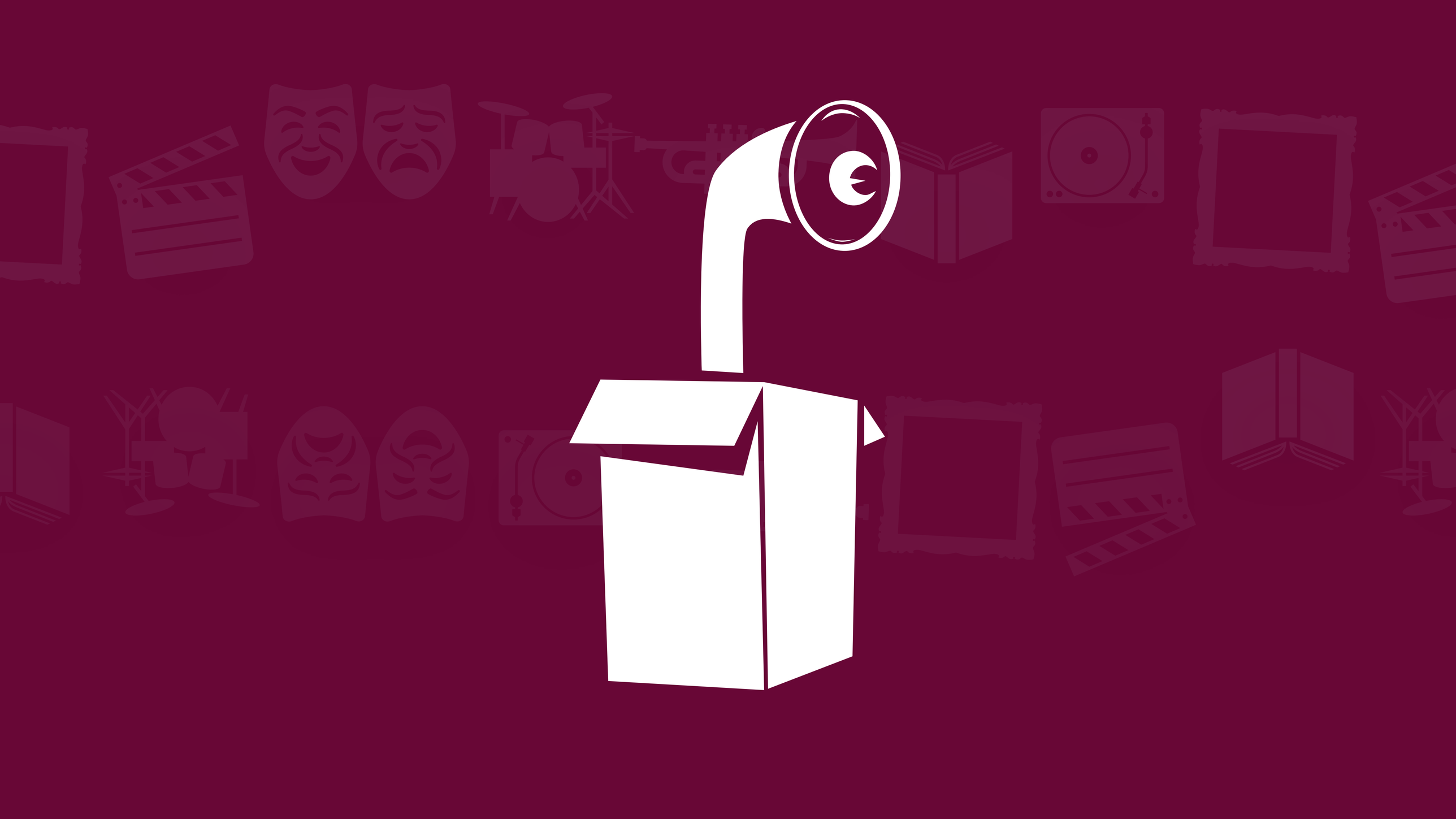
Creativity cannot be computed

HIDDE DE VRIES - BEYOND TELLERAND, BERLIN - NOVEMBER 2024



I love computers

but we tend to overestimate their power

we tend to overestimate tech progress

Elon Musk reveals plans for high

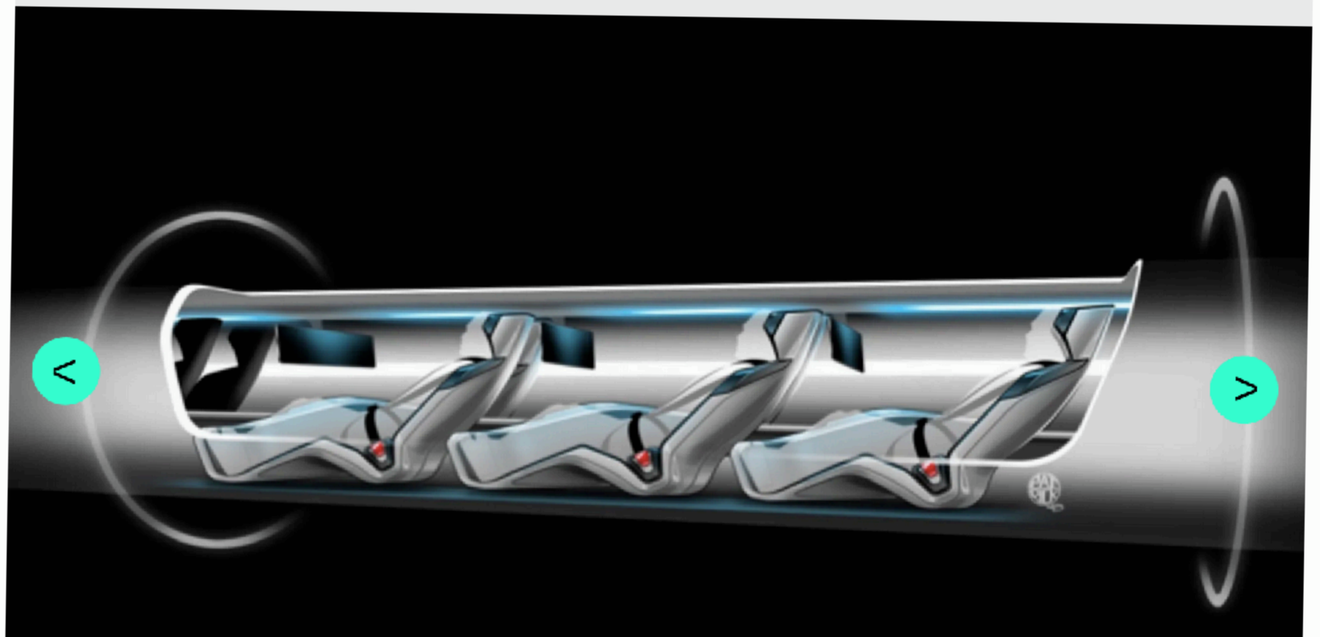
www.theverge.com/2013/8/12/4614940/elon-musk-reveal

120%

The Verge

Menu

model capable of transporting cars. On a following conference call, Musk said he expected a prototype unit might take only three or four years to complete given the right project leader, including a couple years to acclimate themselves to the project. "If it was my top priority, I could probably get it done in one or two years."



Elon Musk reveals plans for high

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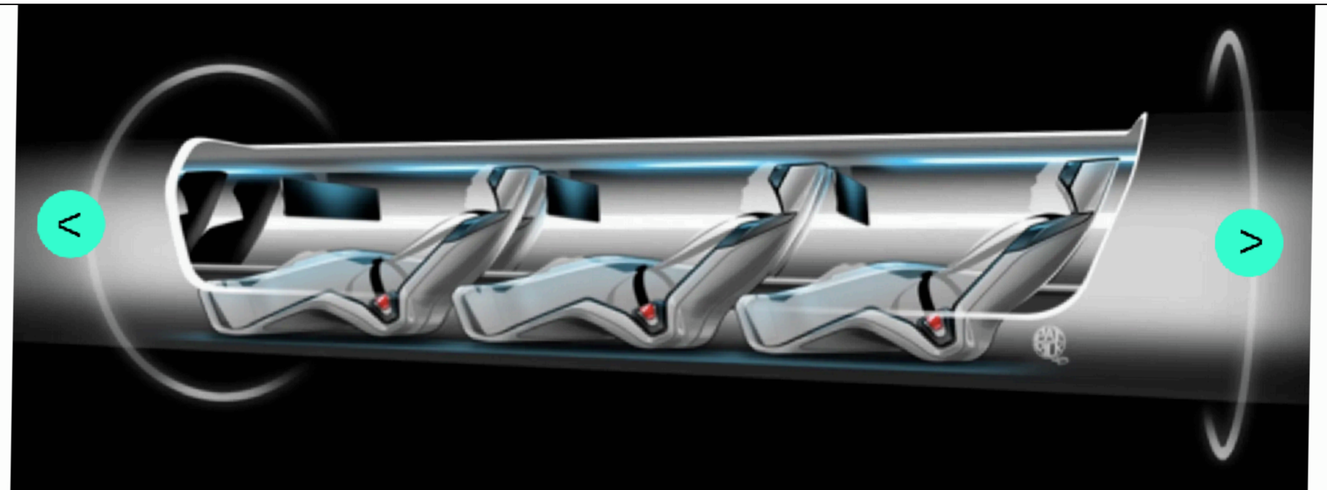
120%

a couple years to acclimate themselves to the project. "If it was my top priority, I could probably get it done in one or two years."



we tend to overestimate computing

while
underestimating
creative work

“I think [creators] tend to overestimate the value of their specific content in the grand scheme of this.”

– Mark Zuckerberg, Facebook, in interview with The Verge (2024)

theverge.com/24253481/meta-ceo-mark-zuckerberg-ar-glasses-orion-ray-bans-ai-decoder-interview

“Creativity has been easier for AI than people thought”

– Sam Altman, CEO of OpenAI at WSJ Tech Live (2023)

youtube.com/watch?v=byYlC2cagLw

“You can see Dall-E generate amazing images, write creative stories with GPT-4, whatever...”

– Sam Altman, CEO of OpenAI at WSJ Tech Live (2023)

youtube.com/watch?v=byYlC2cagLw

“Creativity has been easier for AI than people thought”

– Sam Altman, CEO of OpenAI at WSJ Tech Live (2023)

youtube.com/watch?v=byYlC2cagLw

What is computing?

Computing = manipulating numbers

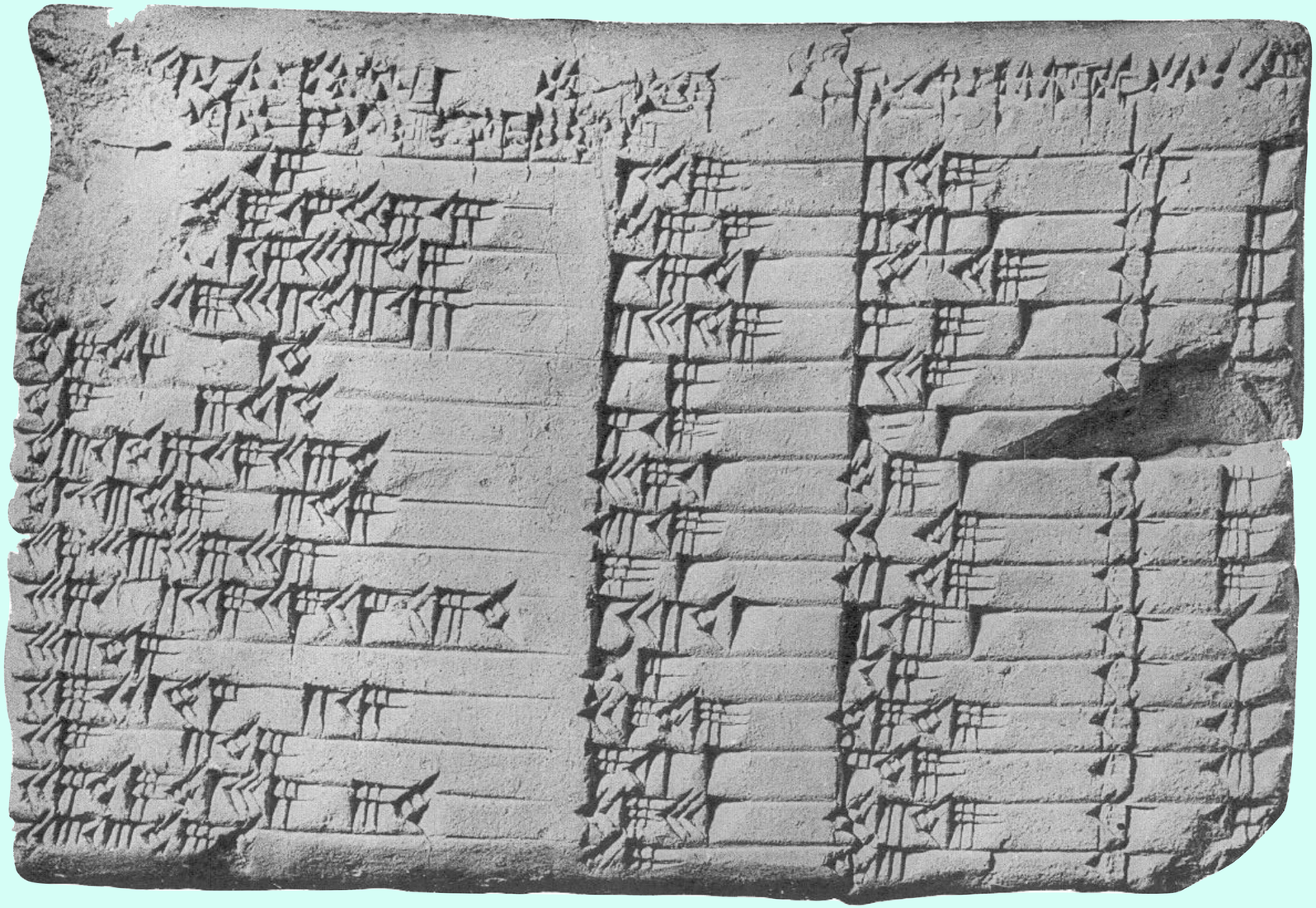
~2000 BC

Clay tablets in Babylonia

(present-day Iraq)

~2000 BC

Plimpton 322



en.wikipedia.org/wiki/Plimpton_322

Computing = manipulating numbers

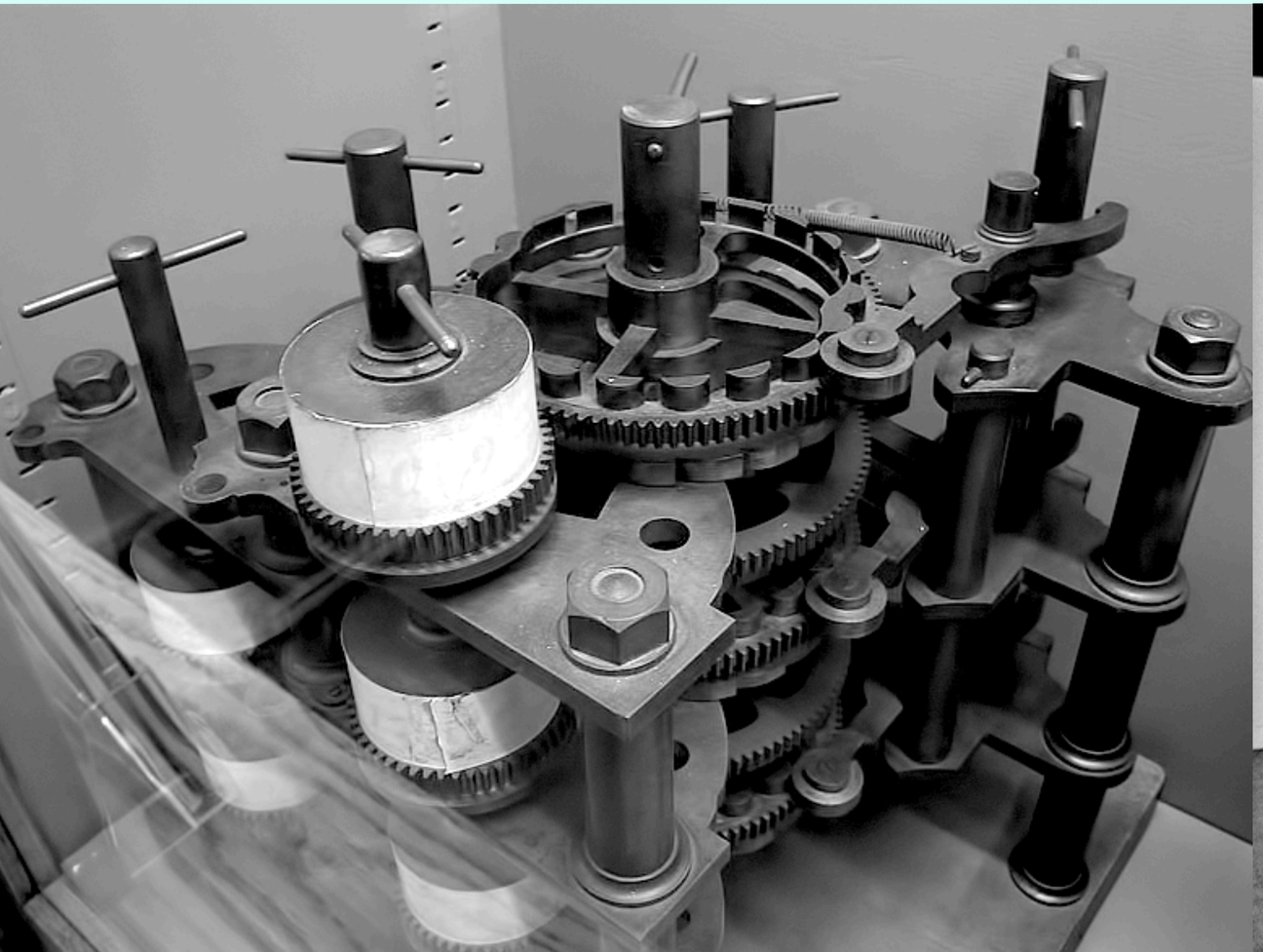
Computing = manipulating data

Computing = completing tasks automatically

Computing = throwing tech at something


Charles
Babbage

The Difference Engine (1820s)



The Analytical Engine (1830s)

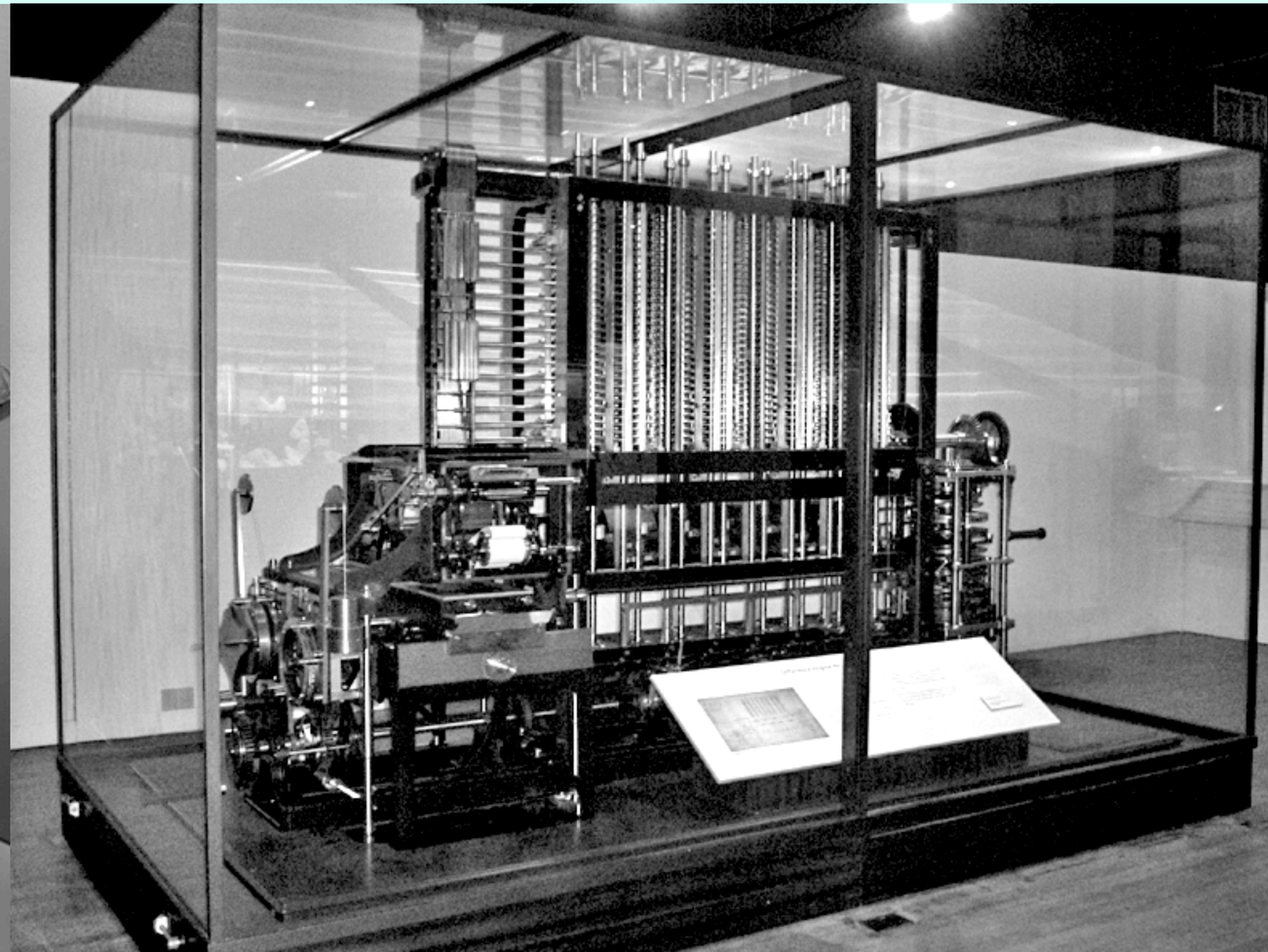
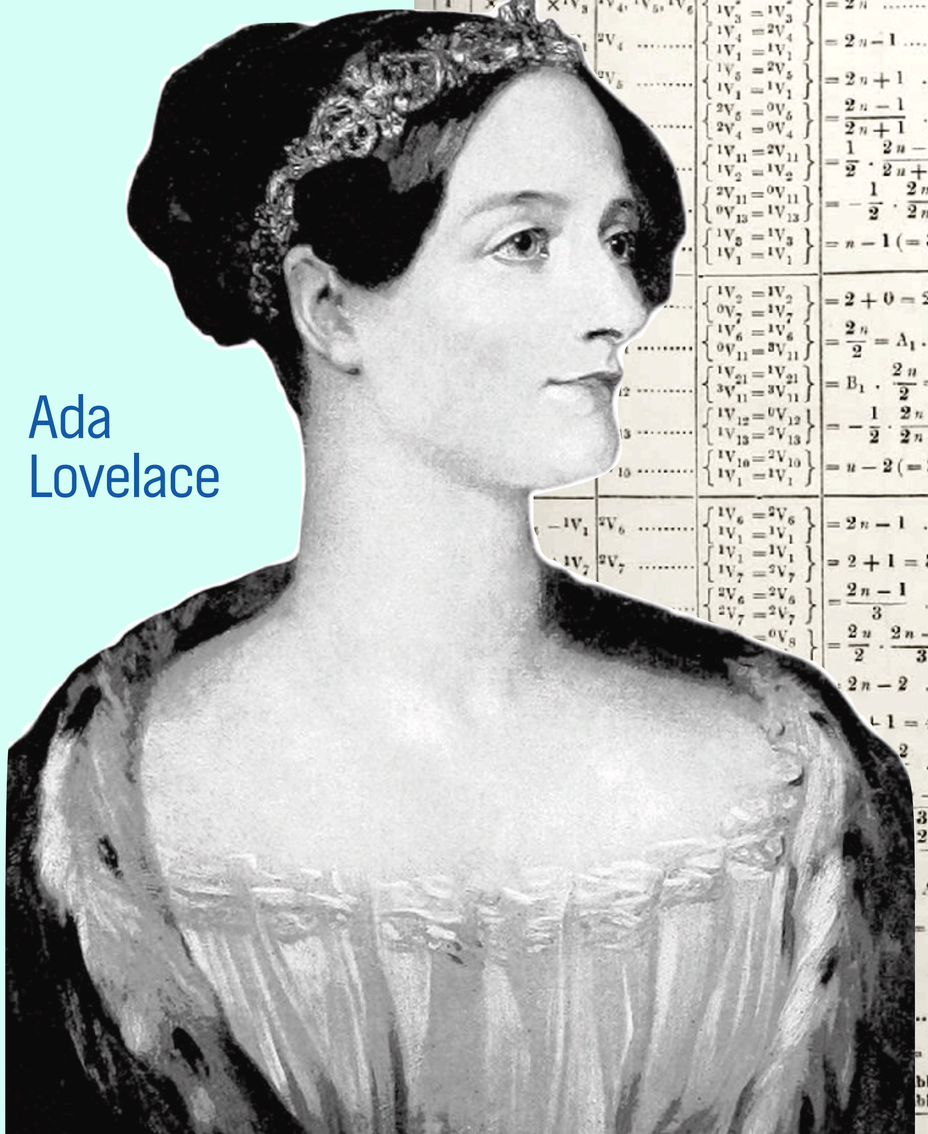


Diagram with Note G



Ada Lovelace

Diagram for the computation by the Engine of the Numbers of Bernoulli. See Note G. (page 722 *et seq.*)

Number of Operation.	Nature of Operation.	Variables acted upon.	Variables receiving results.	Indication of change in the value on any Variable.	Statement of Results.	Data.			Working Variables.									Result Variables.			
						${}^{1}V_1$ 1	${}^{1}V_2$ 2	${}^{1}V_3$ n	${}^{0}V_4$	${}^{0}V_5$	${}^{0}V_6$	${}^{0}V_7$	${}^{0}V_8$	${}^{0}V_9$	${}^{0}V_{10}$	${}^{0}V_{11}$	${}^{0}V_{12}$	${}^{0}V_{13}$	${}^{1}V_{21}$ B_1	${}^{1}V_{22}$ B_3	${}^{1}V_{23}$ B_5	${}^{0}V_{24}$ ... B_7
1	×	×${}^{1}V_3$	${}^{1}V_4$, ${}^{1}V_5$, ${}^{1}V_6$	${}^{1}V_2 = {}^{1}V_2$, ${}^{1}V_3 = {}^{1}V_3$	$= 2n$	...	2	n	$2n$	$2n$	$2n$											
2			${}^{2}V_4$	${}^{1}V_4 = {}^{2}V_4$, ${}^{1}V_1 = {}^{1}V_1$	$= 2n-1$	1	...	...	$2n-1$													
3			${}^{2}V_5$	${}^{1}V_5 = {}^{2}V_5$, ${}^{1}V_1 = {}^{1}V_1$	$= 2n+1$	1	...	...	...	$2n+1$												
4				${}^{2}V_6 = {}^{0}V_5$, ${}^{2}V_4 = {}^{0}V_4$	$= \frac{2n-1}{2n+1}$	...	...	...	0	0	...	...	...	...	...	$\frac{2n-1}{2n+1}$						
5				${}^{1}V_{11} = {}^{2}V_{11}$, ${}^{1}V_2 = {}^{1}V_2$	$= \frac{1}{2} \cdot \frac{2n-1}{2n+1}$	...	2	...	...	...	...	...	...	...	...	$\frac{1}{2} \cdot \frac{2n-1}{2n+1}$						
6				${}^{2}V_{11} = {}^{0}V_{11}$, ${}^{0}V_{13} = {}^{1}V_{13}$	$= -\frac{1}{2} \cdot \frac{2n-1}{2n+1} = A_0$	...	...	...	...	...	...	...	...	...	...	0	.....	$-\frac{1}{2} \cdot \frac{2n-1}{2n+1} = A_0$				
7				${}^{1}V_5 = {}^{1}V_3$, ${}^{1}V_1 = {}^{1}V_1$	$= n-1\ (=3)$	1	...	n	...	...	...	...	...	...	$n-1$							
8				${}^{1}V_2 = {}^{1}V_2$, ${}^{0}V_7 = {}^{1}V_7$	$= 2+0=2$	...	2	...	...	...	...	2										
9				${}^{1}V_6 = {}^{1}V_6$, ${}^{0}V_{11} = {}^{3}V_{11}$	$= \frac{2n}{2} = A_1$	...	...	...	...	...	$2n$	2	...	...	...	$\frac{2n}{2} = A_1$						
10				${}^{1}V_{21} = {}^{1}V_{21}$, ${}^{3}V_{11} = {}^{3}V_{11}$	$= B_1 \cdot \frac{2n}{2} = B_1 A_1$	...	...	...	...	...	...	...	...	...	...	$\frac{2n}{2} = A_1$	$B_1 \cdot \frac{2n}{2} = B_1 A_1$	.....	B_1			
11				${}^{1}V_{12} = {}^{0}V_{12}$, ${}^{1}V_{13} = {}^{2}V_{13}$	$= -\frac{1}{2} \cdot \frac{2n-1}{2n+1} + B_1 \cdot \frac{2n}{2}$	...	...	...	...	...	...	...	...	...	...	.....	0	$\left\{-\frac{1}{2} \cdot \frac{2n-1}{2n+1} + B_1 \cdot \frac{2n}{2}\right\}$				
12				${}^{1}V_{10} = {}^{2}V_{10}$, ${}^{1}V_1 = {}^{1}V_1$	$= n-2\ (=2)$	1	...	...	...	...	...	...	...	...	$n-2$							
13		$-{}^{1}V_1$	${}^{2}V_6$	${}^{1}V_6 = {}^{2}V_6$, ${}^{1}V_1 = {}^{1}V_1$	$= 2n-1$	1	...	...	...	...	$2n-1$											
14		${}^{1}V_7$	${}^{2}V_7$	${}^{1}V_1 = {}^{1}V_1$, ${}^{1}V_7 = {}^{2}V_7$	$= 2+1=3$	1	...	...	...	...	...	3										
15				${}^{2}V_6 = {}^{2}V_6$, ${}^{2}V_7 = {}^{2}V_7$	$= \frac{2n-1}{3}$	...	...	...	...	...	$2n-1$	3	$\frac{2n-1}{3}$									
16				${}^{0}V_8$	$= \frac{2n}{2} \cdot \frac{2n-1}{3}$	...	...	...	...	...	...	...	0	...	...	$\frac{2n}{2} \cdot \frac{2n-1}{3}$						
17					$2n-2$	1	...	...	...	...	$2n-2$											
18					$1=4$	1	...	...	...	...	...	4										
19					2	...	...	...	...	...	$2n-2$	4	...	$\frac{2n-2}{4}$	...	$\left\{\frac{2n}{2} \cdot \frac{2n-1}{3} \cdot \frac{2n-2}{3} = A_2\right\}$						
20					$-1 \cdot \frac{2n-2}{4} = A_3$	...	...	...	...	...	...	...	...	0								
21					$\frac{2n-1}{3} \cdot \frac{2n-2}{3} = B_3 A_3$	...	...	...	...	...	...	...	...	...	...	0	$B_3 A_3$	.....	.....	B_3		
22					$A_1 + B_3 A_3$	...	...	...	...	...	...	...	...	...	...	.....	0	$\{A_3 + B_1 A_1 + B_3 A_3\}$				
23					$=1)$	1	...	...	...	...	...	...	...	...	$n-3$							
					Here follows a repetition of Operations thirteen to twenty-three.																	
					.....	...	...	...	...	...	...	...	...	...	...	.....	.....	.....	.....	.....	.....	B_7
					$= 4+1=5$	1	...	$n+1$	...	...	0	0										
					ble-card.																	
					ble card.																	

“It is desirable to guard against the possibility of exaggerated ideas that might arise as to the powers of the Analytical Engine.”

– Ada Lovelace, also in Note G

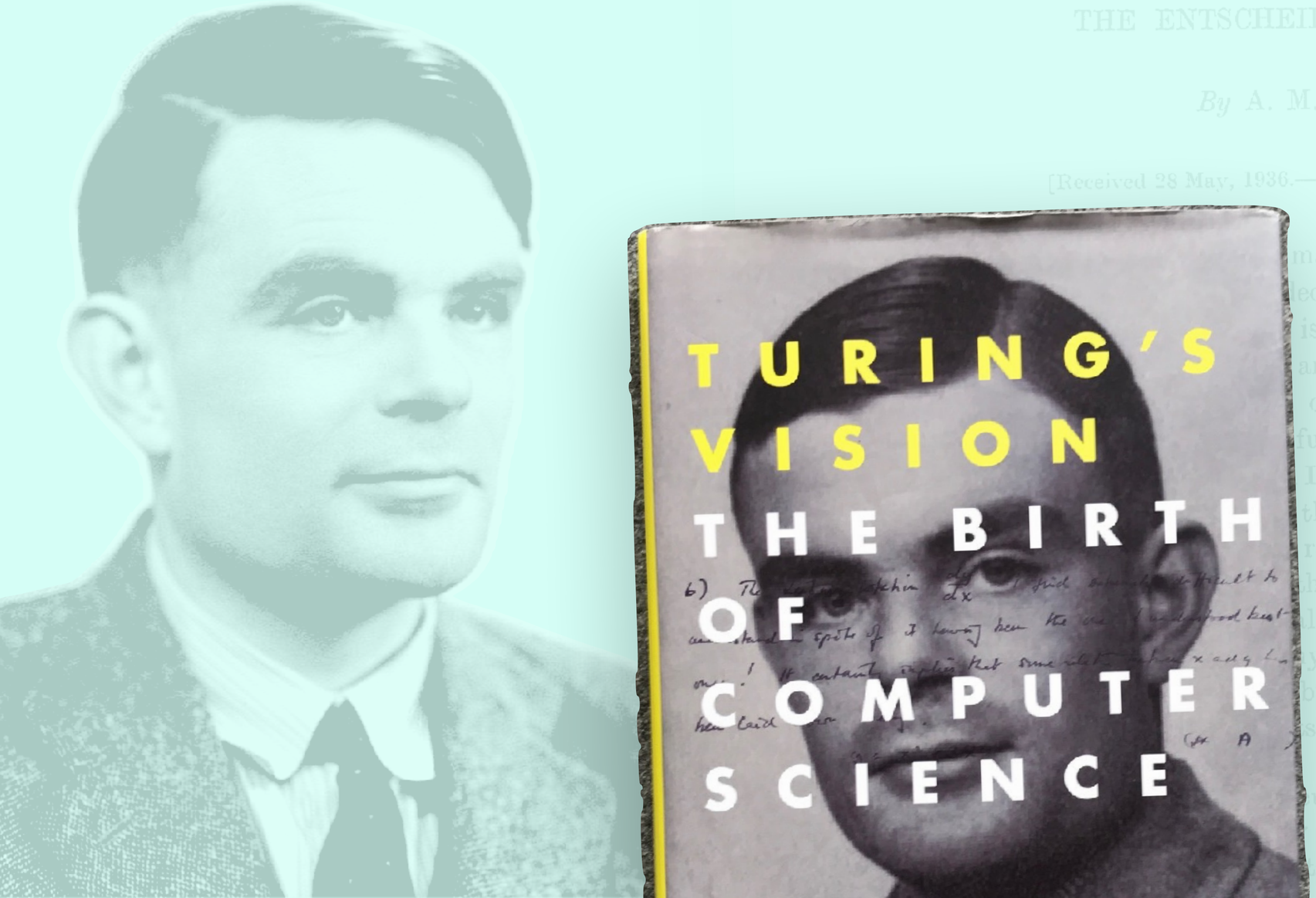
ON COMPUTABLE NUMBERS, WITH AN APPLICATION TO THE ENTSCHEIDUNGSPROBLEM

By A. M. Turing.

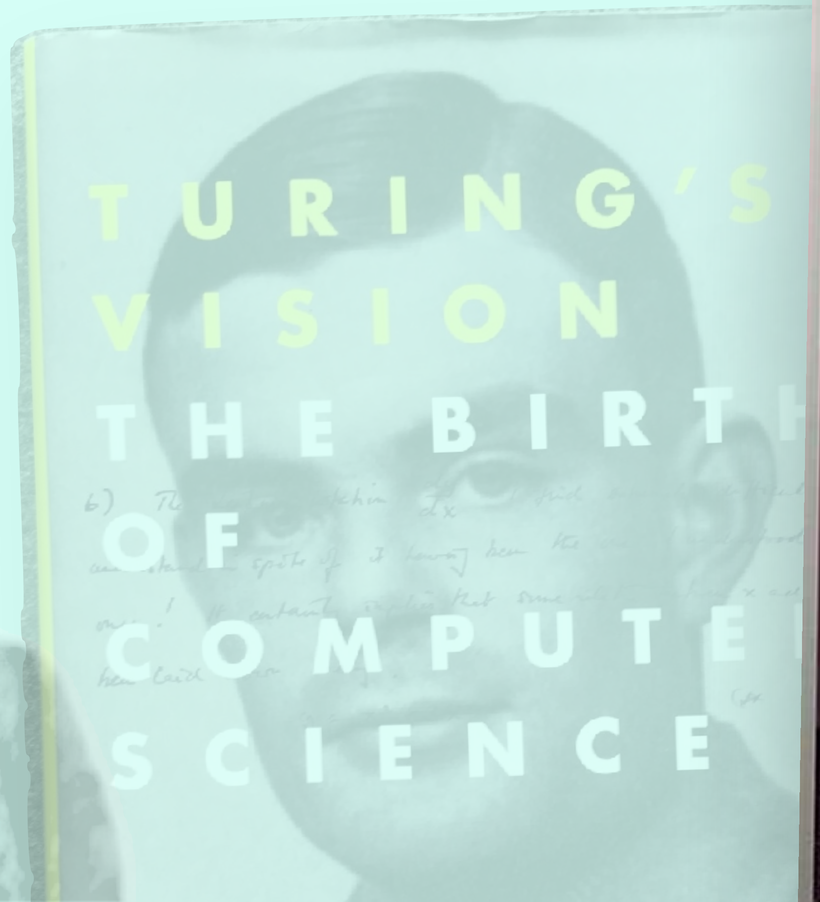
[Received 28 May, 1936.—Read 12 November, 1936.]

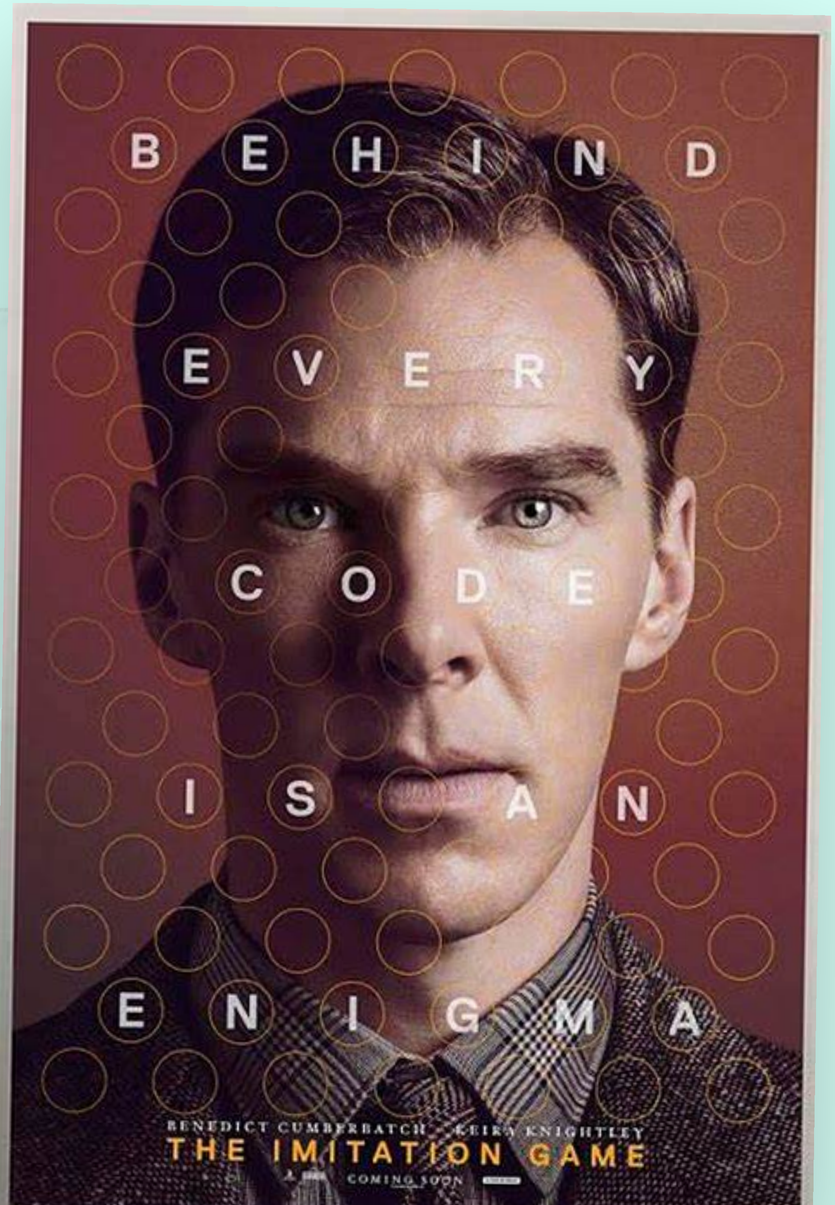
The "computable" numbers may be described briefly as the real numbers whose expressions as a decimal are calculable by finite means. Although the subject of this paper is ostensibly the computable *numbers*, it is almost equally easy to define and investigate computable functions of an integral variable or a real or computable variable, computable predicates, and so forth. The fundamental problems involved are, however, the same in each case, and I have chosen the computable numbers for explicit treatment as involving the least cumbrous technique. I hope shortly to give an account of the relations of the computable numbers, functions, and so forth to one another. This will include a development of the theory of functions of a real variable expressed in terms of computable numbers. According to my definition, a number is computable if its decimal can be written down by a machine.

In §§ 9, 10 I give some arguments with the intention of showing that the computable numbers include all numbers which could naturally be regarded as computable. In particular, I show that certain large classes of numbers are computable. They include, for instance, the real parts of all algebraic numbers, the real parts of the zeros of the Bessel functions.



hidde.blog/book-tip-turings-vision


TURING'S
VISION
THE BIRTH
OF
COMPUTER
SCIENCE


BEHIND
EVERY
CODE
IS AN
ENIGMA
BENEDICT CUMBERBATCH KEIRA KNIGHTLEY
THE IMITATION GAME
COMING SOON

A Proposal for the

DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE

We propose that a 2 month, 10 man study of artificial intelligence be carried out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire. The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves. We think that a significant advance can be made in one or more of these problems if a carefully selected group of scientists work on it together for a summer.


Cascading HTML style sheets -- a proposal
Håkon W Lie
howcome@info.cern.ch
10 Oct 1994
v0.92 This document describes work in progress and is incomplete as a basis for implementation. Its primary purpose is to establish
proposes a style sheet scheme for HTML documents. The proposed scheme provides a simple mapping between HTML
presentation hints. Properties like font family and window size can be suggested by the style sheet, and it can also
presentation decisions based on the user's environment; e.g. the size of the screen or the current date.
scheme is designed so that style sheets can be cascaded; the user/browser specifies initial preferences and hands the
over to the style sheets
to page description langu
upports visual as well as non-

A Proposal for the

DARTMOUTH SUMMER RESEARCH PROJECT ON ARTIFICIAL INTELLIGENCE

We propose that a 2 month, 10 man study of artificial intelligence be carried out during the summer of 1956 at Dartmouth College in Hanover, New Hampshire. The study is to proceed on the basis of the conjecture that every aspect of learning or any other feature of intelligence can in principle be so precisely described that a machine can be made to simulate it. An attempt will be made to find how to make machines use language, form abstractions and concepts, solve kinds of problems now reserved for humans, and improve themselves. We think that a significant advance can be made in one or more of these problems if a carefully selected group of scientists work on it together for a summer.

“AI was harder than we thought.”

- John McCarthy (2006)

From Melanie Mitchell's presentation “Why AI is harder than we think”


1843

The first “algorithm”

1952-1955

Compilers and COBOL

2002

First robotic vacuum cleaner

1933

Turing machine concept

1972

Inverse document frequency

2007

Invention of the iPhone

2024

“AI will fix all of our problems”

“It is desirable to guard against the possibility of exaggerated ideas that might arise as to the powers of the Analytical Engine.”

– Ada Lovelace, in her notes

Creativity and arts

Creativity = problem solving

Designing of actual robots

Technical migrations

Stylesheet languages

Picture books

The presence of creativity is the absence of dullness

Video for “Manon” by De Jeugd van Tegenwoordig

Jessica Hische talking about handrrawn letters at Beyond Tellerrand in Berlin (2024)

Immanuel Kant:
the ability to produce works that are **not only “original”**–since “there can be original nonsense” **–but also “exemplary”**

plato.stanford.edu/entries/creativity

Boden's three types of creativity

Combinational
Exploratory
Transformational

Boden's three types of creativity

Combinational

Exploratory

Transformational

Espresso tonic, Rotterdam (2022)

Boden's three types of creativity

Combinational

Exploratory

Transformational

Herbie Hancock + band in Toronto (2024)

Boden's three types of creativity

Combinational
Exploratory
Transformational

The steam engine

Boden's three types of creativity

Combinational
Exploratory
Transformational

Quincy Jones

Creativity

Art

Design

Aesthetics

Creativity

Creativity

is it new & interesting?

Design

does it function?

Creativity

is it new & interesting?

Design

does it function?

Aesthetics

is this beautiful?

Creativity

is it new & interesting?

Art

what makes it art?

Design

does it function?

Aesthetics

is this beautiful?

Creativity → Art

What is art?

Films, books, paintings, poetry, photography, music, sculpture, performances, plays, operas, street art, comedy, literature, video games, some of your toots.

Art isn't always easy to recognise


SUMACO
SARDINES
TOMATO SAUCE
TUNA

“All the good times we spent together” by Alexandre Lavet (2016).

“Fountain” by Marcel Duchamp (1917).

“Peanut butter platform” by Wim T. Schippers (1969).

Art is legitimised

Art is legitimised

Artist puts it out “as art”

Audience wants to pay for it

Institutions want to display it

Art has critics

Art has critics

Well executed

Great ideas/concepts

Captivating

Original / creative

Clichéd

Stunning

Art is appreciated conditionally


You and me baby ain't nothin' but mammals


So let's do it like they do on the Discovery Channel

Appreciating art

Personal experiences

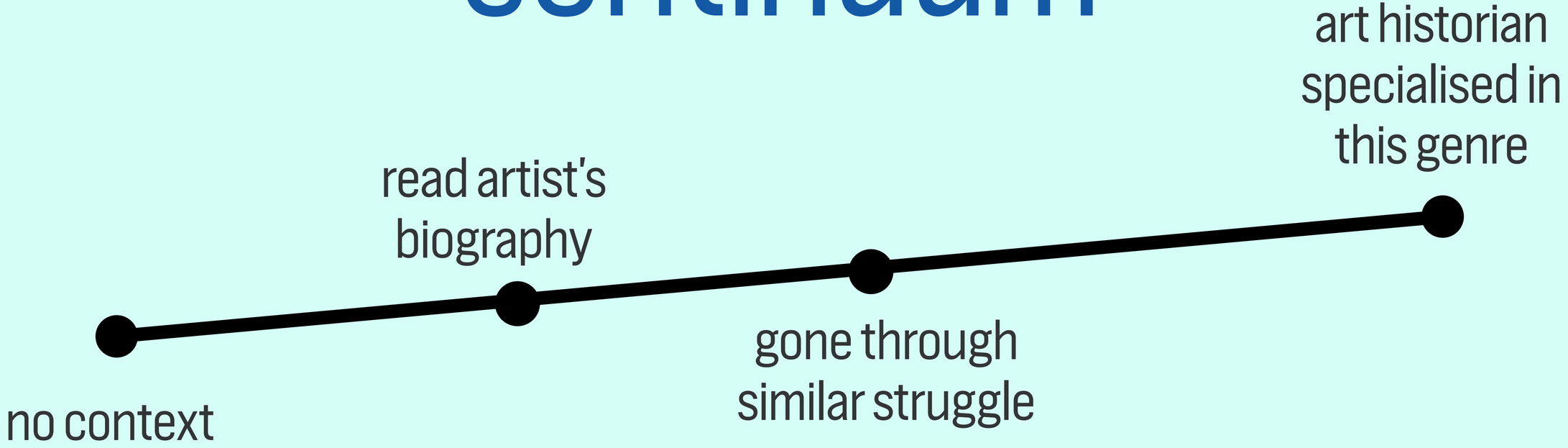
Knowledge of context in history

Knowledge of artist

Descriptions

Prerequisites (like language)

Appreciation is a continuum



Art is repeated


ROA
DA
CHARI
WILLY WONK
& THE CHOCOL
FACTO
JOH
PG
ENTER A WORLD OF
Pure Imagination!
Roald Dahl's
CHARLIE
AND THE CHOCOLATE FACTORY
The New Musical
THEATRE ROYAL DRURY LANE

Scene from La Traviata at the Metropolitan Opera in New York

POS 1213

ABBA

SOS

Man in the middle

POLAR
MUSIC PRODUCTION

Still from music video of Portishead's version of “SOS” by ABBA

Art is repeated

David Hockney
Portrait of an Artist
(Pool with two figures)

Art is repeated


Egypt at one point.
Ah, day 2, day 2. Before we start off, Yoshi and I announced something yesterday.
beyond tellerrand
Düsseldorf
2023


Dorett

Art is repeated

Art may contain intentions

Students interview artist Geoffrey Chadsey tang.skidmore.edu/collection/explore/202-shifting-poses

laurents.art on Instagram

Künstler/in 👦🖌️🎨

3 Years old 🇩🇪

repeats/
reimagined

legitimisation

Art is fuzzy

critics

appreciation

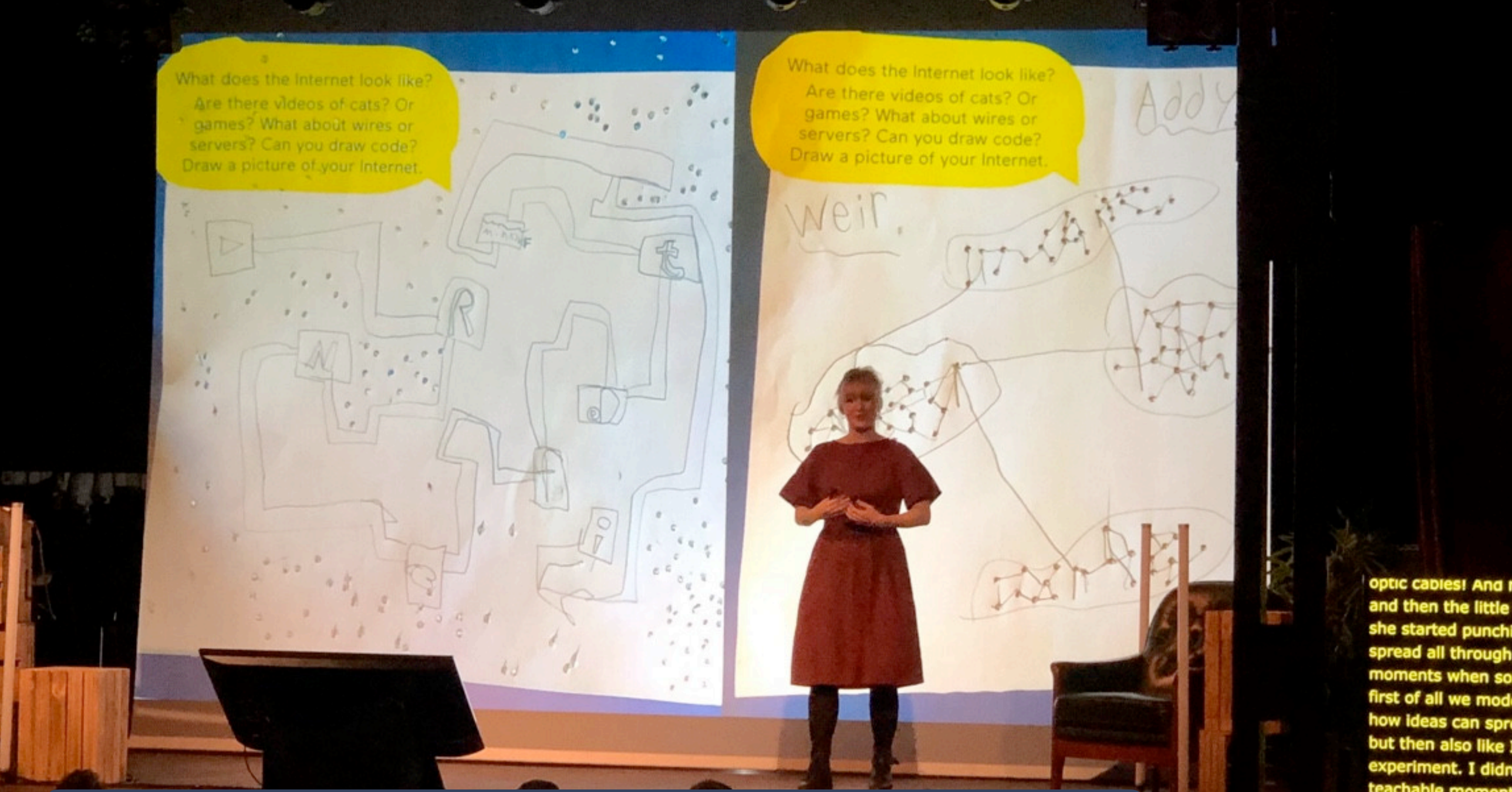
intentions (maybe)

Art = life

What can art do?

ART CAN MAKE US THINK

Art can make the artist think



Linda Liukas shows ‘Draw the internet’ exercise at Beyond Tellerrand 2024, Berlin’. Photo: Nathan de Vries

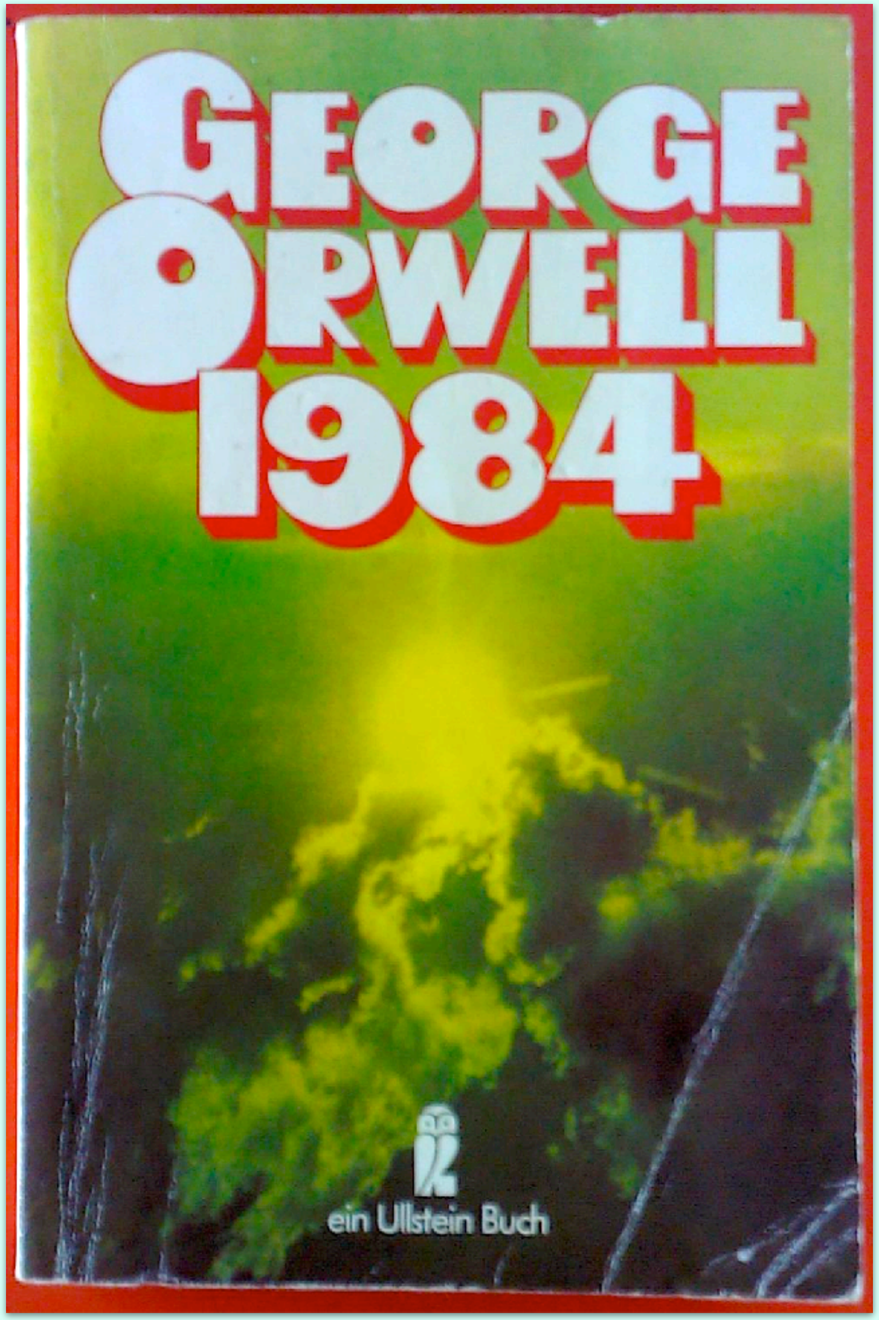
Artists process life through their art

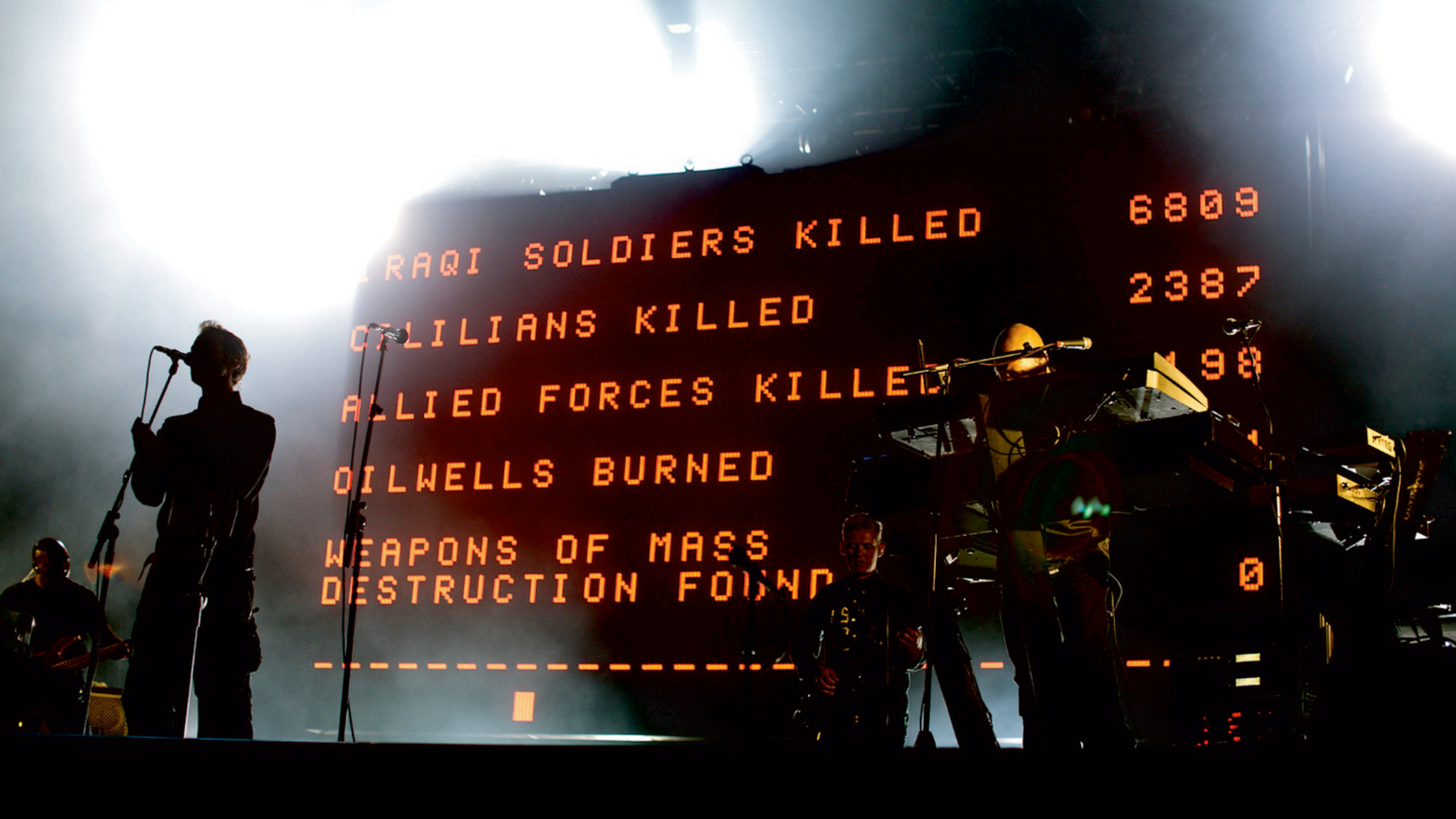

I'm not
ngs in life

Frida Kahlo
Las Dos Fridas
(1939)

Art can also make the audience think

Art can show us futures we should not want




IRAQI SOLDIERS KILLED 6809
CIVILIANS KILLED 2387
ALLIED FORCES KILLED 98
OILWELLS BURNED
WEAPONS OF MASS DESTRUCTION FOUND 0

Art can show us a mirror to reflect

De Zaak Shell, Bureau Vergezicht (2024)

Devolved Parliament, by Banksy

Details from “Devolved Parliament” by Banksy, copyright graffiitstreet.com

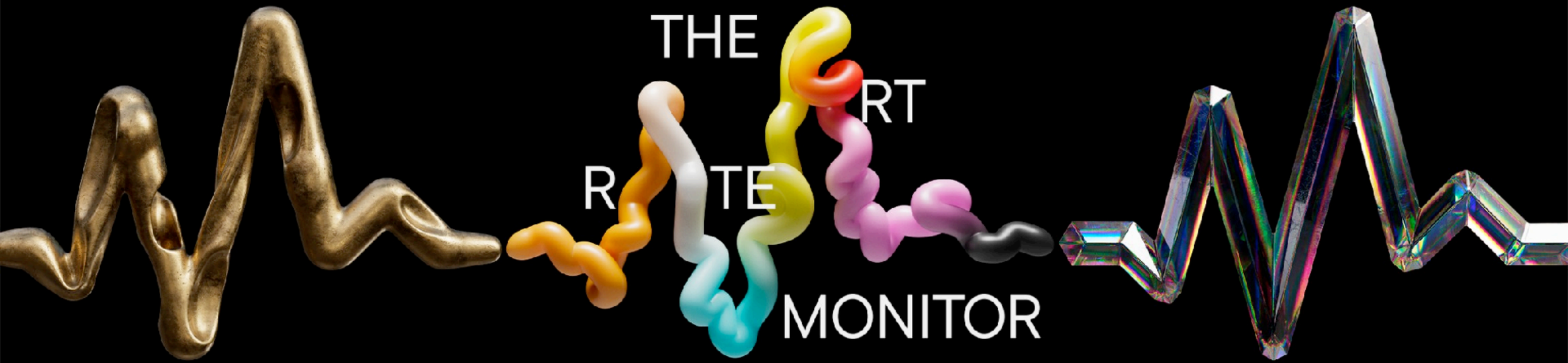
Konzerthaus columns covered with 14,000 discarded life vests (2016) . Photo copyright Clemens Bilan / Getty Images

ART CAN
MOVE US

Paul McCartney singing “Yesterday” in New York (1965). Still from YouTube.

Adele singing “Someone like you” at Tiny Desk (2011). Still from YouTube.

Photo of Ai Weiwei's S.A.C.R.E.D. installation (2013) .


THE
RT
R
TE
MONITOR

AGO | THE ART RATE MONITOR

The Tiff

by Florence Carlyle

Made your heart race

104 BPM

Florence Carlyle, *The Tiff*, c. 1902. Photo © AGO

ART CAN TAKE A STANCE


matuzo.social
FCK
AFD

Art can be used to show solidarity

Led by Donkeys paint the Ukranian flag a year after the Russian invasion (2023)

ART CAN SUPPORT A MOVEMENT

Marvin Gaye singing “What's going on”.

Still from video of “Alright” by Kendrick Lamar.

Kendrick Lamar performing on top of a police car at BET awards (2015)

Me being on a cop car, that's a performance piece after these senseless acts

– Kendrick Lamar, in interview with TMZ

tmz.com/2015/07/02/kendrick-lamar-responds-alright-geraldo-rivera-bet-awards-controversy-tmz-live/

Me being on a cop car, that's a performance piece after these senseless acts (...) This is our music. This is us expressing ourselves.

– Kendrick Lamar, in interview with TMZ

tmz.com/2015/07/02/kendrick-lamar-responds-alright-geraldo-rivera-bet-awards-controversy-tmz-live/

Vincent van Gogh's Sunflowers (1888).

Activists throw a can of tomato soup on the work at National Portrait Gallery (2022).

ART CAN CAPTURE COMPLEX HUMAN EXPERIENCES

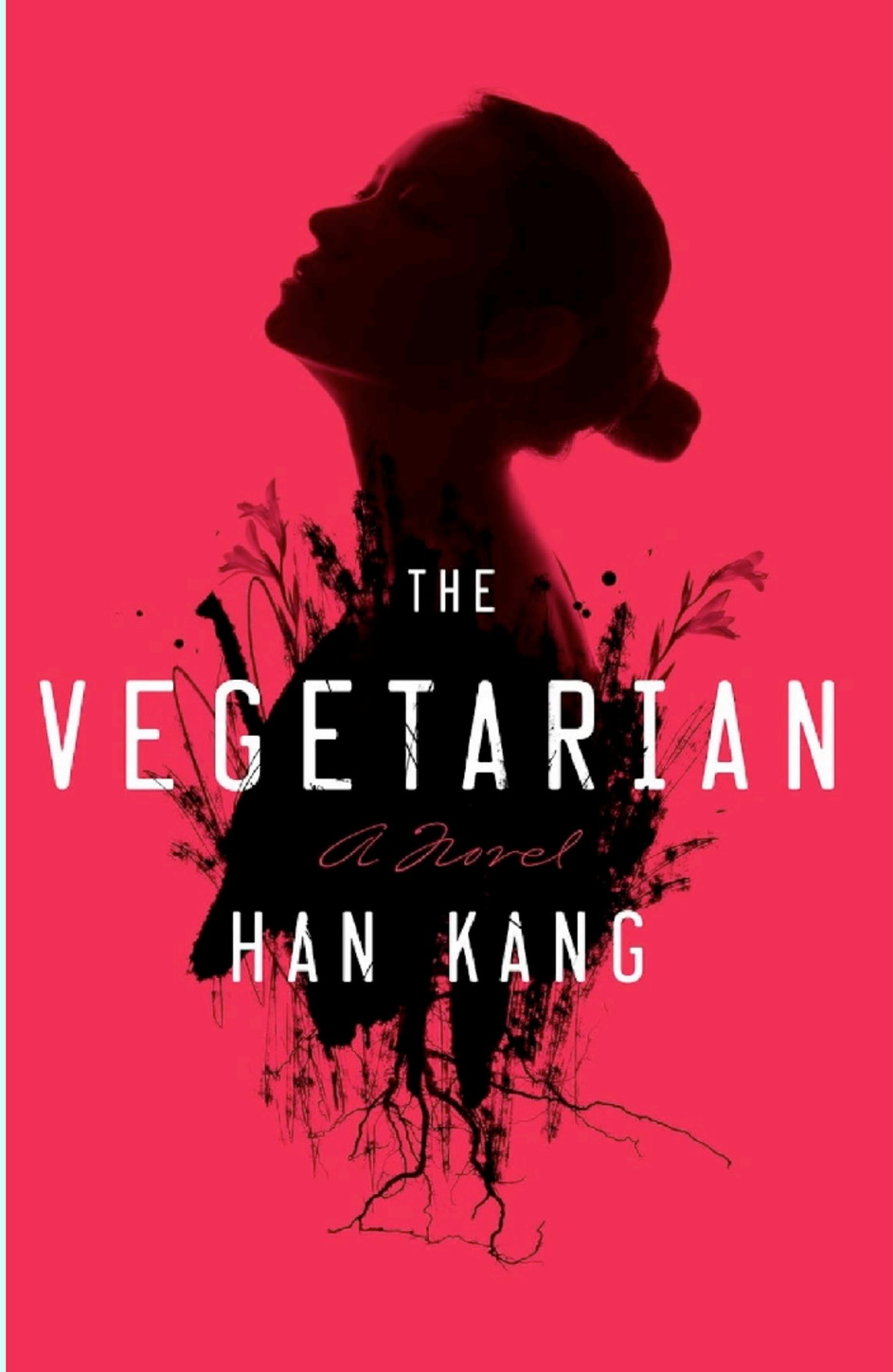

WE'RE NOT
ALONE

What it is like to love


I don't believe that anybody feels the way I do about you now


You are / my fire / the one / I desire

What it is like to try and understand other people



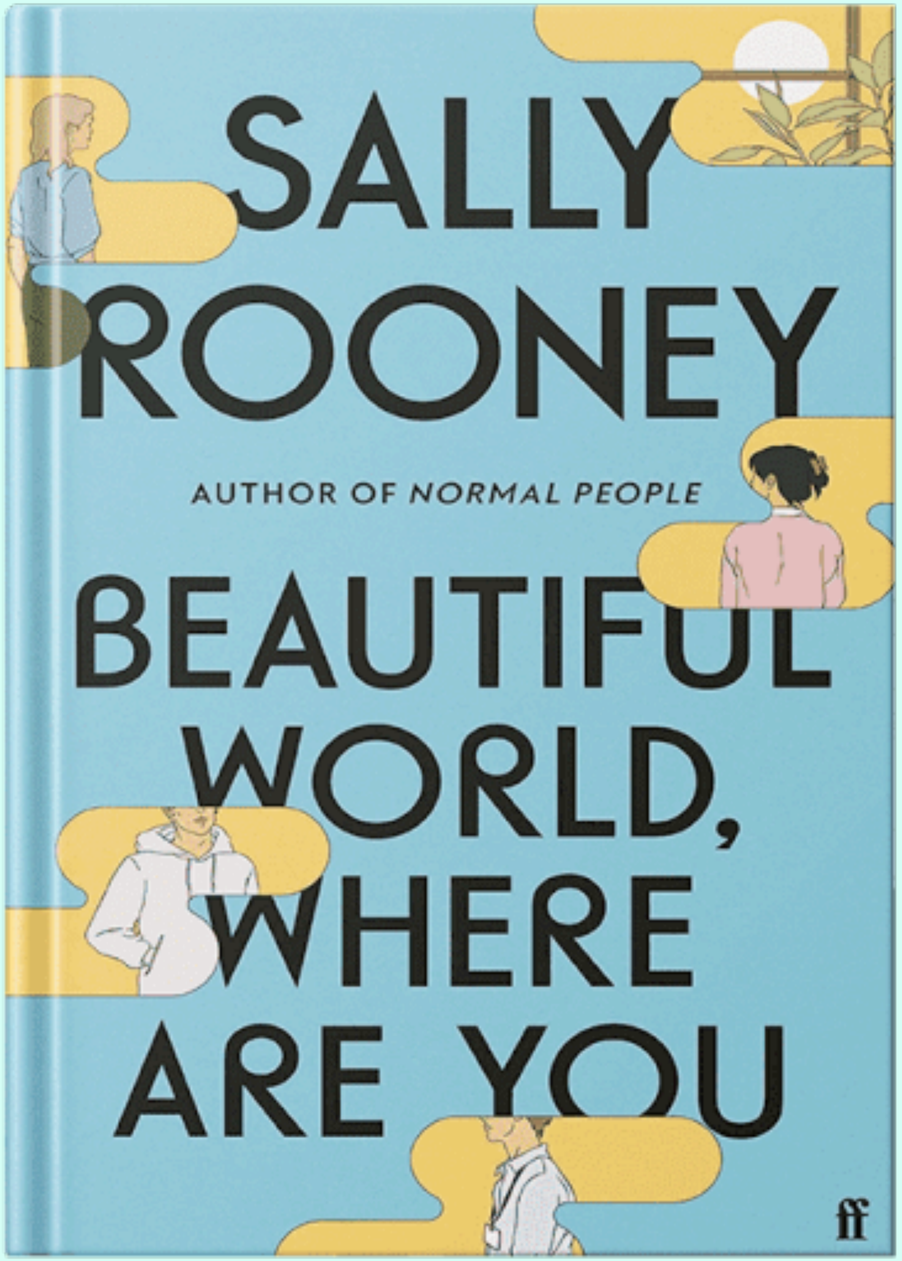
What it's like to be fed up with the status quo

IJSLAND at Melkweg, Amsterdam

What it's like to be fed up with the status quo

and our own hypocrisy

IJSLAND at Melkweg, Amsterdam



What it's like to be young

ART CAN RECORD COLLECTIVE MEMORIES

Guernica by Pablo Picasso (1937)

Bebelplatz / Opernplatz, Berlin (Wikipedia)

“The Empty Library” by Micha Ullman (Wikipedia)

ART DOESN'T
HAVE TO FIT IN

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Exciting | Impressive | Looks great | Awesome product | Exc ›

Add a comment...

AI is so good at simulating school and business language

- Oliver Reichenstein, “AI and the end of writing”

AI is so good at simulating school and business language because a lot of our own understanding in both spheres is largely simulated.

– Oliver Reichenstein, “AI and the end of writing”

Art can insult the audience

“In and Out of Love (White Paintings and Live Butterflies)”) by Damien Hirst

Mistakes in art can be beautiful

Art can make us think

Art can move us

Art can take a stance

Art can support a movement

Art can capture complex human
human experiences

Art can record collective memories

Art can make us think

Art can move us

Art can take a stance

Art can support a movement

Art can capture complex human experiences

Art can record collective memories

all optional

the point isn't always
the art itself

The artist's

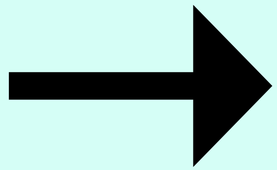
intention

reflection

research

skill

world view



art

The artist's

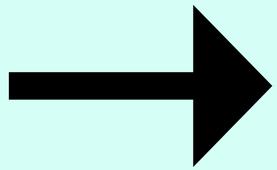
voice

life experience

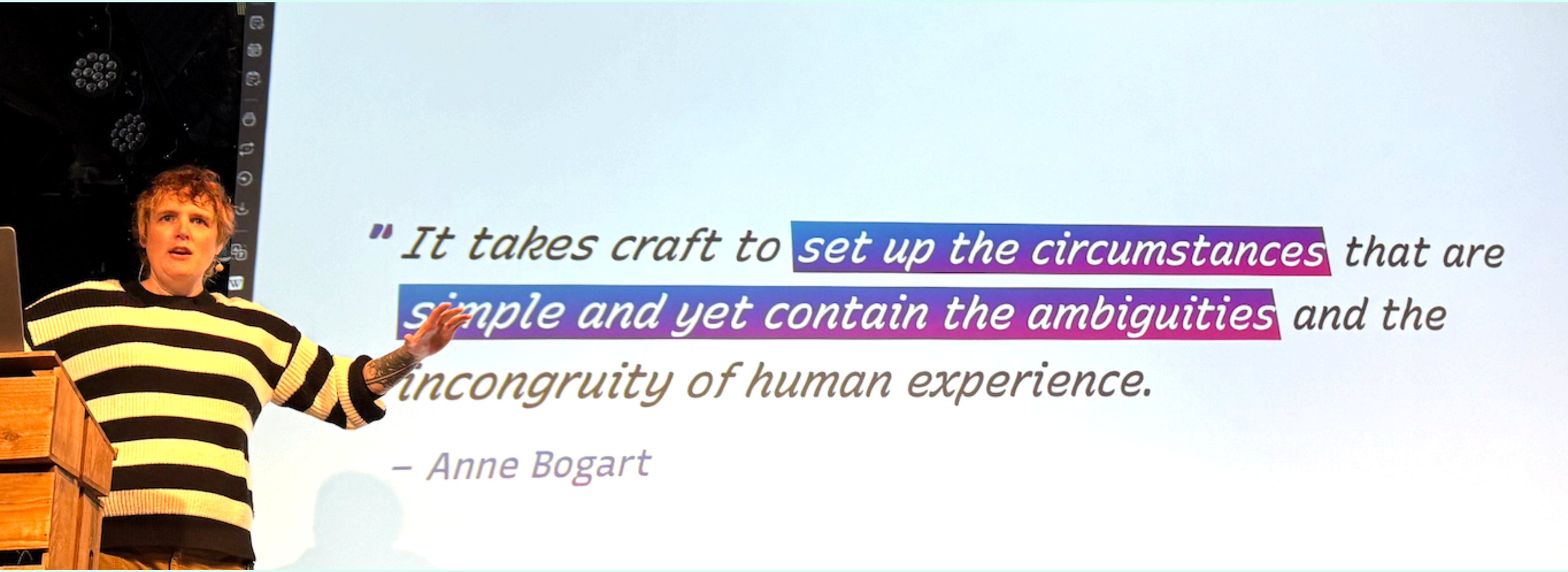
talent

background

culture



art


" It takes craft to set up the circumstances that are simple and yet contain the ambiguities and the incongruity of human experience.
– Anne Bogart

art → **The audience's** shared experiences

“Pop music is a promise that you aren’t listening alone”

– Mat Dryhurst

art →

The audience's

emotion
reflection
empathy
understanding
inspiration

an artwork

before making /
after releasing

Source: Wikipedia (Iceberg)


R. MUTT
1917
R. MUTT
1917
R. MUTT
1917
R. MUTT
1917
R. MUTT
1917

Meaning is in between the lines

Net als altijd gingen we naar de eetzaal en aten ons avondeten. We gingen in bad. Daarna maakten we een fles goede wijn open die ik voor een speciale gelegenheid had bewaard.

We dronken er samen van en ik speelde gitaar. Haar gebruikelijke favorieten van de Beatles zoals "Norwegian Wood" en"Michelle". Het was heel gezellig. We deden het licht uit, we kleedden ons uit en kropen in bed. Het was een heel warme nacht en zelfs met het raam open kwam er geen zuchtje wind naar binnen. Het was buiten inktzwart en we hoorden

can computers have

intention

reflection

research

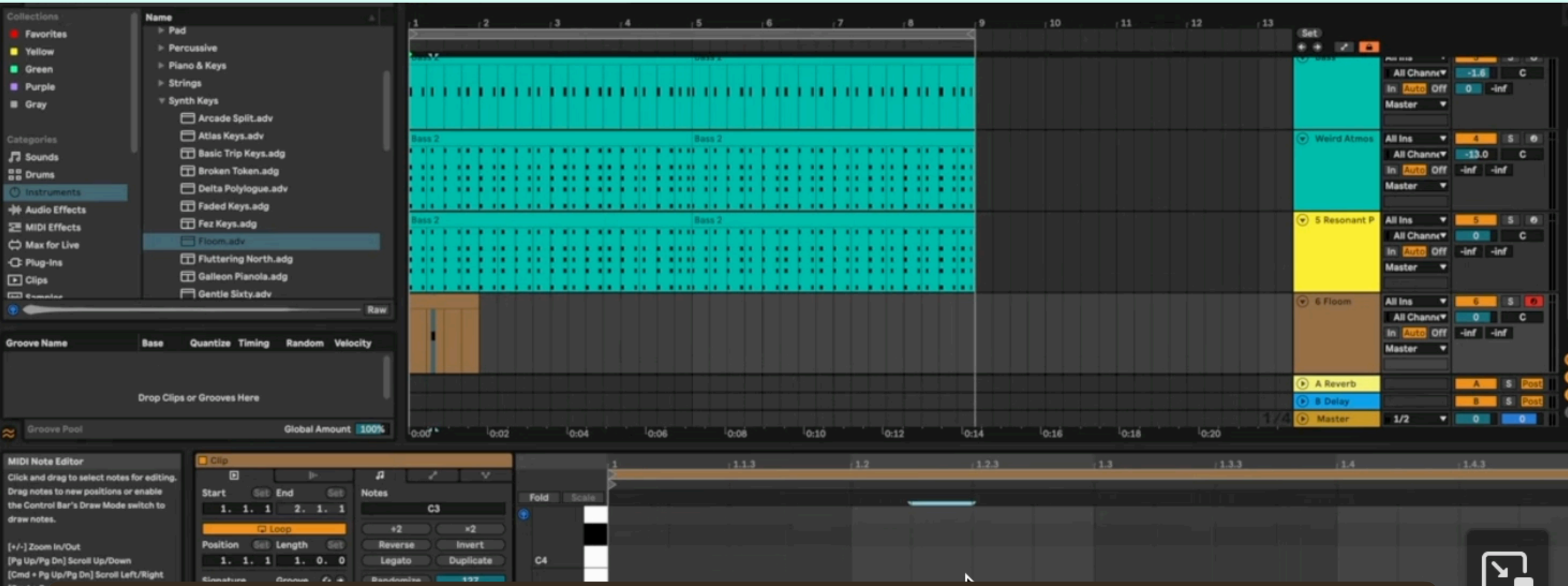
skills

experiences

a world view

?

Computers are often part of the toolset to make artifacts.



Still from “What is Techno?” by 343 Labs on YouTube

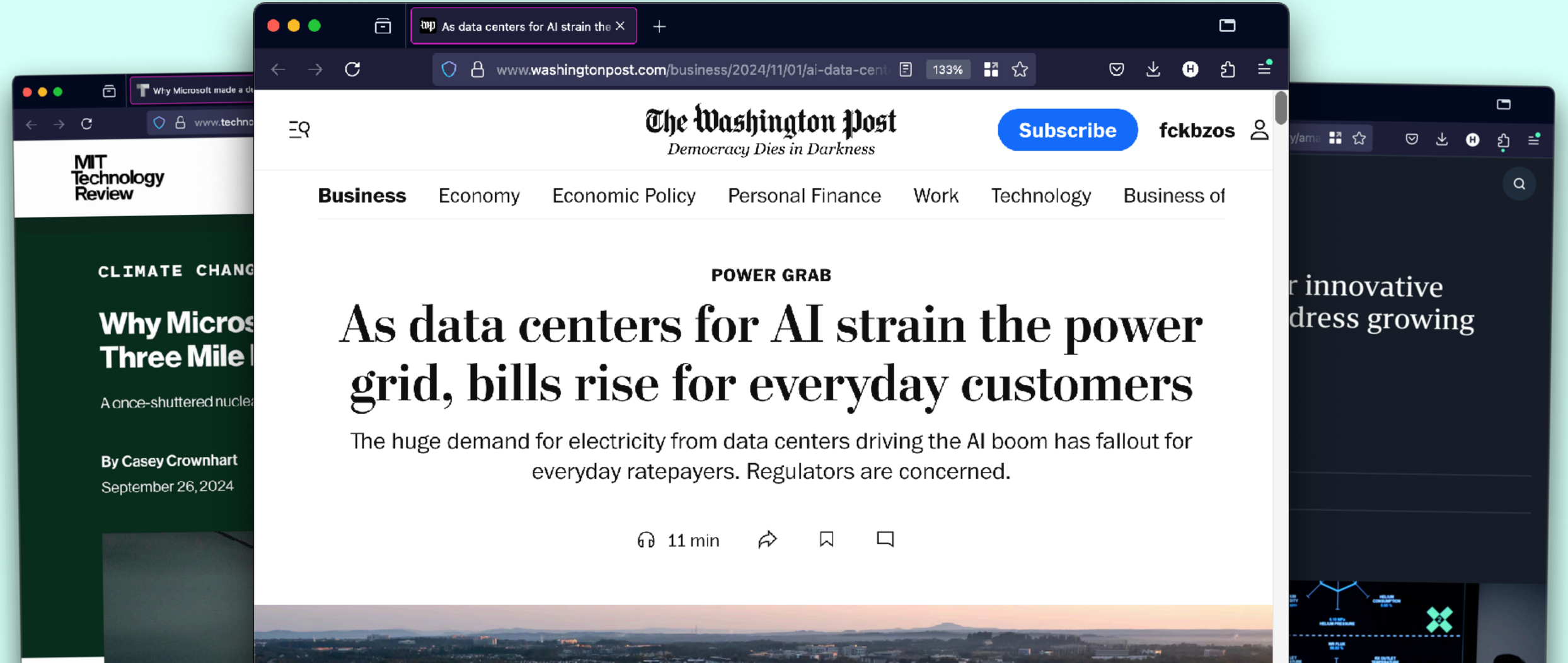
“It’s a tool.”

– Mira Murati, (then) CTO of OpenAI (2024). when asked if LLMS would produce creative works

youtu.be/yUoj9B8OpR8

Open questions for computing

Environmental impact



Environmental impact

Copyright infringement

Environmental impact

Co

OpenAI—written evidence (LLM0113)

House of Lords Communications and Digital Select Committee inquiry: Large language models

OpenAI welcomes the opportunity to provide written evidence to the House of Lords Communications and Digital Select Committee's inquiry into Large Language Models. This inquiry and forthcoming report will contribute significantly

provide. Because copyright today covers virtually every sort of human expression–including blog posts, photographs, forum posts, scraps of software code, and government documents–it would be impossible to train today's leading AI models without using copyrighted materials. Limiting training data to public domain books and drawings created more than a century ago might yield an interesting experiment, but would not provide AI systems that meet the needs of today's

availability of safe and beneficial AI tools.

1. **Future Trajectories: Please could you describe how the next generation of large language models is likely to develop over the next 3**

Environmental impact

Copyright infringement

Vector for abuse

Environmental impact

Copyright infringement

Vector for abuse

Not open

Environmental impact

Copyright infringement

Vector for abuse

Not open

Risk of dullness

Risk of dullness

Creativity cannot be computed

Art is as much about the **artist** and **audience** than its deliverables.

the possibility of exaggerated ideas

- Ada Lovelace, in her notes

We can use computers to express ourselves creatively

But making creative work is about process, intentions and creativity.

But making creative work is about process, intentions and creativity.

Not the output or tools.

I love computers

but they don't use creativity in the way artists can

Make art

Enjoy art

Thank you!

Thanks to: Paul van Buuren, Arjan Eising, Miriam Suzanne, Vasilis van Gemert, Geart de Vries, Jelmer van der Linde, Melinda Seckington, Yi-Chu Lin (林逸筑), Matijs Brinkhuis.

Slides + links are live on

hidde.blog/slides

Links

tante, On “AI” Art https://tante.cc/2024/09/06/on-ai-art/

SEP, The definition of art https://plato.stanford.edu/entries/art-definition/

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The project plan to invent artificial intelligence in a summer https://raysolomonoff.com/dartmouth/boxa/dart564props.pdf

Review of one of Boden's books https://anyoldmusic.com/creativity-and-art-book/

Links

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Li Jin, "'Pop Music Is a Promise That You Aren't Listening Alone': What AI Music Can and Can't Do" https://variant.fund/articles/pop-music-ai-holly-herndon-mat-dryhurst/

Melanie Mitchell, "Why AI is Harder Than We Think" https://raw.githubusercontent.com/computationalmind/computationalmind.github.io/main/speaker_slides/Mitchell_WhyAIIsHarderThanWeThink.pdf

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