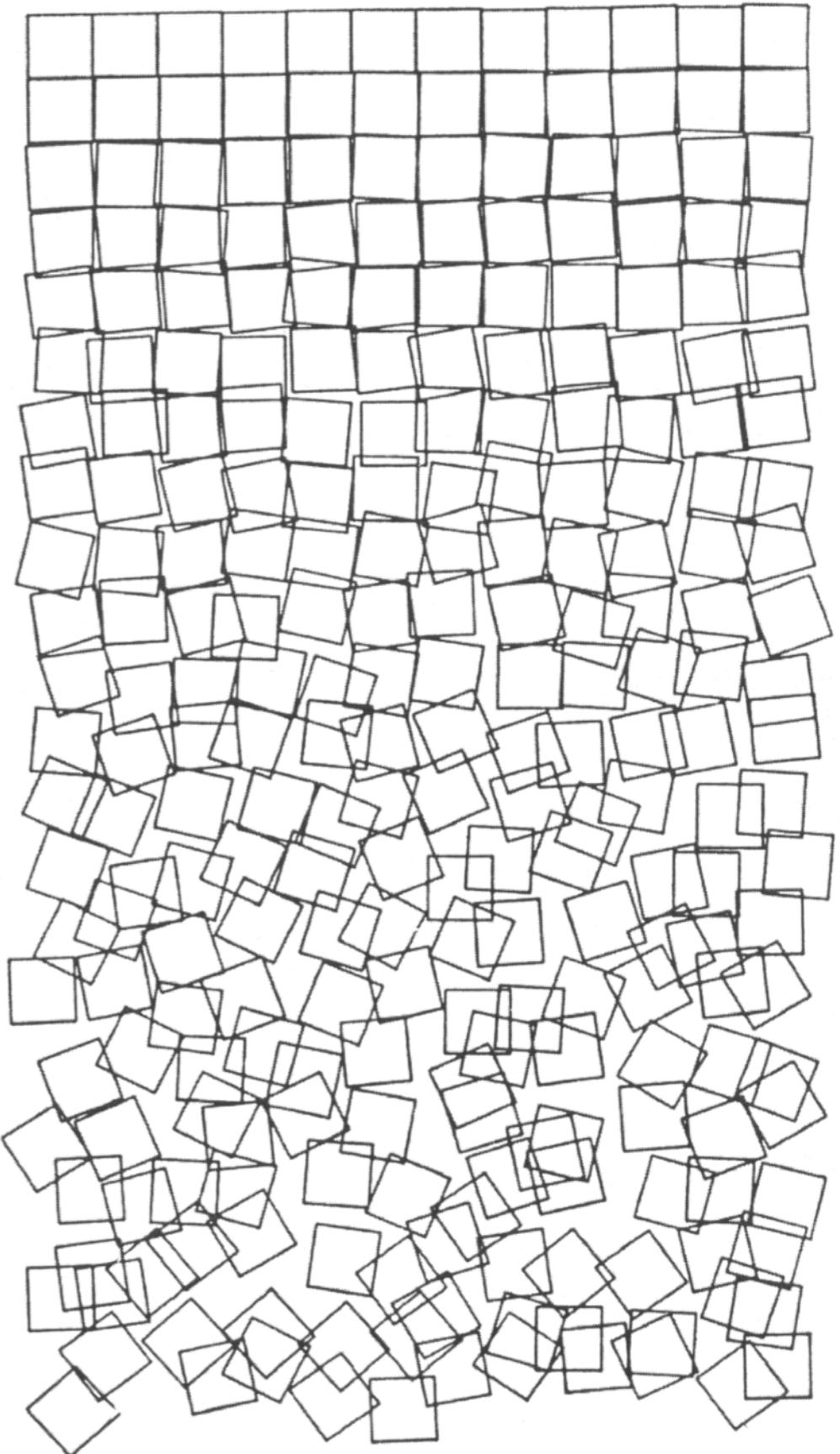


RANDOMNESS & CREATIVE CODE

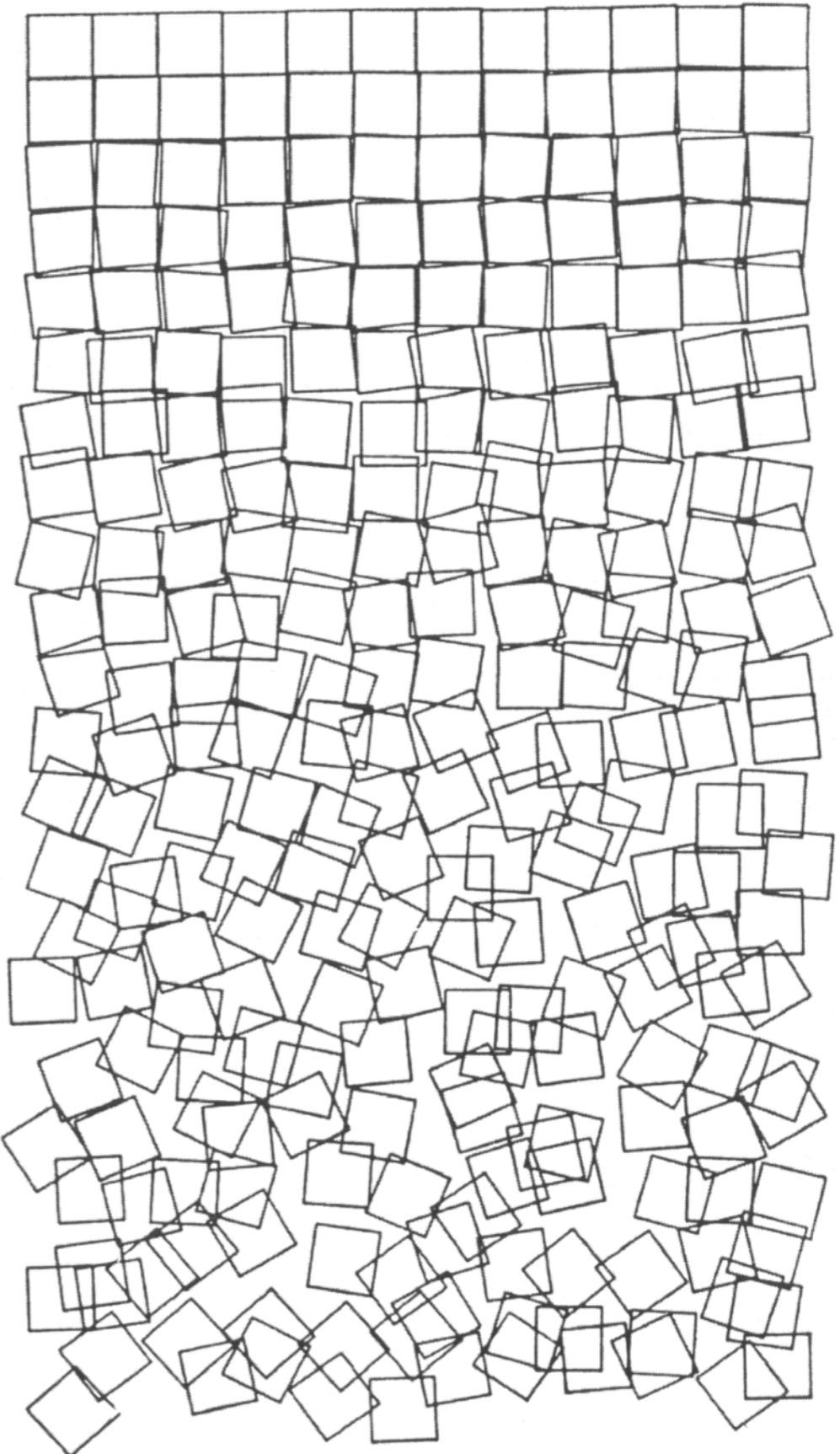
DANIEL C. HOWE
AALTO UNIVERSITY
JANUARY 19, 2022



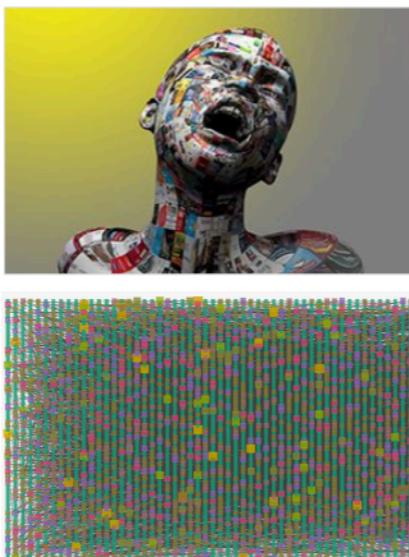
Schotter (Gravel) - Georg Nees, 1968

RANDOMNESS & CREATIVE CODE

DANIEL C. HOWE
AALTO UNIVERSITY
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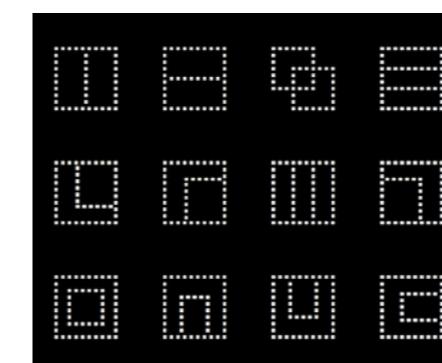
Schotter (Gravel) - Georg Nees, 1968



desperate course was to ask a fellow prov
of mine to trace Ah-Q through his crimin
ord. [REDACTED] got
: no such individual – by the name of Ah
Ah-Gui, or anything like it – existed. Th
I had no way of finding out whether this
deed the case, or whether my acquaintar



swimming back alone to the bathing rock, head under, he reaches out to grasp the familiar ledge, a fold in the rose-tinged granite just above the surface of the waist-deep water at its edge, by the stone which he can see clearly though unfocused through the lake water. but he has not reached it yet, his expectant hand breaks the surface, down through 'empty' water and his knuckles graze the rock, his face will not rise up, dripping and gasping, out of the water, instead, it 'falls' forward and, momentarily, down, into the shallows, stumbles, breathes a choking mouthful, which he



DANIEL HOWE
SCHOOL OF CREATIVE MEDIA
CITY UNIVERSITY HONG KONG
MAIL: DANIEL@REDNOISE.ORG
[HTTPS://REDNOISE.ORG/DANIEL](https://rednoise.org/daniel)

SINCE THE BEGINNING OF THE 20TH CENTURY, RANDOMNESS IS ONE OF THE KEY PIECES THAT CONSTITUTE THE LANGUAGE OF ART.

LALI BARRIÈRE

- INTRODUCTION: RESOURCES
 - THEORETICAL: WHAT IS RANDOMNESS?
 - AESTHETIC: EXAMPLES IN ART + DESIGN
 - STRATEGIC: WHY USE RANDOMNESS?
 - PRACTICAL: USING RANDOMNESS EFFECTIVELY
-

OBJECTIVES

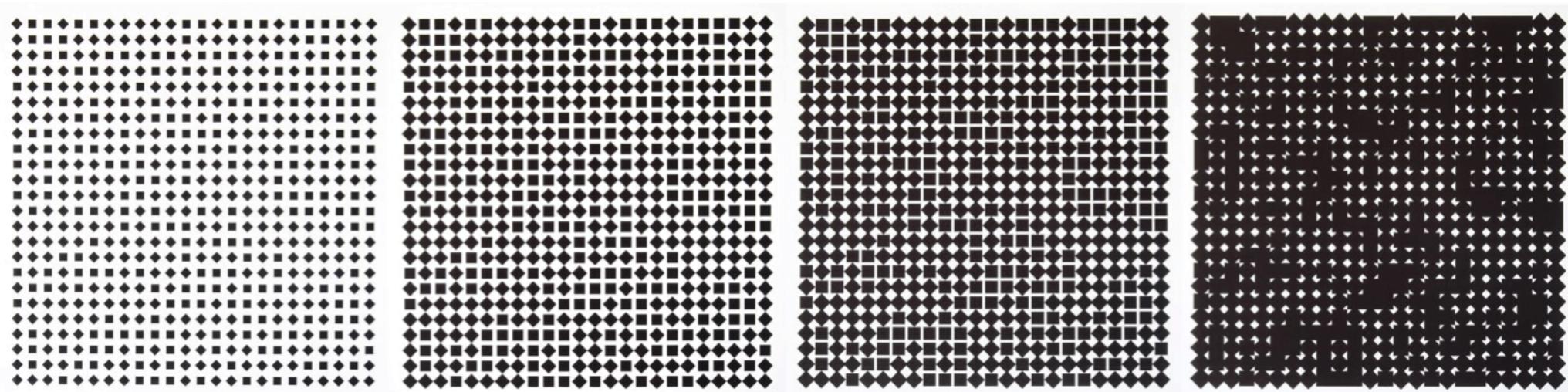
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-

OBJECTIVES

RESOURCES



<https://github.com/dhowe/rws>



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

A screenshot of a GitHub repository page for `dhowe/rws`. The page shows a commit history for the `master` branch, which includes updates to `README.md`, `RandomRects.js`, `RandomWalk1.js`, `RandomWalk2.js`, `Recode-Quads.js`, `Recode-Schotter.js`, `randomness.png`, and `slides.pdf`. The most recent commit was made 15 seconds ago. Below the commit history is the `README.md` file, which contains the following content:

```
A micro-workshop on randomness

Resources

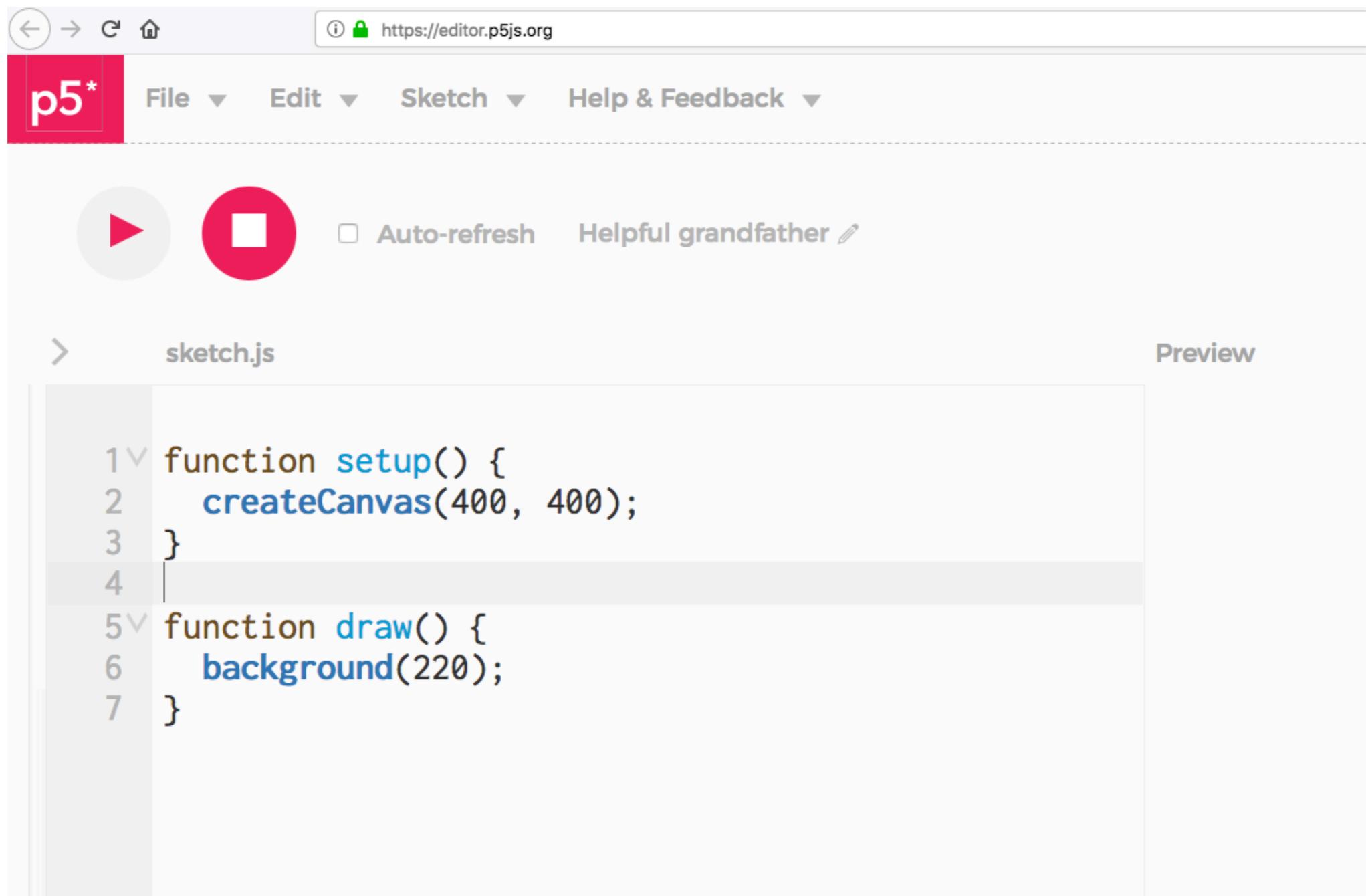

- Lecture slides \(.pdf\)
- p5.js editor and reference
- Vera Molnar on randomness (2-min video)

```

A red arrow points from the link in the `Resources` section of the `README.md` file to the URL at the bottom of the image.

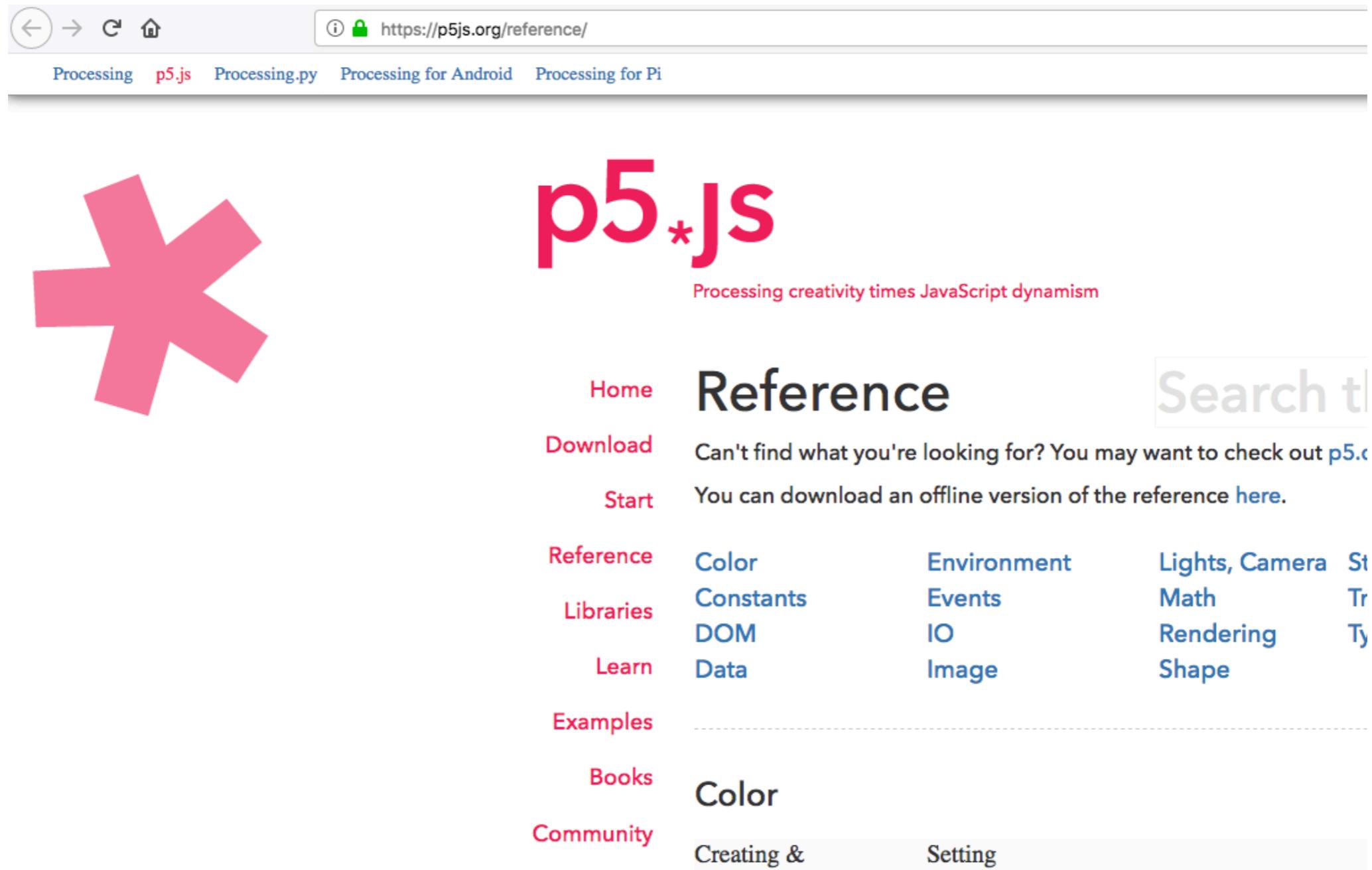
<https://raw.githubusercontent.com/dhowe/rws/master/slides.pdf>

TOOLS: P5.JS EDITOR



<https://editor.p5js.org>

TOOLS: REFERENCE



The screenshot shows the p5.js reference website at <https://p5js.org/reference/>. The page features a large pink asterisk icon on the left. The title "p5.js" is prominently displayed in pink, with the subtitle "Processing creativity times JavaScript dynamism" below it. A search bar is visible on the right. The main content area includes navigation links like Home, Download, Start, Reference, Libraries, Learn, Examples, Books, and Community. Under the "Reference" section, there are tables for Color, Environment, Math, DOM, Events, IO, Data, Image, Rendering, Shape, and Text. The "Color" section is expanded, showing sub-sections for Creating & Setting.

Processing p5.js Processing.py Processing for Android Processing for Pi

p5.js

Processing creativity times JavaScript dynamism

Home

Download

Start

Reference

Libraries

Learn

Examples

Books

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Environment

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IO

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Rendering

Shape

Text

Creating & Setting

Search t

<https://p5js.org/reference/>

RANDOM()

Description

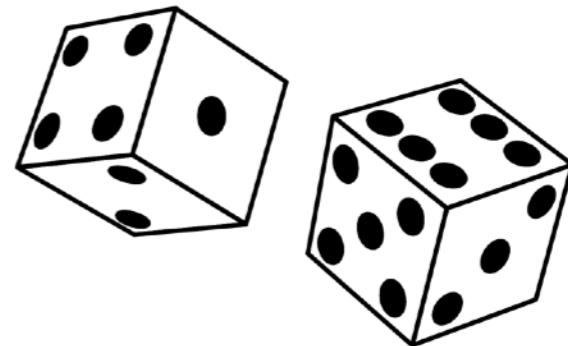
Return a random floating-point number.

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.

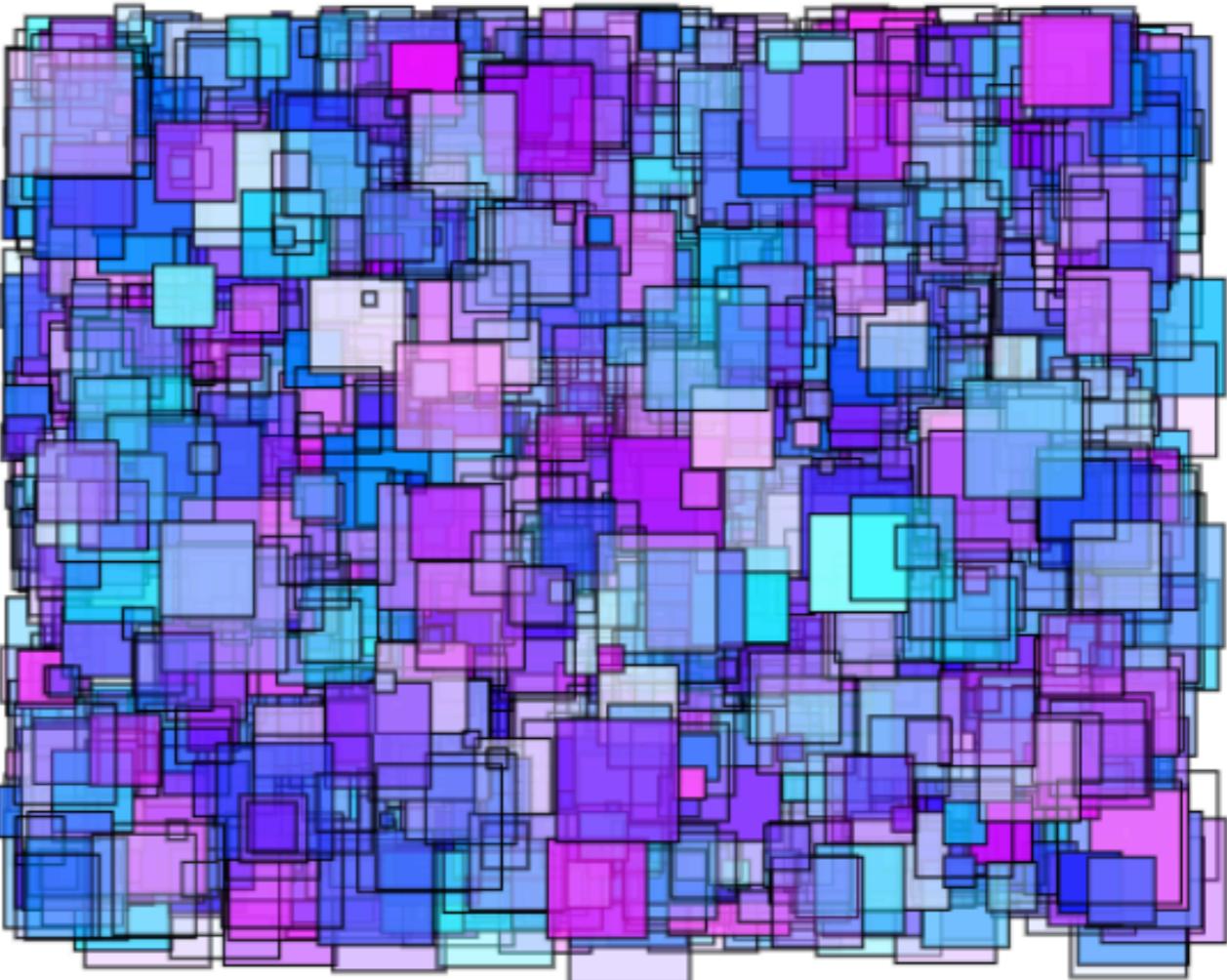
If two arguments are given, returns a random number from the first argument up to (but not including) the second argument.



QUICKSTART

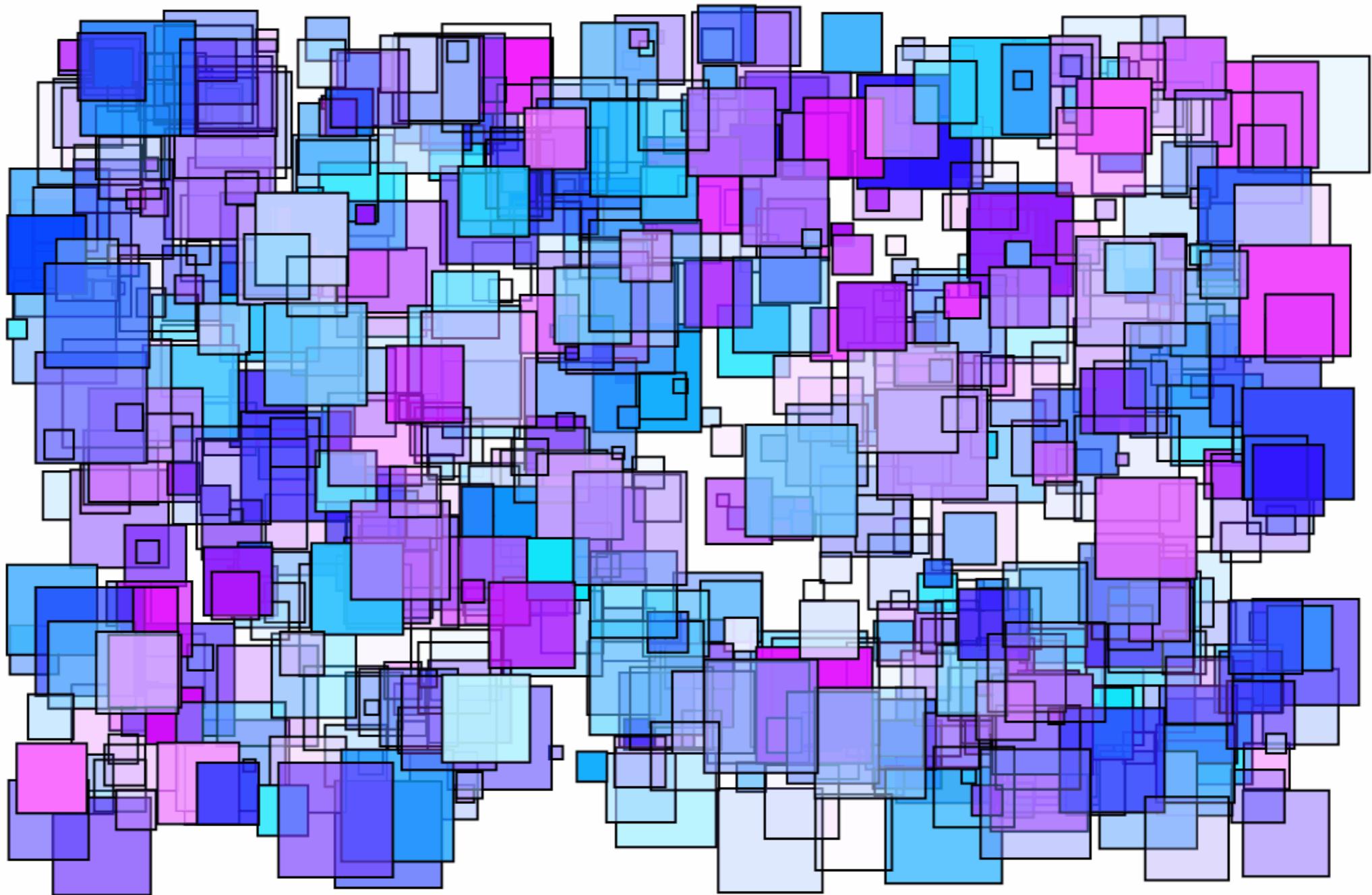
```
> sketch.js•  
1  function setup() {  
2    createCanvas(500, 400);  
3    background(255);  
4  }  
5  
6  function draw() {  
7    let x = random(0, width);  
8    let y = random(0, height);  
9    let sz = random(5, 50);  
10  
11   let r = random(0, 255);  
12   let g = random(0, 255);  
13   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



QUICKSTART

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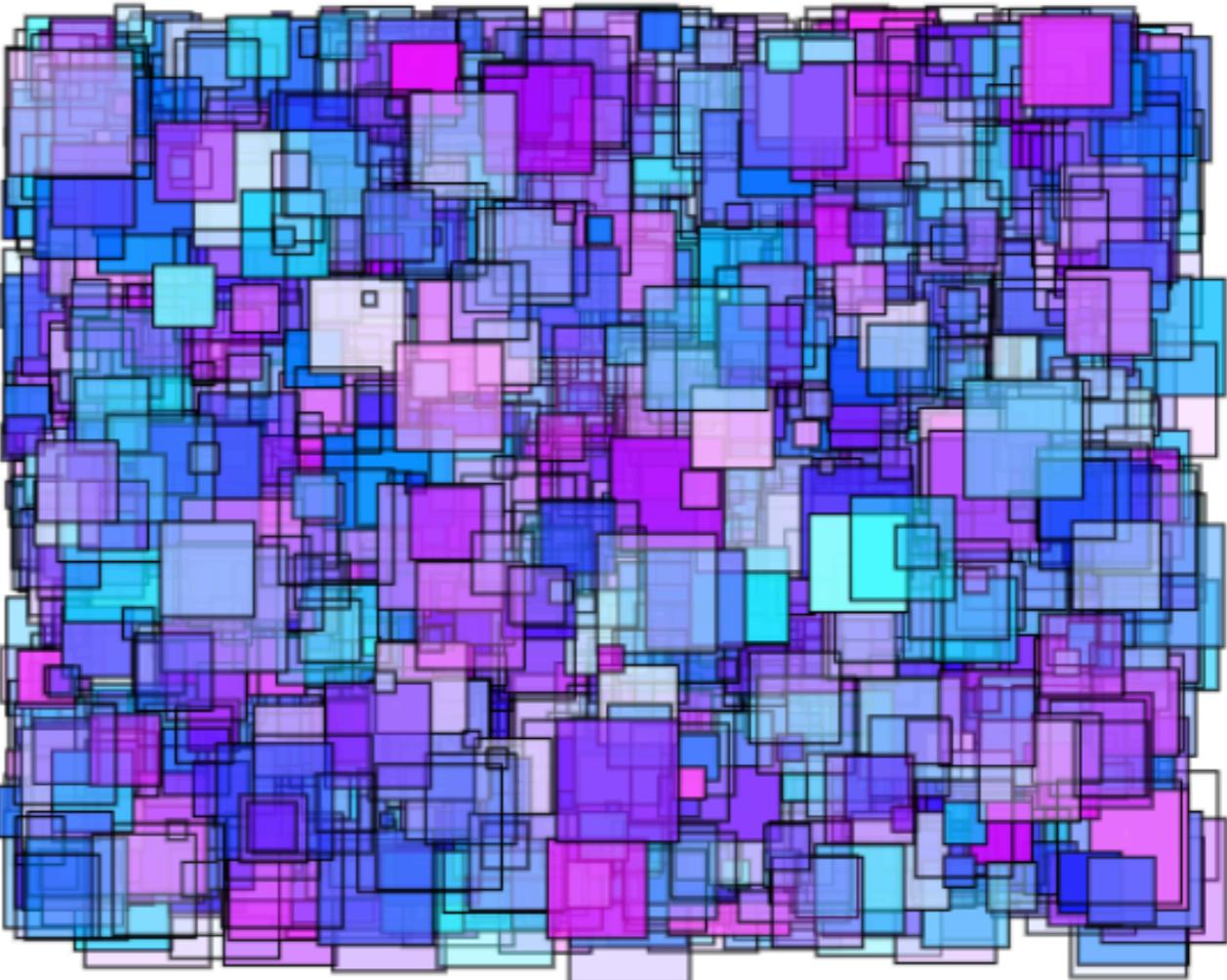
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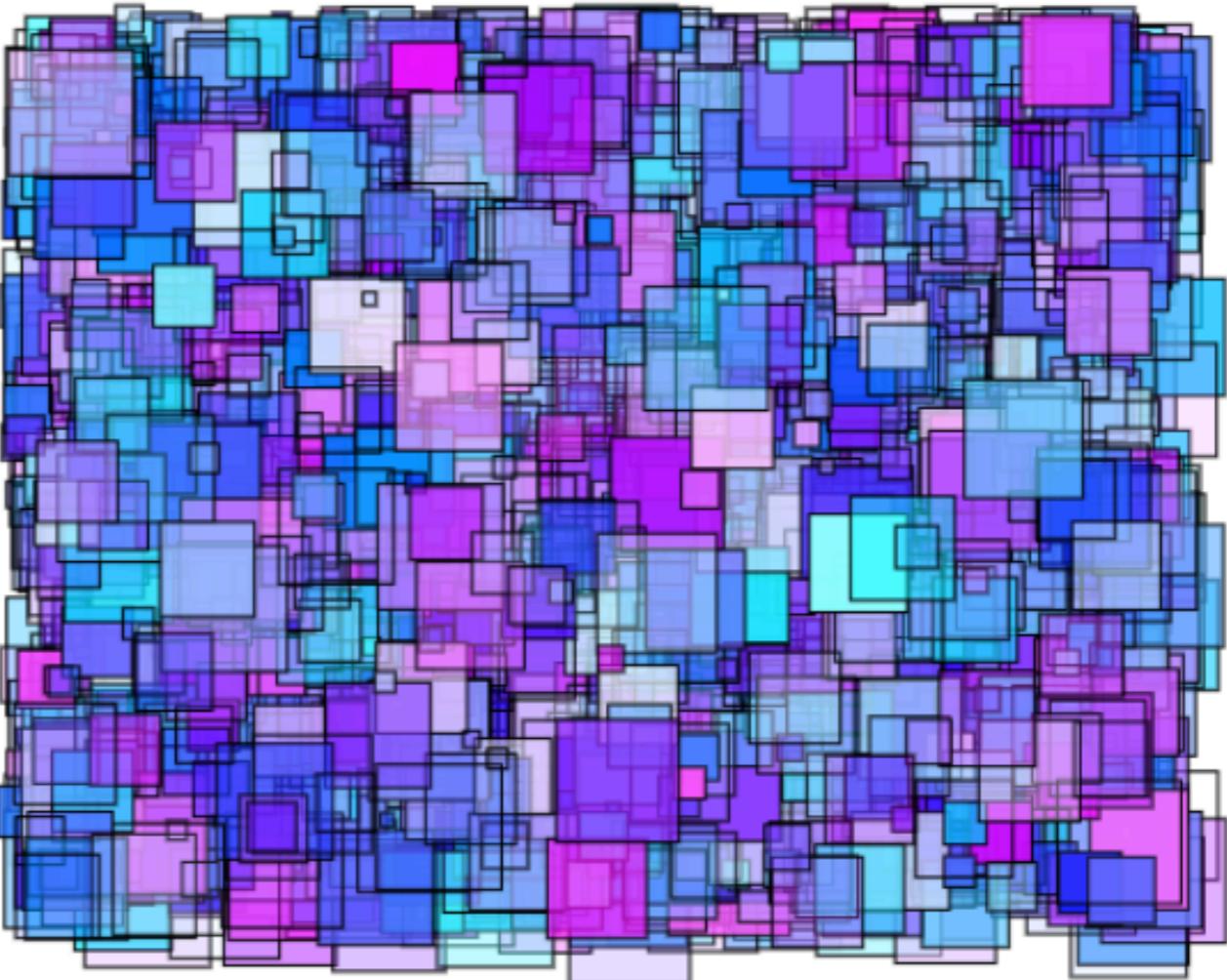
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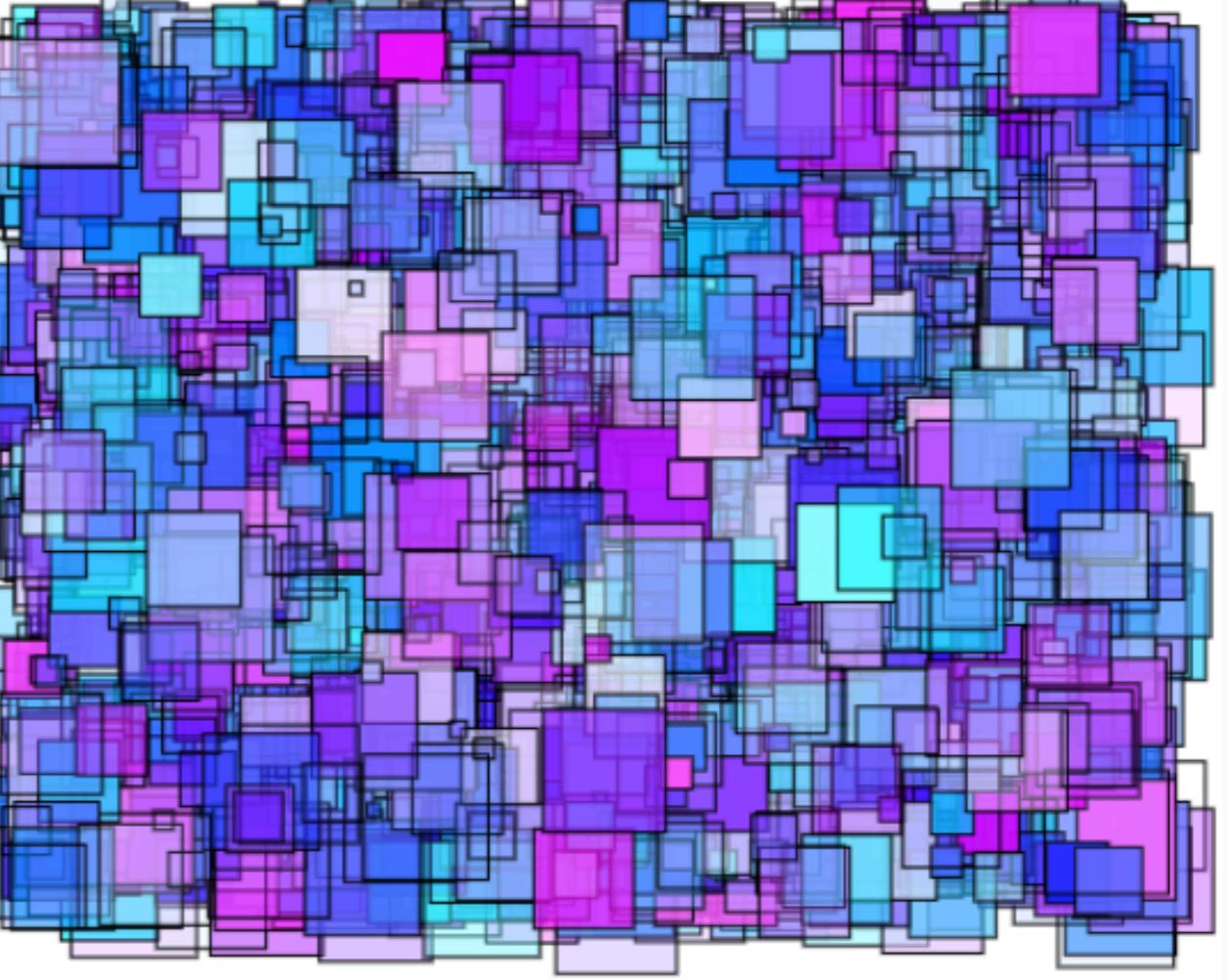
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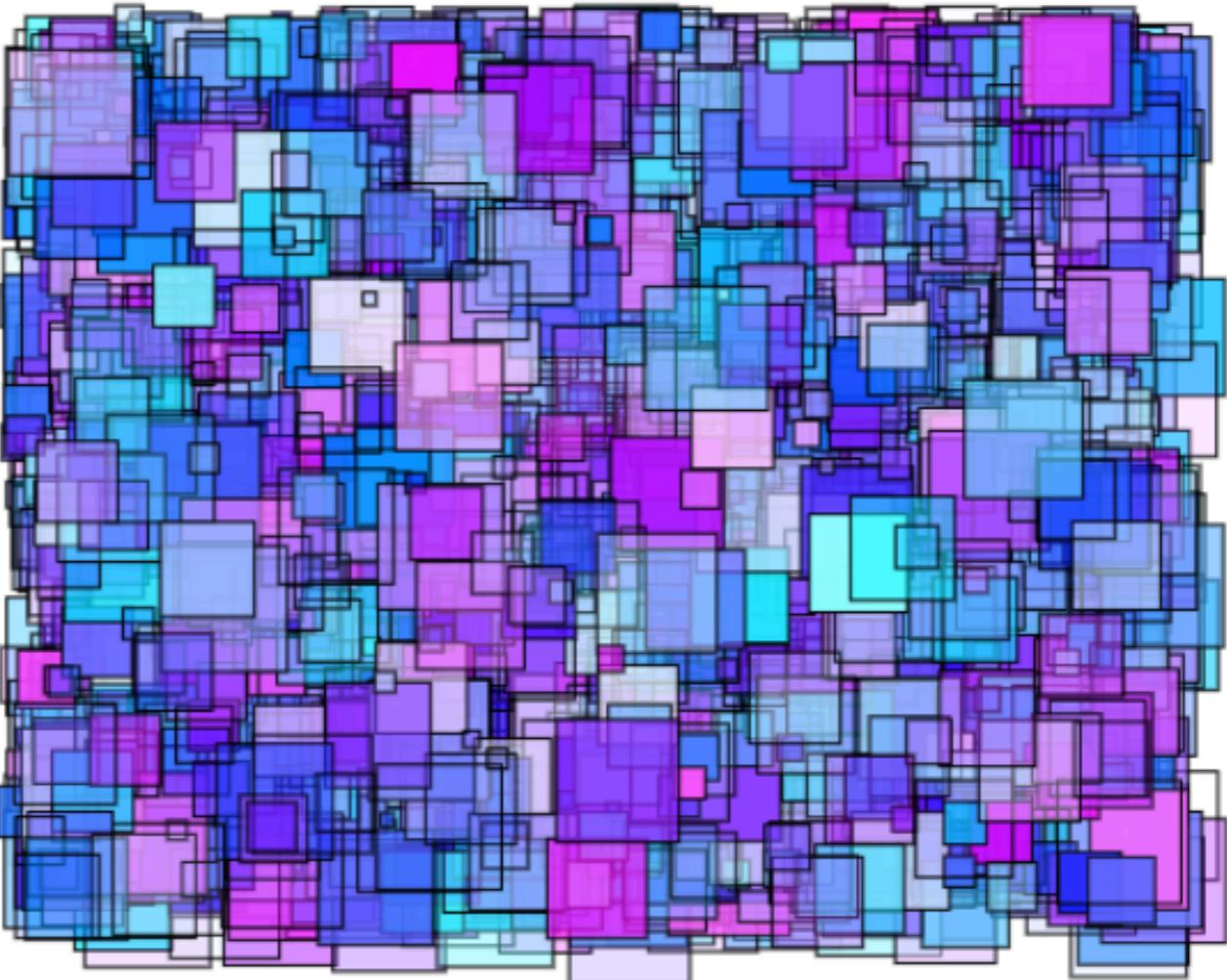
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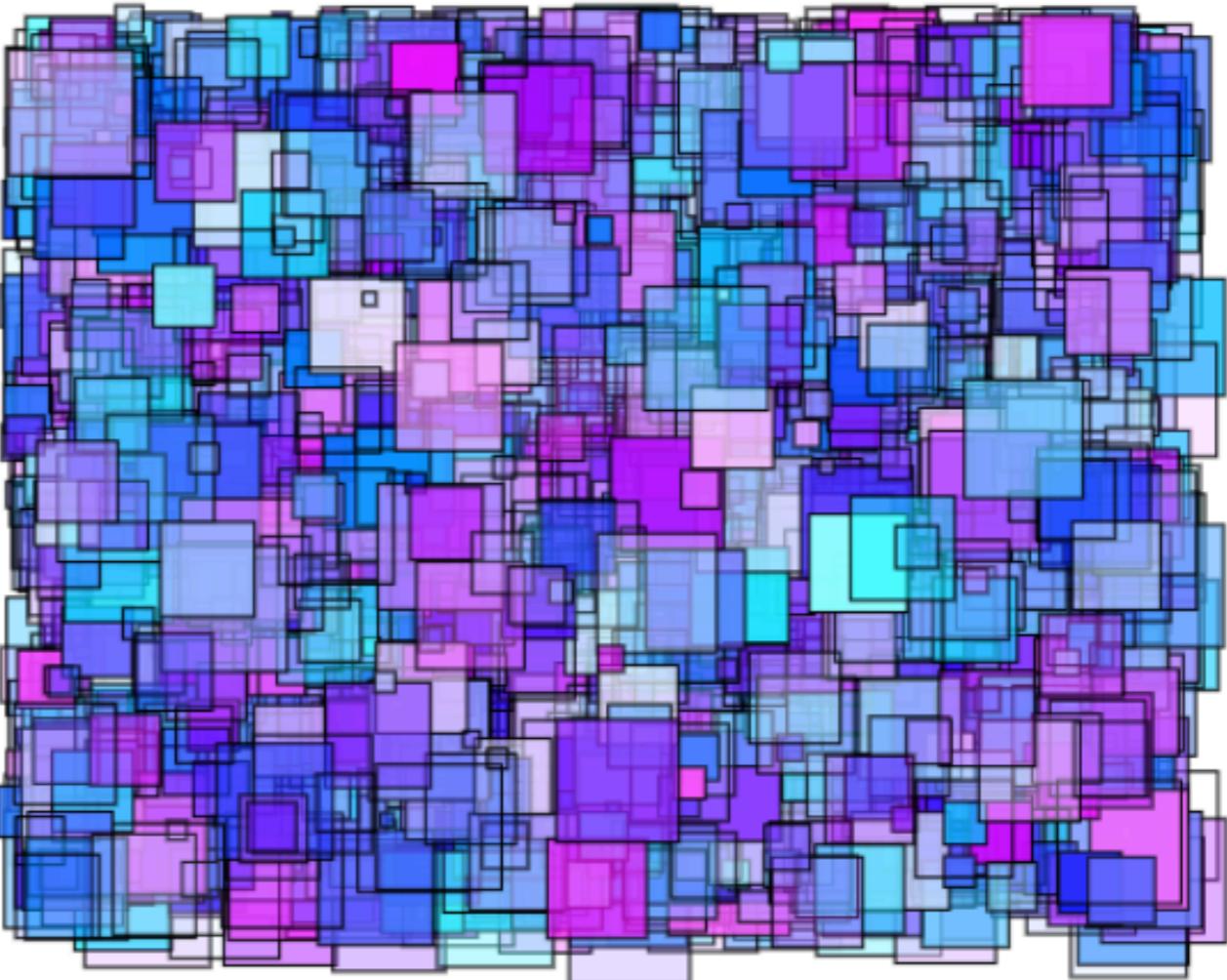
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OBJECTIVES

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



**CONSIDER THE FOLLOWING TWO
SEQUENCES OF 20 COIN FLIPS:**

- A. HTHHTTTHTTTHTHHTHTHH
- B. TTTTTTTTTTTTTTTTTTT

WHICH IS MORE LIKELY, A OR B?



ACCORDING TO PROBABILITY, THE TWO ARE EQUALLY LIKELY, EACH HAVING A CHANCE OF 1 IN 1 048 576

- A. HTHHTTTHTTTTHHTHHHTHTHH
- B. TTTTTTTTTTTTTTTTTTT

BUT WHICH SEQUENCE IS MORE RANDOM?



ACCORDING TO PROBABILITY, THE TWO ARE EQUIALLY LIKELY, EACH HAVING A CHANCE OF 1 IN 1048576

- A. HTHHTTTHTTTTHHHHTHTH
- B. TTTTTTTTTTTTTTTTTTT

BUT WHICH SEQUENCE IS MORE RANDOM?



ACCORDING TO PROBABILITY, THE TWO ARE EQUALLY LIKELY, EACH HAVING A CHANCE OF 1 IN 1 048 576

- A. HTHHTTTHTTTTHHTHHHTHTHH
- B. TTTTTTTTTTTTTTTTTTT

BUT WHICH SEQUENCE IS MORE RANDOM?

LET'S DESCRIBE EACH AS CONCISELY AS POSSIBLE

B. TTTTTTTTTTTTTTTTTTT

→ *write T 20 times*

A. HTHHTTHTTTHTHHHTHTH

???

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

HTHHTTHTTTHTHHHTHTH



LET'S ADD ONE MORE SEQUENCE...

C. TTFFFTTFFTFFTTFFTTFF

???

B. TTTTTTTTTTTTTTTTT

write T 20 times

A. HTHHTTTHTTTHTHHHTHTH

write HTHHTTTHTTTHTHHHTHTH



LESS
RANDOM
(SHORTER)



B. TTTTTTTTTTTTTTTTT

write T 20 times

C. TTFFTFFTTFFTTFF

write TTFF 5 times

A. HTHTTHTHTTHHHTHTH

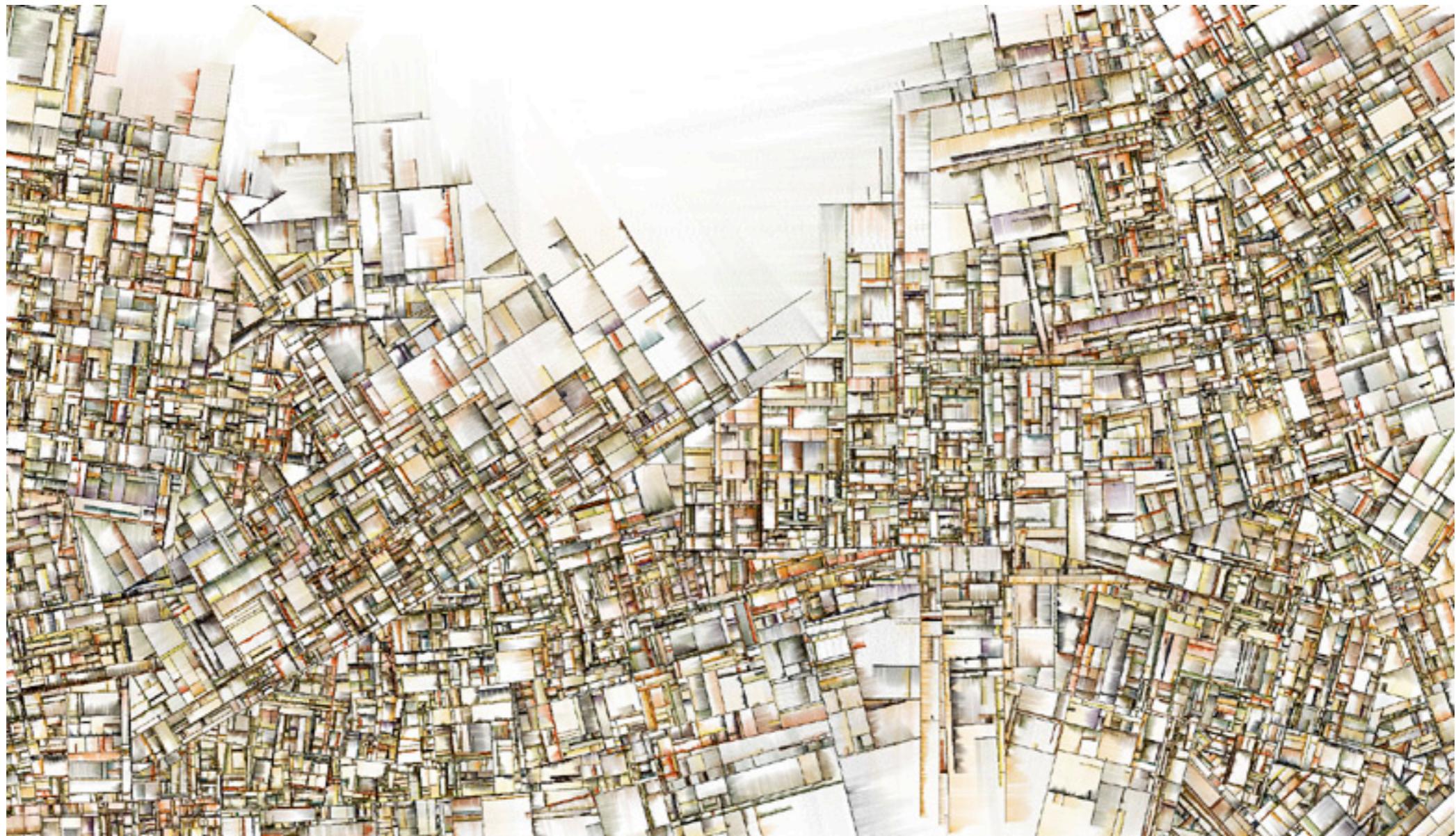
write HTHTHTTHTTTHTHHHTHTH

MORE
RANDOM
(LONGER)

from Kolmogorov, 1965

ANOTHER WAY OF THINKING ABOUT
KOLMOGOROV'S APPROACH IS TO ASK ...

IS THERE A PATTERN TO THE SEQUENCE?



Jared Tarbell, Substrate, 2003

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OBJECTIVES

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

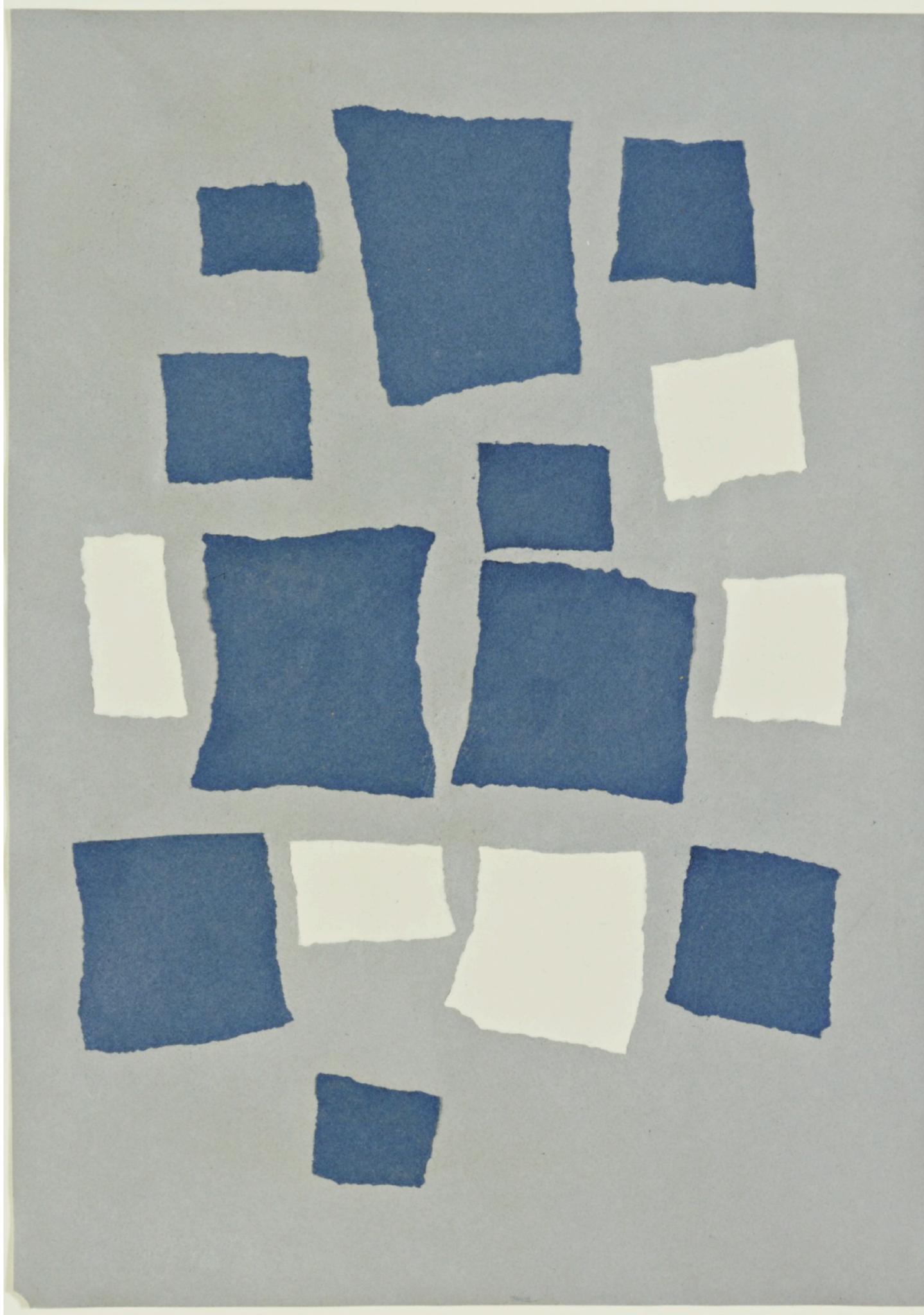


“

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...

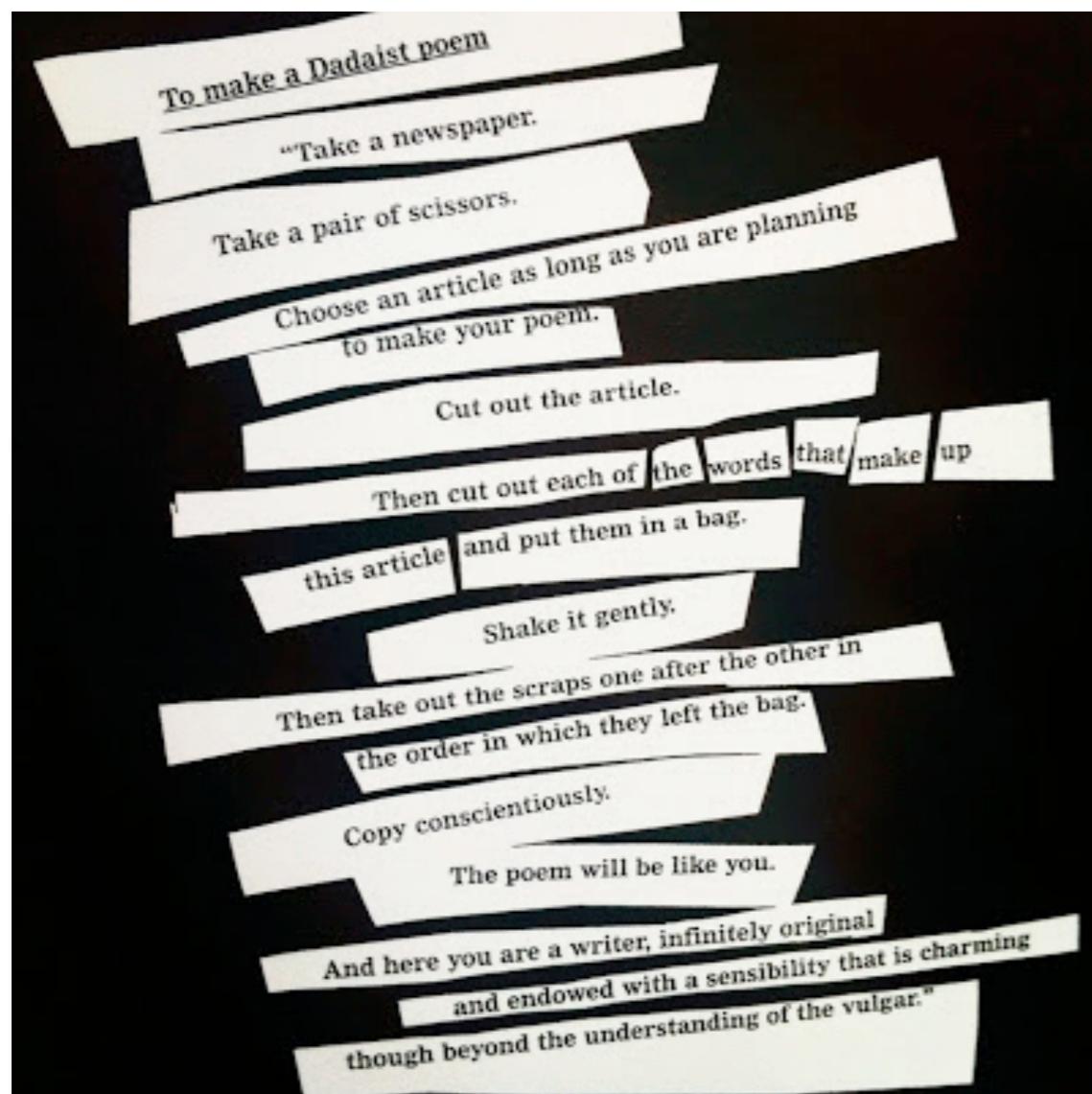


Jean (Hans) Arp

Untitled (Collage with Squares Arranged according to the Law of Chance)
1916-17

TO MAKE A DADAIST POEM

TRISTAN TZARA, 1951



ASSESSMENT

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 5.50 francs
cocaine slowly gnaws the walls for its pleasure
satanic horoscope dilates under your vigor
VIRGIL'S VIGILANCE VERIFIES THE VIRAL WIND

eyelid droop once more



TRISTAN TZARA

VERA MOLNAR

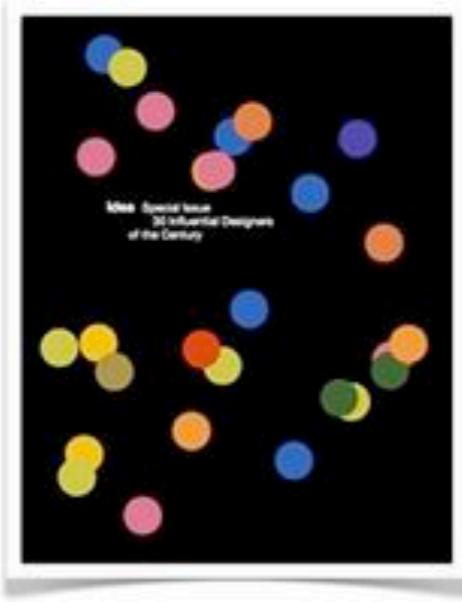
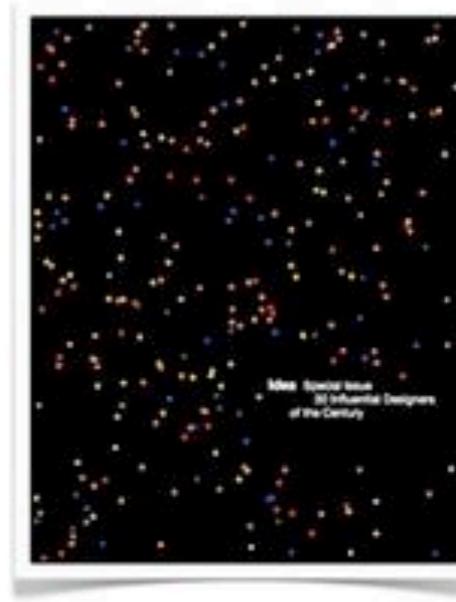
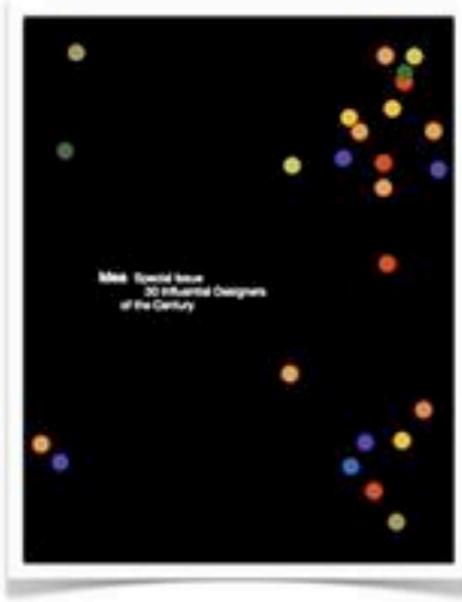
“*The machine, thought to be cold and inhuman, can help to realize what is most subjective, unattainable, and profound in a human being.*

-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...

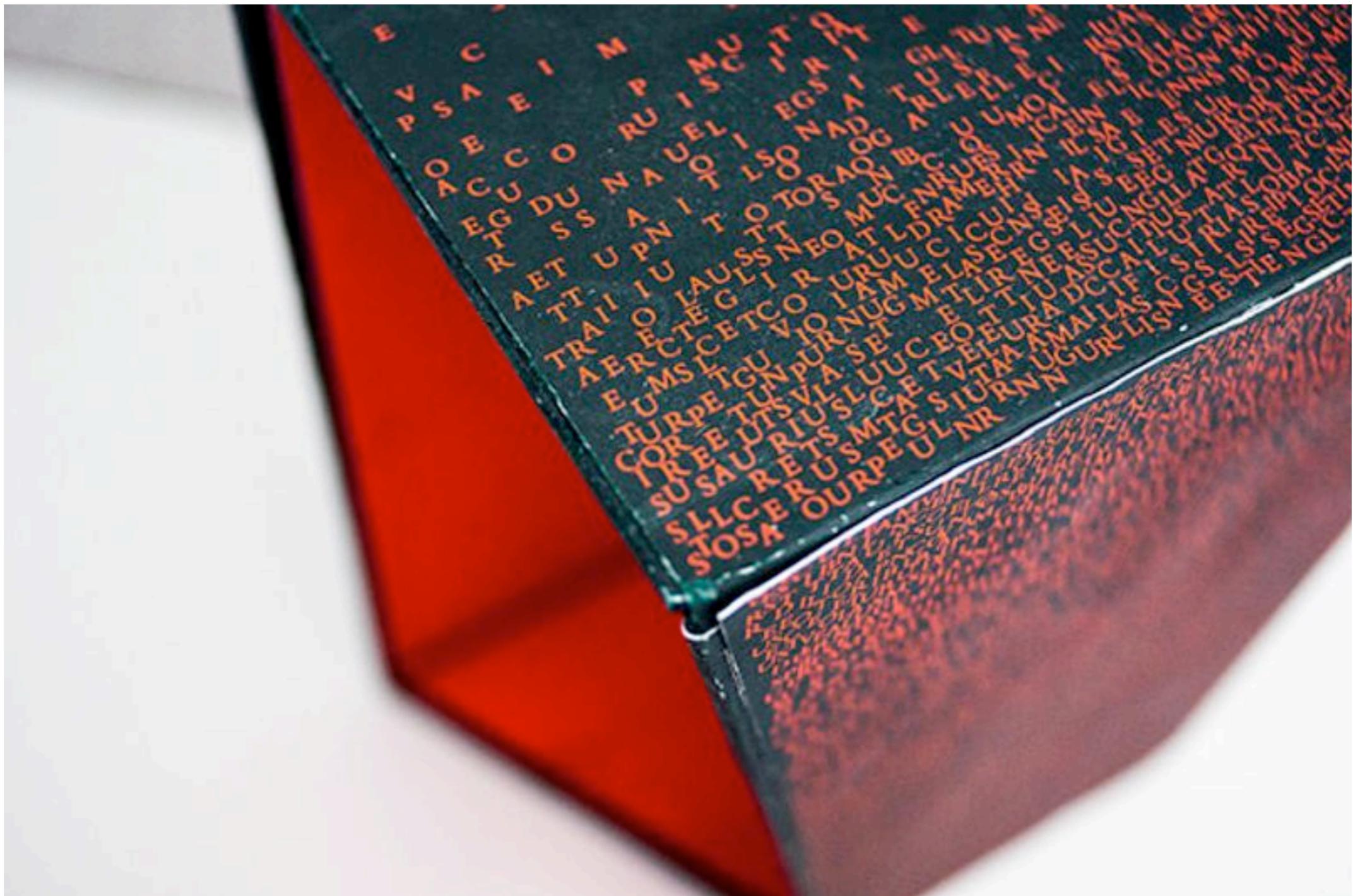


RANDOMNESS IN DESIGN



Paul Rand

RANDOMNESS IN DESIGN



Design by Zhusi 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.

TIM KNOWLES



Tim Knowles, Oak/Larch On Easel (2005)

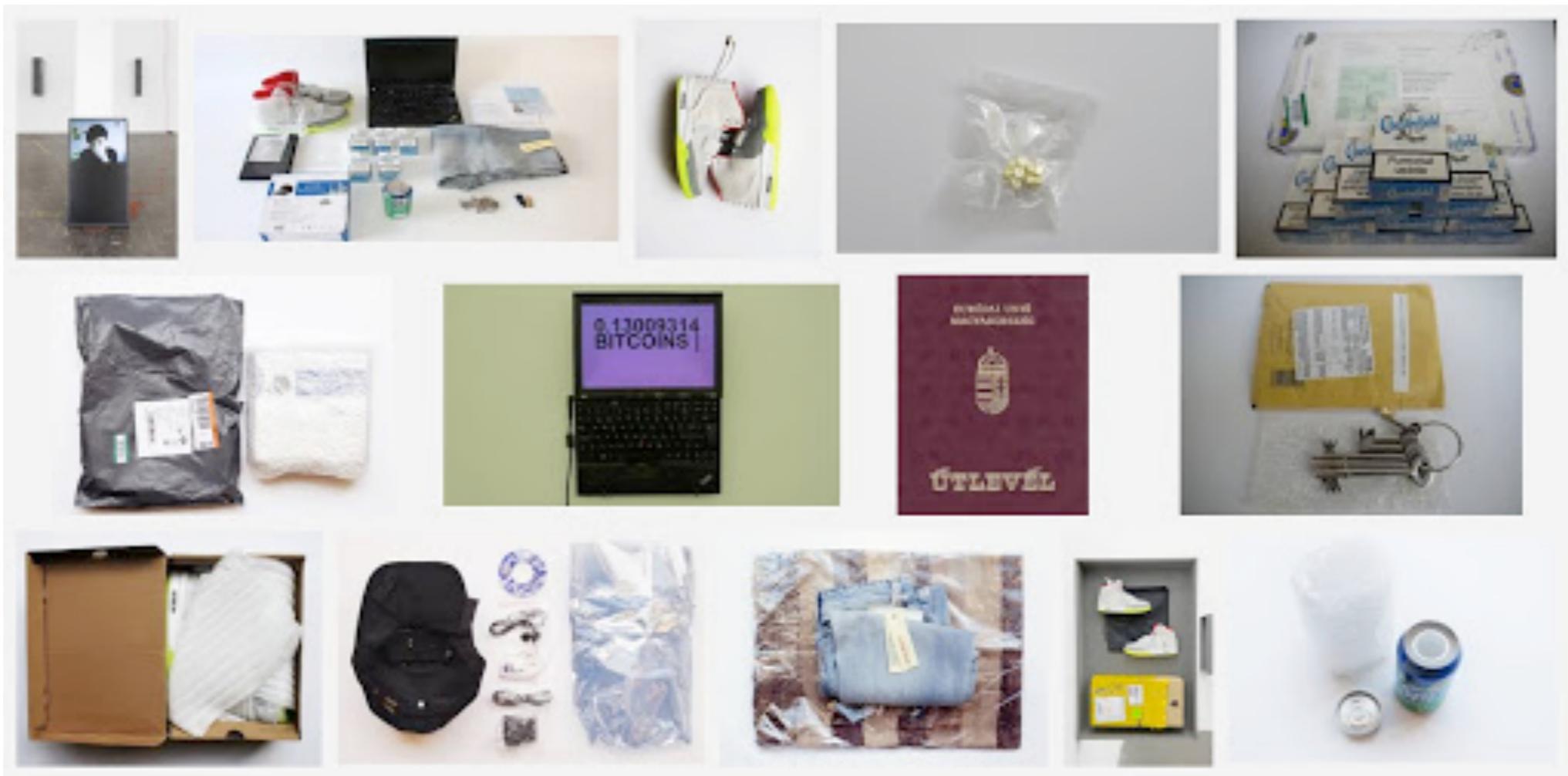
CAROLEE SCHNEEMANN

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.



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)

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OBJECTIVES

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

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

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OBJECTIVES

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...

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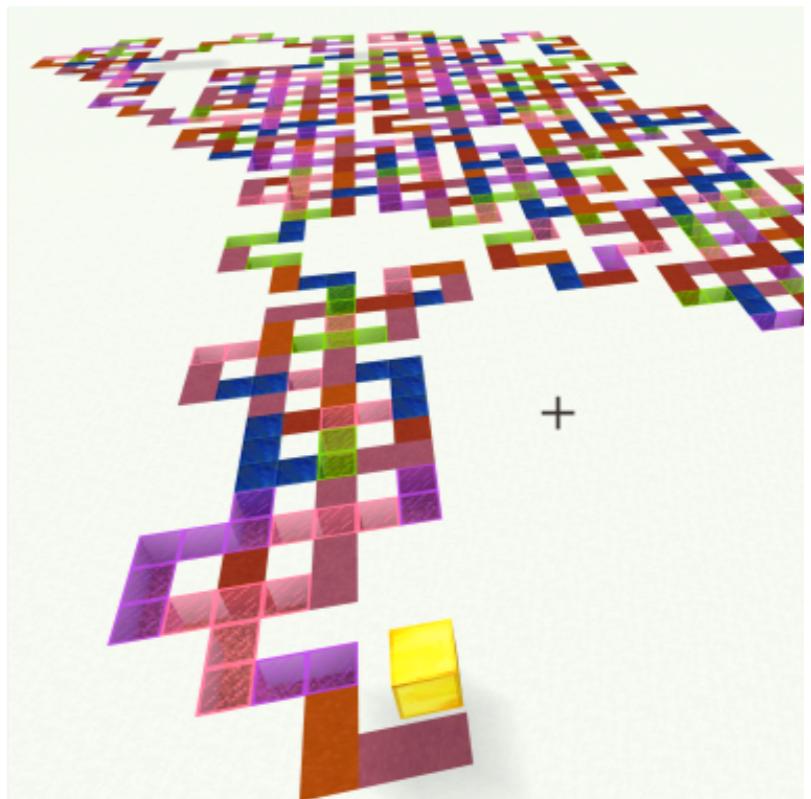
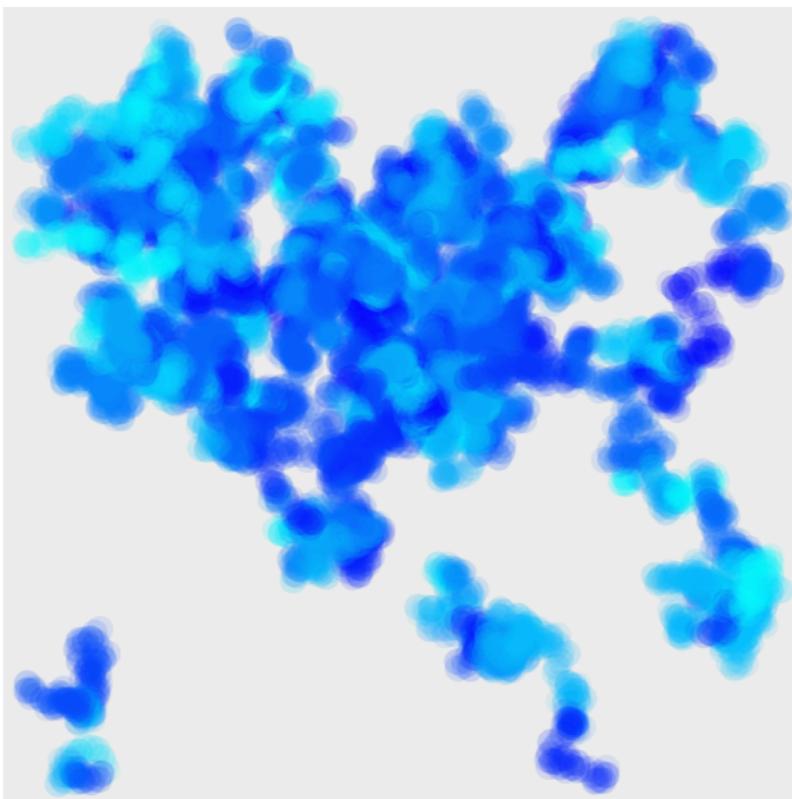
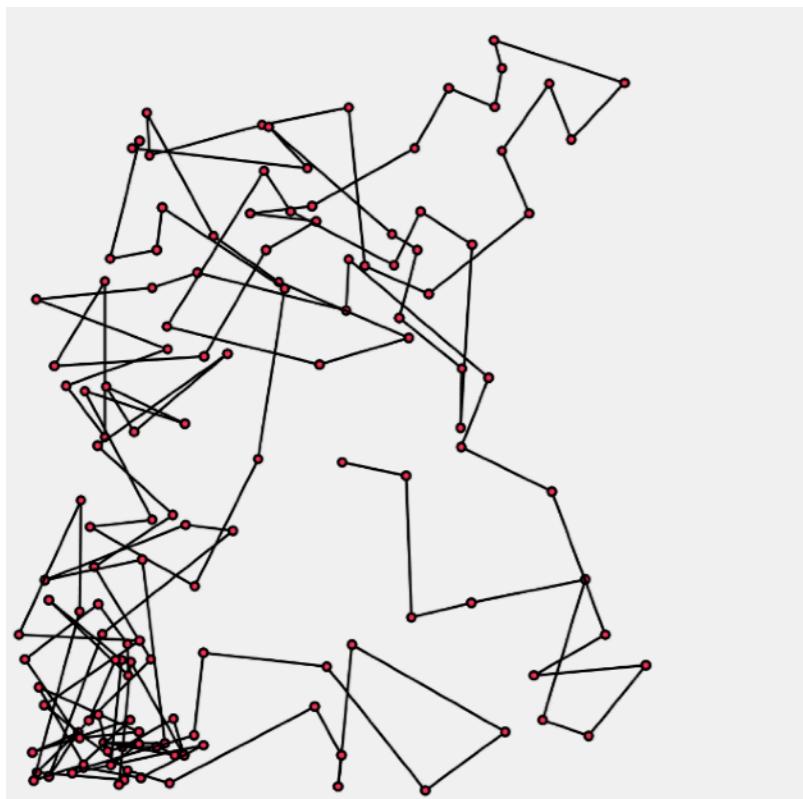
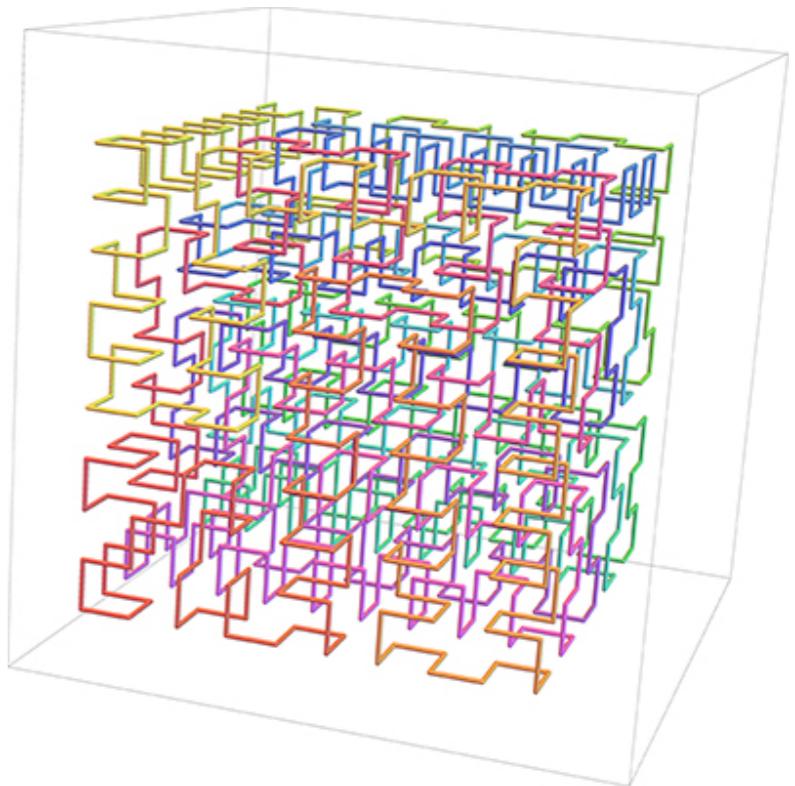
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RANDOM WALK



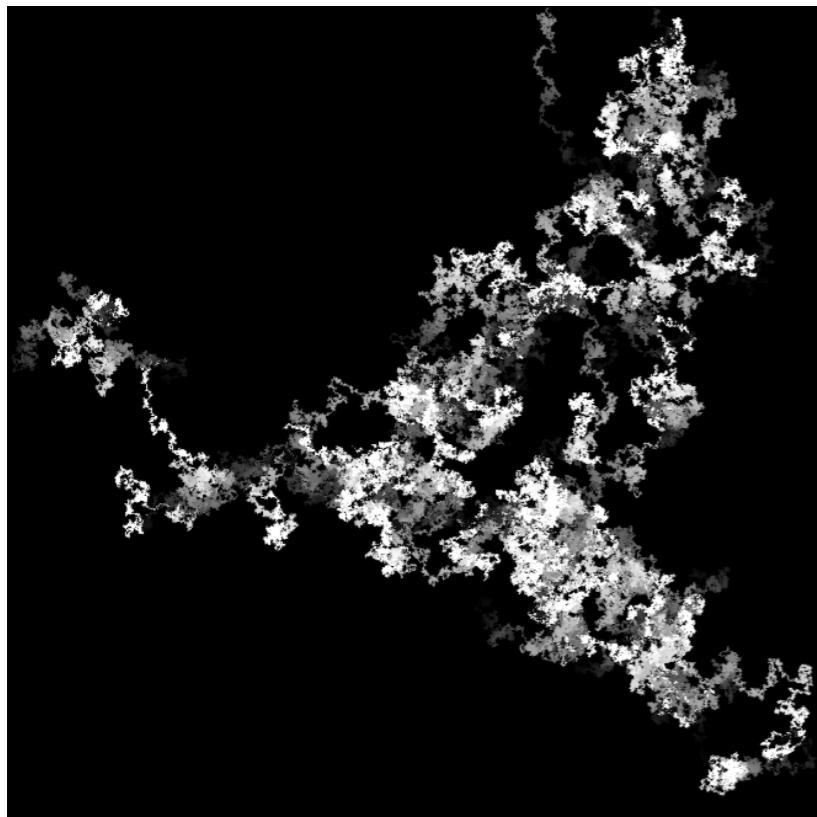
a single random walker over several hundred steps...

RANDOM WALK

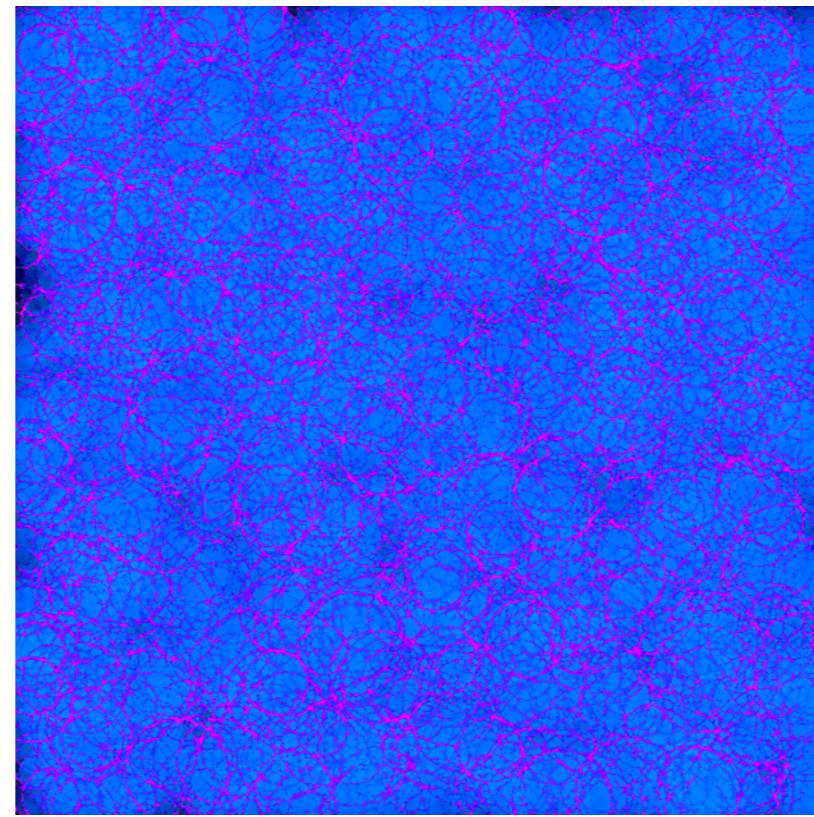


visualizing random walks...

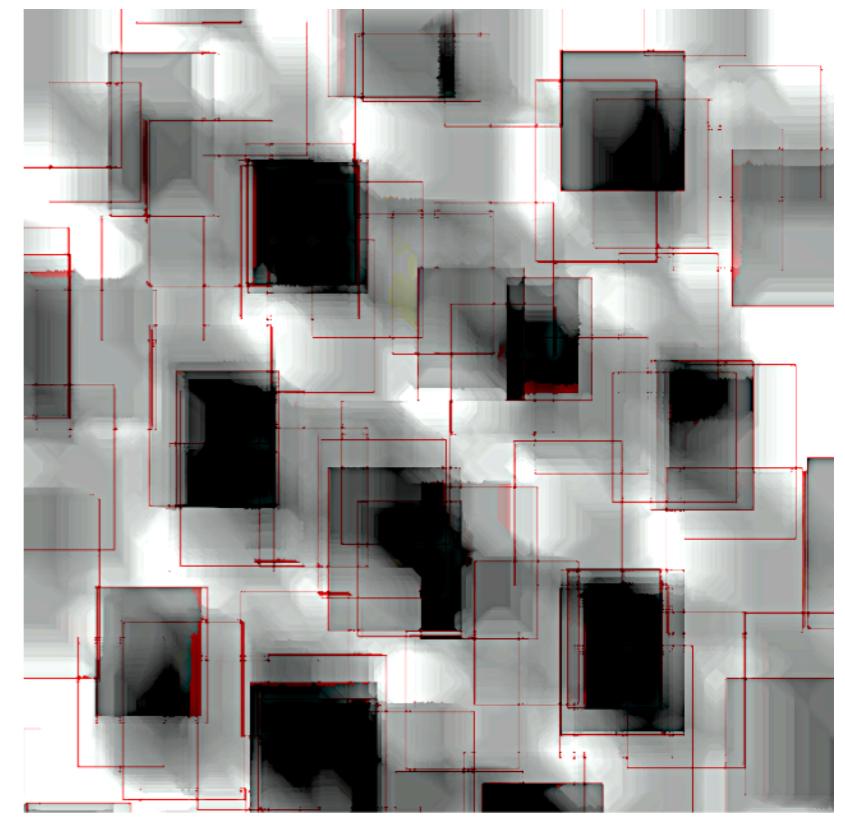
MULTIPLE RANDOM WALKERS



as lines



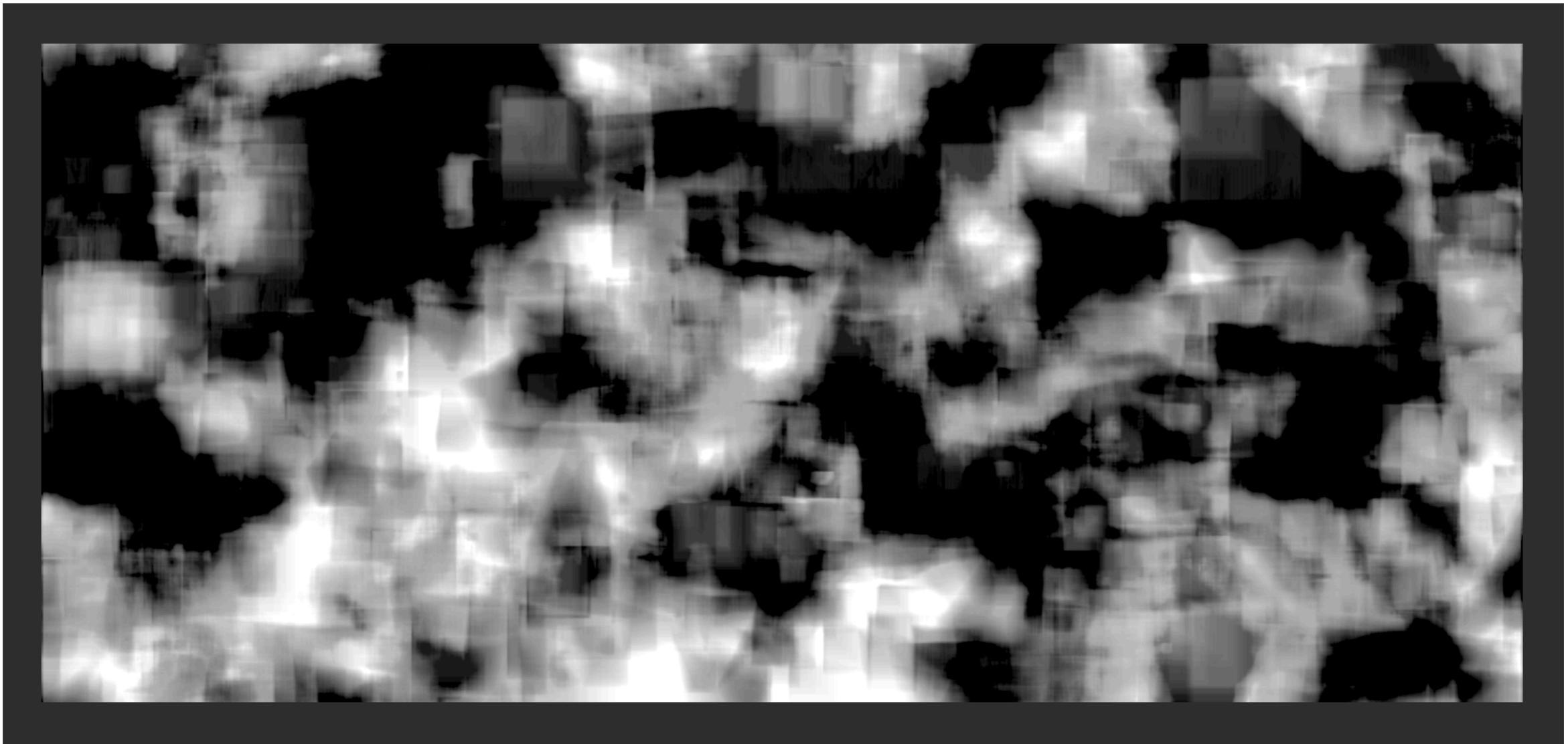
as circles



as rectangles

random walkers interacting ...

MULTIPLE RANDOM WALKERS



multiple random walkers interacting ...

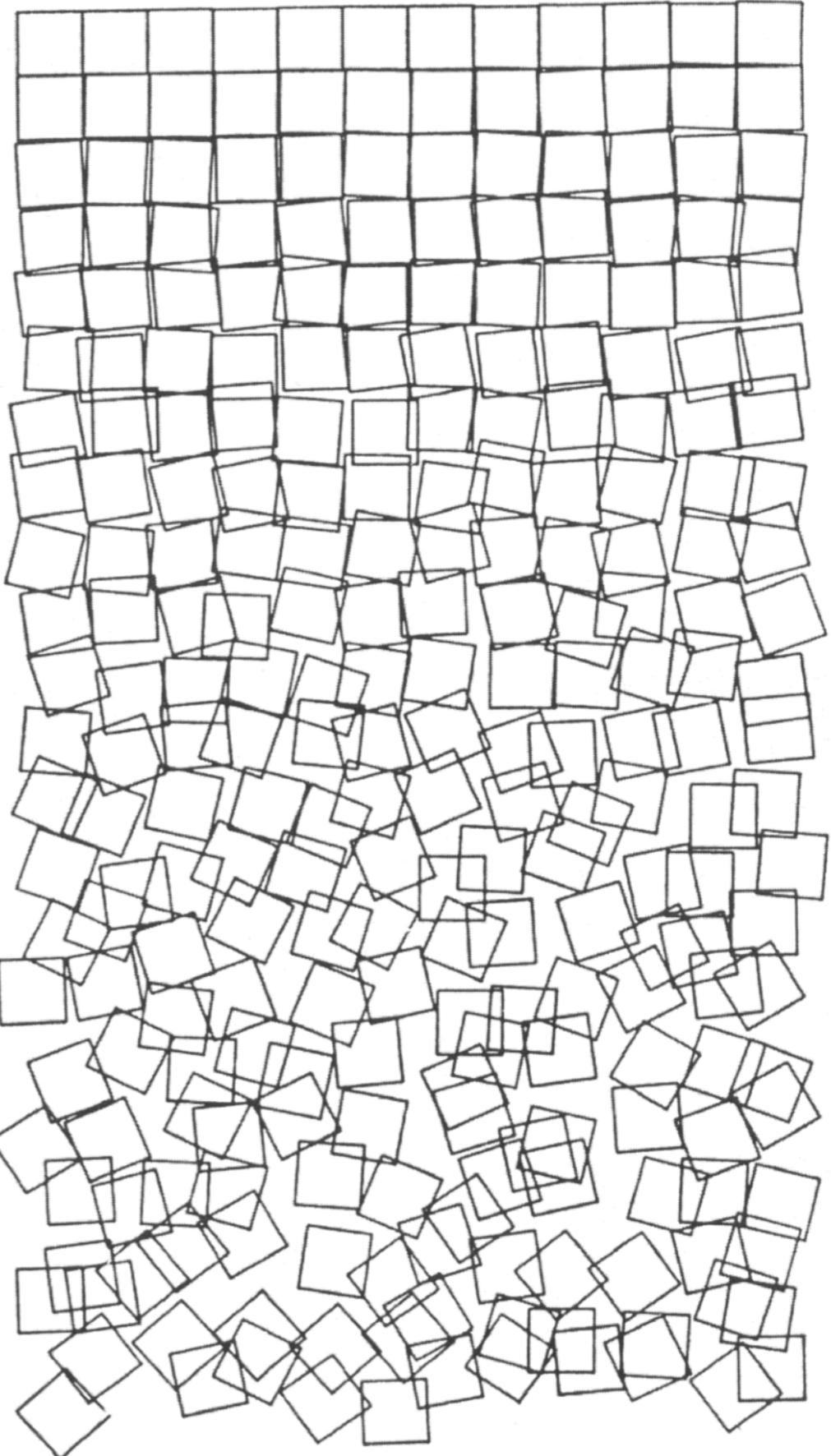
RECODING

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

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

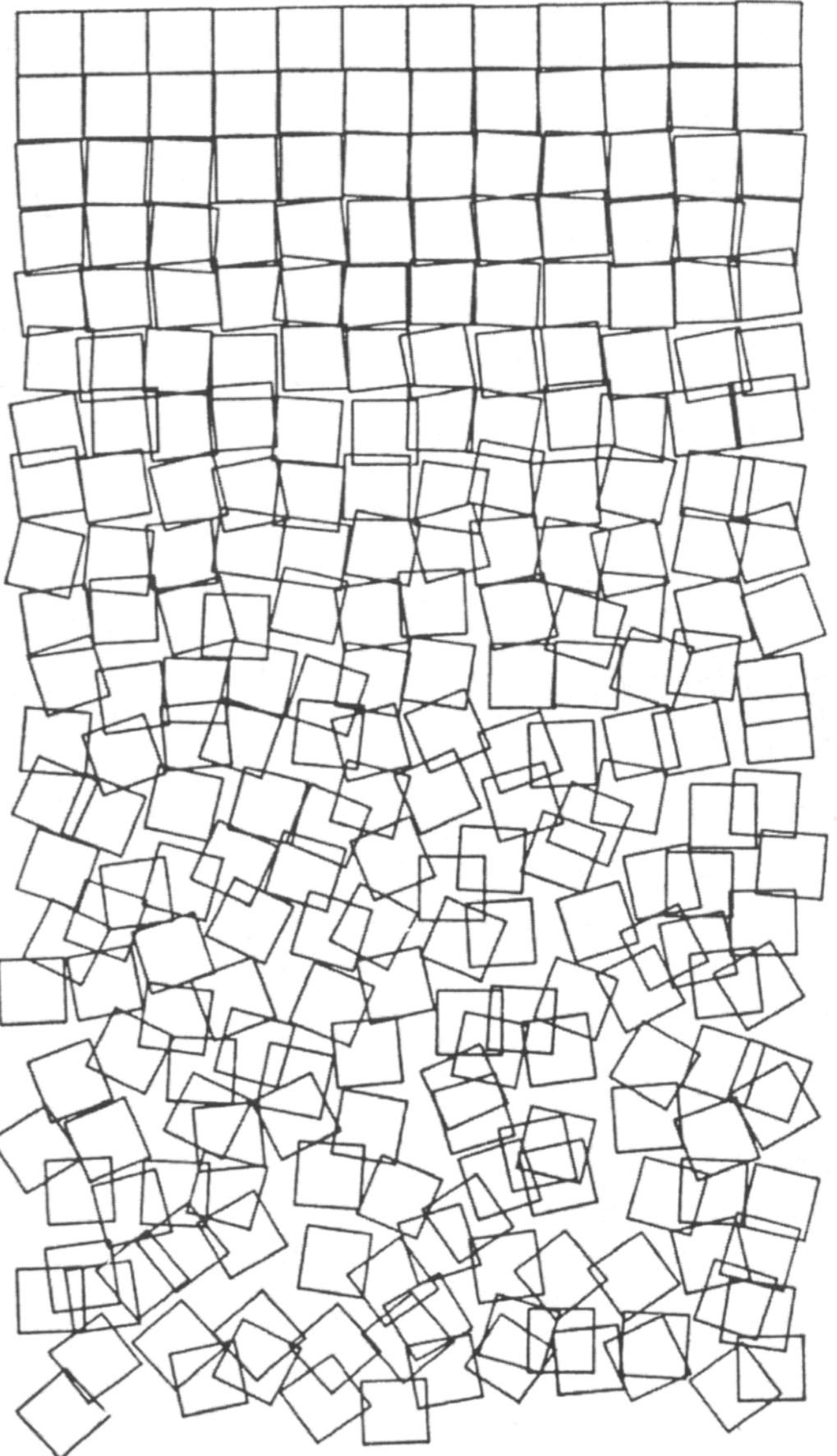
?



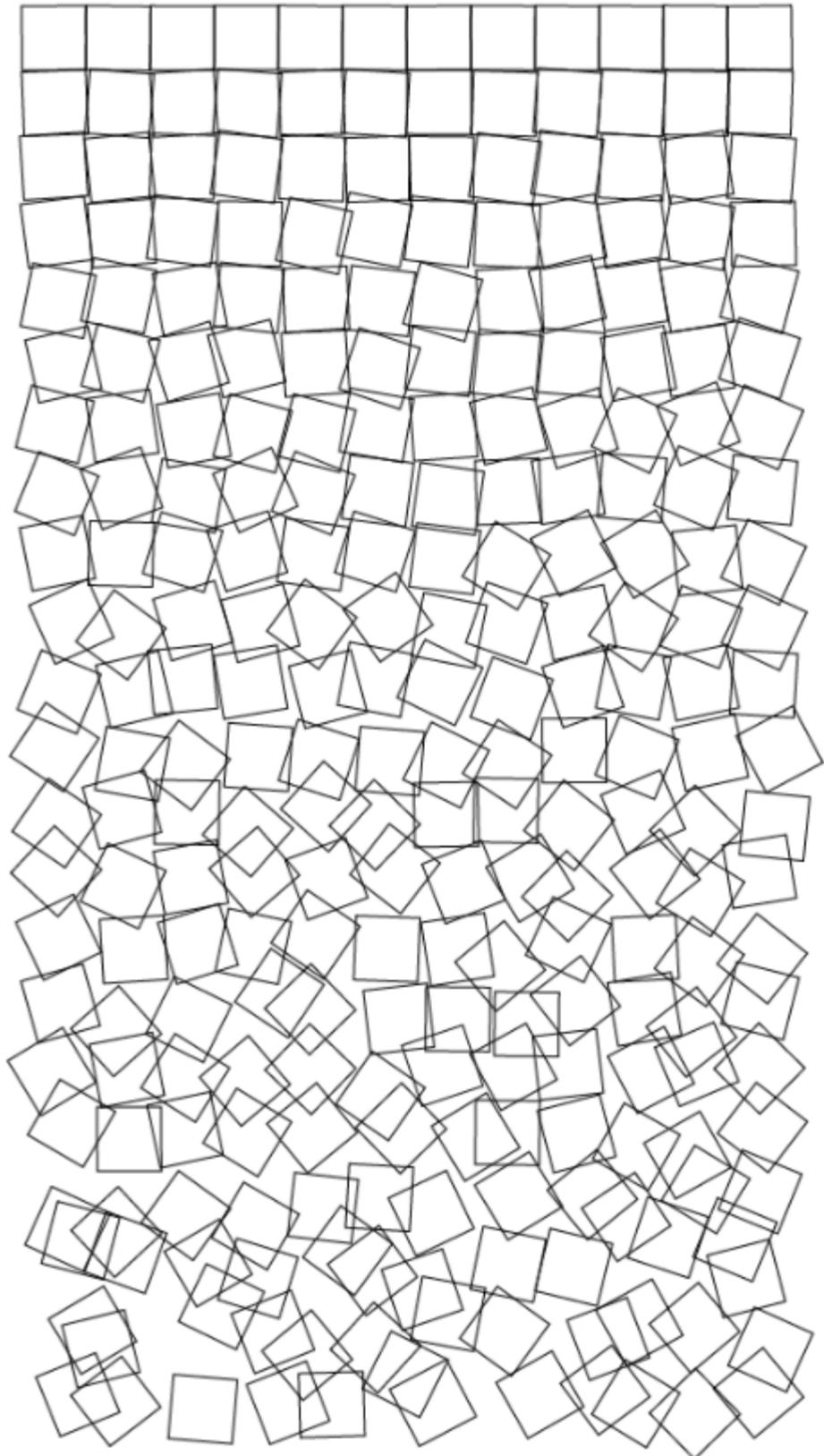
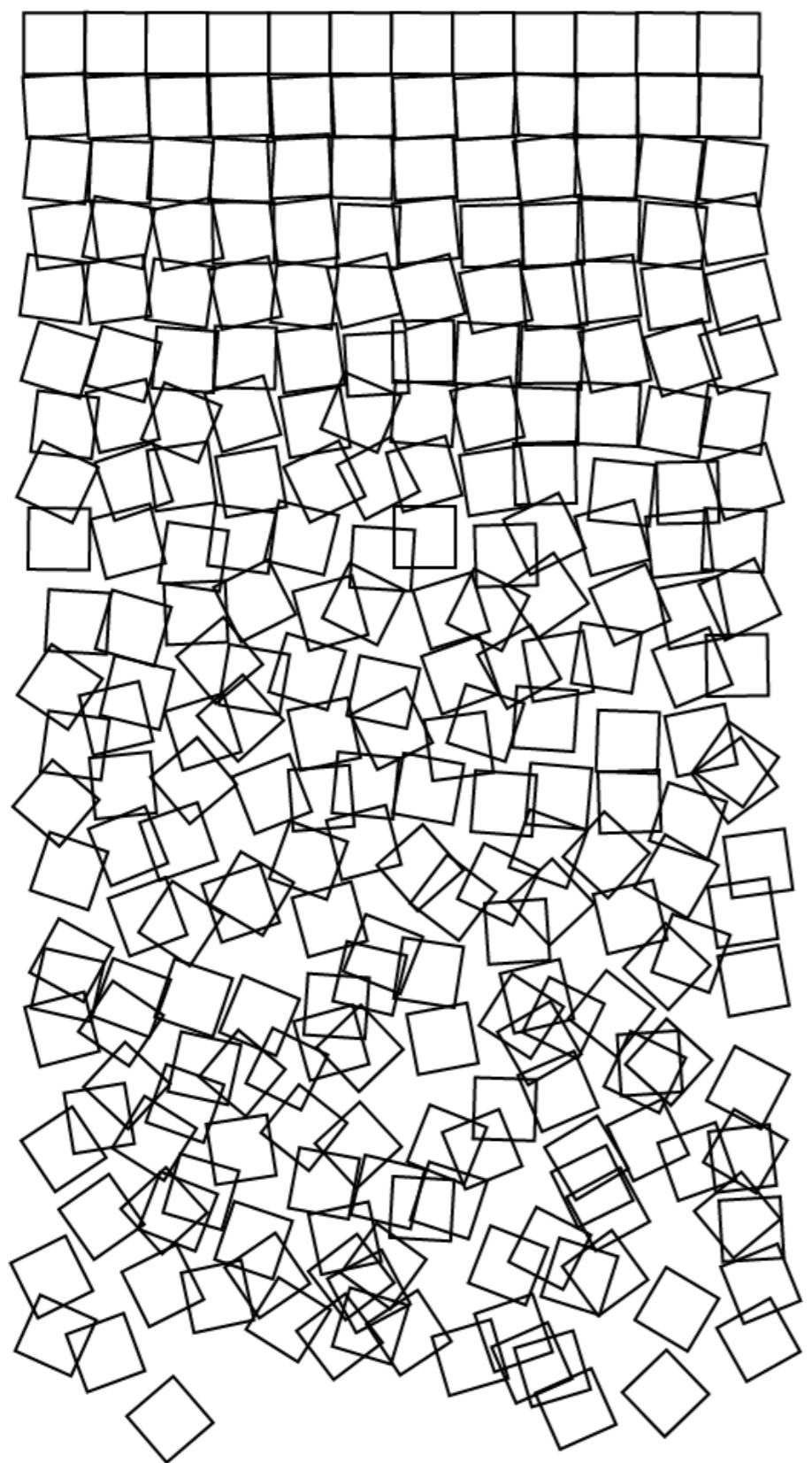
Schotter (Gravel) - Georg Nees, 1968

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

?



Schotter (Gravel) - Georg Nees, 1968



Recode of *Schotter (Gravel)* by Georg Nees, 2021

```
let sqSz = 20;

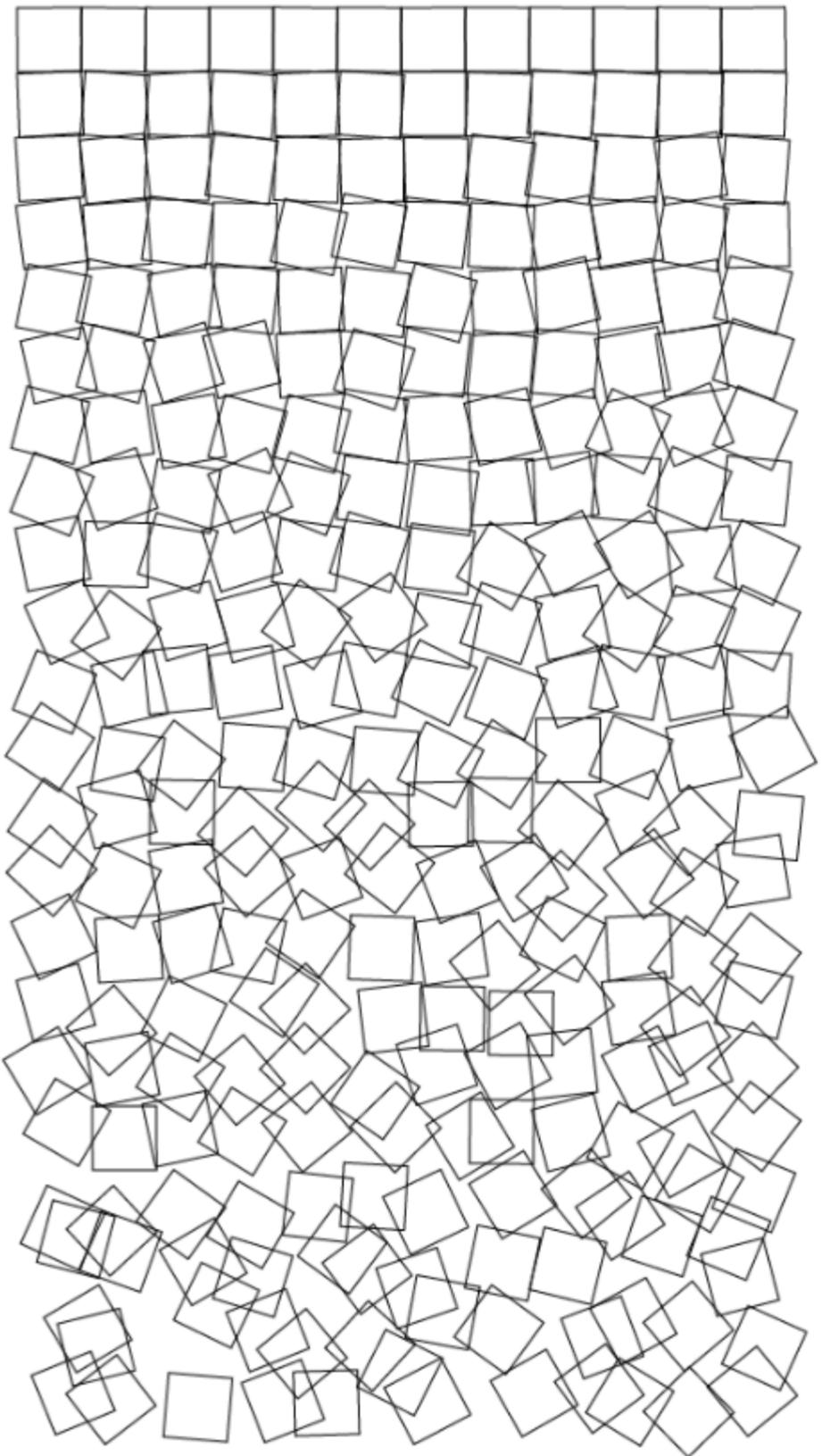
function setup() {
  createCanvas(400, 600);
  noFill();
  background(255);
  translate(width/5, height/8);

  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;

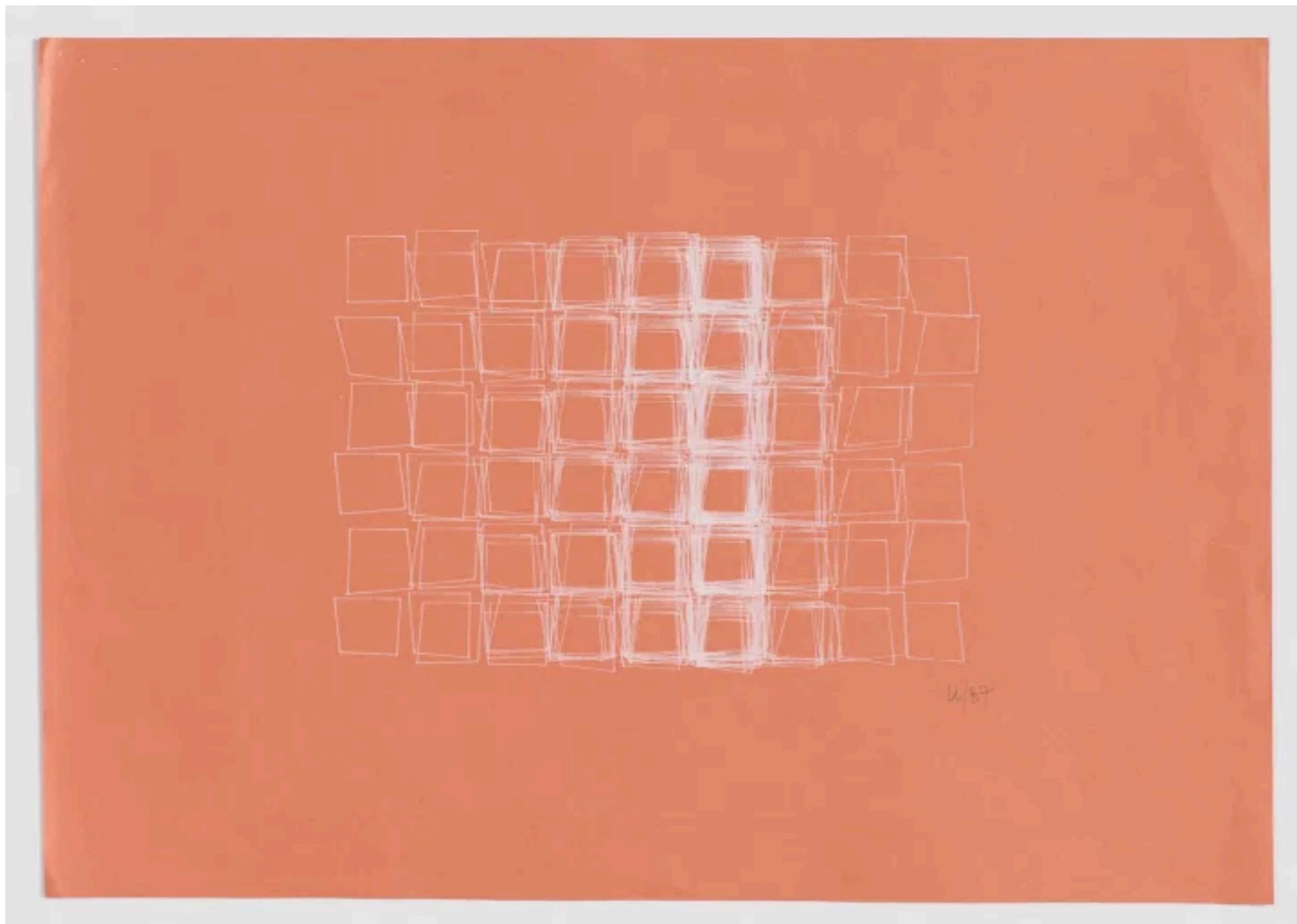
      translate(i * sqSz, j * sqSz);
      rotate(radians(randRot));
      square(-sqSz / 2 + randShift, -sqSz / 2 + randShift, sqSz);

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

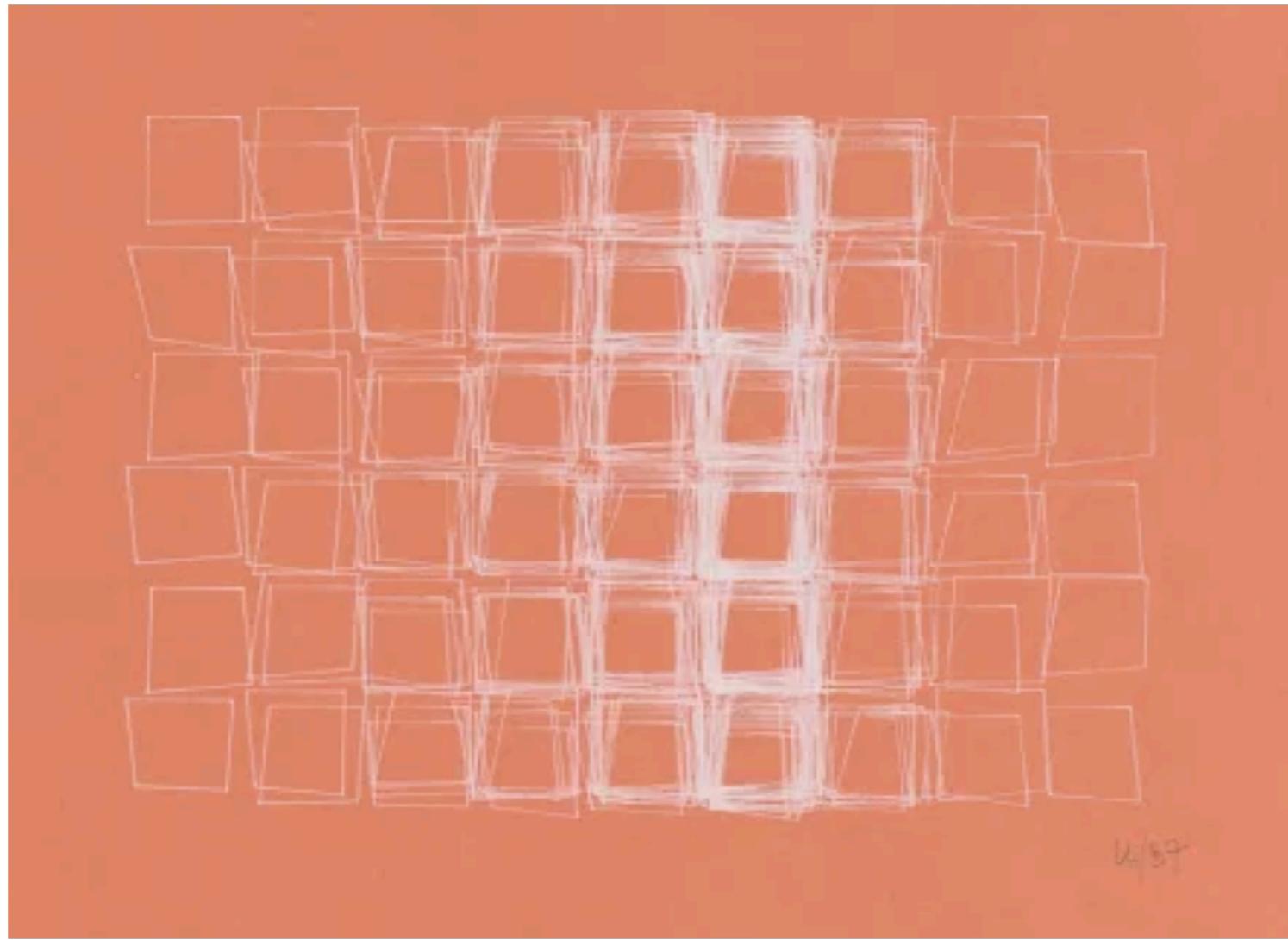
file: Recode-Schotter.js



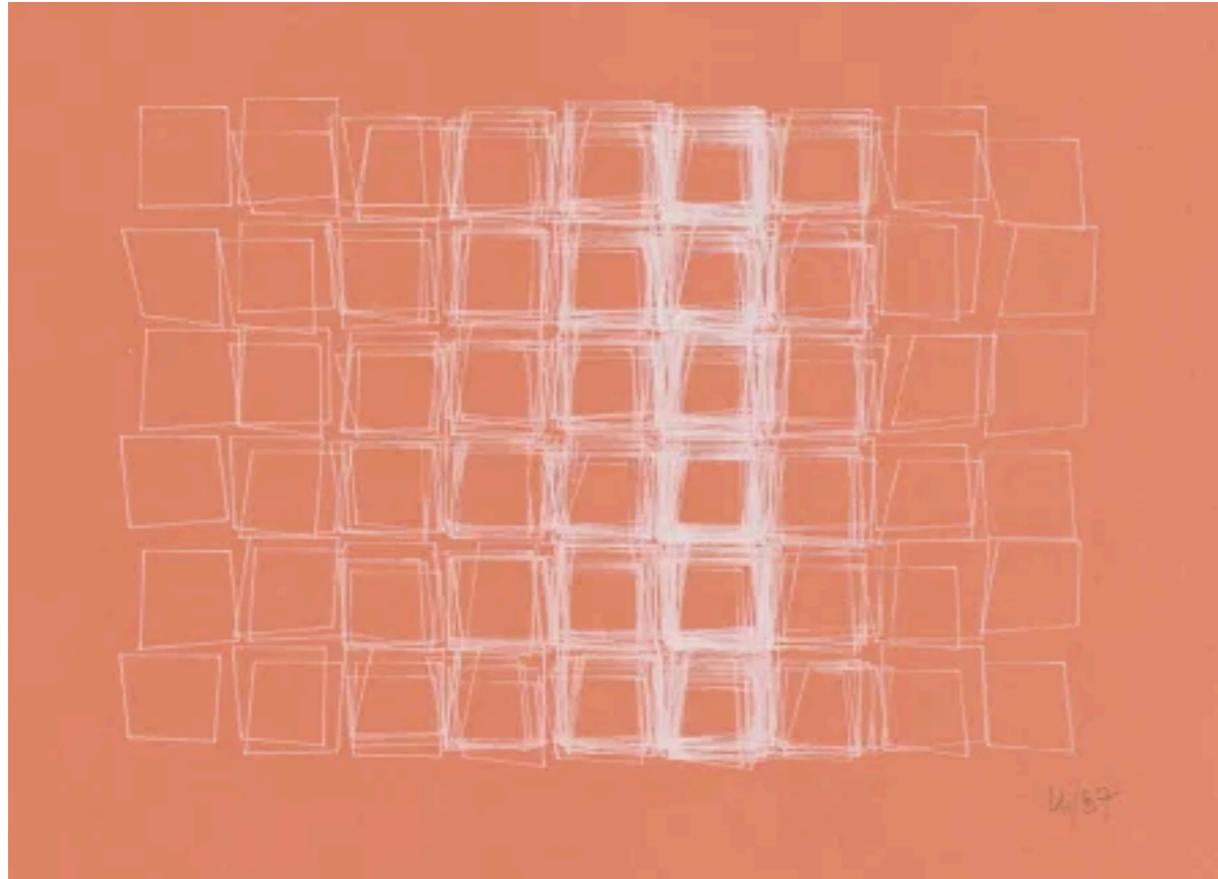
Recode of Schotter (*Gravel*) by Georg Nees, 2021



VERA MOLNAR “STRUCTURE DE QUADRILATERES” (1987)

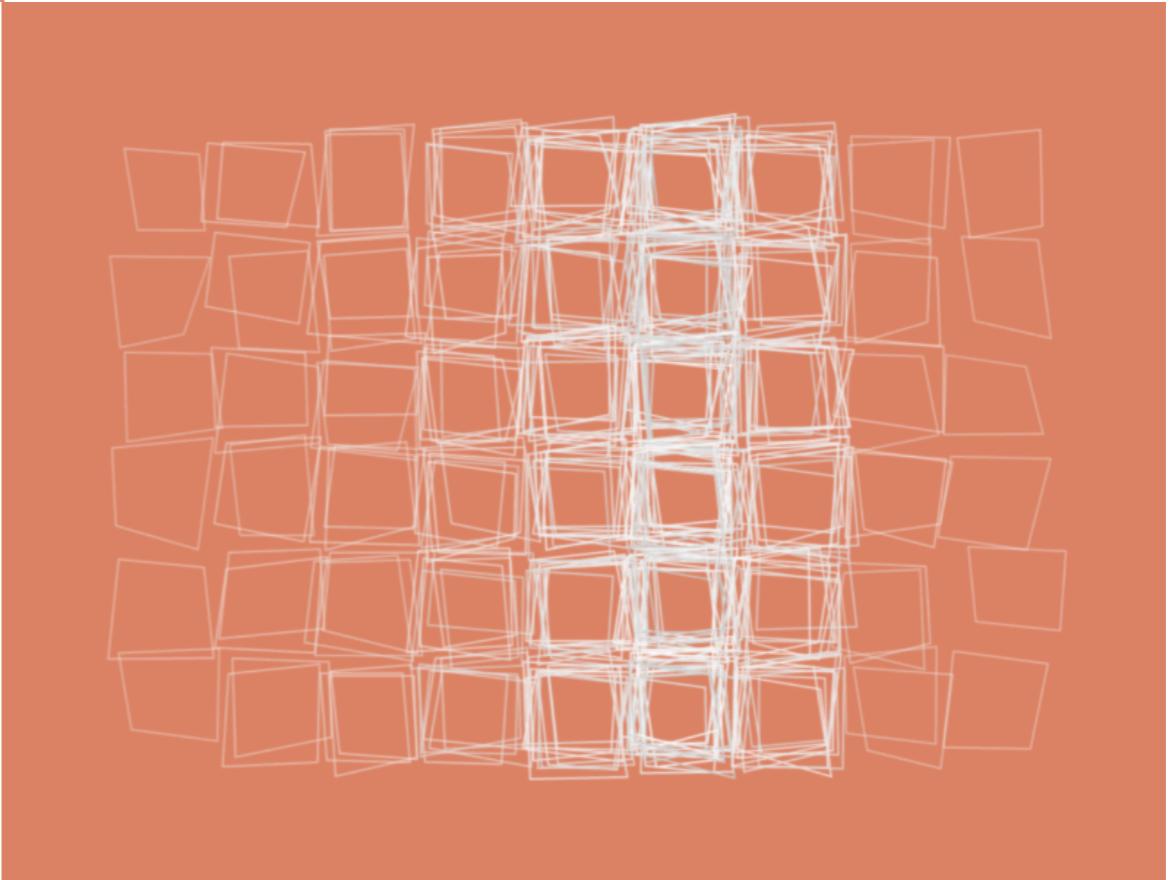


- white lines on a salmon-colored background
- a grid of squares, this time with 9 columns and 6 rows
- moving from left to right, the number of quads in each column increases, reaching a max in the 6th column, and then decreasing again...
- each of the 4 points in the square is randomly offset from its position (thus making the squares into quadrilaterals)



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);

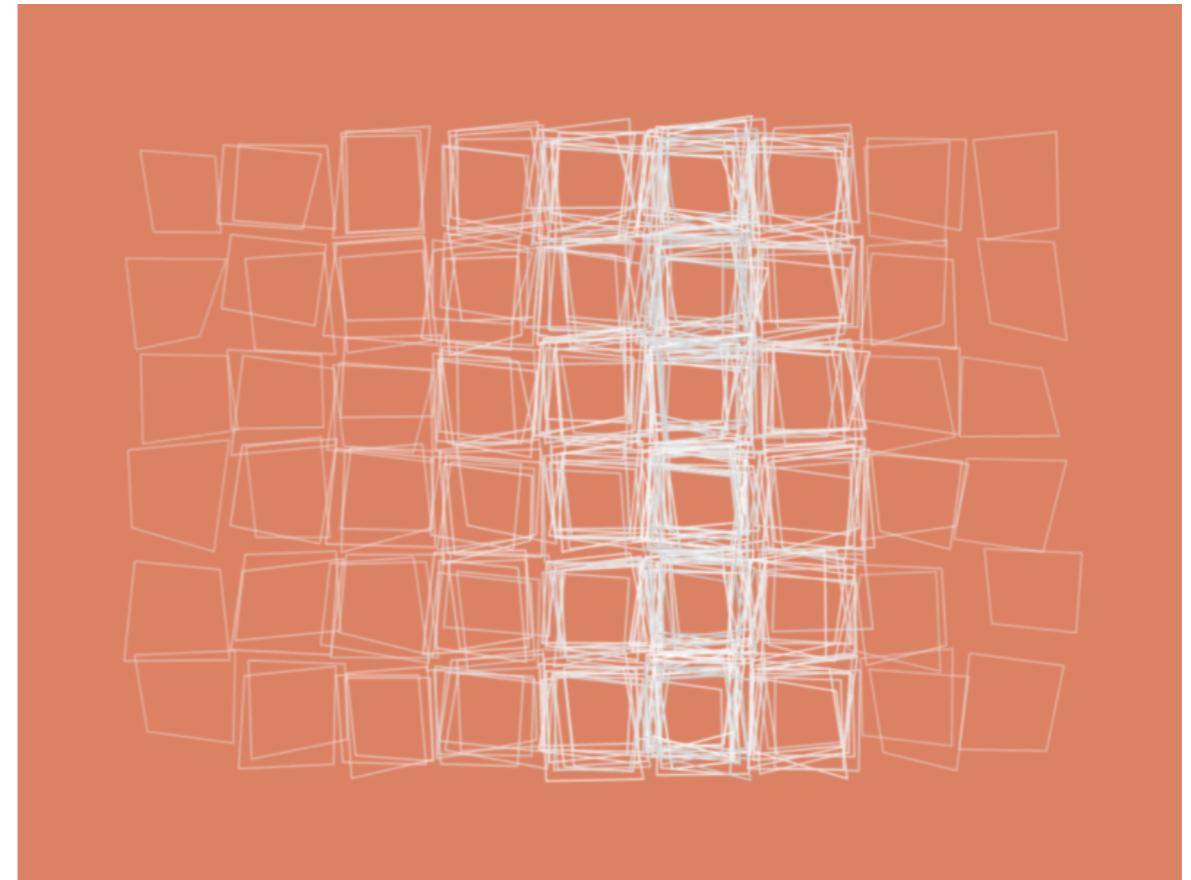
        let x3 = x1 + sz + random(-k, k);
        let y3 = y1 + sz + random(-k, k);

        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

- INTRODUCTION ...
 - THEORETICAL: DEFINITIONS
 - AESTHETIC: EXAMPLES IN ART
 - STRATEGIC: WHY USE RANDOMNESS?
 - PRACTICAL: USING RANDOMNESS ...
-

WRAPUP

END

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