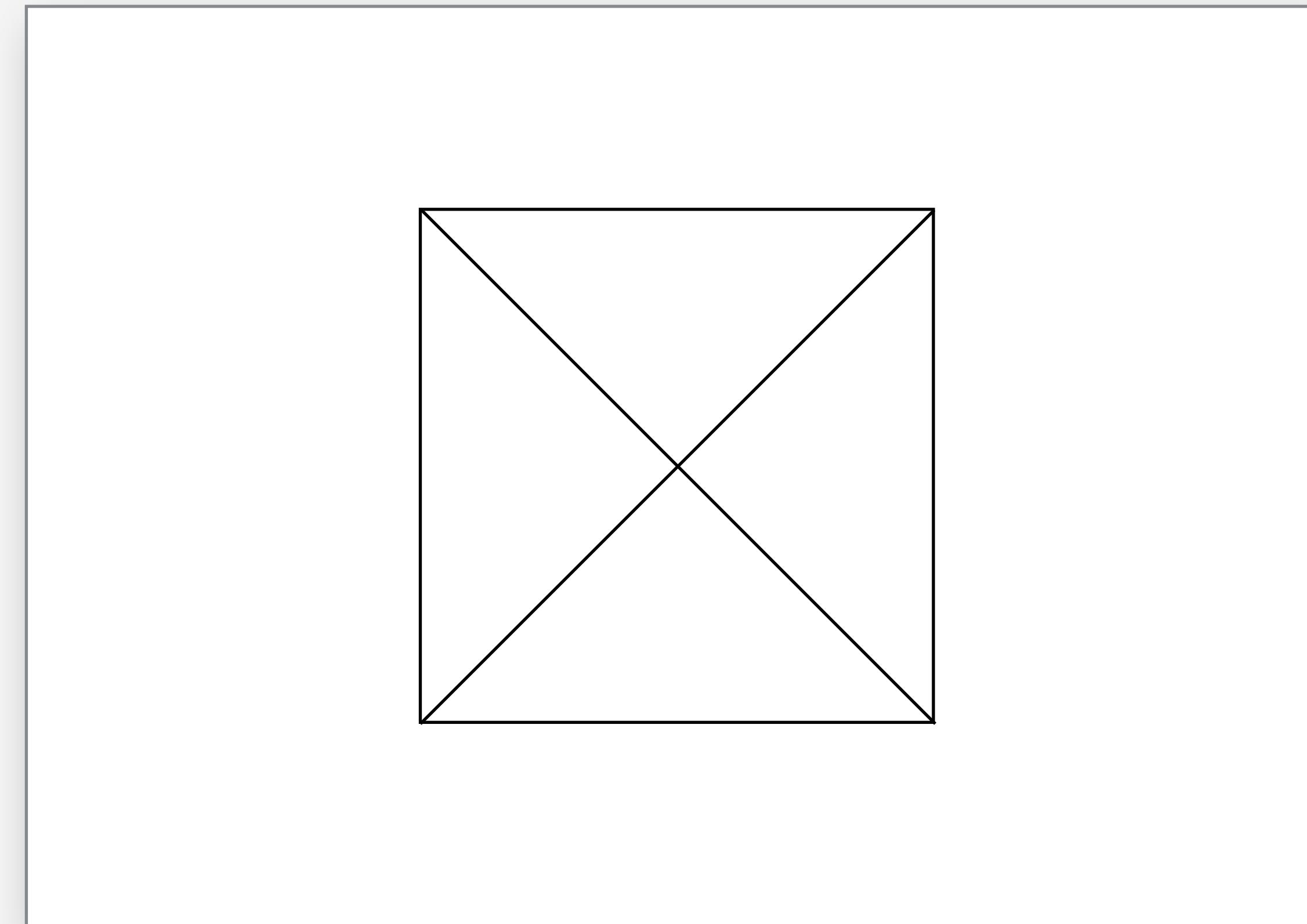
Benedikt Groß

# PROCEDURAL DRAWING LANGUAGE

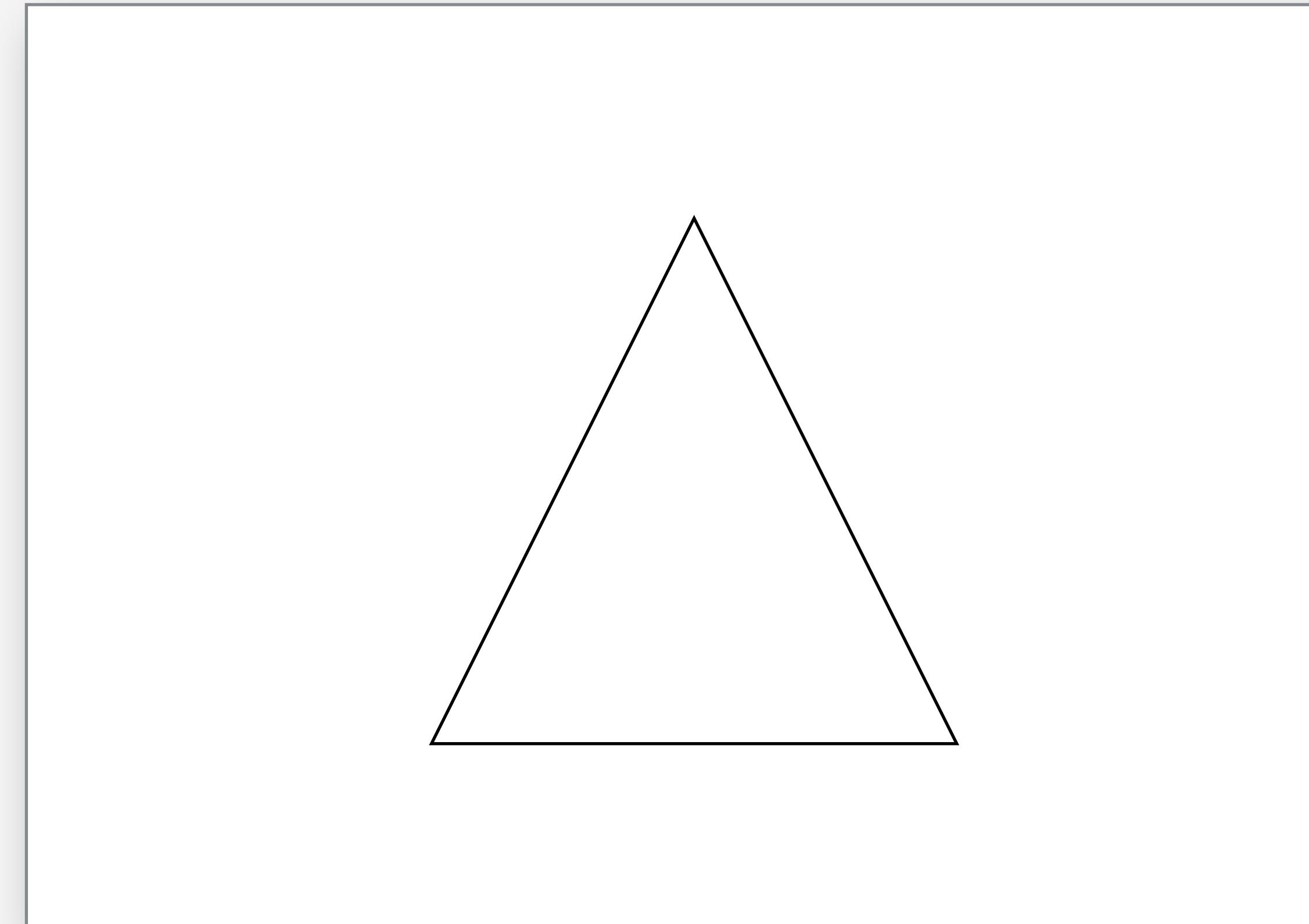
## **Class exercise**

1. Partner up.
2. Get a pen and some papers
3. The person drawing is blindfolded
4. Agree on a set of rules for drawing the following images

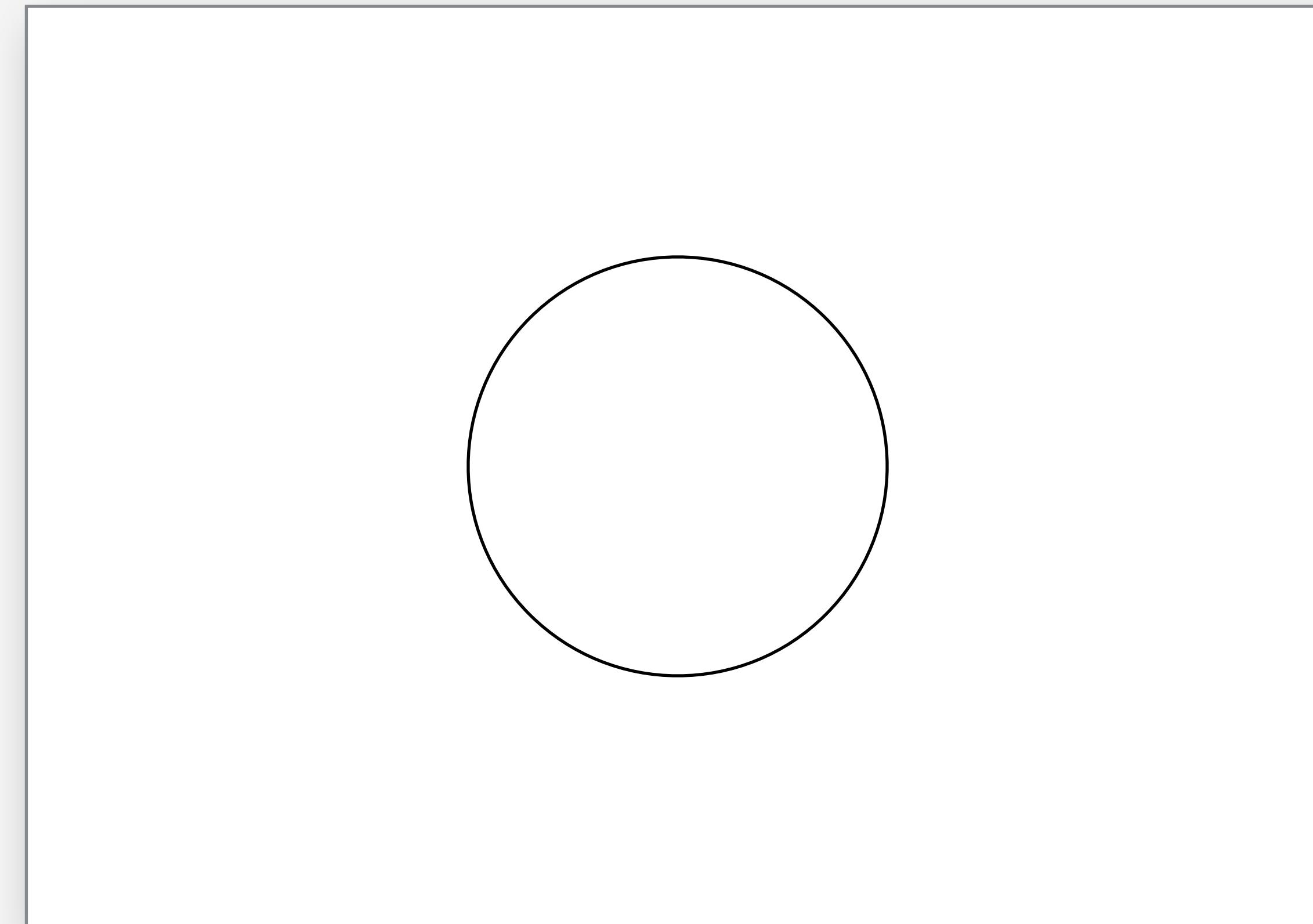
# DRAWING LANGUAGE



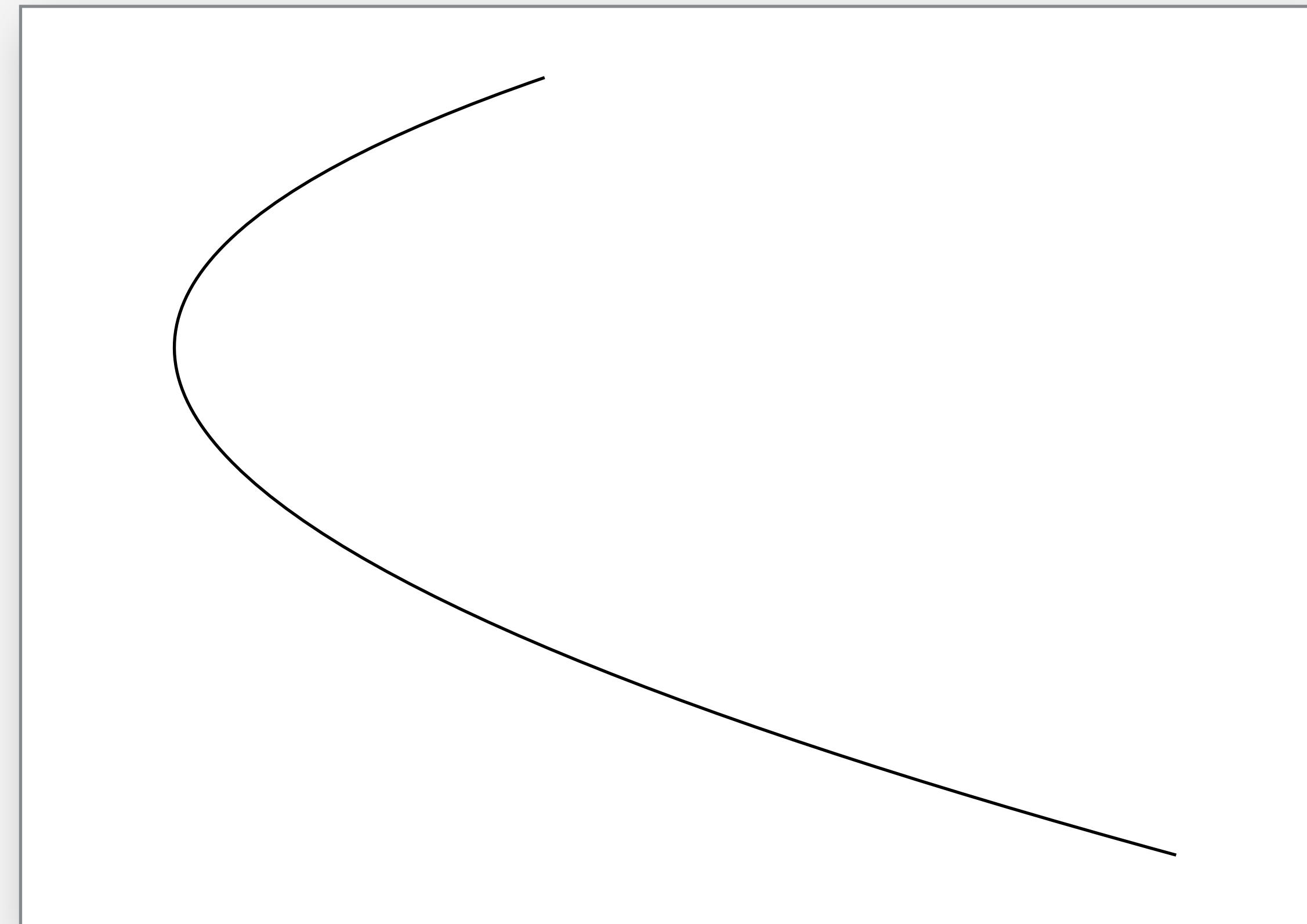
# DRAWING LANGUAGE



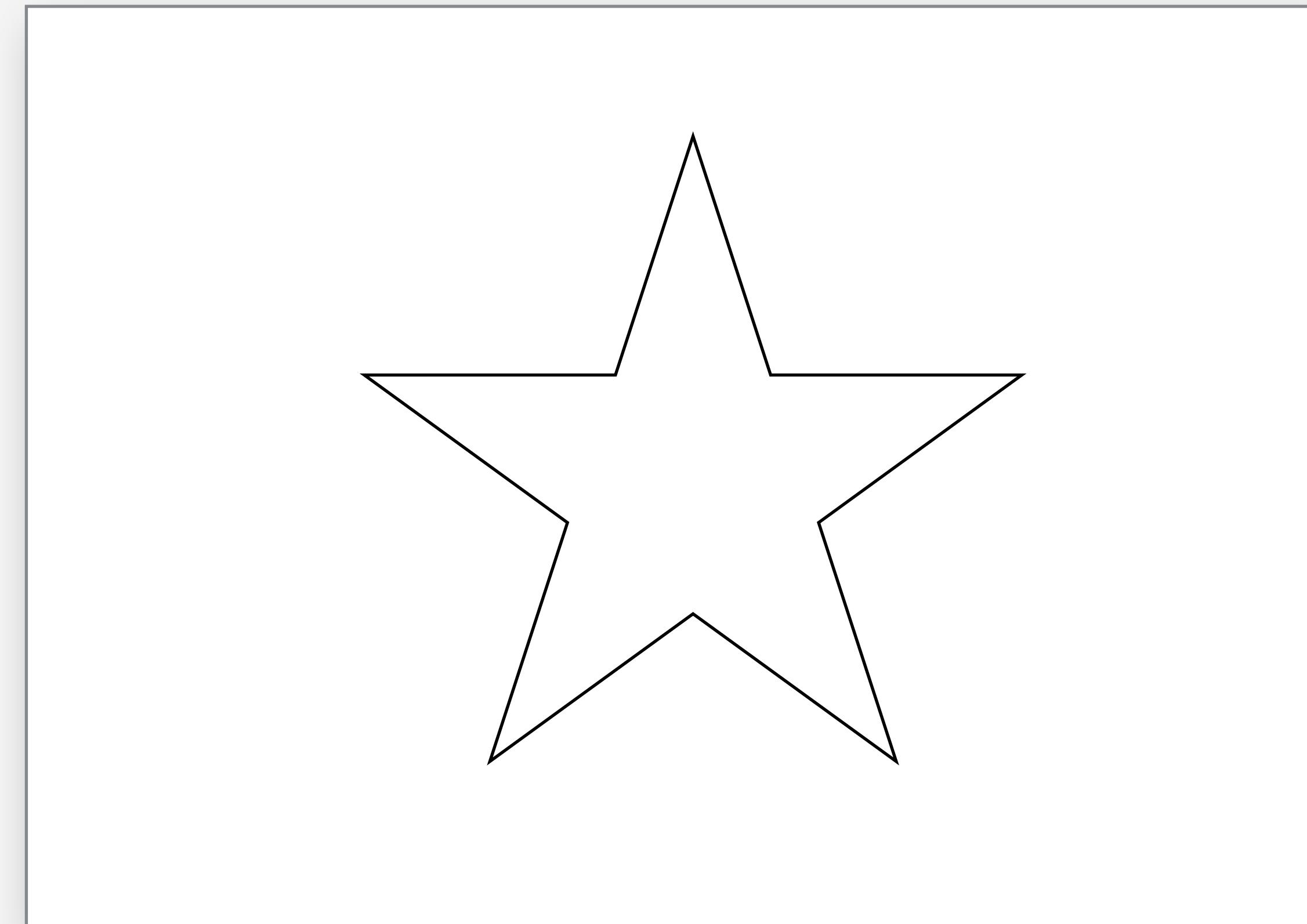
# DRAWING LANGUAGE



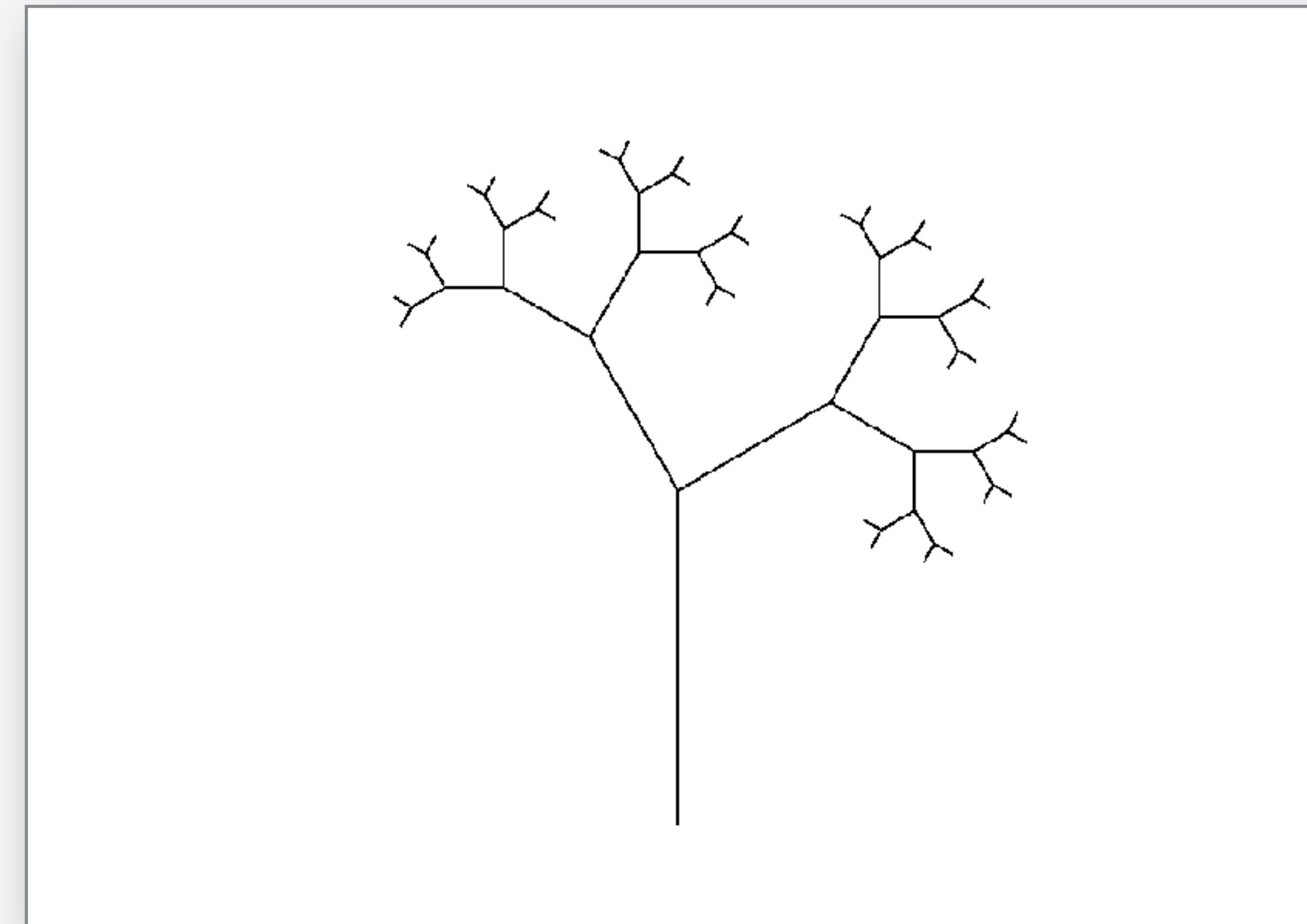
# DRAWING LANGUAGE



# DRAWING LANGUAGE



# DRAWING LANGUAGE



# THIS IS OUR NEW WORKSPACE:

The screenshot shows the p5.js Reference website. It features a large pink p5.js logo at the top left. Below it is a navigation bar with links for Processing, p5.js, Processing.py, Processing for Android, and Processing for Pi. The main content area is titled "Reference" and includes a search bar labeled "Search the API". A sidebar on the left contains links for Home, Download, Start, Reference, Libraries, Learn, Examples, Books, and Community. The Reference section lists categories like Color, Environment, Lights, Camera, Structure, Constants, Events, Math, Transform, DOM, IO, Rendering, Typography, Data, and Image.

The screenshot shows the p5.js Web Editor. It has a header with the p5.js logo and a "Processing Foundation" link. The main area consists of a code editor with a "sketch.js" file containing the following code:

```
function setup() {
  createCanvas(400, 400);
}

function draw() {
  background(220);
}
```

Below the code editor is a "Preview" window showing a blank white canvas. At the bottom is a "Console" tab.

The screenshot shows the CodePen website. The header includes the CodePen logo and a search bar. The main content area is titled "Picked Pens" and displays several examples of user-submitted code snippets. Each snippet is shown in a card format with a thumbnail, title, and author. On the right side, there are interactive sliders for "rotation axis" and "rotation angle".

[p5js.org/reference](https://p5js.org/reference)

[editor.p5js.org](https://editor.p5js.org)

[codepen.io](https://codepen.io)

# 2D DRAWING COMMANDS

`size(width, height)`

---

`background(r, g, b)`

---

`stroke(r, g, b, a)`

---

`fill(r, g, b, a)`

---

`strokeWeight(w)`

---

`noStroke()`

---

`noFill()`

---

`smooth(level)`

---

`save("imgName.png")`

---

`point(x, y)`

---

`line(x1, y1, x2, y2)`

---

`rect(x, y, width, height)`

---

`ellipse(x, y, width, height)`

---

`arc(x, y, width, height, start, stop)`

---

`quad(x1, y1, x2, y2, x3, y3, x4, y4)`

---

`triangle(x1, y1, x2, y2, x3, y3)`

---

`curve(x1, y1, x2, y2, x3, y3, x4, y4)`

---

`bezier(x1, y1, x2, y2, x3, y3, x4, y4)`

---

## CLASS EXERCISES

Do one of the following:

- Create a processing sketch which uses all 2D drawing commands.
- Create a composition which expresses the word "CONTACT" using only the arc() drawing command
- Pick an object in the room and create an abstract visualization of it.

# HOMEWORK

## A. Program a self portrait

Please Program a self portrait in p5.

Be mindful of details and make purposeful visual decisions.

## B. Watch:

Hello World! Processing (film) - <https://vimeo.com/60735314> [ 40 minutes ]