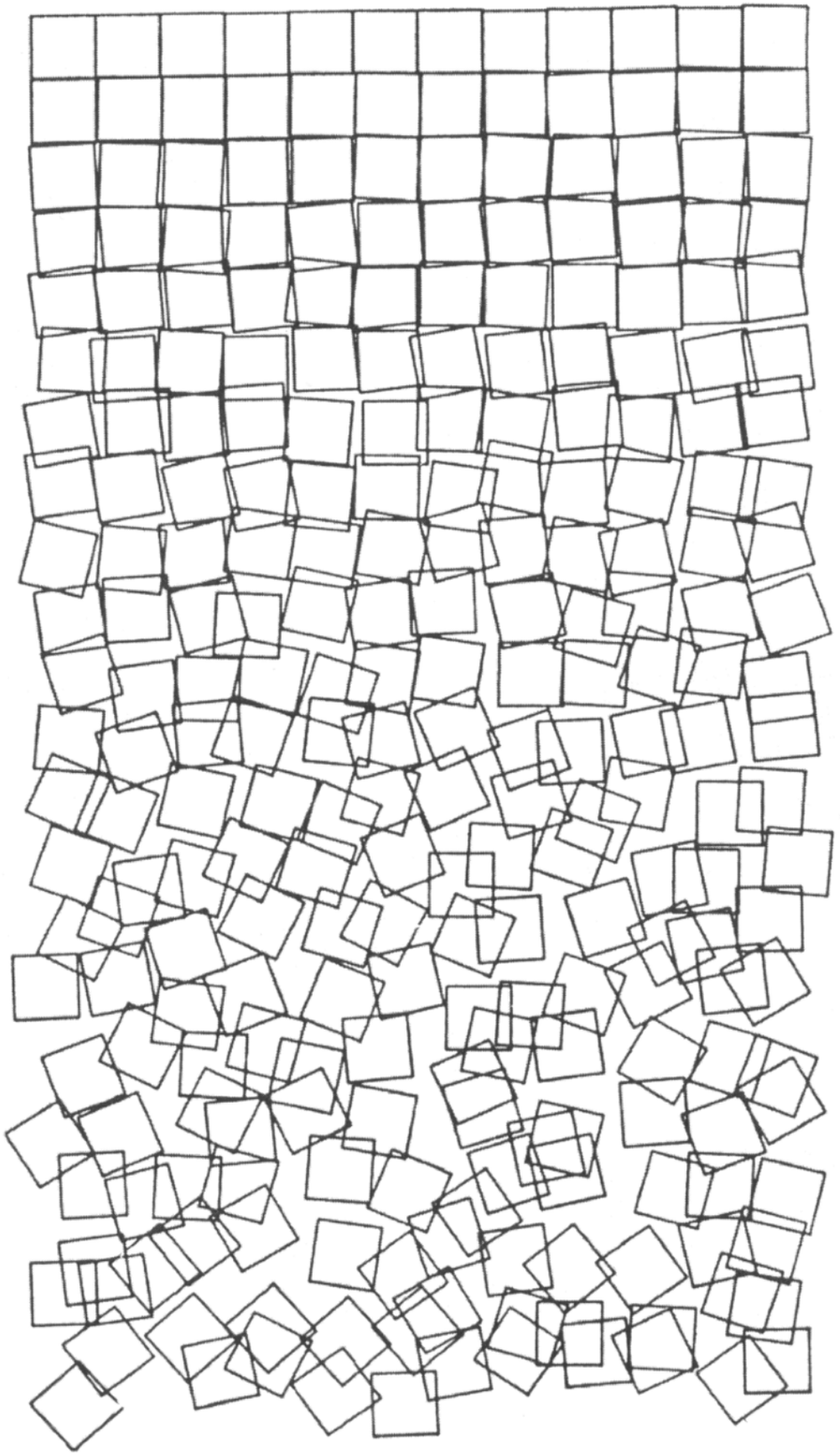
RANDOMNESS & CREATIVE CODE

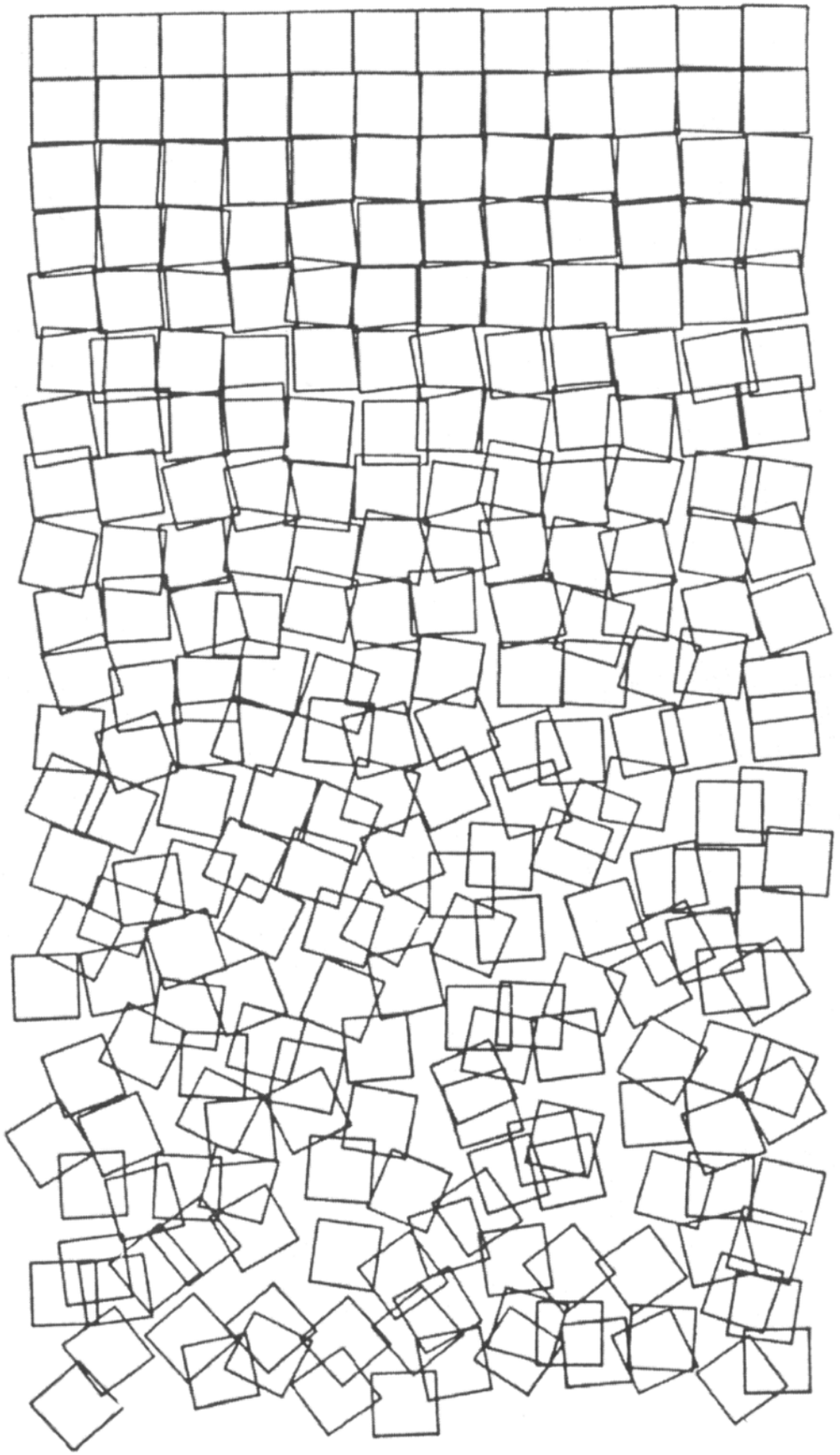
DANIEL C. HOWE
UNIVERSITY OF THE ARTS
LONDON, JULY 9, 2021



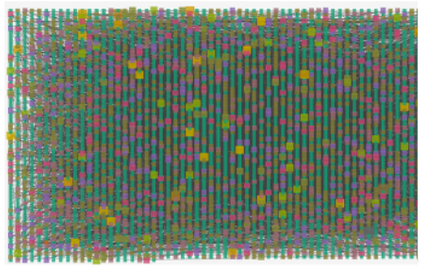
Schotter (Gravel) - Georg Nees, 1968

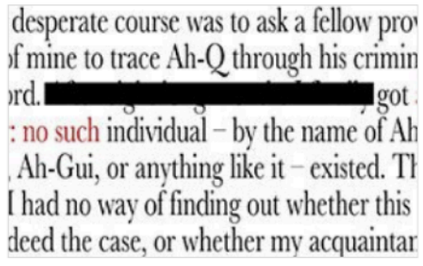
RANDOMNESS & CREATIVE CODE

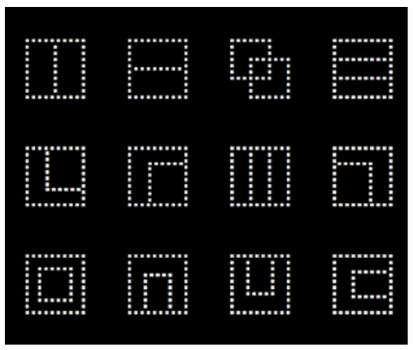
DANIEL C. HOWE
UNIVERSITY OF THE ARTS
LONDON, JULY 9, 2021

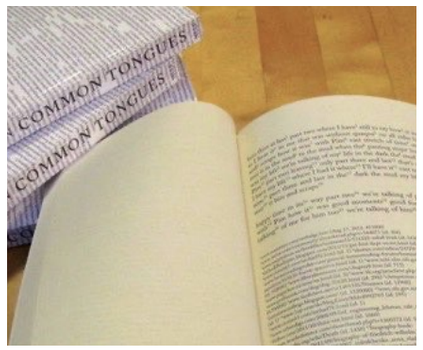


Schotter (Gravel) - Georg Nees, 1968



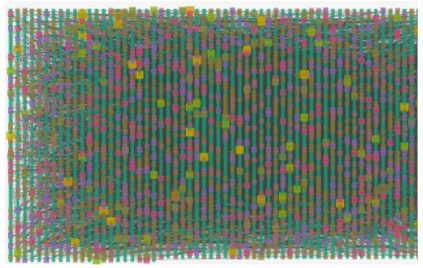


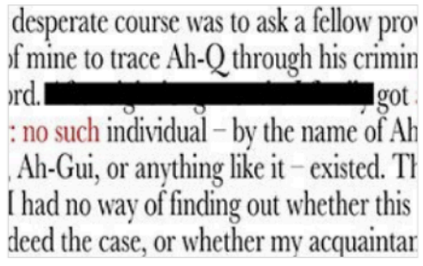


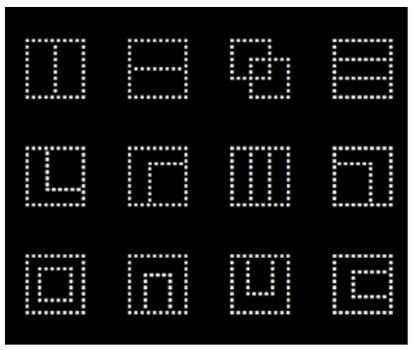


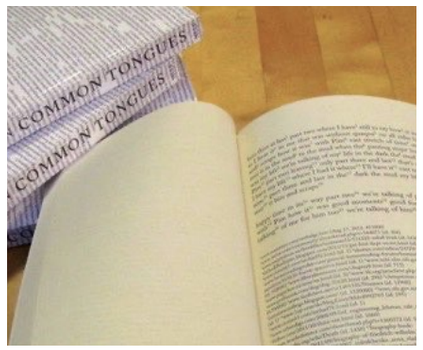
DIALOGIC

DANIEL HOWE
SCHOOL OF CREATIVE MEDIA
CITY UNIVERSITY HONG KONG
MAIL: DANIEL@REDNOISE.ORG
HTTPS://REDNOISE.ORG/DANIEL







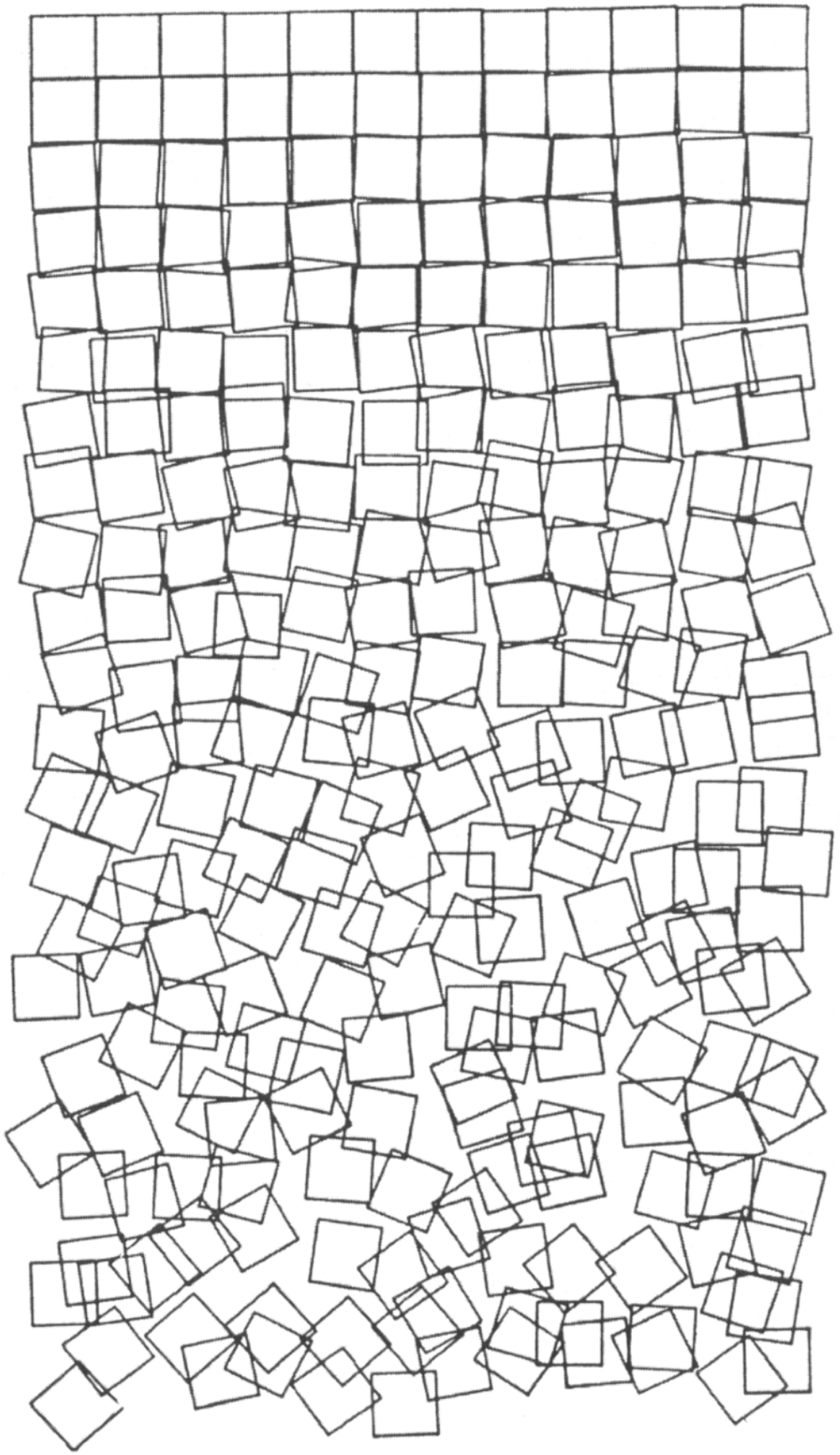


DIALOGIC

DANIEL HOWE
SCHOOL OF CREATIVE MEDIA
CITY UNIVERSITY HONG KONG
MAIL: DANIEL@REDNOISE.ORG
HTTPS://REDNOISE.ORG/DANIEL

RANDOMNESS & CREATIVE CODE

DANIEL C. HOWE
UNIVERSITY OF THE ARTS
LONDON, JULY 9, 2021



Schotter (Gravel) - Georg Nees, 1968

- INTRODUCTION: RESOURCES
- THEORETICAL: DEFINITIONS
- AESTHETIC: EXAMPLES IN ART
- STRATEGIC: WHY USE RANDOMNESS?
- TECHNICAL: USING RANDOMNESS EFFECTIVELY

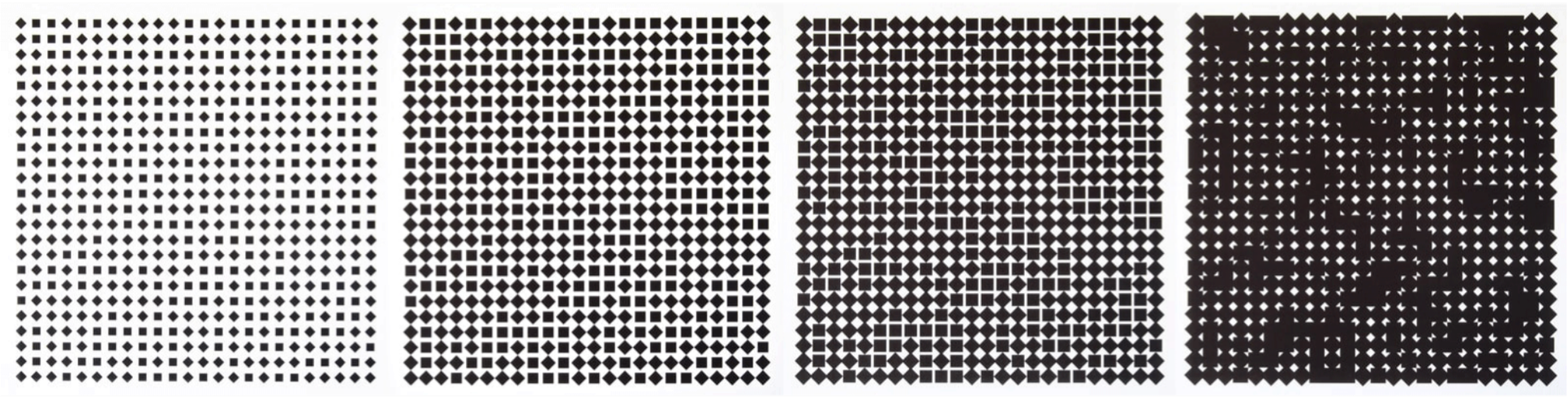
OBJECTIVES

RESOURCES

TOOLS & LINKS

SLIDES + CODE

https://github.com/dhowe/rws



VERA MOLNAR, CARRÉS EN
2 POSITIONS 1-4 , 2011-13

dhowe / GetGen

Unwatch 1 | Star 0 | Fork 0

Code | Issues 0 | Pull requests 0 | Projects 0 | Wiki | Insights | Settings

A Workshop for Processing Community Day @ HK 2019

Edit

Manage topics

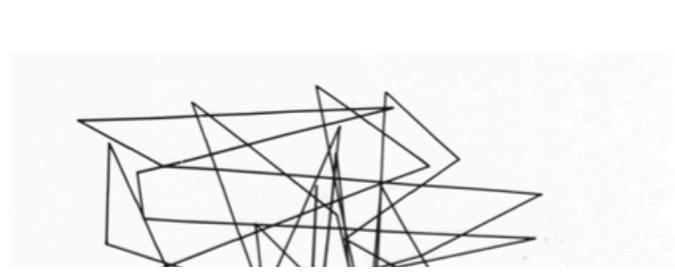
19 commits | 1 branch | 0 releases | 1 contributor

Branch: master | New pull request | Create new file | Upload files | Find file | Clone or download

dhowe updated — Latest commit 49854aa 27 seconds ago

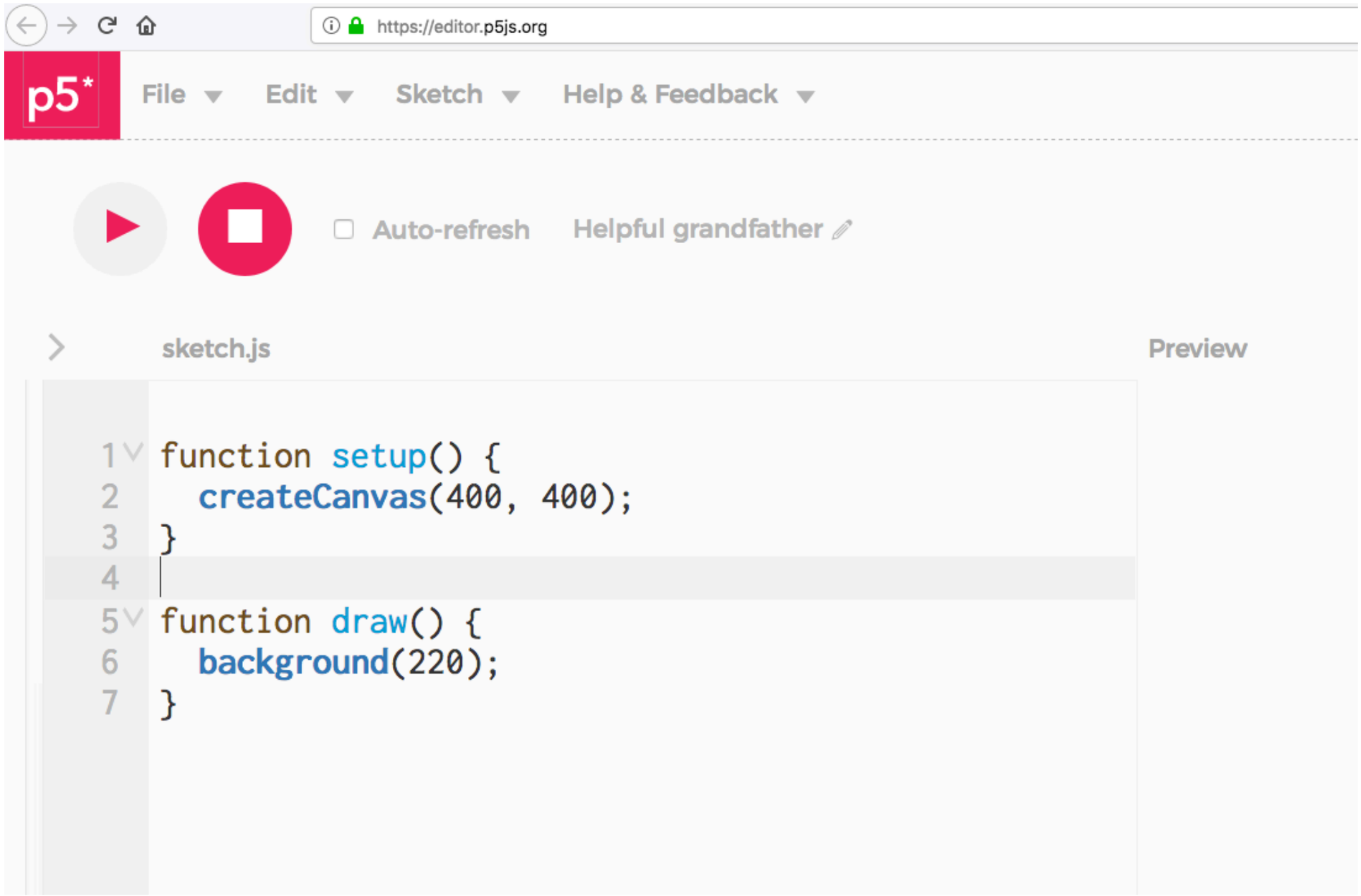
README.md	Update README.md	23 hours ago
basic-tree.js	initial	a day ago
fractal-tree1.js	initial	a day ago
fractal-tree2.js	initial	a day ago
fractal-tree3.js	initial	a day ago
getgen.png	initial	23 hours ago
mapped-tree.js	initial	a day ago
slides.pdf	updated	26 seconds ago

README.md



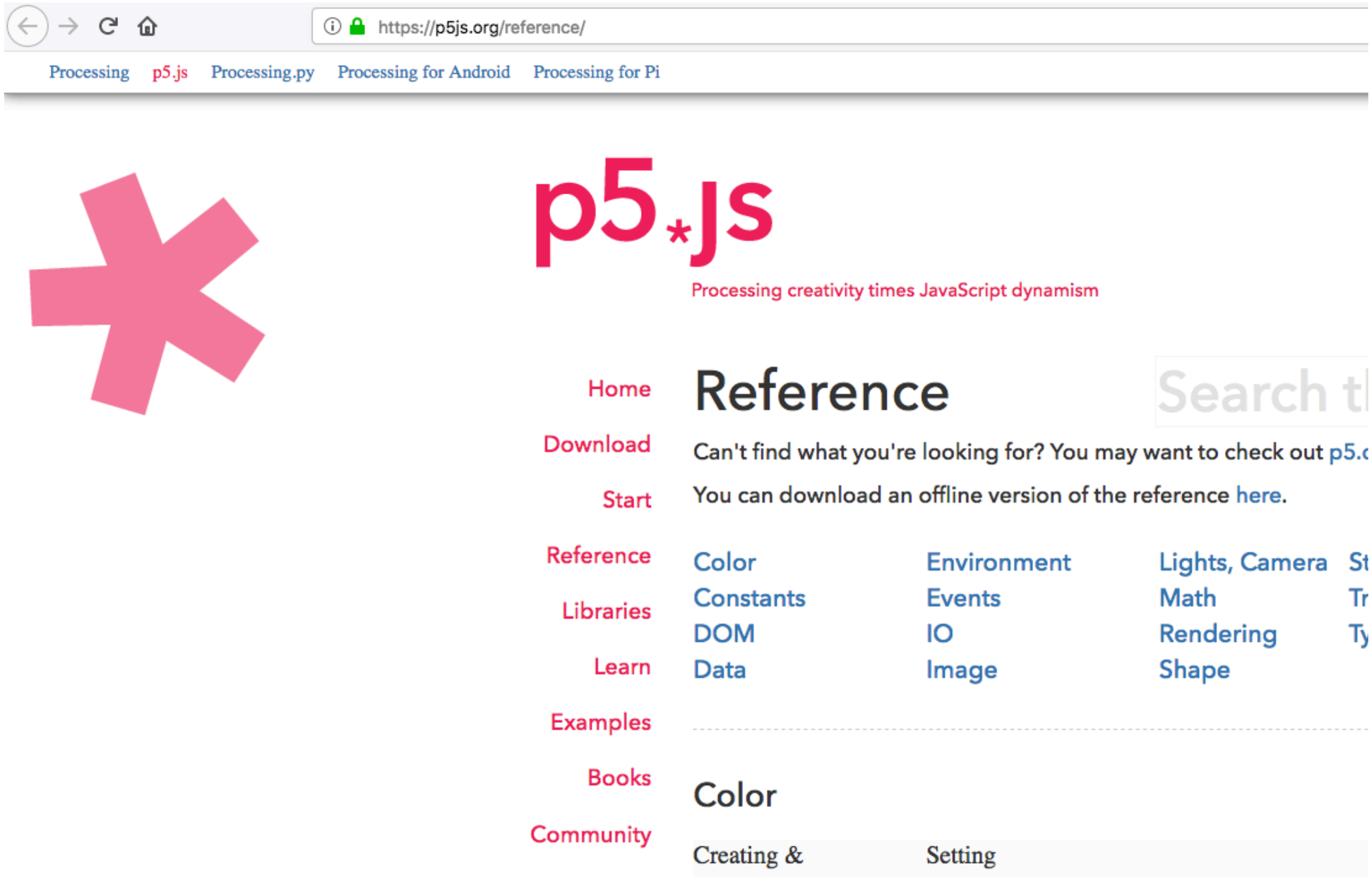
https://github.com/dhowe/rws

TOOLS: P5.JS EDITOR



https://editor.p5js.org

TOOLS: REFERENCE



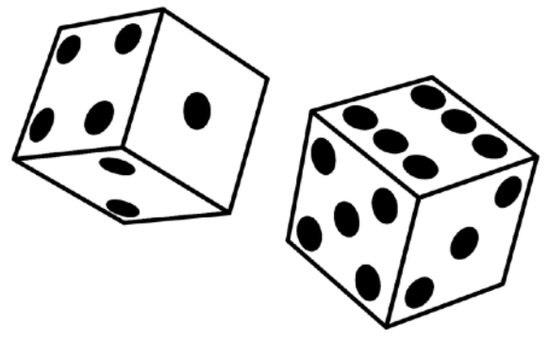
https://p5js.org/reference/

RANDOM()

p5.js

Description

Return a random floating-point number.



Takes either 0, 1 or 2 arguments.

If no argument is given, returns a random number from 0 up to (but not including) 1.

If one argument is given and it is a number, returns a random number from 0 up to (but not including) the number.

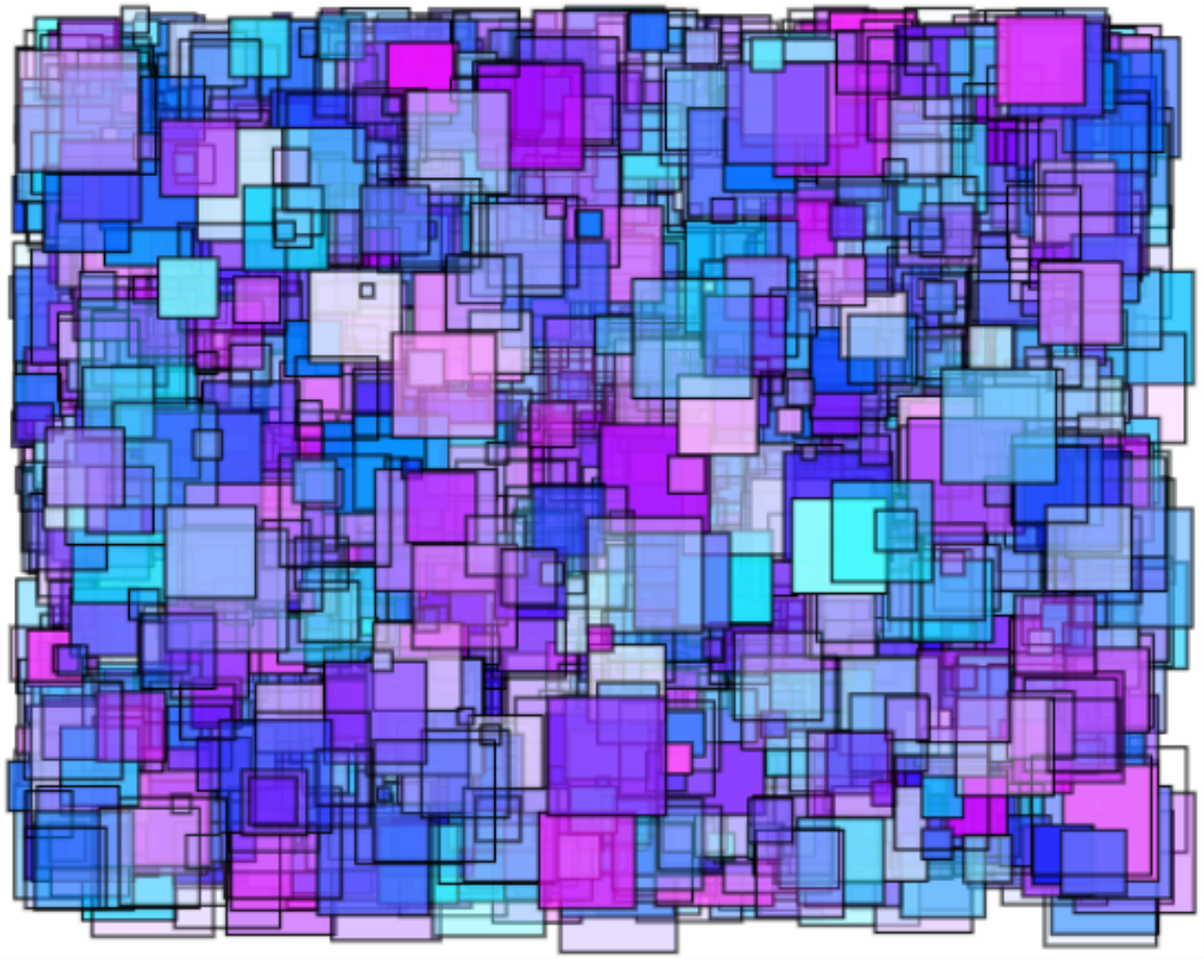
If two arguments are given, returns a random number from the first argument up to (but not including) the second argument.

QUICKSTART

sketch.js

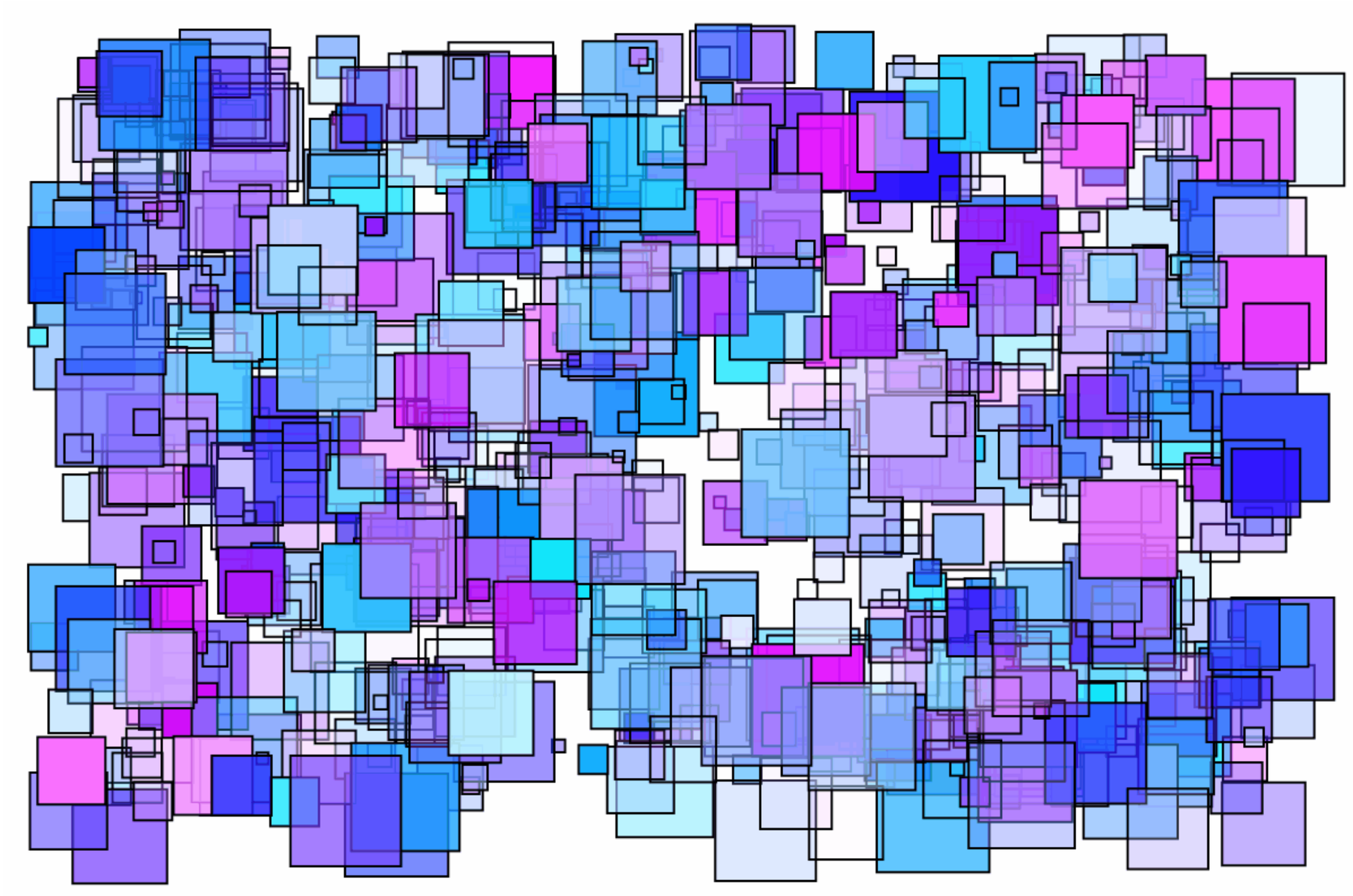
```
function setup() {
  createCanvas(500, 400);
  background(255);
}

function draw() {
  let x = random(0, width);
  let y = random(0, height);
  let sz = random(5, 50);

  let r = random(0, 255);
  let g = random(0, 255);
  let a = random(0, 255);

  fill(r, 255-g, 255, a);
  square(x, y, sz);
}
```

Preview



file: RandomRects.js

QUICKSTART

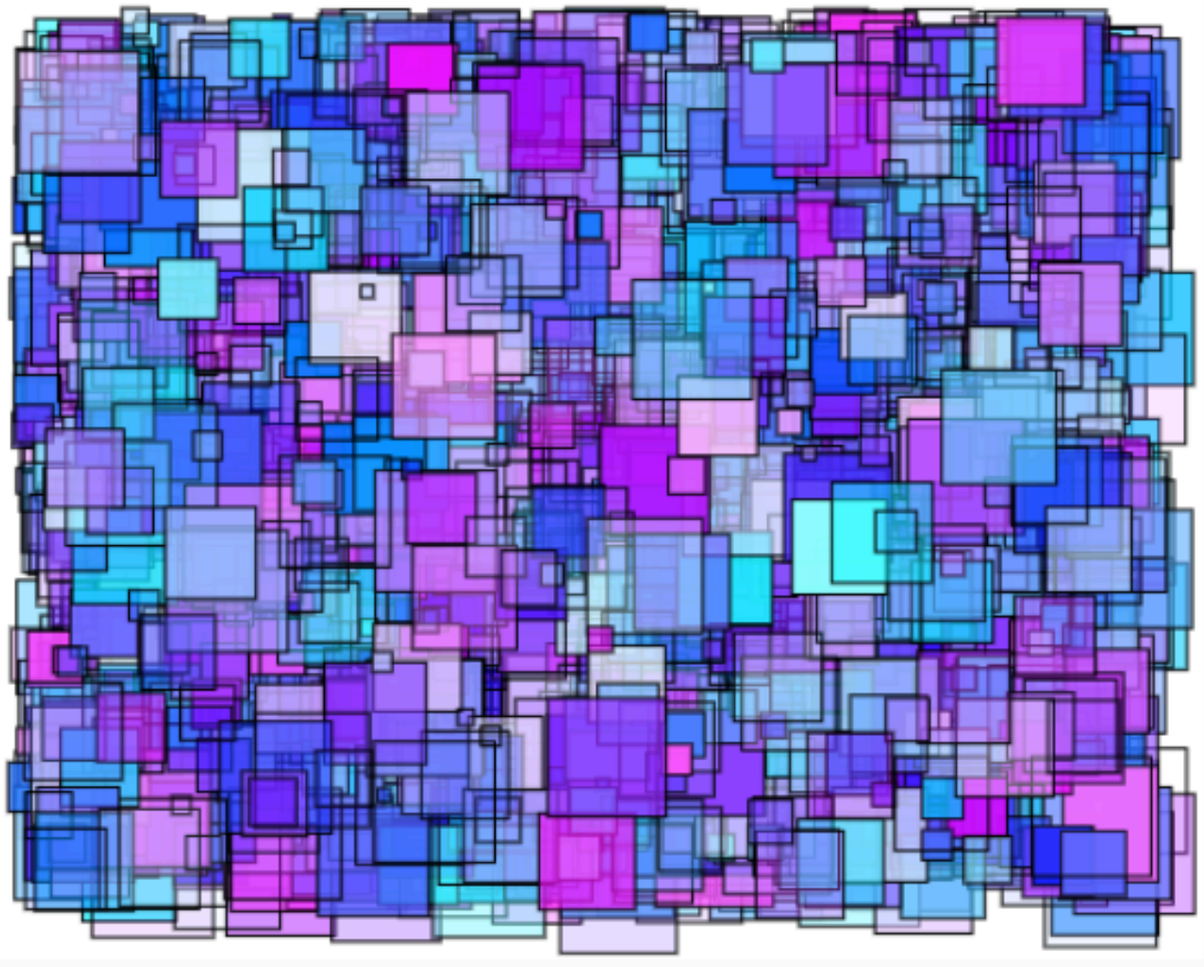


QUICKSTART

sketch.js

```
function setup() {
  createCanvas(500, 400);
  background(255);
}

function draw() {
  let x = random(0, width);
  let y = random(0, height);
  let sz = random(5, 50);

  let r = random(0, 255);
  let g = random(0, 255);
  let a = random(0, 255);

  fill(r, 255-g, 255, a);
  square(x, y, sz);
}
```

Preview



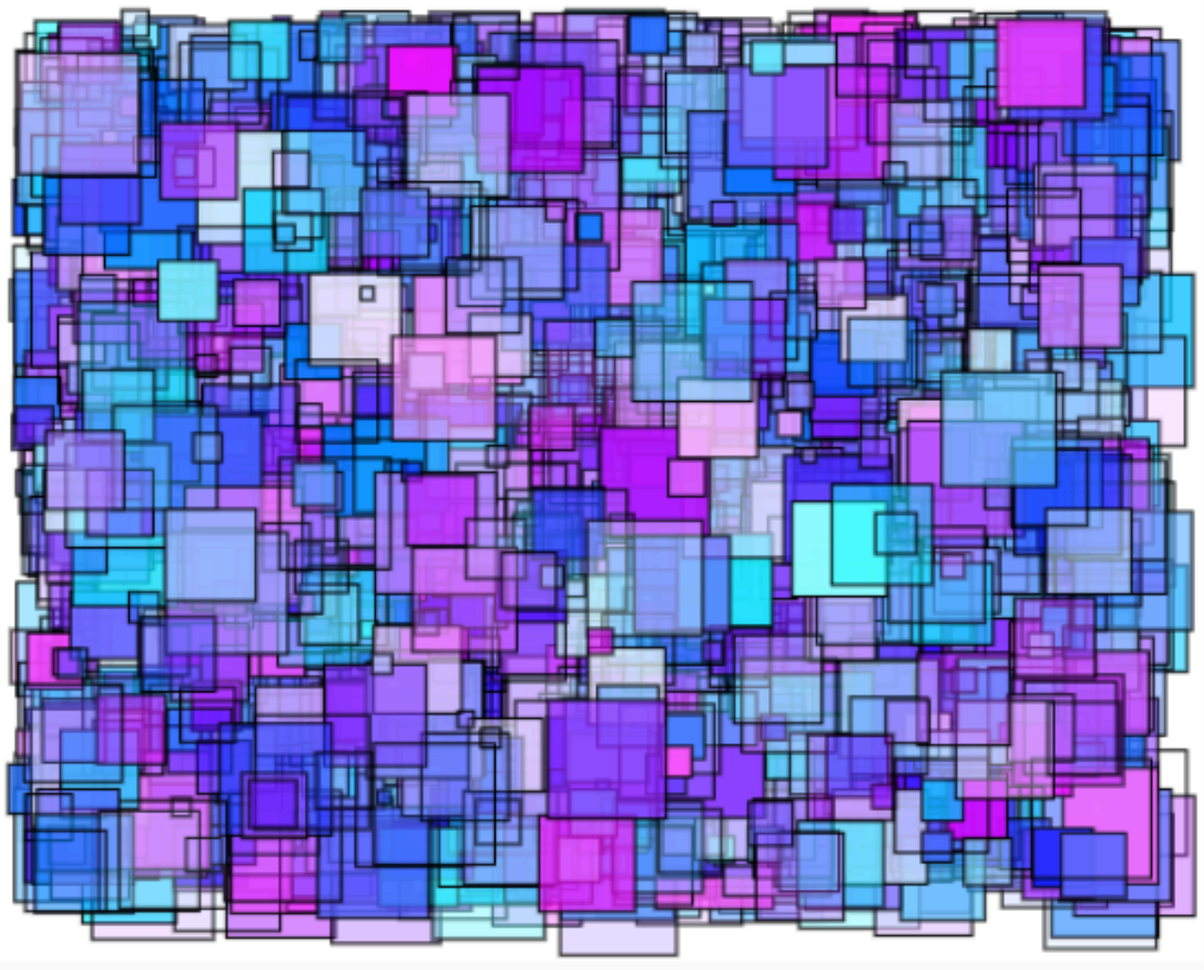
file: RandomRects.js

QUICKSTART

sketch.js

```
1  function setup() {
2    createCanvas(500, 400);
3    background(255);
4  }
5
6  function draw() {
7    let x = random(0, width);
8    let y = random(0, height);
9    let sz = random(5, 50);
10
11   let r = random(0, 255);
12   let g = random(0, 255);
13   let a = random(0, 255);
14
15   fill(r, 255-g, 255, a);
16   square(x, y, sz);
17 }
18
19
20
```

Preview



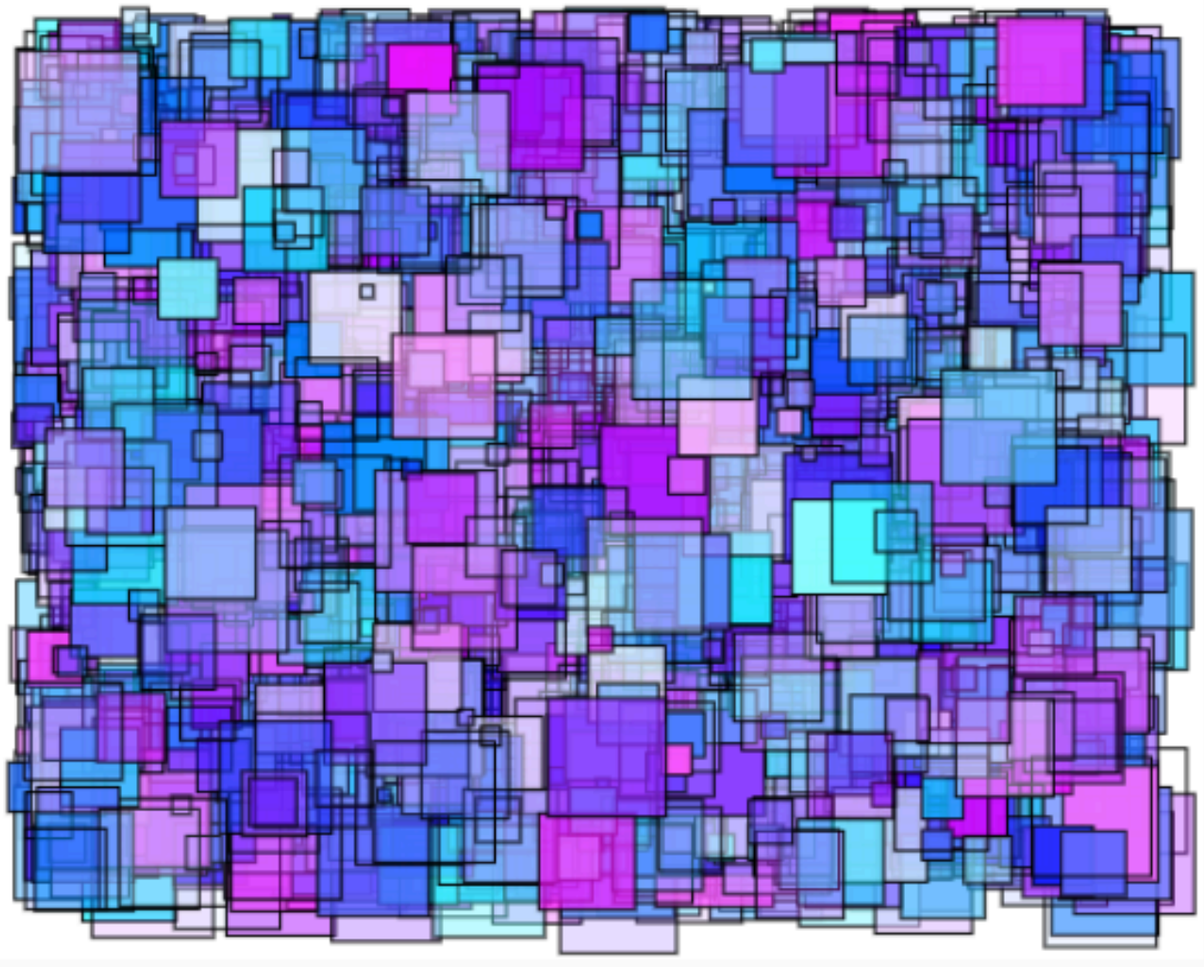
file: RandomRects.js

QUICKSTART

sketch.js

```
function setup() {
  createCanvas(500, 400);
  background(255);
}

function draw() {
  let x = random(0, width);
  let y = random(0, height);
  let sz = random(5, 50);

  let r = random(0, 255);
  let g = random(0, 255);
  let a = random(0, 255);

  fill(r, 255-g, 255, a);
  square(x, y, sz);
}
```

Preview



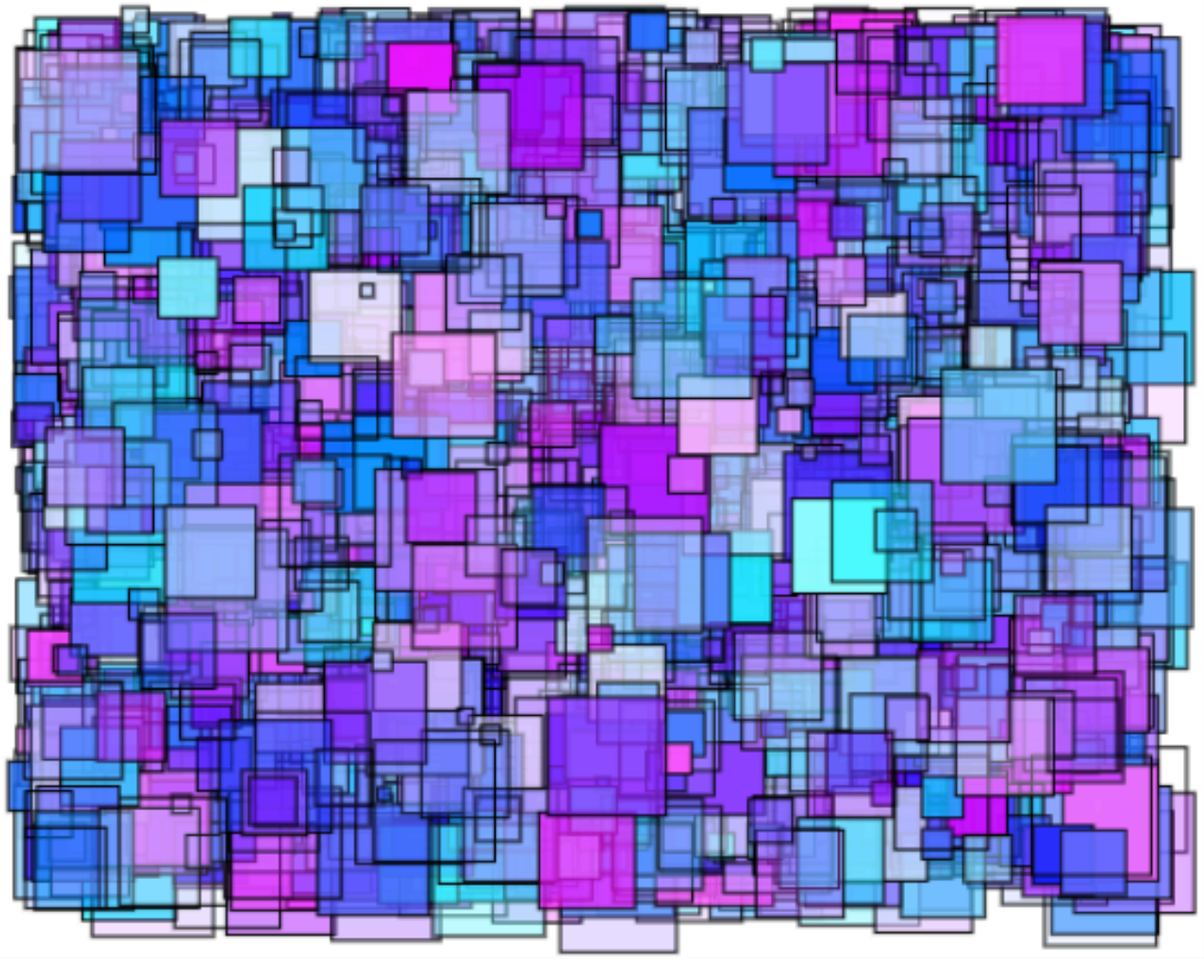
file: RandomRects.js

QUICKSTART

sketch.js

```
function setup() {
  createCanvas(500, 400);
  background(255);
}

function draw() {
  let x = random(0, width);
  let y = random(0, height);
  let sz = random(5, 50);

  let r = random(0, 255);
  let g = random(0, 255);
  let a = random(0, 255);

  fill(r, 255-g, 255, a);
  square(x, y, sz);
}
```

Preview



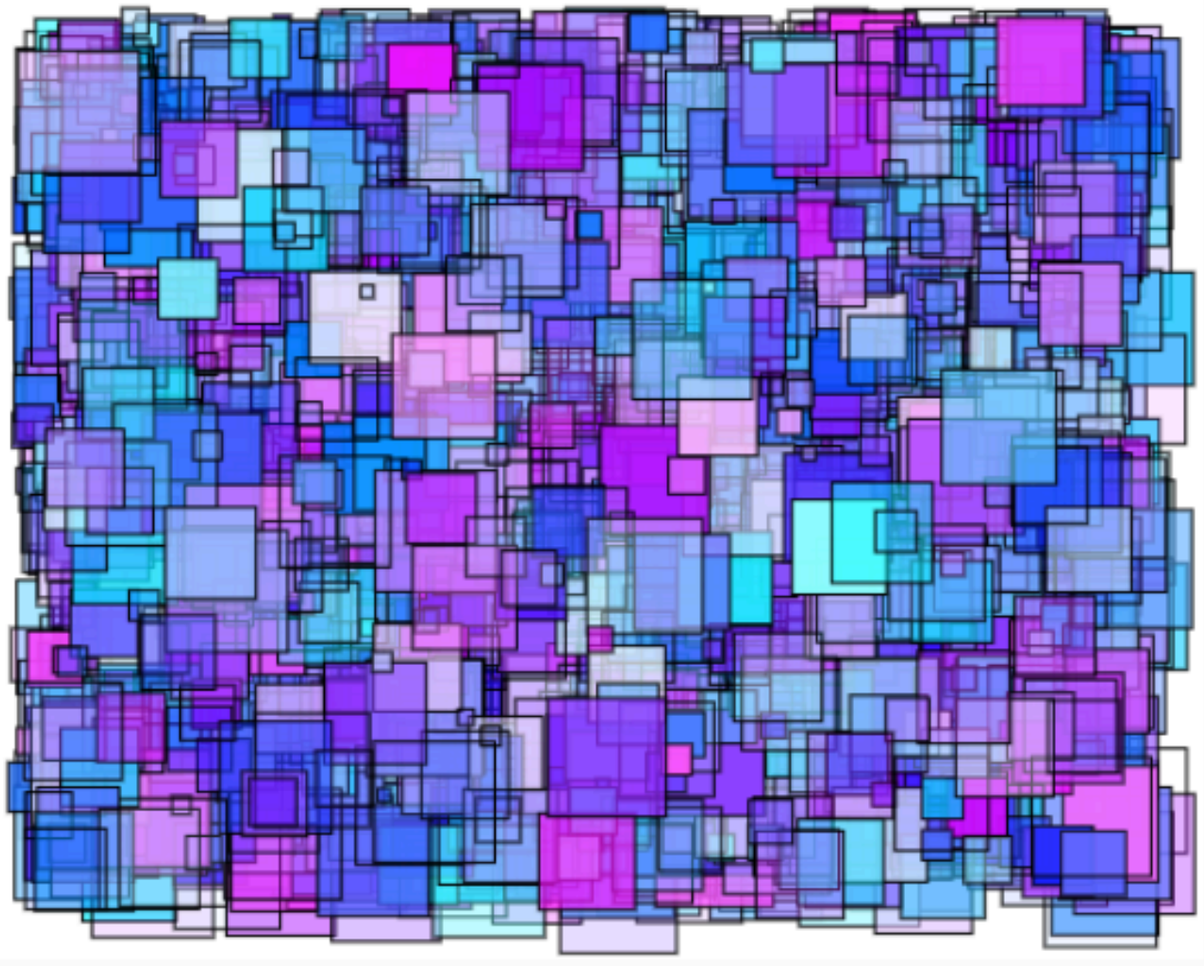
file: RandomRects.js

QUICKSTART

sketch.js

```
function setup() {
  createCanvas(500, 400);
  background(255);
}

function draw() {
  let x = random(0, width);
  let y = random(0, height);
  let sz = random(5, 50);

  let r = random(0, 255);
  let g = random(0, 255);
  let a = random(0, 255);

  fill(r, 255-g, 255, a);
  square(x, y, sz);
}
```

Preview



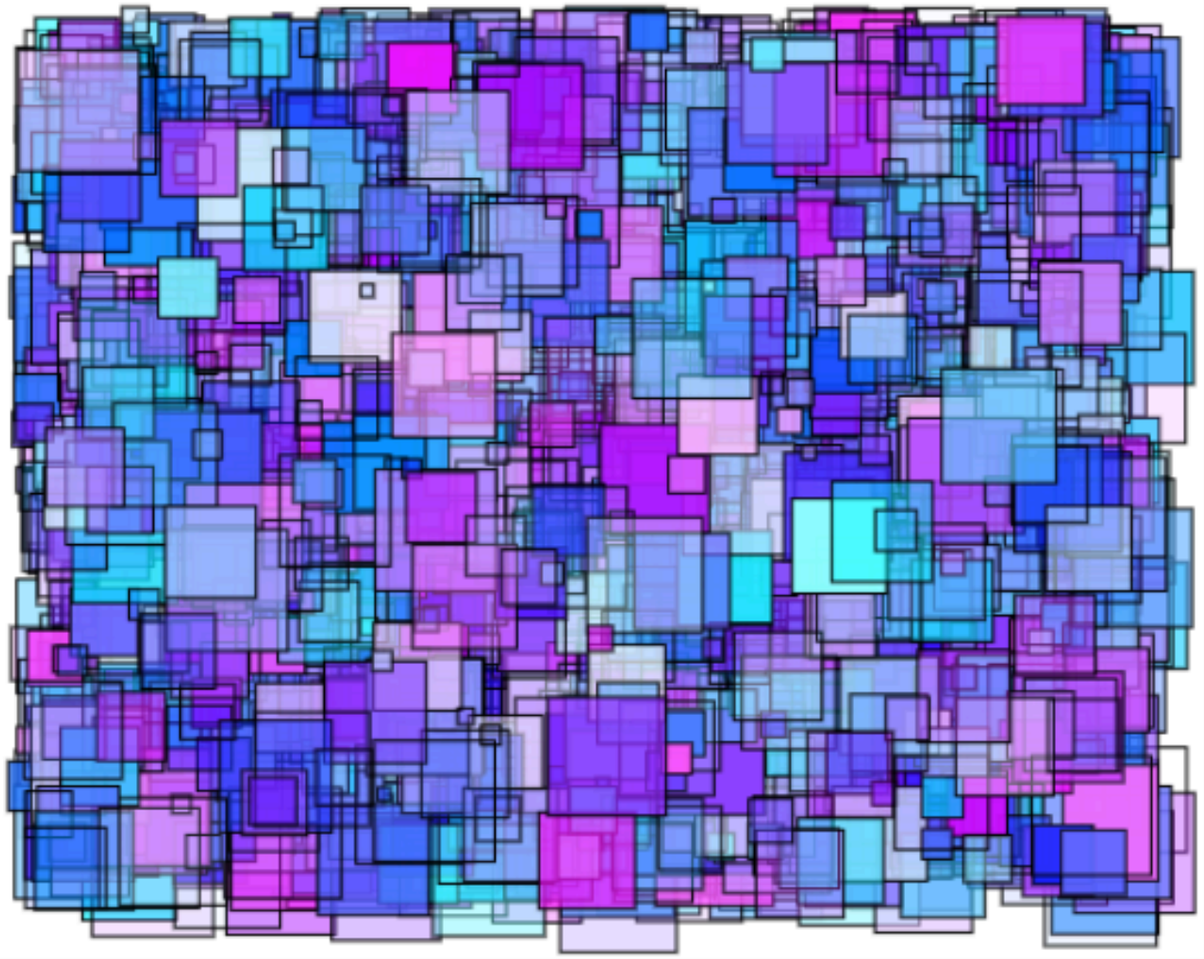
file: RandomRects.js

QUICKSTART

sketch.js

```
function setup() {
  createCanvas(500, 400);
  background(255);
}

function draw() {
  let x = random(0, width);
  let y = random(0, height);
  let sz = random(5, 50);

  let r = random(0, 255);
  let g = random(0, 255);
  let a = random(0, 255);

  fill(r, 255-g, 255, a);
  square(x, y, sz);
}
```

Preview



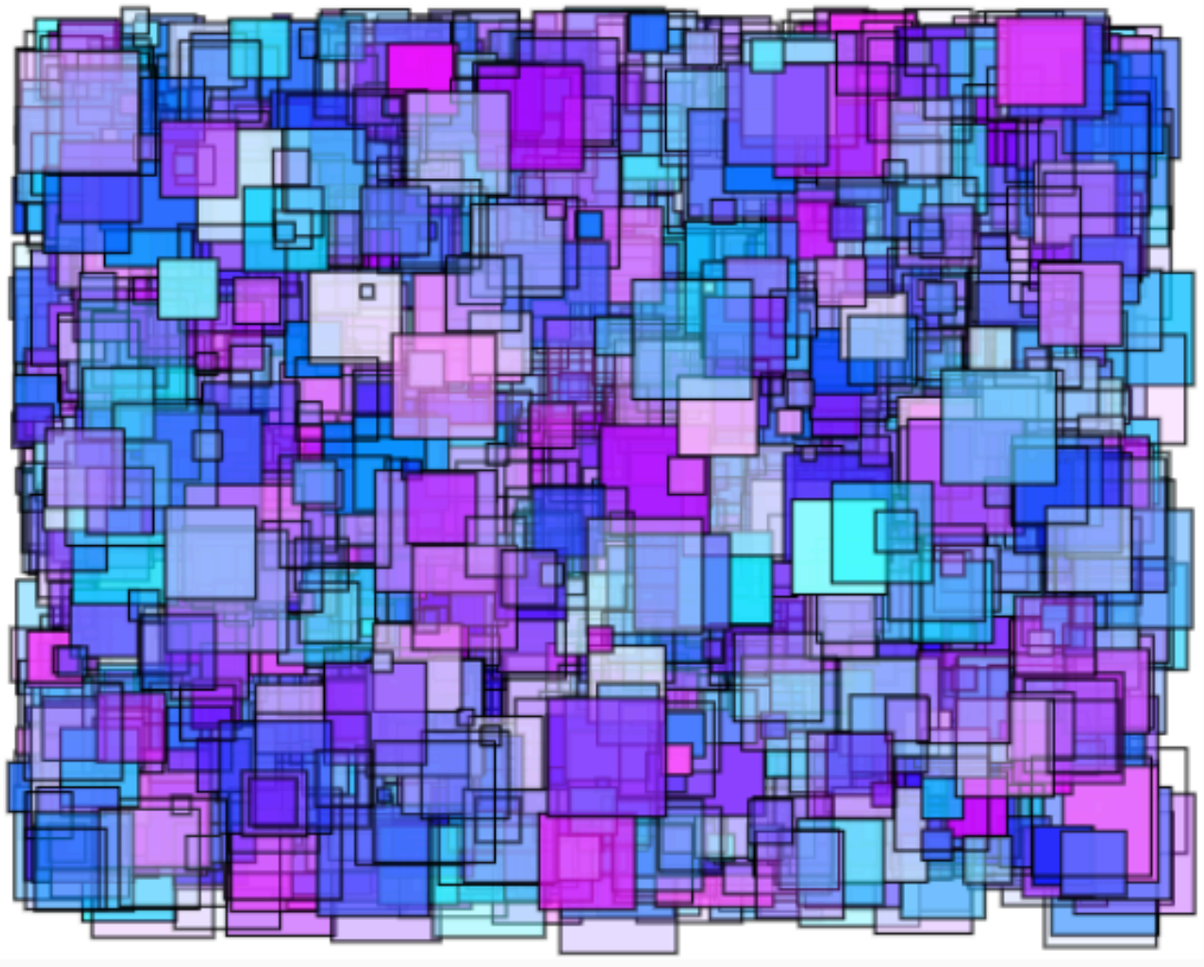
file: RandomRects.js

QUICKSTART

sketch.js

```
function setup() {
  createCanvas(500, 400);
  background(255);
}

function draw() {
  let x = random(0, width);
  let y = random(0, height);
  let sz = random(5, 50);

  let r = random(0, 255);
  let g = random(0, 255);
  let a = random(0, 255);

  fill(r, 255-g, 255, a);
  square(x, y, sz);
}
```

Preview



THEORETICAL

CAN WE DEFINE RANDOMNESS ?

RANDOMNESS HAS AN INCREDIBLY POWERFUL PLACE IN OUR CULTURE. IF YOU THINK ABOUT IT, YOU CAN SEE IT DRIVING THE ALGORITHMS THAT RUN OUR INFORMATION ECONOMY, PATTERNS THAT MAKE UP THE TRAFFIC OF OUR CITIES, AND ON OVER TO THE WAY THE STARS AND GALAXIES FORMED.

DJ SPOOKY

HOW TO DEFINE RANDOMNESS ?

RANDOMNESS

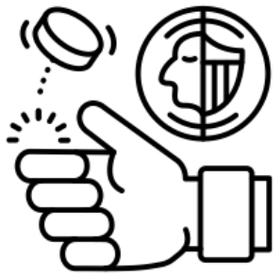
IS ‘2’ A RANDOM NUMBER ?

RANDOMNESS

A NUMBER IS RANDOM WHEN THERE IS AN EQUAL PROBABILITY FOR IT TO BE SELECTED FROM A SET OF POSSIBLE VALUES...

RANDOMNESS

from Mathematics

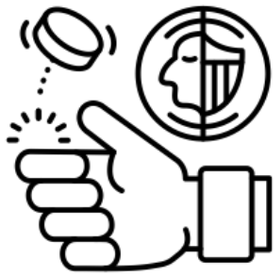


CONSIDER THE FOLLOWING TWO SEQUENCES OF 20 COIN FLIPS:

A. `HTHHTTTHTTTHTHHHTHTH`

B. `TTTTTTTTTTTTTTTTTTTT`

WHICH IS MORE LIKELY, A OR B?

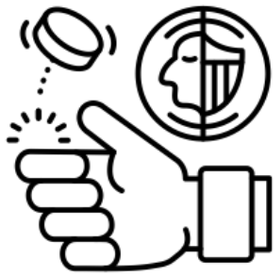


ACCORDING TO PROBABILITY, THE TWO ARE EQUALLY LIKELY, EACH HAVING A CHANCE OF 1 IN 1024

A. `HTHHTTTHTTTTHTHHHTHTHH`

B. `TTTTTTTTTTTTTTTTTTTTTTTT`

BUT WHICH SEQUENCE IS MORE RANDOM?

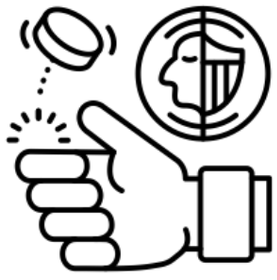


ACCORDING TO PROBABILITY, THE TWO ARE EQUALLY LIKELY, EACH HAVING A CHANCE OF 1 IN 1024

A. `HTHHTTTHTTTTHTHHHTHTHH`

B. `TTTTTTTTTTTTTTTTTTTTTTTT`

BUT WHICH SEQUENCE IS MORE RANDOM?



ACCORDING TO PROBABILITY, THE TWO ARE EQUALLY LIKELY, EACH HAVING A CHANCE OF 1 IN 1024

A. `HTHHTTTHTTTTHTHHHTHTHH`

B. `TTTTTTTTTTTTTTTTTTTTTTTT`

BUT WHICH SEQUENCE IS MORE RANDOM?

LET'S DESCRIBE EACH AS CONCISELY AS POSSIBLE

B. `TTTTTTTTTTTTTTTTTTTT`

→ *write T 20 times*

A. `HTHHTTTHTTTTHTHHHTHTHH`

???

FOR A, THE BEST WE CAN DO IS TO LIST THE WHOLE SEQUENCE ITSELF...

HTHHTTTHTTTTHTHHHTHTHH

LET'S ADD ONE MORE SEQUENCE...

C. `TTFFTTFFTTFFTTFFTTFF`

???

B. `TTTTTTTTTTTTTTTTTTTT`

write T 20 times

A. `HTHHTTTHTTTHTHHHTHTH`

write HTHHTTTHTTTHTHHHTHTH

LESS RANDOM (SHORTER)

B. `TTTTTTTTTTTTTTTTTTTT`

write T 20 times

C. `TTFFTTFFTTFFTTFFTTFF`

write TTFF 5 times

A. `HTHHTTTHTTTTHTHHHHTHTH`

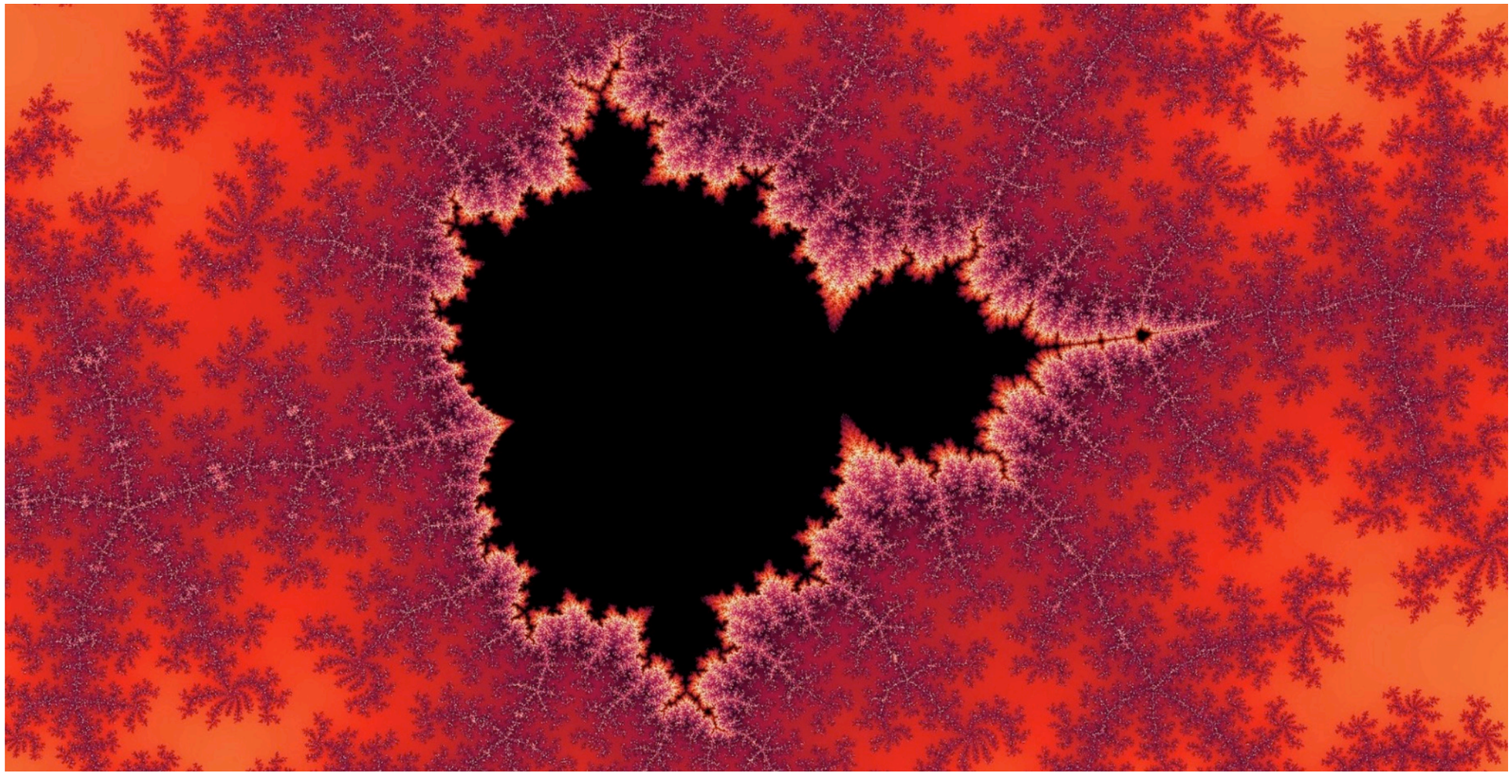
write HTHHTTTHTTTTHTHHHHTHTH

MORE RANDOM (LONGER)

from Kolmogorov, 1965

THE THEORY OF **KOLMOGOROV COMPLEXITY**
IS BASED ON A SIMPLE INSIGHT:

random objects (or sequences) cannot be described with a short program

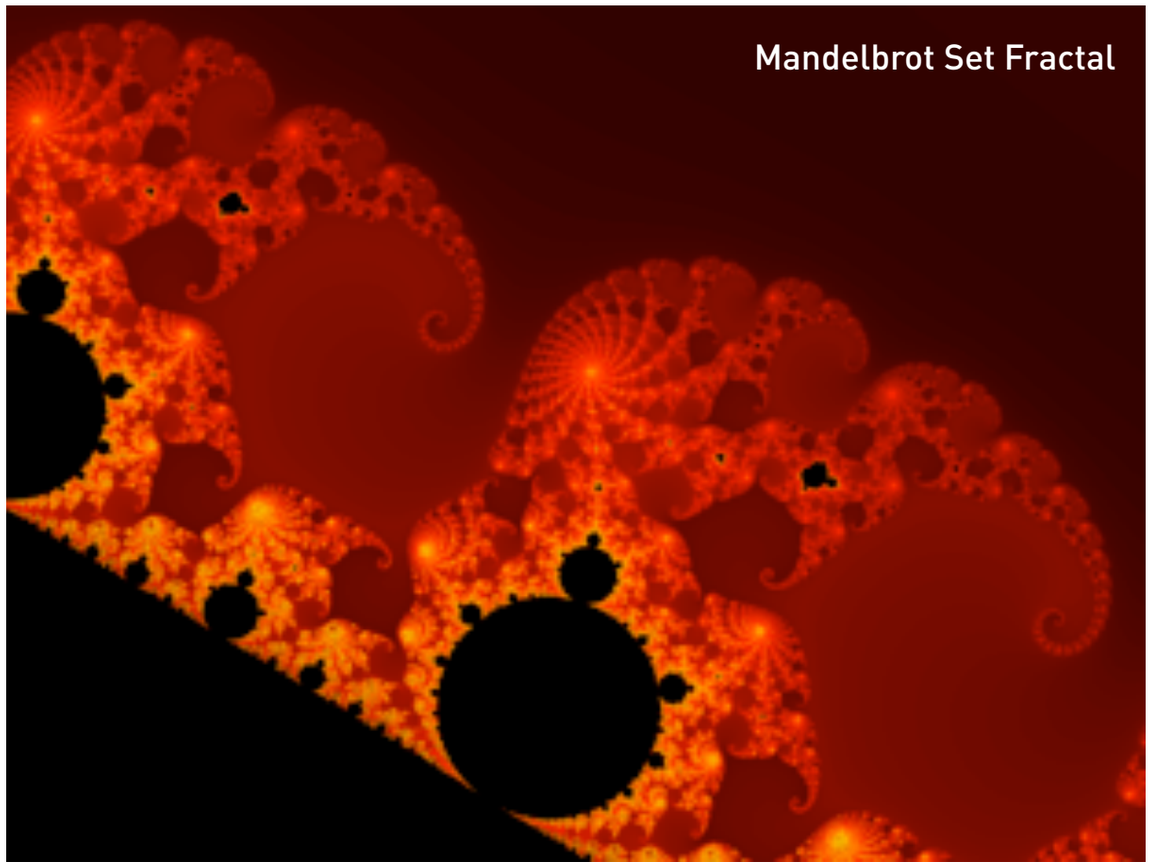


KOLMOGOROV COMPLEXITY

- Storing the 24-bit color of each pixel in this Mandelbrot set fractal would requires around 1.6 million bytes

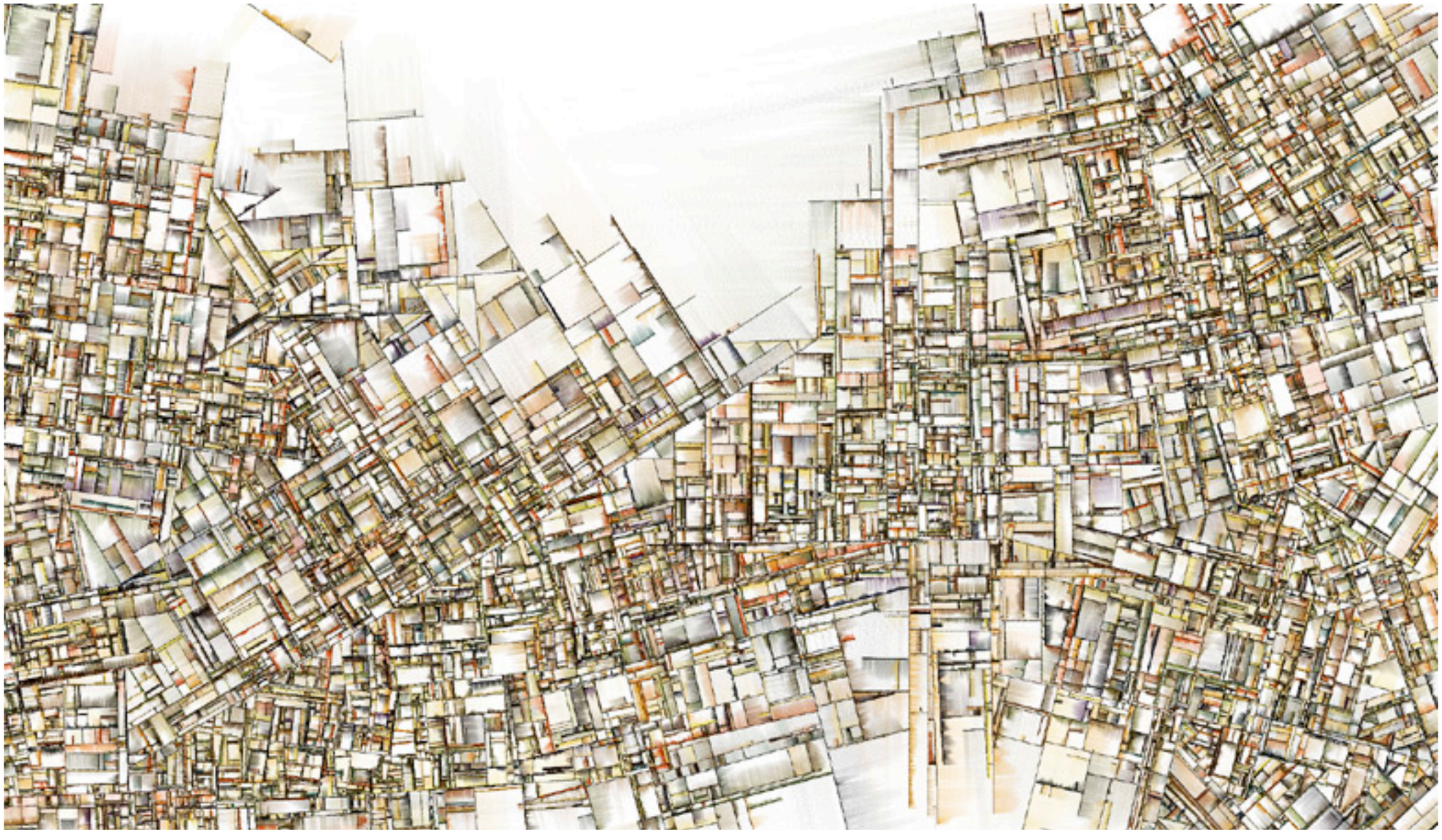
- Yet a short program can reproduce the image using the definition of the Mandelbrot set

- Thus, the complexity of the image is far less than 1.6 million bytes, or, equivalently that it is not very random at all…



KOLMOGOROV'S APPROACH WAS ANOTHER WAY OF ASKING ...

IS THERE A PATTERN TO THE SEQUENCE?



Jared Tarbell, Substrate, 2003

RANDOMNESS IN ART + DESIGN

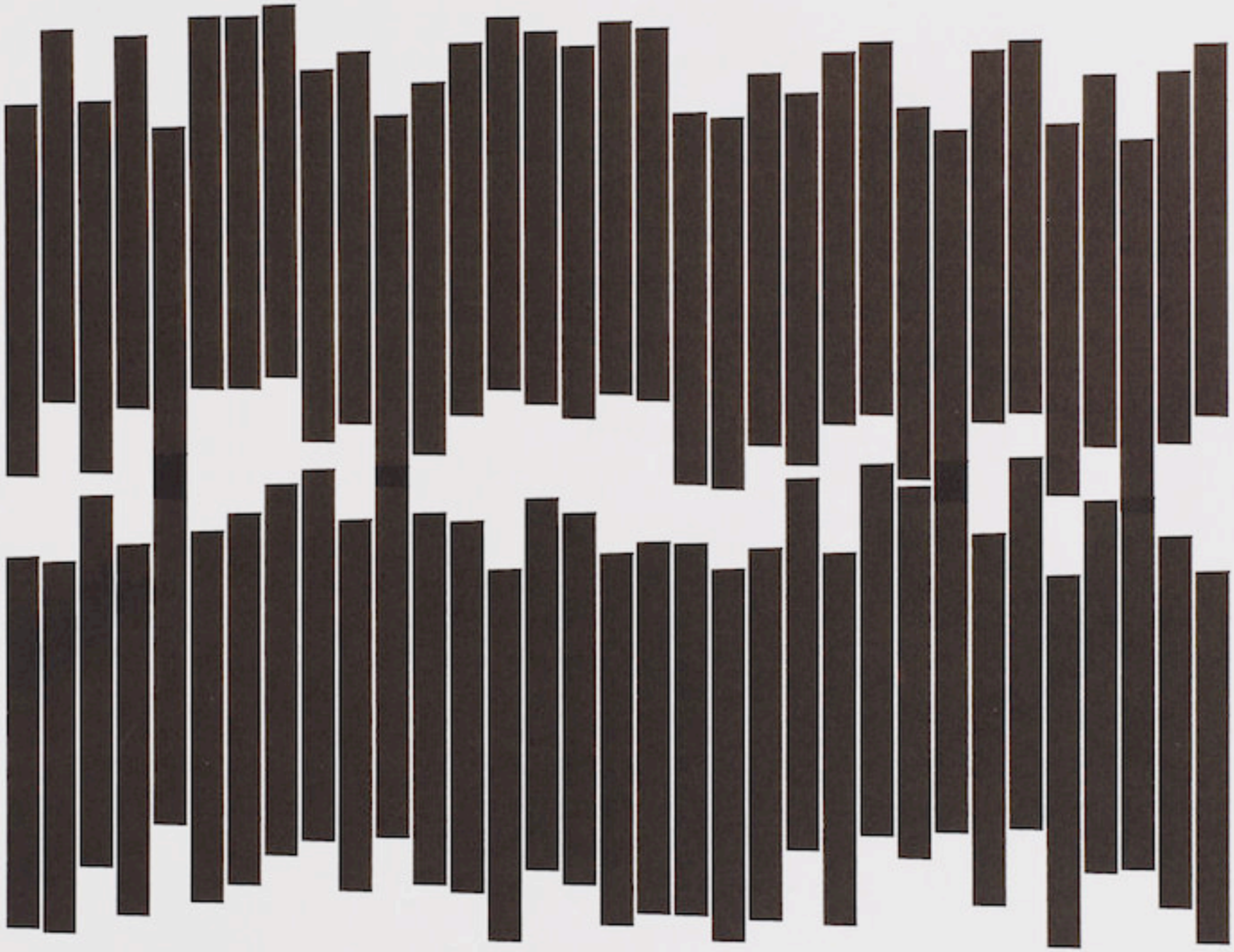
HISTORICAL EXAMPLES

VERA MOLNAR

“The machine, thought to be cold and inhuman, can help to realize what is most subjective, unattainable, and profound in a human being.

-Vera Molnár

Vera Molnár (born 1924) is a French media artist of Hungarian origin. She is a pioneer of computer and generative art, active for over 75 years...



VERA MOLNAR

PERHAPS YOU ARE WONDERING WHY ARTISTS COPY PAINTINGS IN MUSEUMS, AS I AM DOING. THE ANSWER IS TO STUDY, TO LEARN, AND TO FIND INSPIRATION FROM THE GREAT MASTERS OF THE PAST.

COPYING DIRECTLY FROM WORKS OF ART GIVES THE ARTIST INSIGHT INTO THE CREATIVE PROCESS: INSIGHTS WHICH CANNOT BE LEARNED FROM ANY OTHER SOURCE.

- GERALD KING

RECODING

Marcel Duchamp

3 Standard Stoppages

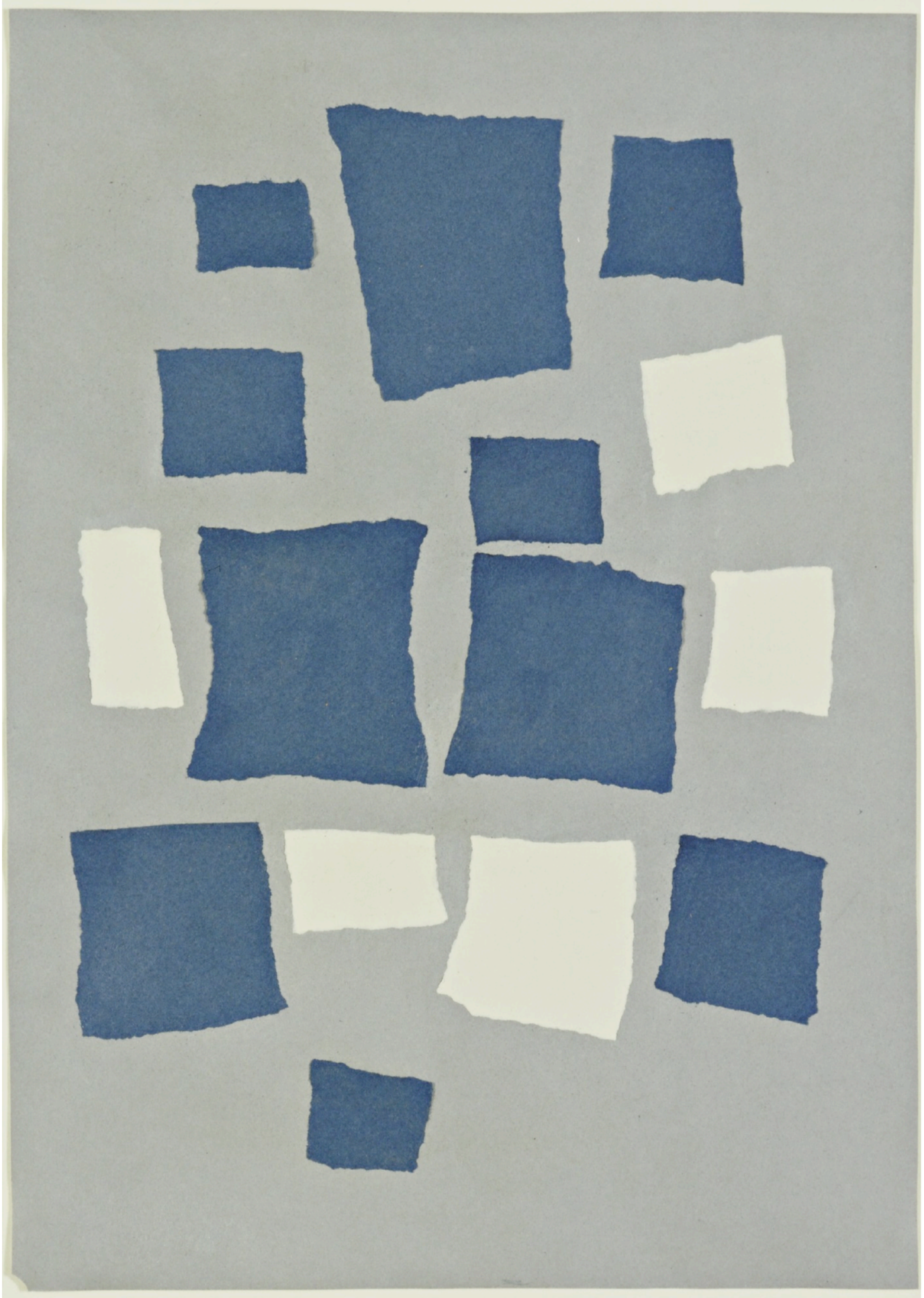
Paris 1913-14

In *3 Standard Stoppages* (*3 stoppages étalon*), Duchamp dropped three meter-long lengths of thread onto three stretched canvases, where they were then adhered, in order to preserve the random curves they assumed upon landing

“ *If a straight horizontal thread one meter long falls from a height of one meter onto a horizontal plane twisting as it pleases, [it] creates a new image of the unit of length…*

DADA

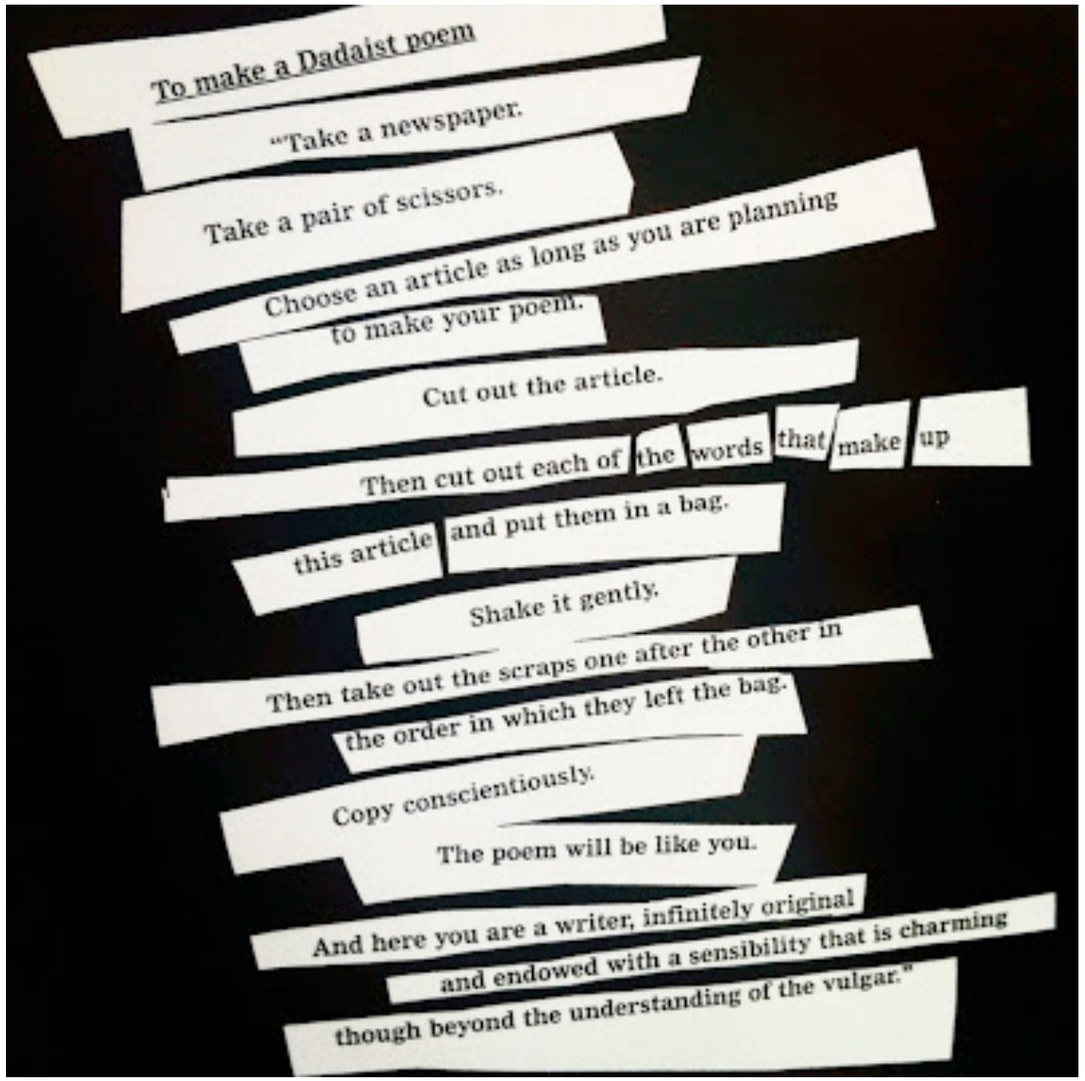
In this and similar works, Dadaist Jean Arp played with random composition by dropping painted pieces of paper onto a surface, then gluing them into place…



Jean (Hans) Arp
Untitled (Collage with Squares Arranged according to the Law of Chance)
1916–17

TO MAKE A DADAIST POEM

TRISTAN TZARA, 1951



ASSESMENT

voltaic arc of these two nerves that don't touch

near the heart

we note the black shivers under a lens

is this feeling this white spouting

and methodical love

splits my body into rays

toothpaste pastry

transatlantic

tickets

the crowds crash the column couched in wind

range of rockets

on my head

the bloody revenge of the liberated two-step

directory of determinations at prix fixe

folly at 3:20 am

or 5.80 francs

cocaine slowly gnaws the walls for its pleasure

satanic horoscope dilates under your vigor

VIRGIL'S VIGILANCE VERIFIES THE VIRAL WIND

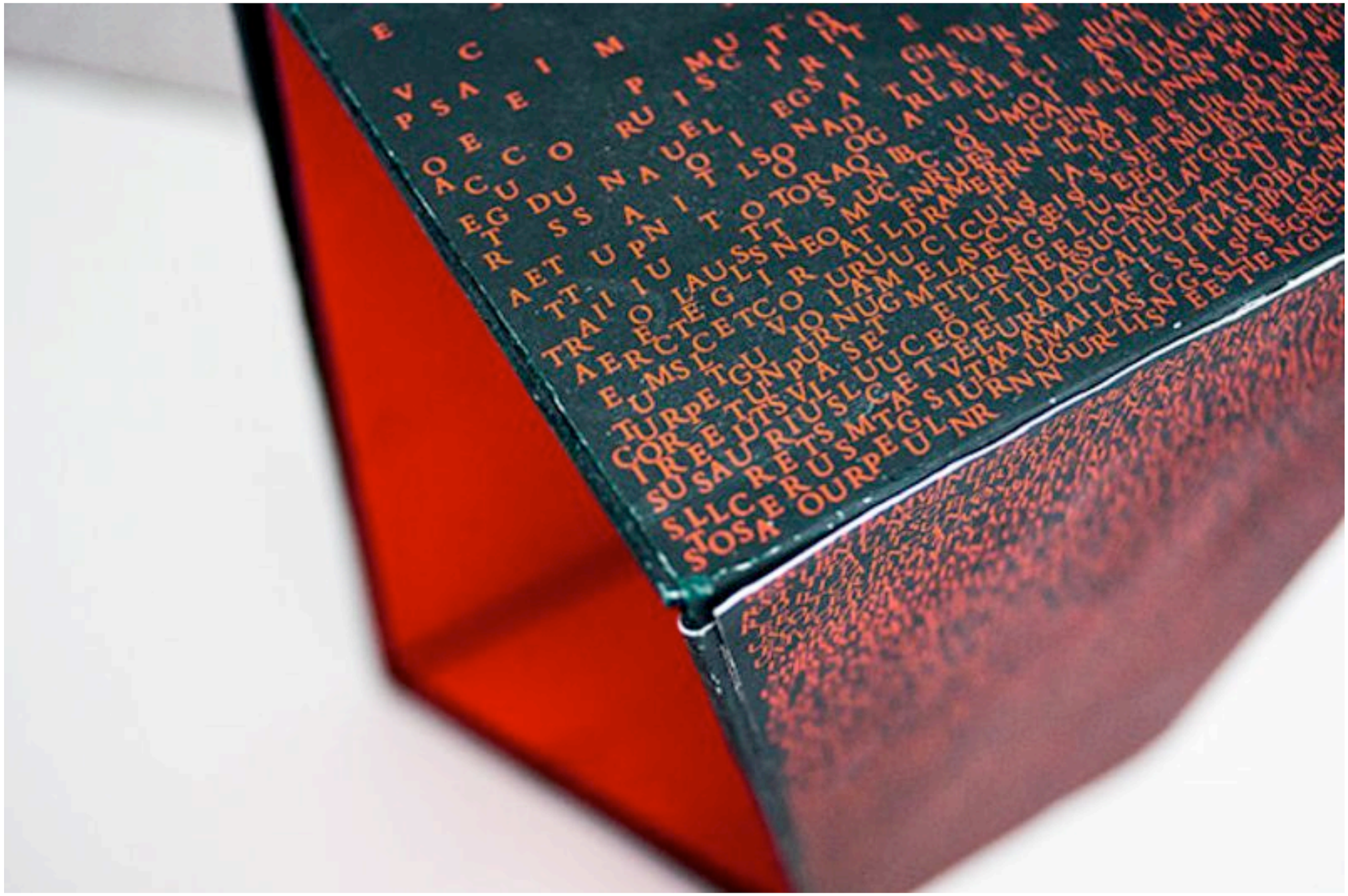
eyes droop once more

TRISTAN TZARA

RANDOMNESS IN DESIGN

Paul Rand

RANDOMNESS IN DESIGN



Design by Zhuoshi Xie, for a John Cage novel

MUSIC OF CHANGES

JOHN CAGE, 1951

“
the first sound composition to be largely determined by random procedures…

Music of Changes for solo piano, composed by John Cage in 1951 for pianist and friend David Tudor, applied decisions made using the *I Ching*, a classical Chinese text commonly used as a divination system, to sounds durations, dynamics, tempo and densities.

EMILY MASON

Abstract painter Emily Mason (1932–2019) used the laws of chance and gravity to create vital works with poured paint. She believed in chance operation, particularly as experienced in New York, where, she said, “you could be inspired by a tropical fruit in Chinatown and an exhibition on Byzantine art uptown…”

Emily Mason, The Bullock Farm, 1987, Oil on canvas

TIM KNOWLES

Tim Knowles, Oak/Larch On Easel (2005)

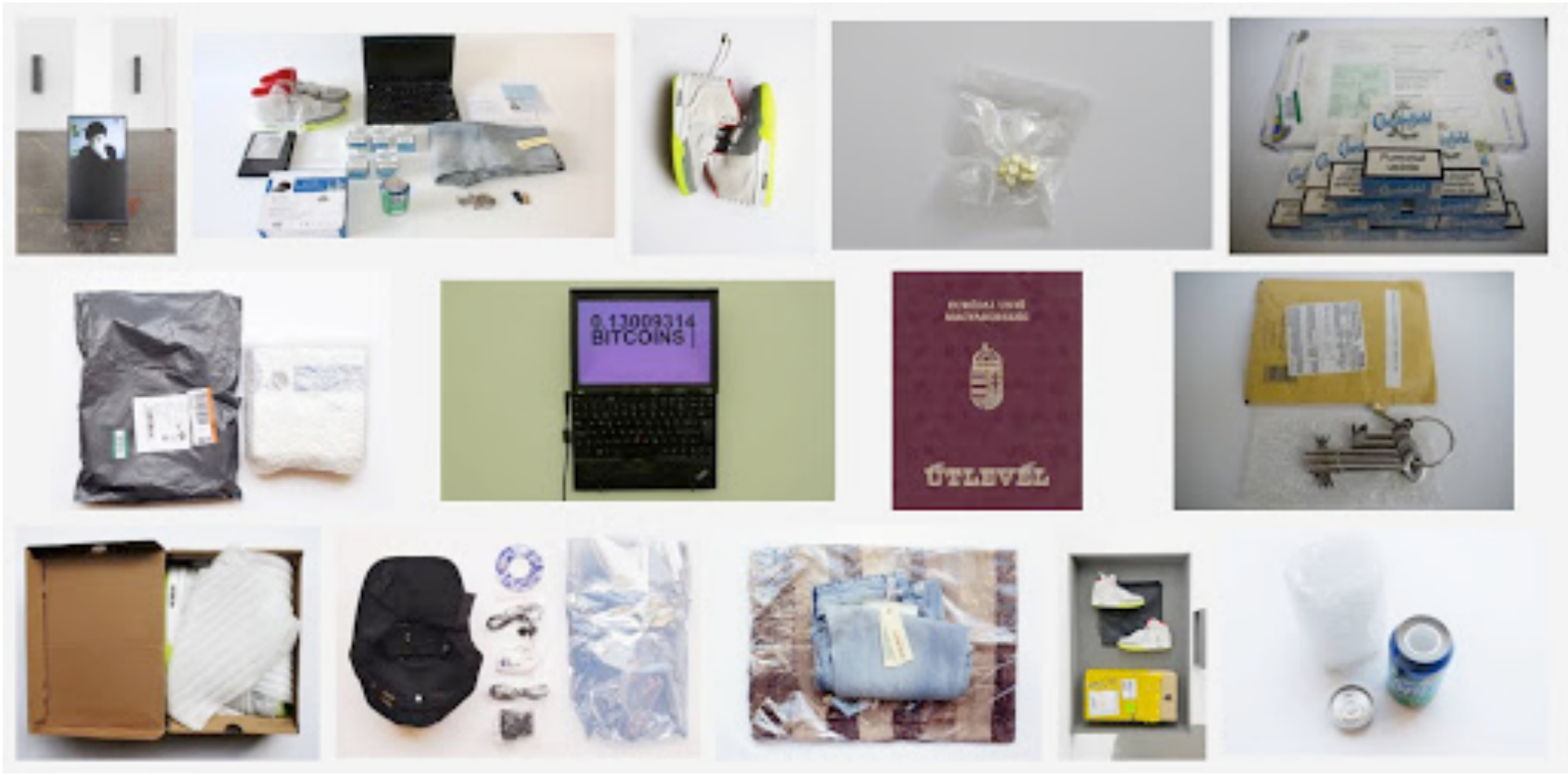
CAROLEE SCHNEEMANN

Schneemann's video *American I-Ching Apple Pie (*1977) incorporated the notion of chance as a ruling cosmological principle, associated with the *I-Ching,* to free women from the confines of both the kitchen and the rational recipe.

Schneemann chose her cooking tools randomly, including colanders, strainers, nails, hammers, arrows, and ball bearings, using chance and Eastern philosophy to break down traditional gender boundaries.

Filippone, Christine. " Science, Technology, and Utopias: Women Artists and Cold War America". Routledge, 2017

RANDOMNESS AS CRITICAL INTERVENTION



AN ALGORITHM WITH A WEEKLY BUDGET OF $100 IN BITCOIN, RANDOMLY PURCHASES ITEMS FROM THE DARK WEB, INCLUDING ECSTASY, A HUNGARIAN PASSPORT, AND A BASEBALL CAP WITH A BUILT-IN CAMERA...

IN JANUARY 2015, THE SWISS POLICE CONFISCATED THE ROBOT AND ITS ILLEGAL PURCHASES. THEN THREE MONTHS LATER, RETURNED ALL (MINUS THE ECSTASY)

Random Darknet Shopper (2014-16) !Mediengruppe Bitnik

- INTRODUCTION: RESOURCES
- THEORETICAL: DEFINITIONS
- AESTHETIC: EXAMPLES IN ART
- STRATEGIC: WHY USE RANDOMNESS?
- TECHNICAL: USING RANDOMNESS EFFECTIVELY

OBJECTIVES

TO DARE EVERY DAY TO BE IRREVERENT AND BOLD.
TO DARE TO PRESERVE THE RANDOMNESS OF MIND
WHICH IN CHILDREN PRODUCES STRANGE AND
WONDERFUL NEW THOUGHTS AND FORMS. TO
CONTINUALLY SCRAMBLE THE FAMILIAR AND
BRING THE OLD INTO NEW JUXTAPOSITION.

GORDON WEBBER

WHY USE RANDOMNESS ?

- diminish authorial control
- avoid common habits of the artist
- add variation to predictable outputs
- create surprise (for author or audience)
- explore a possibility space (see Molnár)
- conceptual or critical strategies

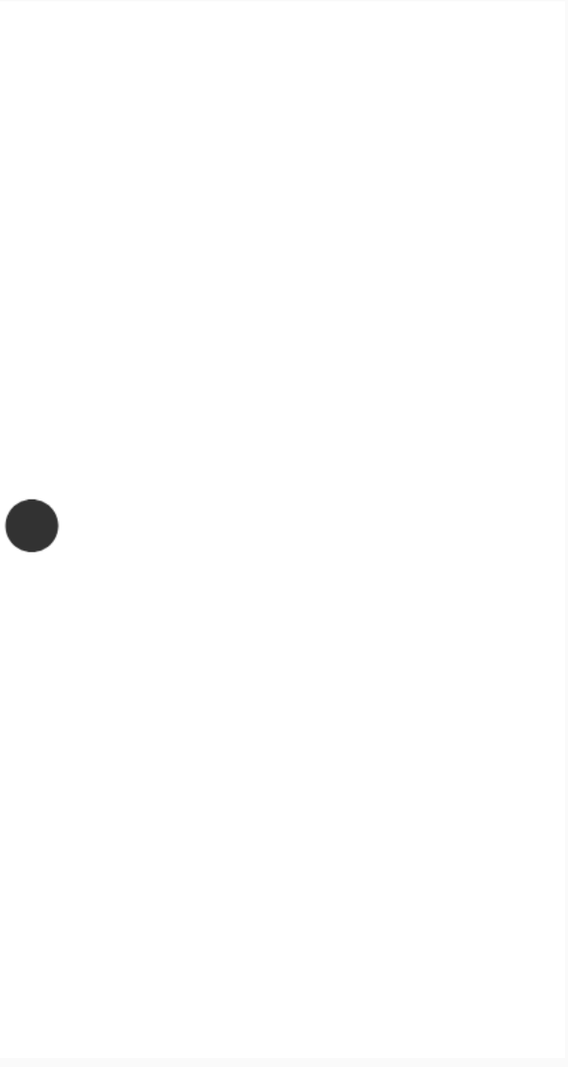
TECHNICAL

RANDOM WALK

sketch.js

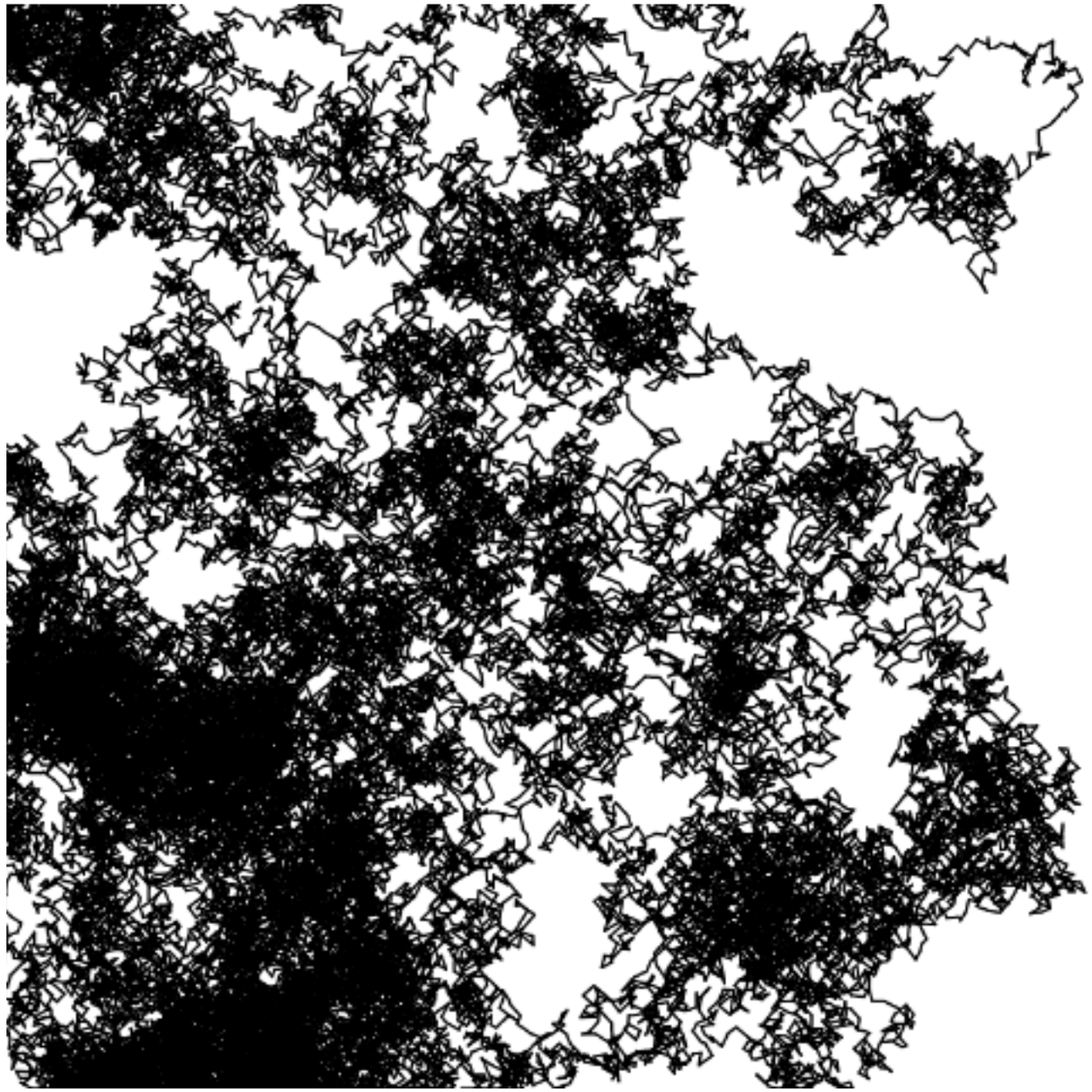
```
let x = 200, y = 200;

function setup() {

  createCanvas(400, 400);
  noStroke();
}

function draw() {

  x += random(-3, 3);
  y += random(-3, 3);

  background(255);
  fill(50);
  circle(x, y, 20);
}
```

Preview



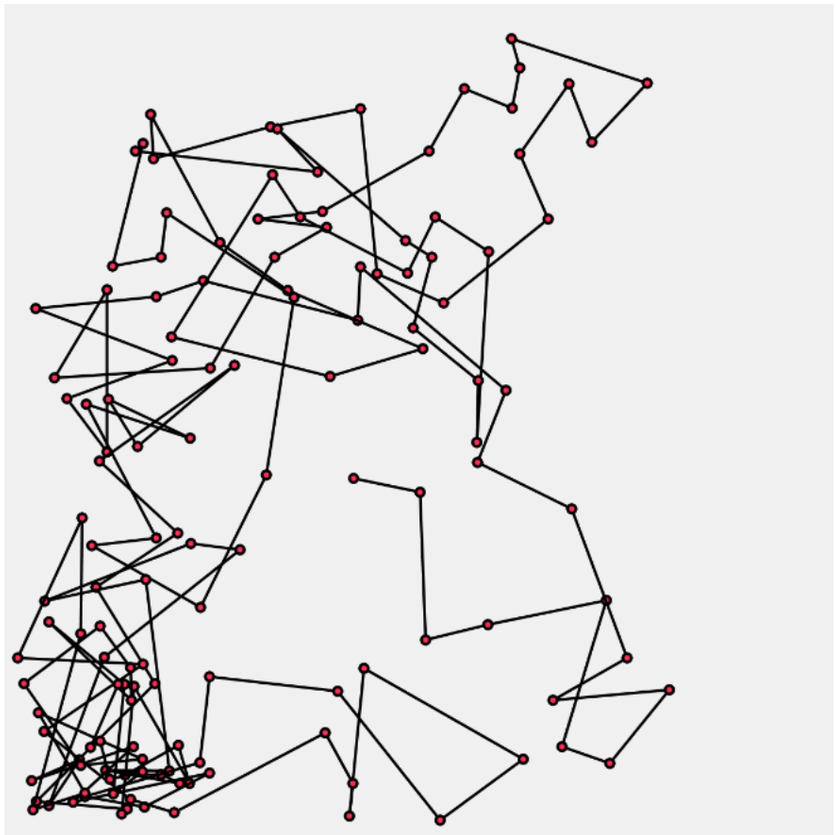
One of the most common techniques using randomness is the *random walk*, which shows up in a ranges of real-world contexts, from the movement of financial asset prices, to the paths of particles in quantum physics…

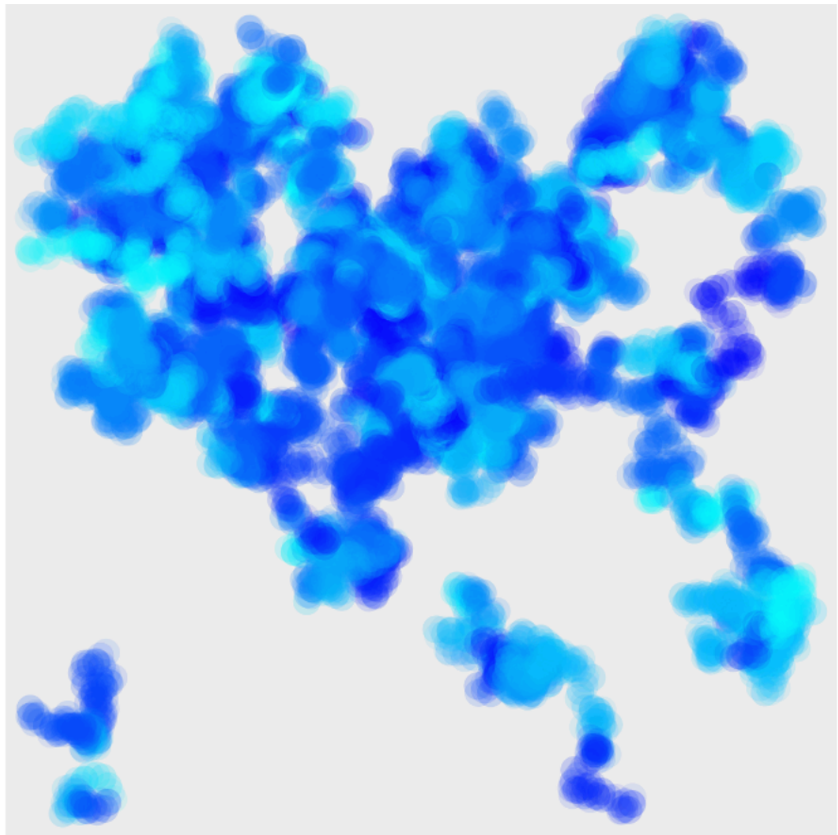
RANDOM WALK

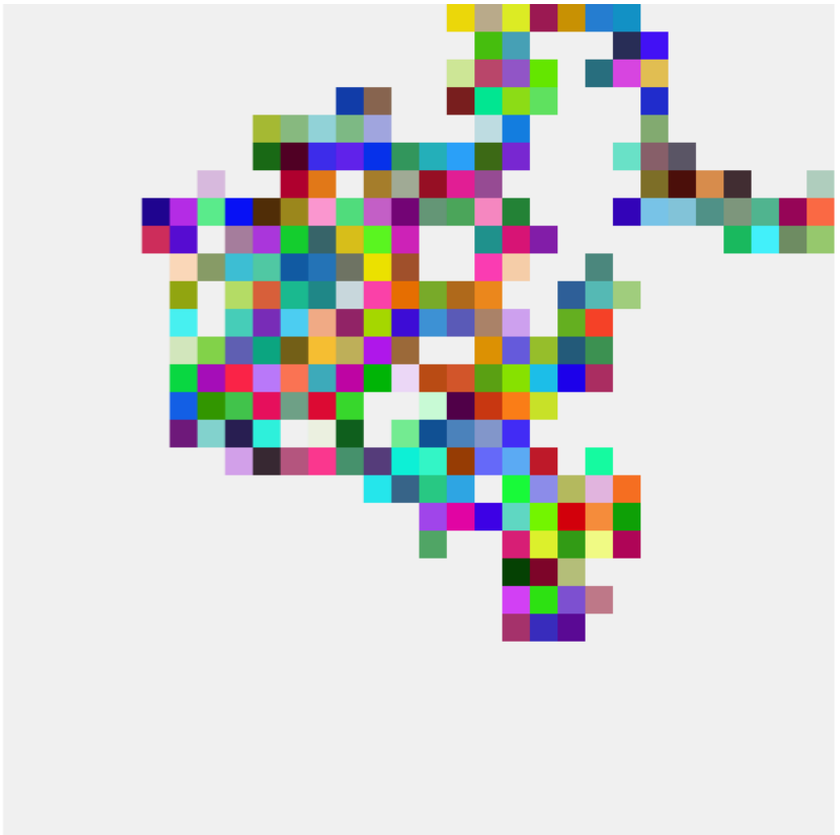


a single random walker over thousands of steps…

RANDOM WALK



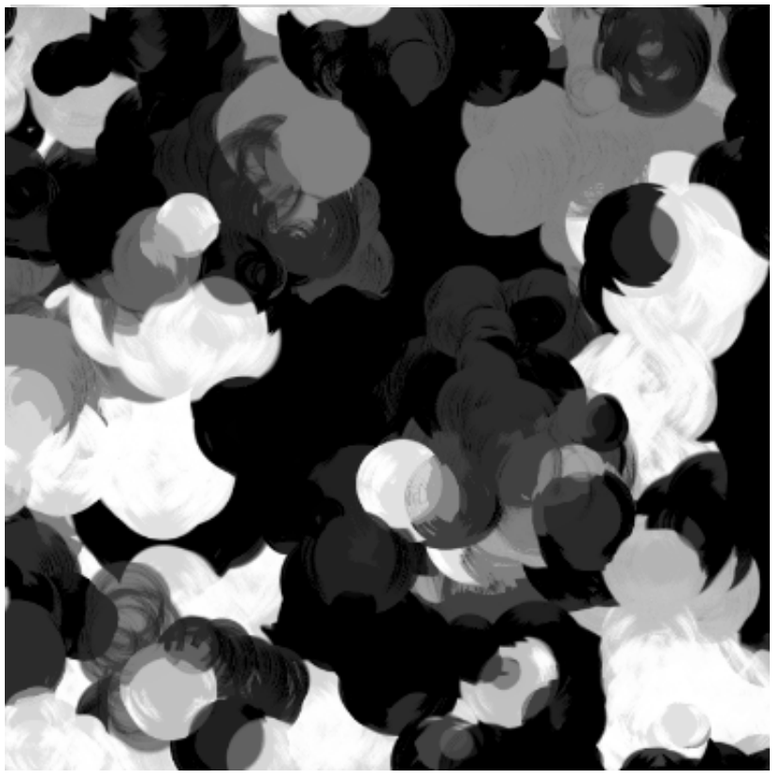




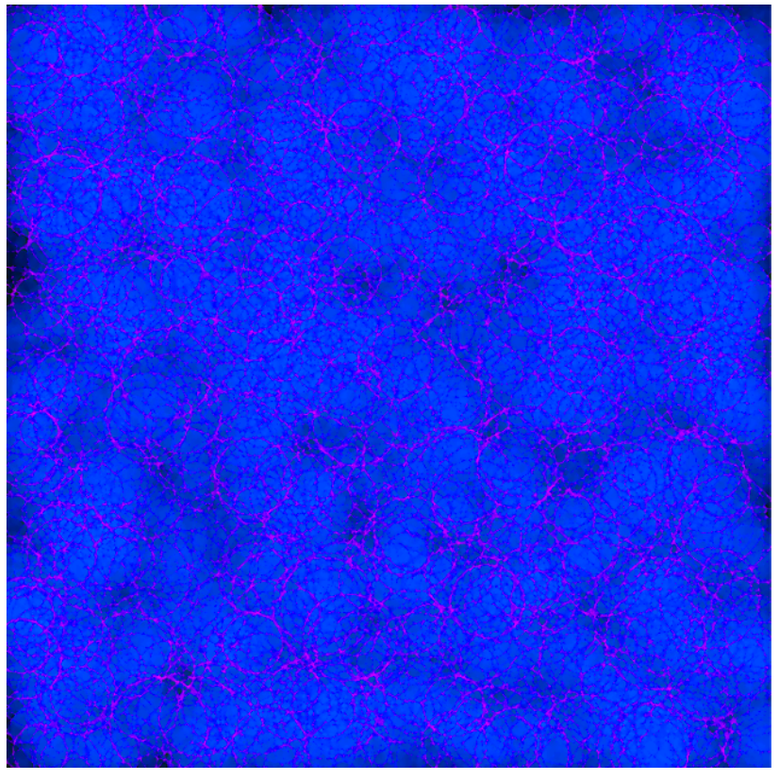
visualizing random walks…

Image credit: Lali Barrière

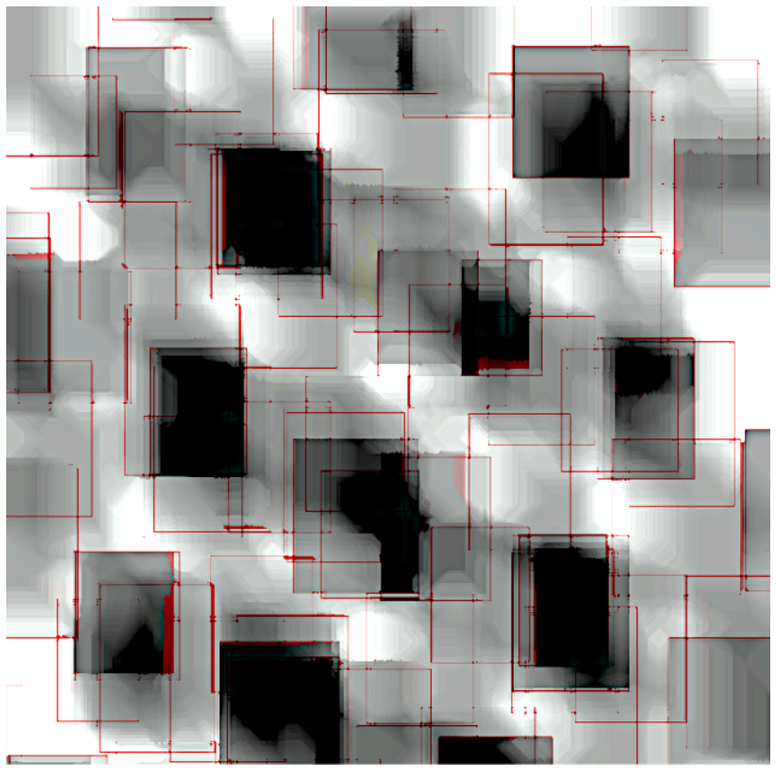
RANDOM WALK



as circles



on a grid



as rectangles

multiple random walkers interacting …

RANDOM WALK

multiple random walkers interacting …

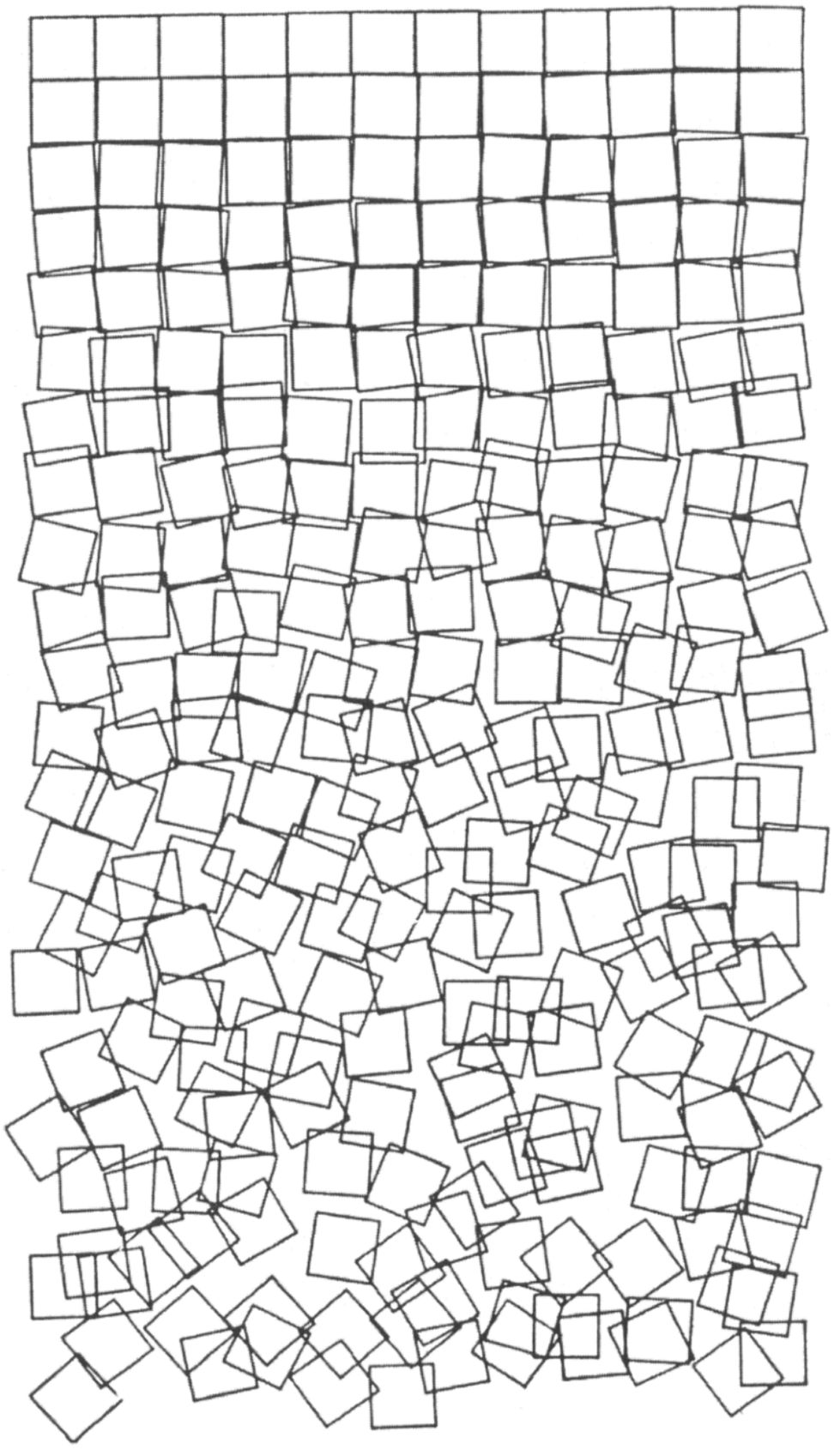
RECODING

COPYING DIRECTLY FROM WORKS OF ART GIVES THE ARTISTS INSIGHT INTO THE CREATIVE PROCESS: INSIGHTS WHICH CANNOT BE LEARNED FROM ANY OTHER SOURCE.

- GERALD KING

LET'S DESCRIBE THIS WORK AS CONCISELY AS WE CAN, USING PLAIN ENGLISH...

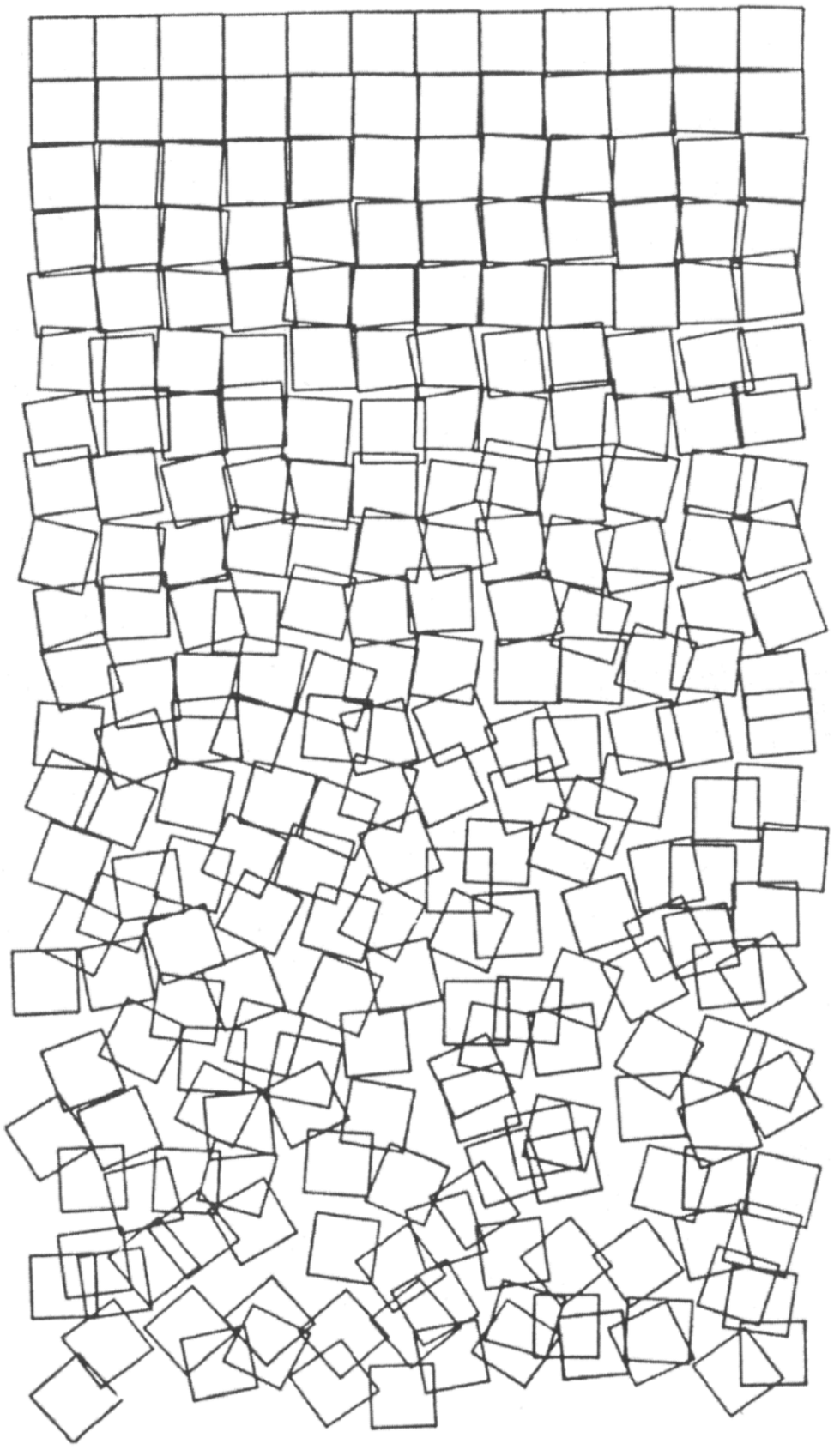
?



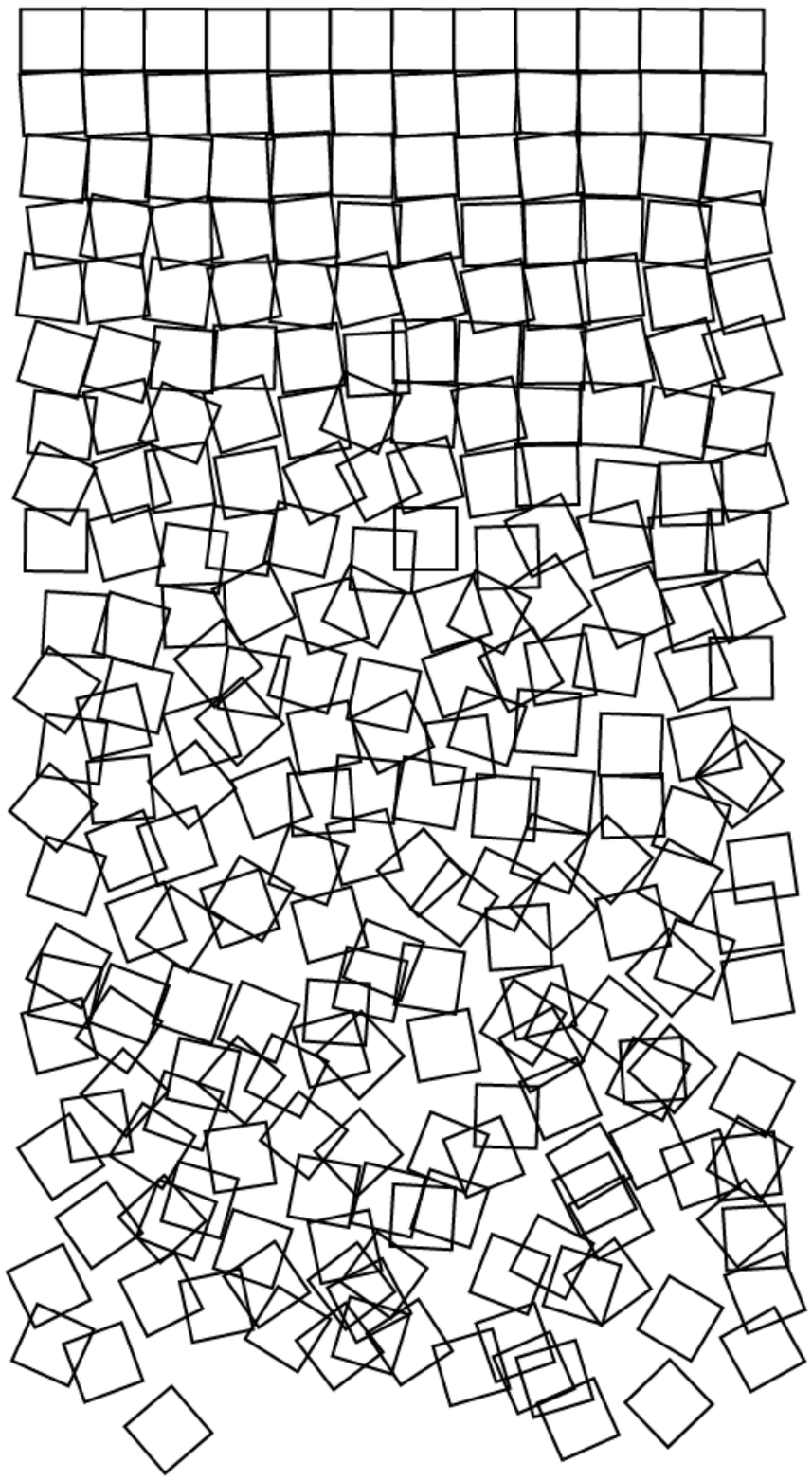
***Schotter (Gravel)* - Georg Nees, 1968**

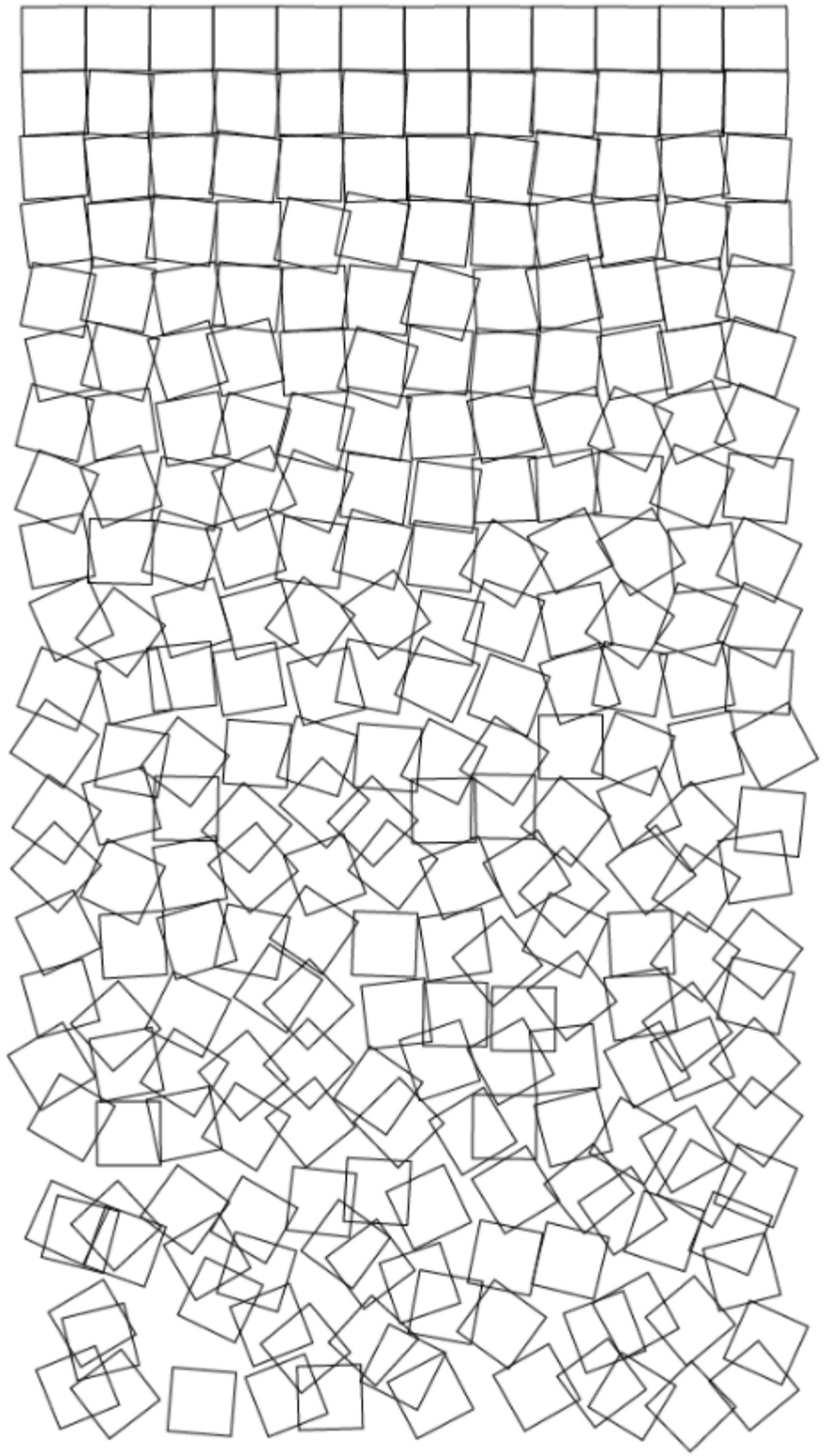
LET'S DESCRIBE THIS WORK AS CONCISELY AS WE CAN, USING PLAIN ENGLISH...

?



***Schotter (Gravel)* - Georg Nees, 1968**

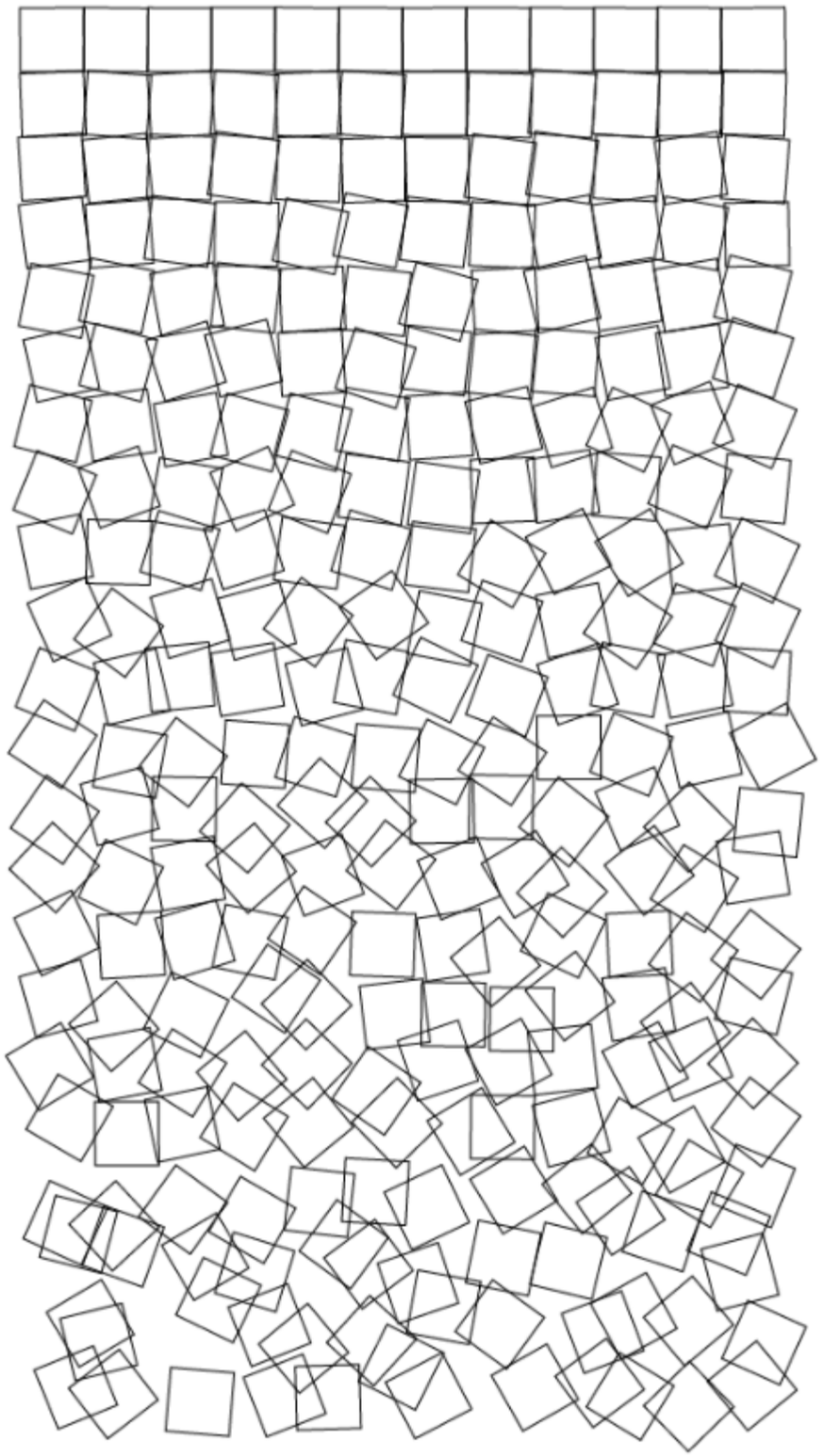




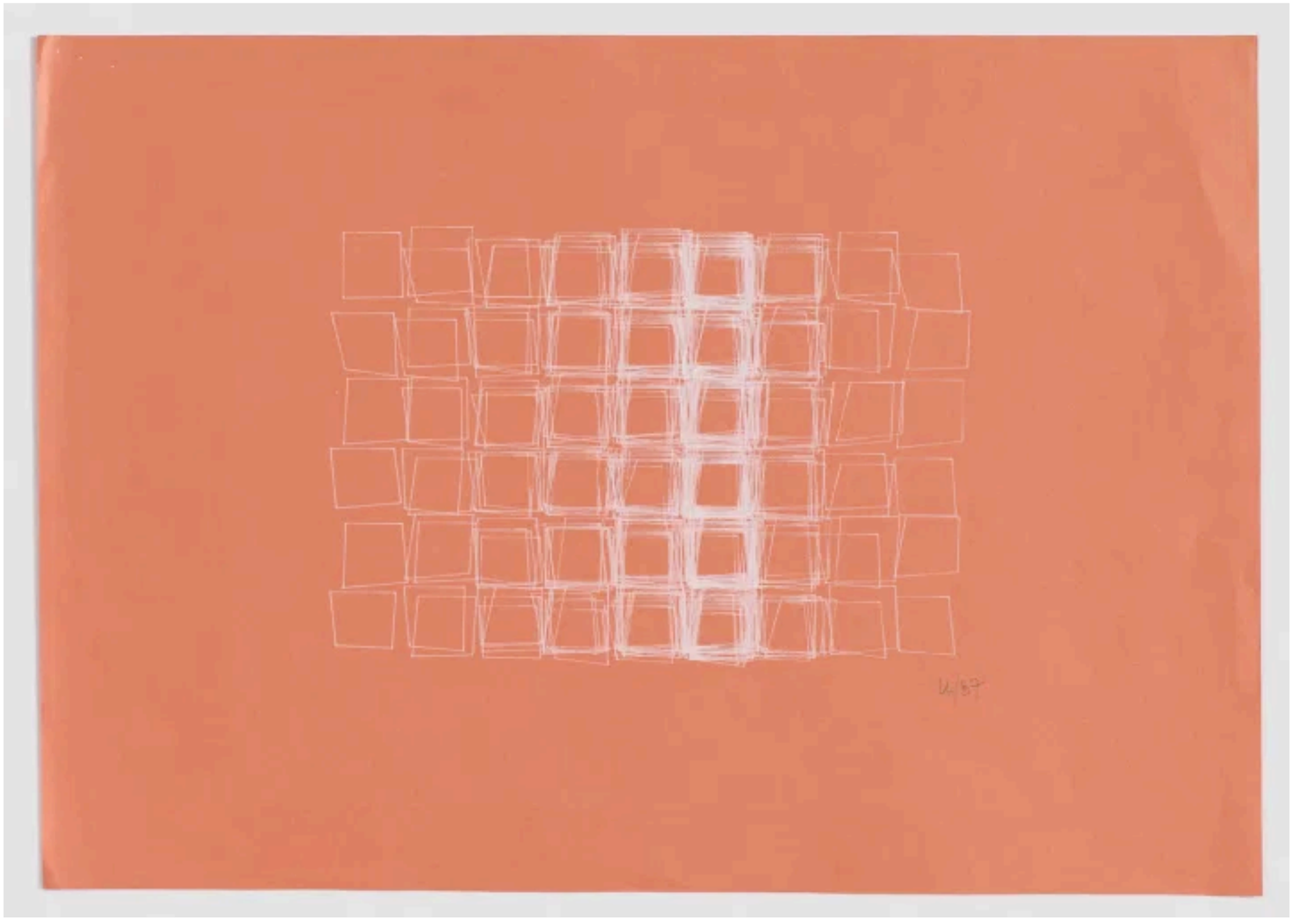
Recode of S*chotter (Gravel)* by Georg Nees, 2021

```
let sqSz = 20;

function setup() {

  createCanvas(400, 600);

  noFill();
  background(255);
  translate(width/5, height/8);

  for (let i = 0; i < 12; i++) {

    for (let j = 0; j < 22; j++) {

      let displace = max(j, 0.2);
      let randRot = random(-4, 4) * displace;
      let randShift = random() * displace;

      translate(i * sqSz, j * sqSz);
      rotate(radians(randRot));

      square(-sqSz / 2 + randShift, -sqSz / 2 + randShift, sqSz);

      rotate(radians(-randRot));
      translate(-i * sqSz, -j * sqSz);
    }
  }
}
```

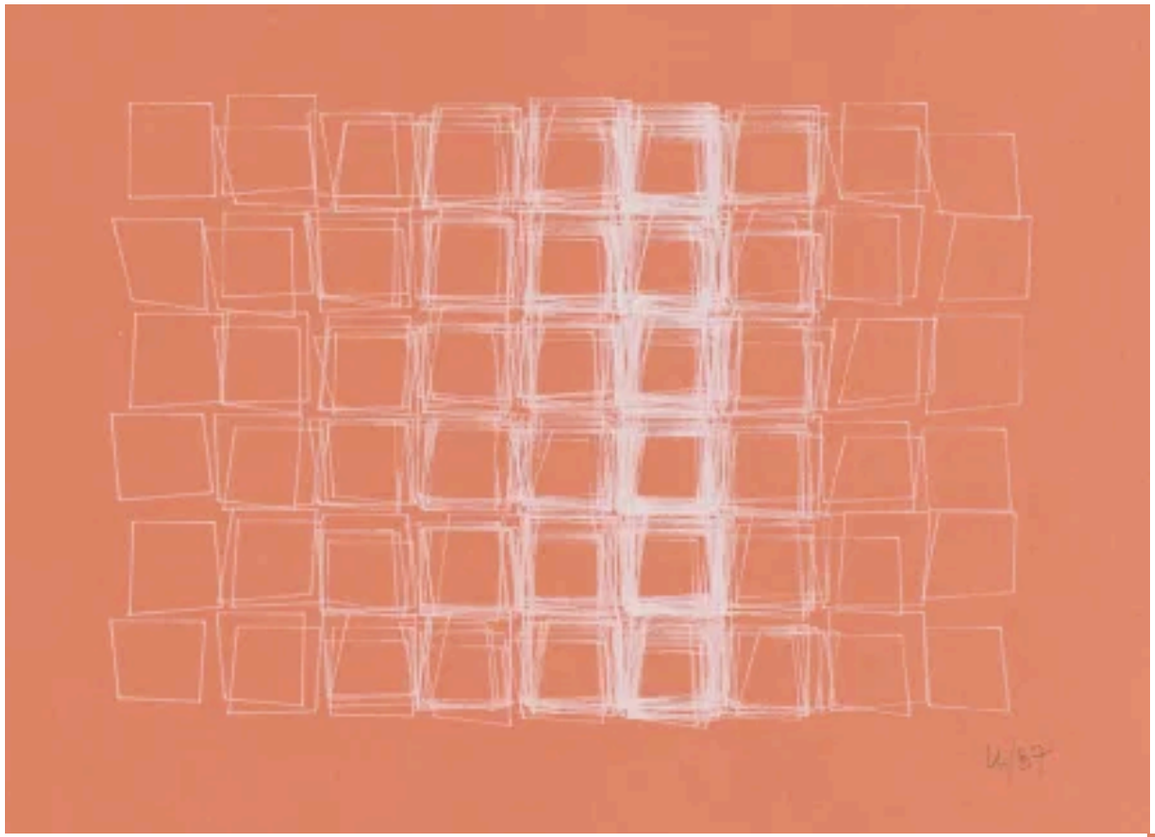
file: Recode-Schotter.js



Recode of S*chotter (Gravel)* by Georg Nees, 2021

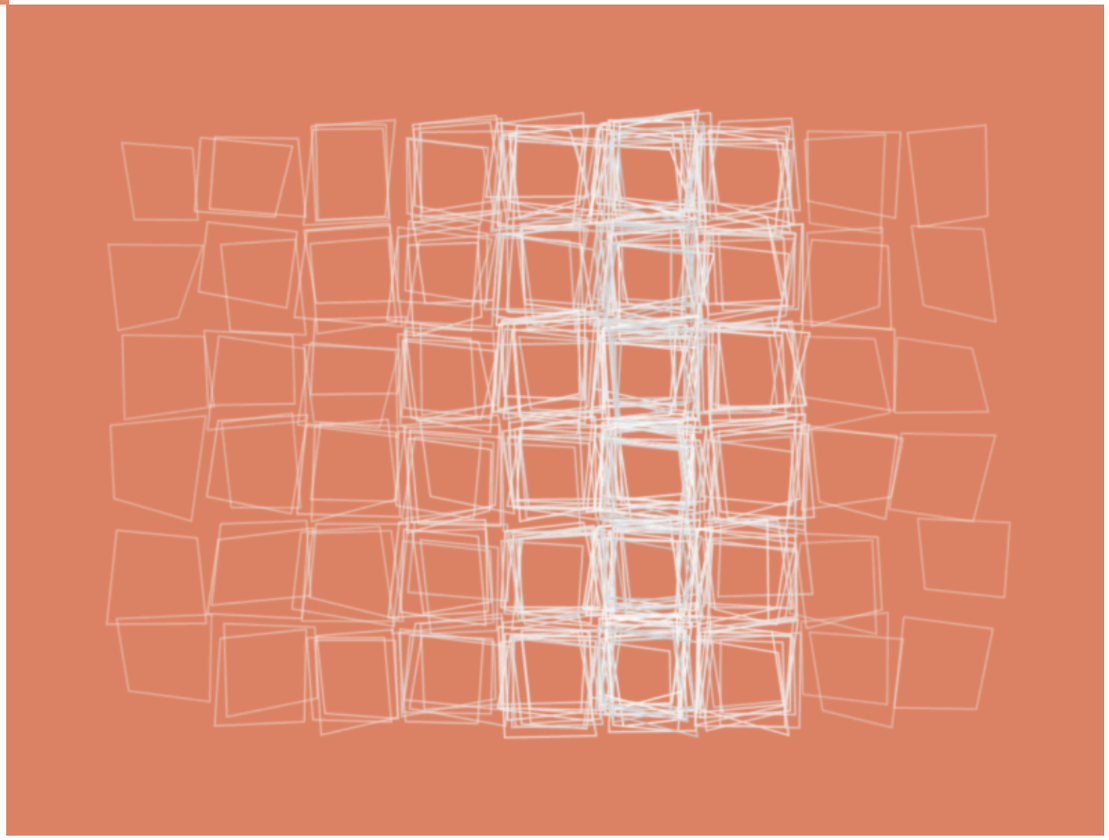


VERA MOLNAR “STRUCTURE DE QUADRILATERES” (1987)



ORIGINAL

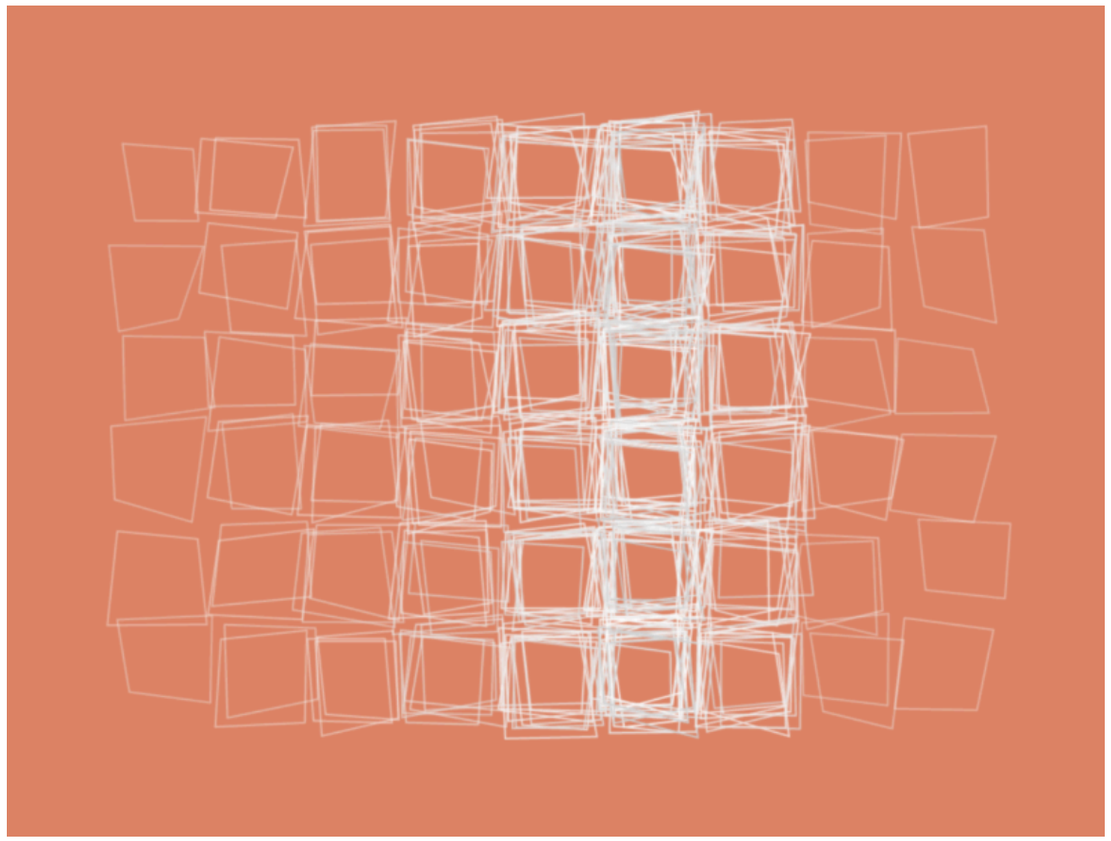
RECODE



VERA MOLNAR “STRUCTURE DE QUADRILATERES” (1987)

```
let sz = 50, k = 8;
let num = [1,2,3,6,10,18,9,2,1];

function setup() {

  createCanvas(690, 520);
  background(222, 133, 103);
  noFill();

  for (let i = 0; i++ < 6; ) {
    for (let j = 0; j++ < 9; ) {
      for (let h = 0; h < num[j-1]; h++) {

        let x1 = 50 + j * 60 - sz / 2 + random(-k, k);
        let y1 = 50 + i * 60 - sz / 2 + random(-k, k);

        let x2 = x1 + sz + random(-k, k);
        let y2 = y1 + random(-k, k);

        let x3 = x1 + sz + random(-k, k);
        let y3 = y1 + sz + random(-k, k);

        let x4 = x1 + random(-k, k);
        let y4 = y1 + sz + random(-k, k);

        stroke(random(240-num[j-1]*2, 255), 100+num[j-1]*12);
        quad(x1, y1, x2, y2, x3, y3, x4, y4);
      }
    }
  }
}
```

file: Recode-Quads.js

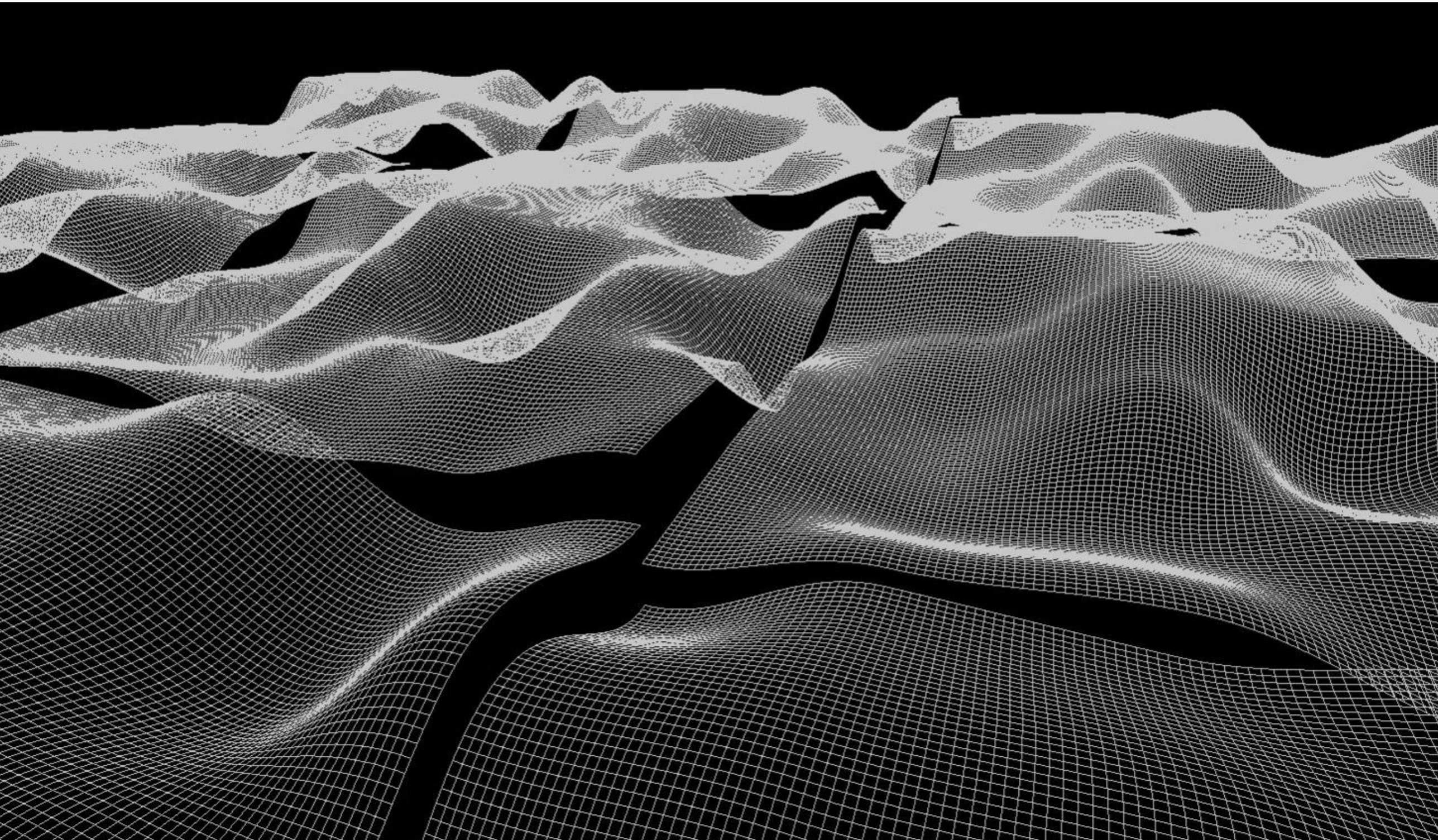


RECODE OF VERA MOLNAR “STRUCTURE DE QUADRILATERES” (1987)

LIFE CANNOT BE CALCULATED. THAT'S THE BIG MISTAKE OUR CIVILIZATION MADE. WE NEVER ACCEPTED THAT RANDOMNESS IS NOT A MISTAKE IN THE EQUATION - IT IS PART OF THE EQUATION.

JEANETTE WINTERSON

NOISE



END

DANIEL C. HOWE
email: daniel@rednoise.org
web: https://rednoise.org/daniel
twitter/mastodon: @danielchowe