(INFORMATICA PER LE)
DIGITAL HUMANITIES

LECTURE 3

MARCH 3 2023

Informatica per le Digital Humanities
Lecture 3
March 3 2023

Texts

Slide 2

In the past lessons, again with a split trend, we introduced the general problems relating to digital Humanities, trying to give them a theoretical and methodological definition that would compare the foundations and the differences between the two components.
Now it is up to give a scientific palette to the term DIGITAL, which explores the mathematical, computational and physical foundations that underlie the functioning of the machine.

Slide 3

And this is strictly necessary for DH, remember?
We used a chromatic metaphor to define digital humanities: we must consider this intersection, the relationship in-between, even if not as clear as a defined color, as the true identity of this research field.

It is the structure that we have given to the lessons to fully understand the chromatic metaphor. These Digital Humanities lessons must be understood as a sort of reading with a parallel text, on the one side the technical and methodological bases that underlie the daily use of digital tools and on the other their application to a concrete example to understand better the problems characterizing this production and to look at the technical issues with a historical and sociological gaze.
Today is about the deepening of the mathematical bases, focusing on the fundamentals of the numbers and figures that underlie all these endeavours.

Slide 4

The bibliographic reference for these in-depth computer, mathematical and physical lecture derive in part from this bibliographic source.
In particular, the first four chapters of the book give you the theoretical and philosophical foundations that underlie the term digital and the scientific disciplines that regulate the production of data and their computation.

Slide 5

There will be no specific technicalities in this effort: humanists cannot think of acquiring sufficient computer science knowledge, they don't even have to.
It is also necessary to establish some basic principles, to demonstrate, despite appearances, that this is not magic and that, only by fully understanding the main mechanisms of each language, it is possible to have that state of bidirectional correspondence that is necessary for the co-design work that the DH discipline requires.

Now, focus on the slide: how do you read this image?

How do you read the numbers, the colors, the letters? In truth all these are symbolic codes (where the symbol, as an element of communication, indicates in the mind of the observer a concept other than how the symbol is physically represented, be it a sign, number, gesture, or another entity as in the case that we are going to analyze) that acquire meaning also on the basis of the context.

How do you read this image?
A) mathematical hypothesis: (3 - 5) = -2
B) archival textual hypothesis: this part of the lesson concerns the digital aspect of lessons 3 to 5

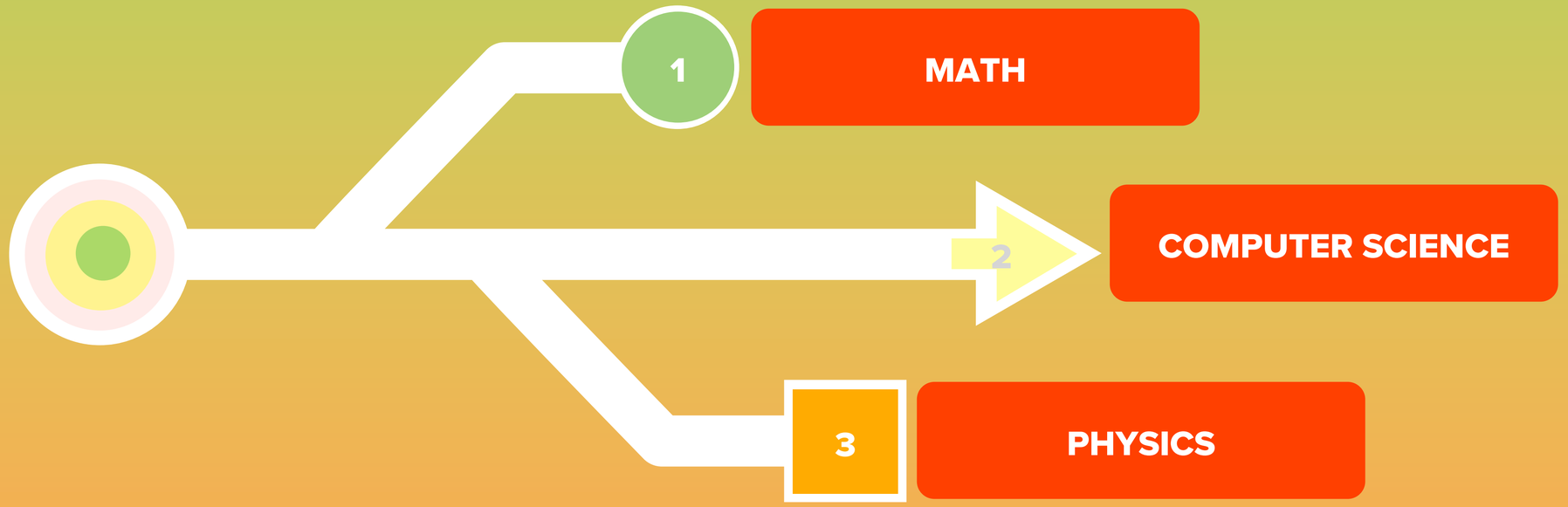
To understand a symbol well, as well as life, you need a context: here we are returning to the theme of language.

Slide 6

I take up the problem that we have already posed in the definition of DIGITAL HUMANITIES, and, in trying to identify from the inside what has made the world we are in DIGITAL, we have to deal with the concept of COMPUTATION

It is often implied that computer science began with the first digital electronic computer, which seems to lead to the definition of computer science as the "science of digital electronic computers". Is this a universal definition? The rigorous answer would be no because we can easily find examples of efforts that are fully fledged computer science results but do not have a direct connection with digital electronic computers: Charles Babbage's "analytical engine" was a project started in the first half of the 19th century, that is, an entirely mechanical calculator inspired by Jacquard's loom capable of the four basic arithmetic operations. This clearly shows how one can do computer science without electronic computers and, thus, the definition above seems to be too restrictive. It is more than legitimate then to ask what is the connection between digital electronic computers and Babbage's engine, that is, what enables us to consider indisputably these efforts as part of computer science: the factors creating such connection would be the best candidate for a general definition of the discipline. We are speaking of the concept of computation: the analytical engine performs arithmetic operations, that is, it executes operations on numbers that yield numbers; digital electronic computers are comprised of circuits built insuch a way that they respond to electric impulses with other impulses and such response follows the rules of arithmetic.There is indeed a fundamental, even definitory link between computer science and computation. Let us not forget that one of the pioneers of computer science, Alan Turing, when writing about a "computer" in one of his most important works meant a person who computes, just like "player" means a person who plays. In his article, Turing presents his vision on how to automatize by means of a machine what happens in the brain of a human while they are performing some computation. In the second half of the 20th century,when the pioneering efforts of Babbage and Turing were followed by a number of success stories in the creation of such machines, the term "computer" lost its original meaning and acquired the one we are used to today, and the discipline dealing with computation and how to automatize it was called "computer science"

From *Computer science and art: Contradiction, revolution, evolution*. Available from: https://www.researchgate.net/publication/286269407_Computer_science_and_art_Contradiction_revolution_evolution


1
MATH
2
COMPUTER SCIENCE
3
PHYSICS

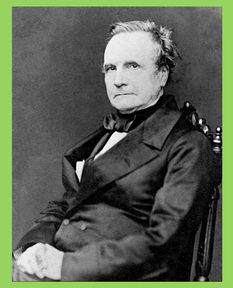

DIGITAL
HUMANITIES

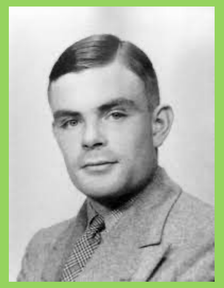
CHAP. 1 - 4

VERDICCHIO M., *L'INFORMATICA PER LA COMUNICAZIONE*, FRANCO ANGELI, MILANO, 2016 (SECONDA EDIZIONE)

DIGITAL (3-5)

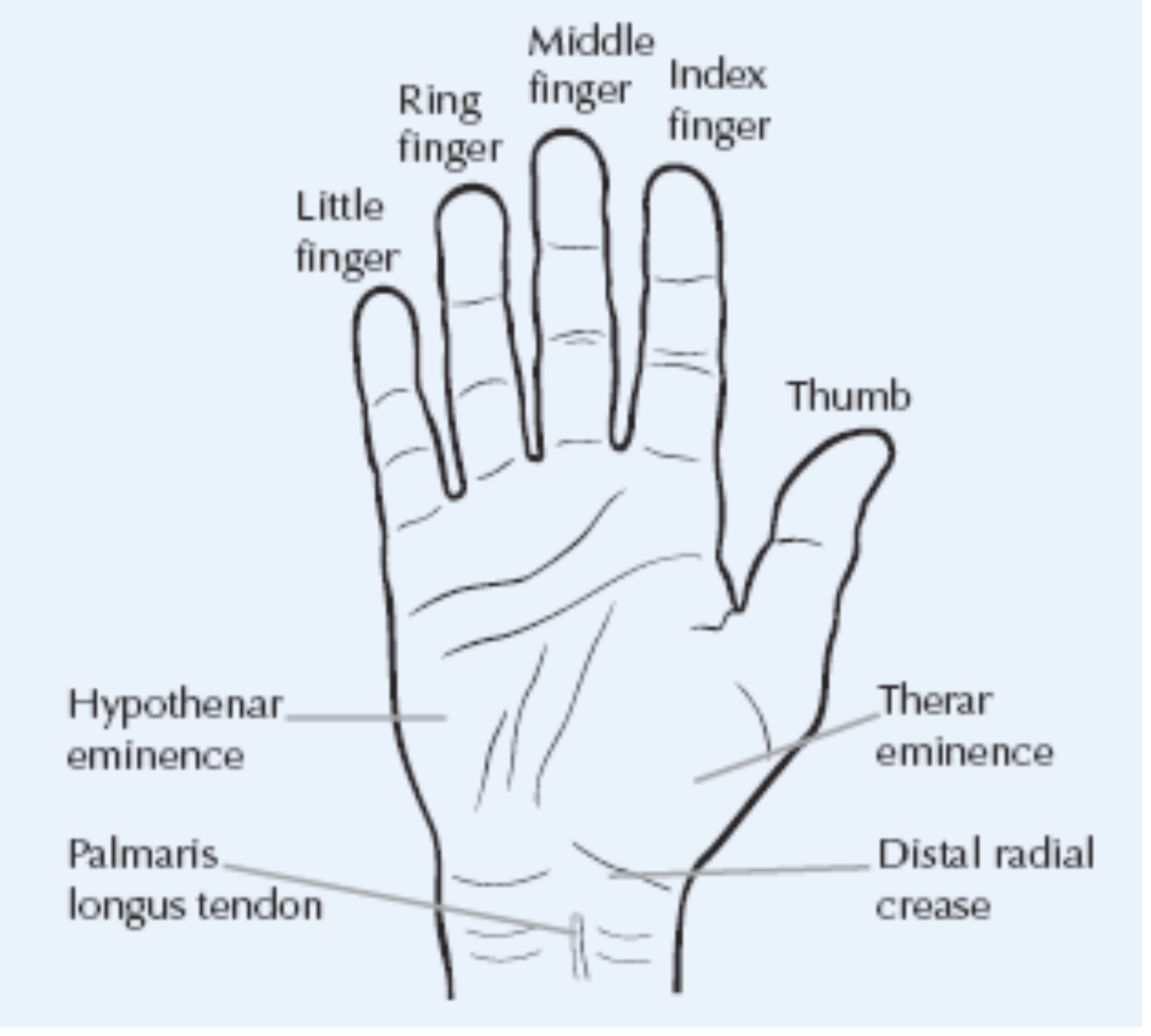
COMPU
TATION





Digital

0123456789012345678
1234567890123456789
2345678901234567890
3456789012345678901
1234567890123456789
2345678901234567890
3456789012345678901
4567890123456789


Middle finger
Index finger
Ring finger
Little finger
Thumb
Hypothenar eminence
Therar eminence
Palmaris longus tendon
Distal radial crease

3

4

5

5

٥

5


5

Digital

Humanities


WAIT!

Is this a cat?

Is this a cat?


Ceci n'est pas une pipe.

“The Treachery of Images” oil on canvas by René Magritte, 1929

Is this a pipe?


Ceci n'est pas une pipe
WAIT!


Ceci n'est pas une pipe.

THIS IS NOT A TEXT

“The impossibility of a treachery of texts” ~~oil on canvas~~ by me, today.

Is this a cat?

NO!
IT'S AN ICON!

Is this a cat?

Is this a cat?

Is this a cat?

THIS IS NOT A TEXT

Is this text?

NO!

IT'S A POWERPOINT SLIDE OF TEXT!

THIS IS NOT A TEXT

Is this text?

Is this text?

DIGITAL IMAGE OF A CAT

👍 very cute

👍 doesn’t poop

👍 doesn’t need food

👎 cannot cuddle

DIGITAL TEXT

THIS IS NOT A TEXT

DIGITAL TEXT

THIS IS NOT A TEXT

👍 you can read it

THIS

IS

TEXT

What is the difference?

Physical cats exist.
On the left, a physical cat is depicted.
A depiction of a cat is not a cat.

Does physical text exist? Whether it exists or not, on the right is a depiction of text. A depiction of text is also text.

THIS IS TEXT

“Love” sculpture by Robert Indiana, 1970

“Love” US postage stamp design by Robert Indiana, 1973


THIS
IS
TEXT

SIGNS PEOPLE AGREE ON

0123456789012345678
1234567890123456789
2345678901234567890
3456789012345678901
1234567890123456789
2345678901234567890
3456789012345678901
4567890123456789

0123456789012345678
1234567890123456789
2345678901234567890
3456789012345678901
1234567890123456789
2345678901234567890
3456789012345678901
4567890123456789

TEXT

ANALYSIS
ANNOTATION
CONVERSION
EDITING
ENCODING
MINING
PROCESSING
RECOGNITION
TRANSCRIPTION
VISUALIZATION

TEXT

ANALYSIS
ANNOTATION
CONVERSION
EDITING
ENCODING
MINING
PROCESSING
RECOGNITION
TRANSCRIPTION
VISUALIZATION

ENCODING

is

EVERYTHING*

ENCODING
is
EVERYTHING*

*in digital technology

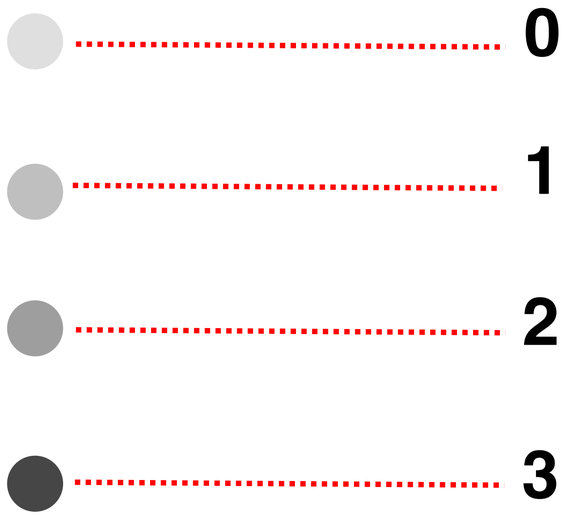
ENCODING [ɪnˈkəʊdɪŋ]: biunivocal correspondence between a set of entities of any kind and a set of natural numbers.

biunivocal correspondence

between a set of entities of any kind

and a set of natural numbers.

ENCODING



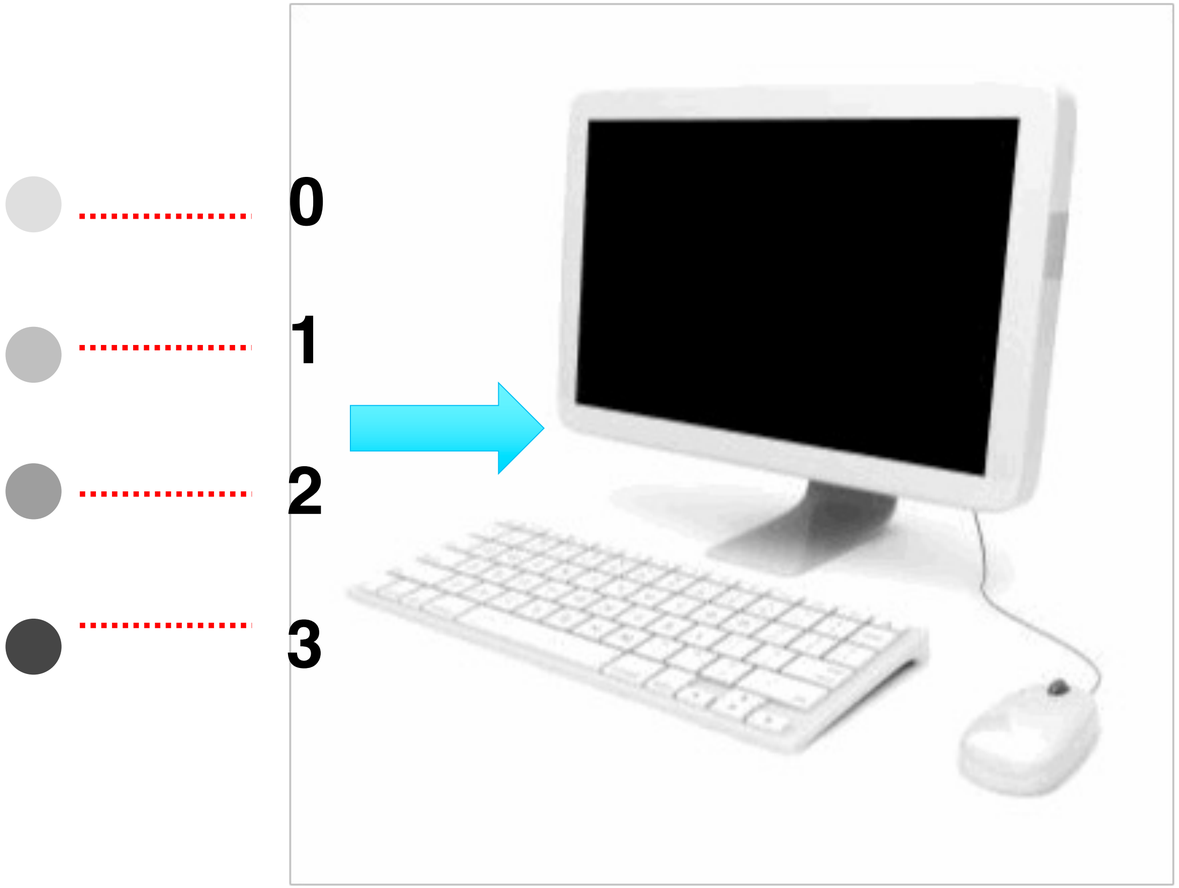

That's all Folks! *

***from a conceptual perspective**

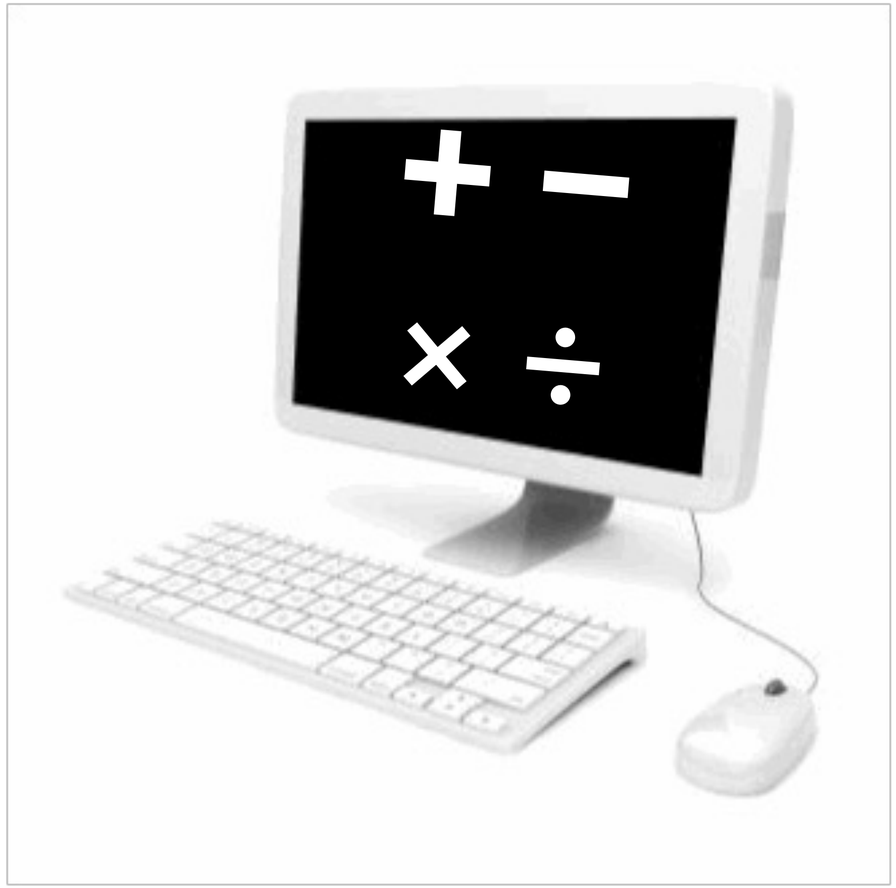
A computer.

It only works with numbers.

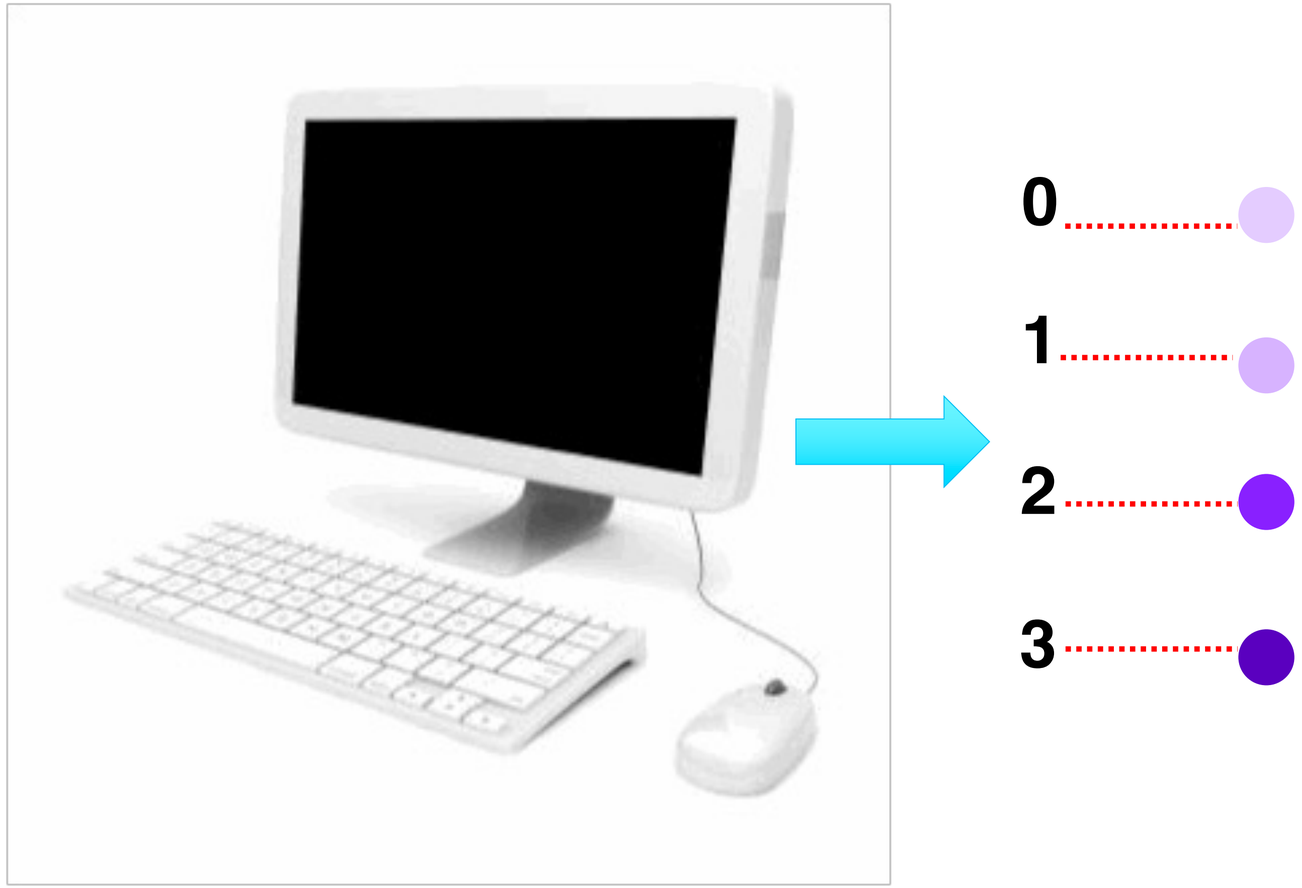
It cannot work with anything else.



Input needs to be ENCODED.



The computer works.

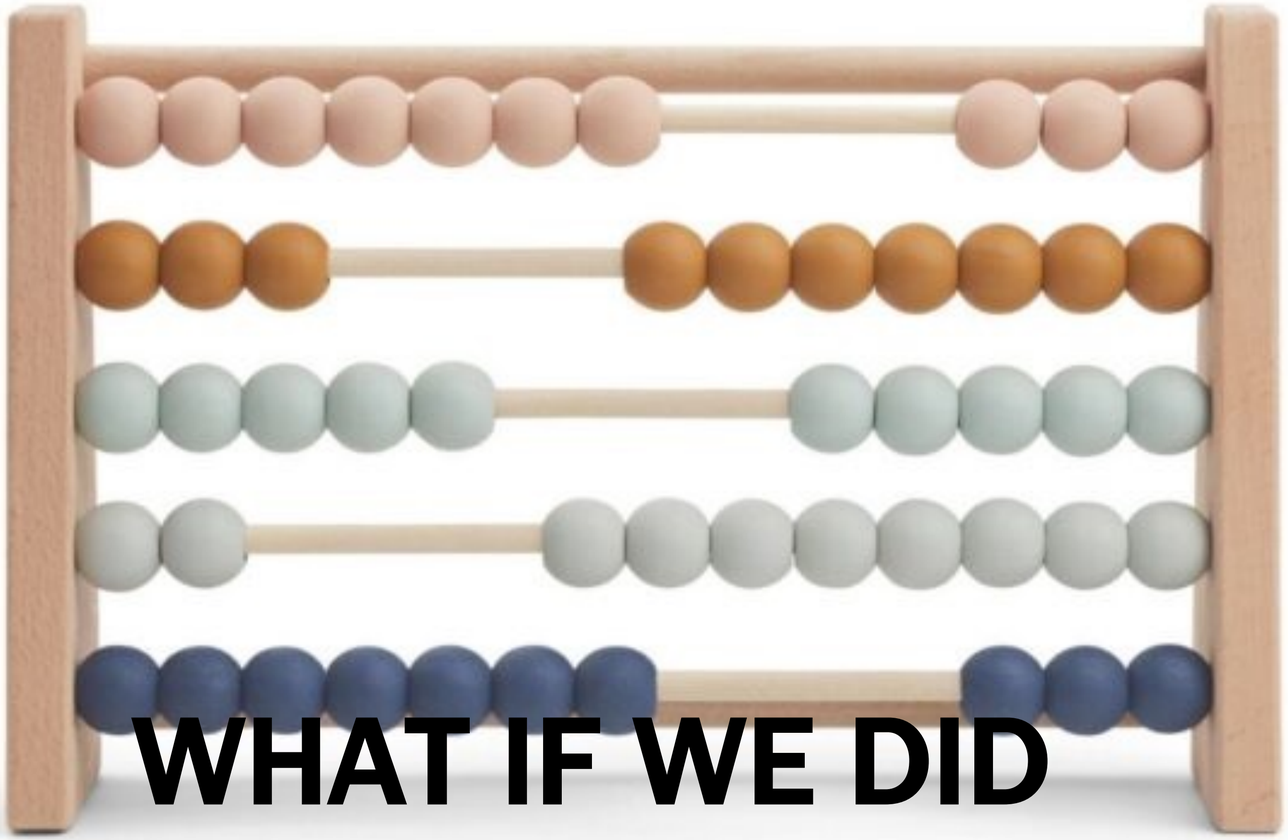


Output needs to be DECODED.

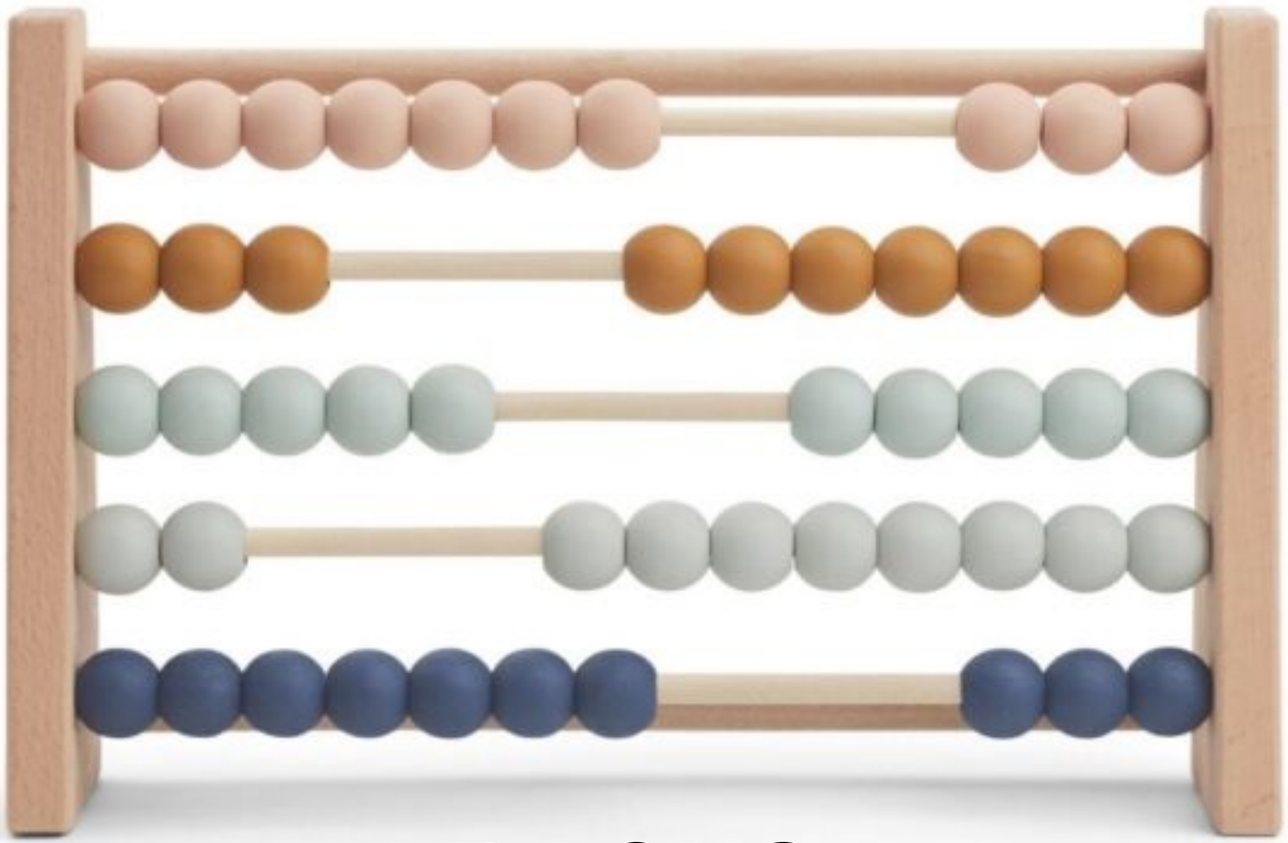
COMPUTER SCIENCE

WAIT!

THIS IS HOW DIGITAL TECHNOLOGY WORKS

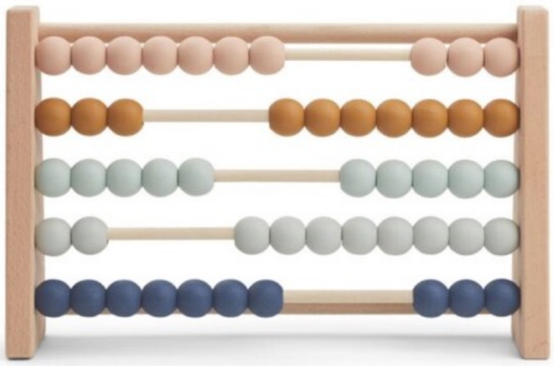


WHAT IF WE DID COMPUTATION ON AN ABACUS?

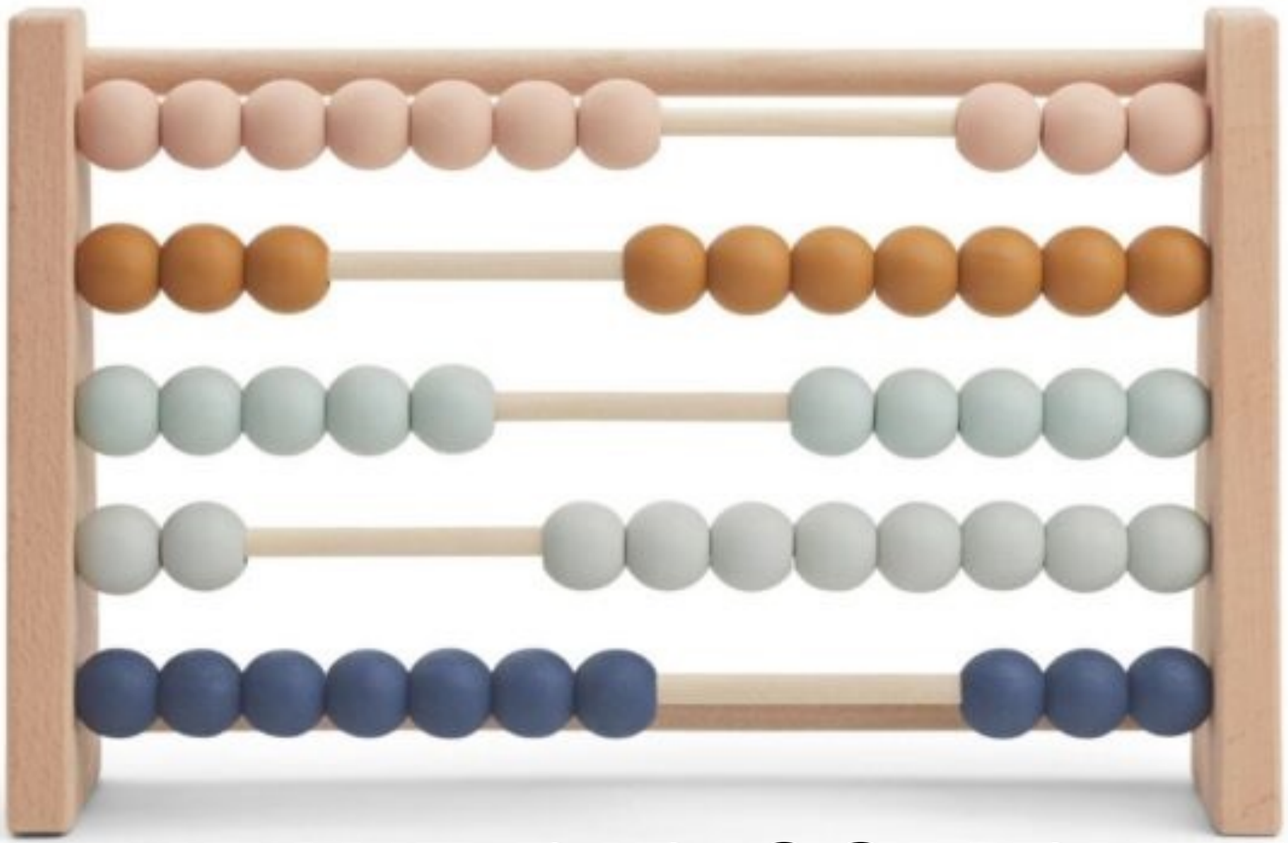


ABACUS:
THE OTHER ANALOG COMPUTER

FINGERS:
THE FIRST ANALOG COMPUTER

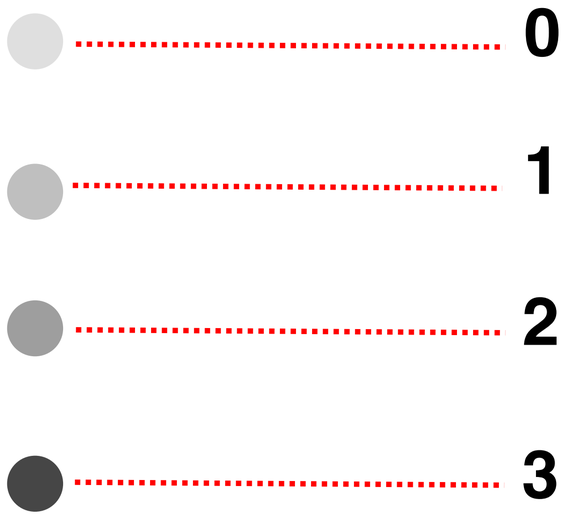


VS.

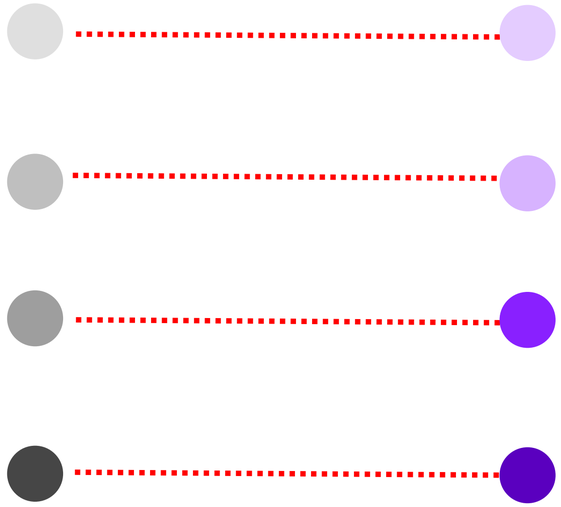


WHAT IF WE DID COMPUTING ON ABACUSES? (ABACI?)

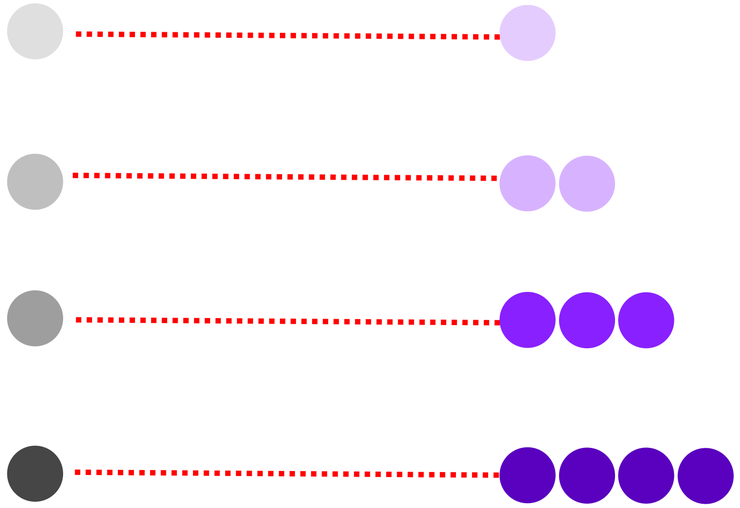
ENCODING?



~~ENCODING?~~

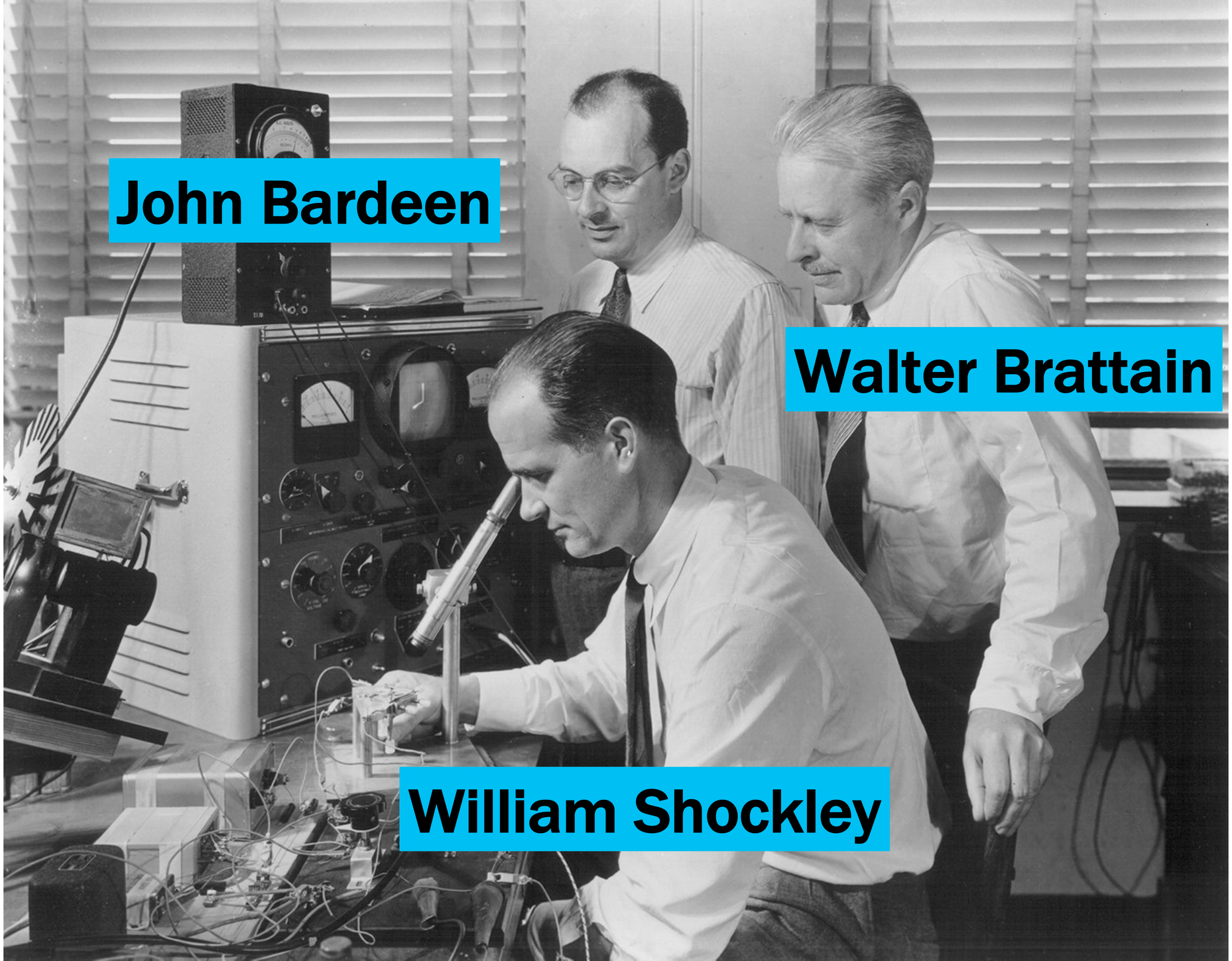


~~ENCODING?~~



WE HAVE ENCODING BECAUSE COMPUTERS ARE DIGITAL

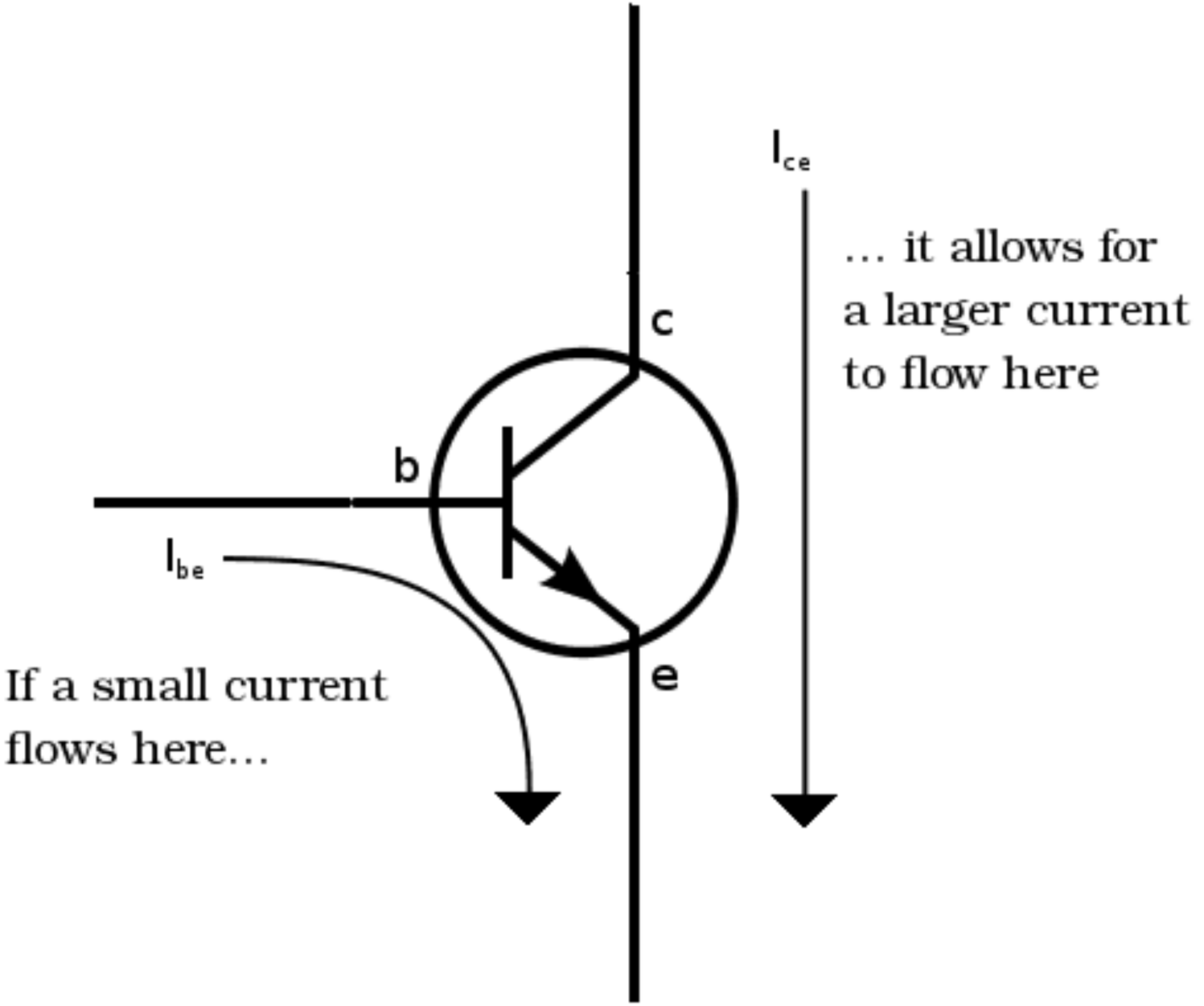
WE HAVE ENCODING BECAUSE COMPUTERS HAPPEN TO BE DIGITAL

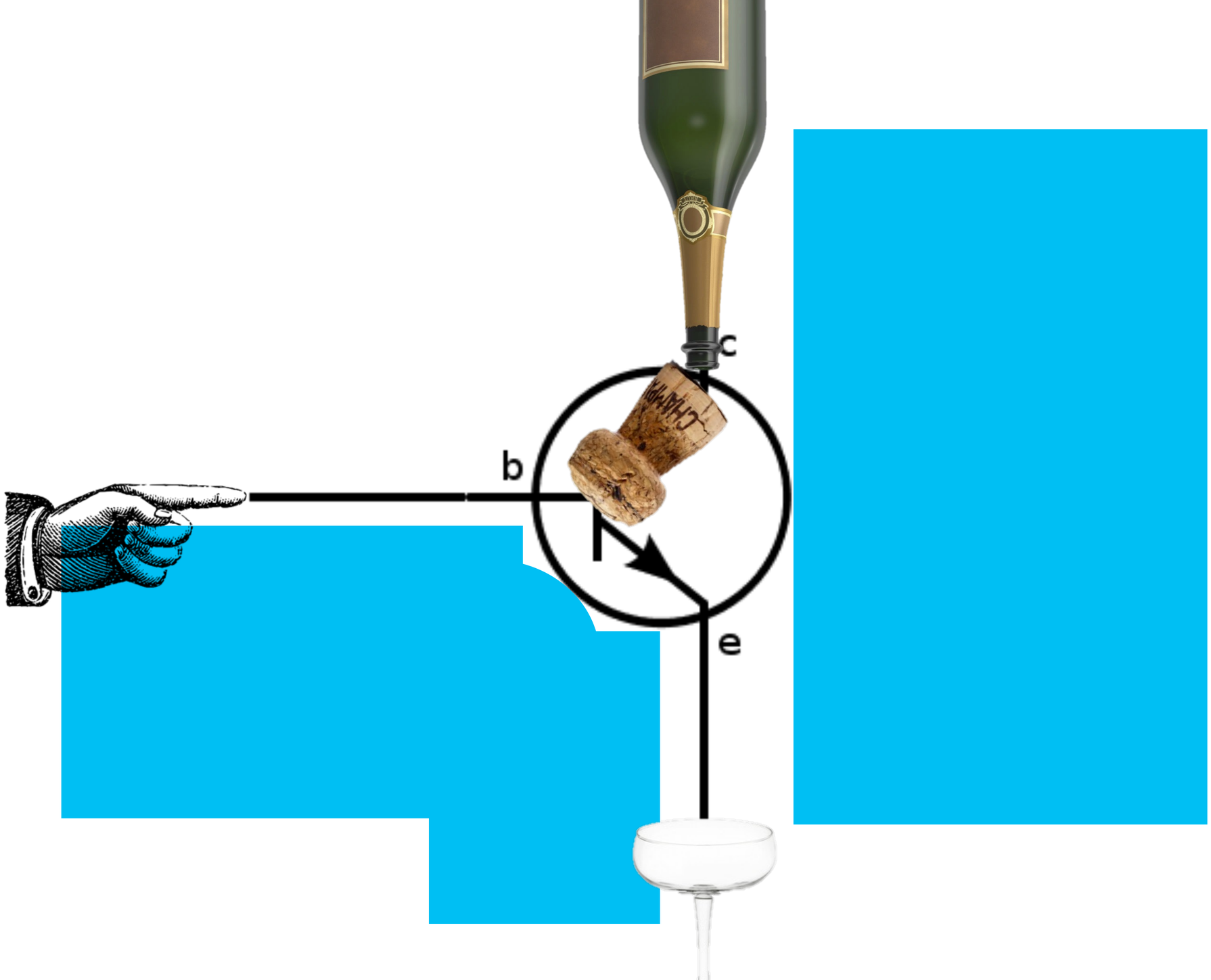

John Bardeen
Walter Brattain
William Shockley

THEY INVENTED THE TRANSISTOR

AND GOT A NOBEL PRIZE*

*IN PHYSICS


I_{ce}
… it allows for
a larger current
to flow here
c
b
I_{be}
e
If a small current
flows here…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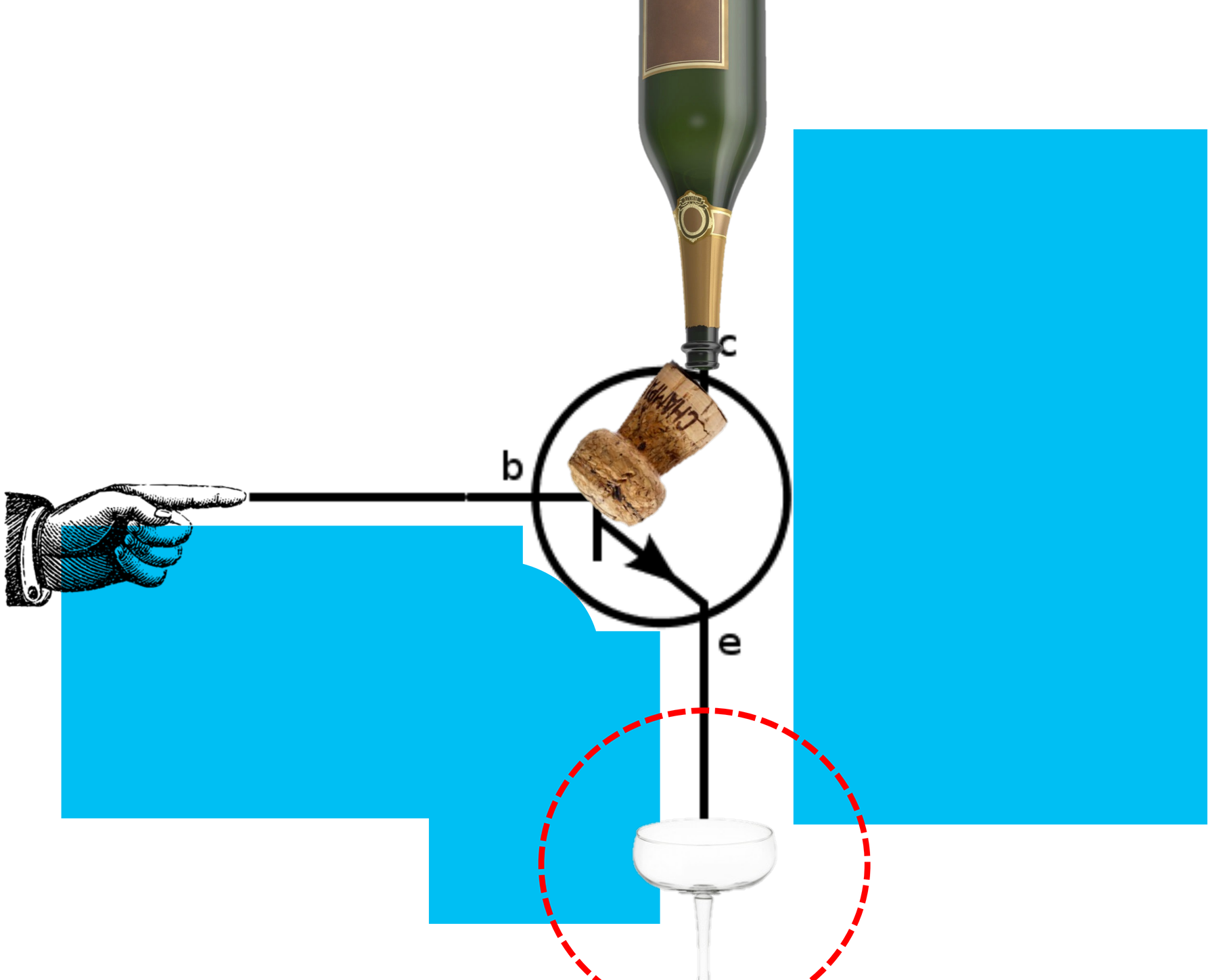
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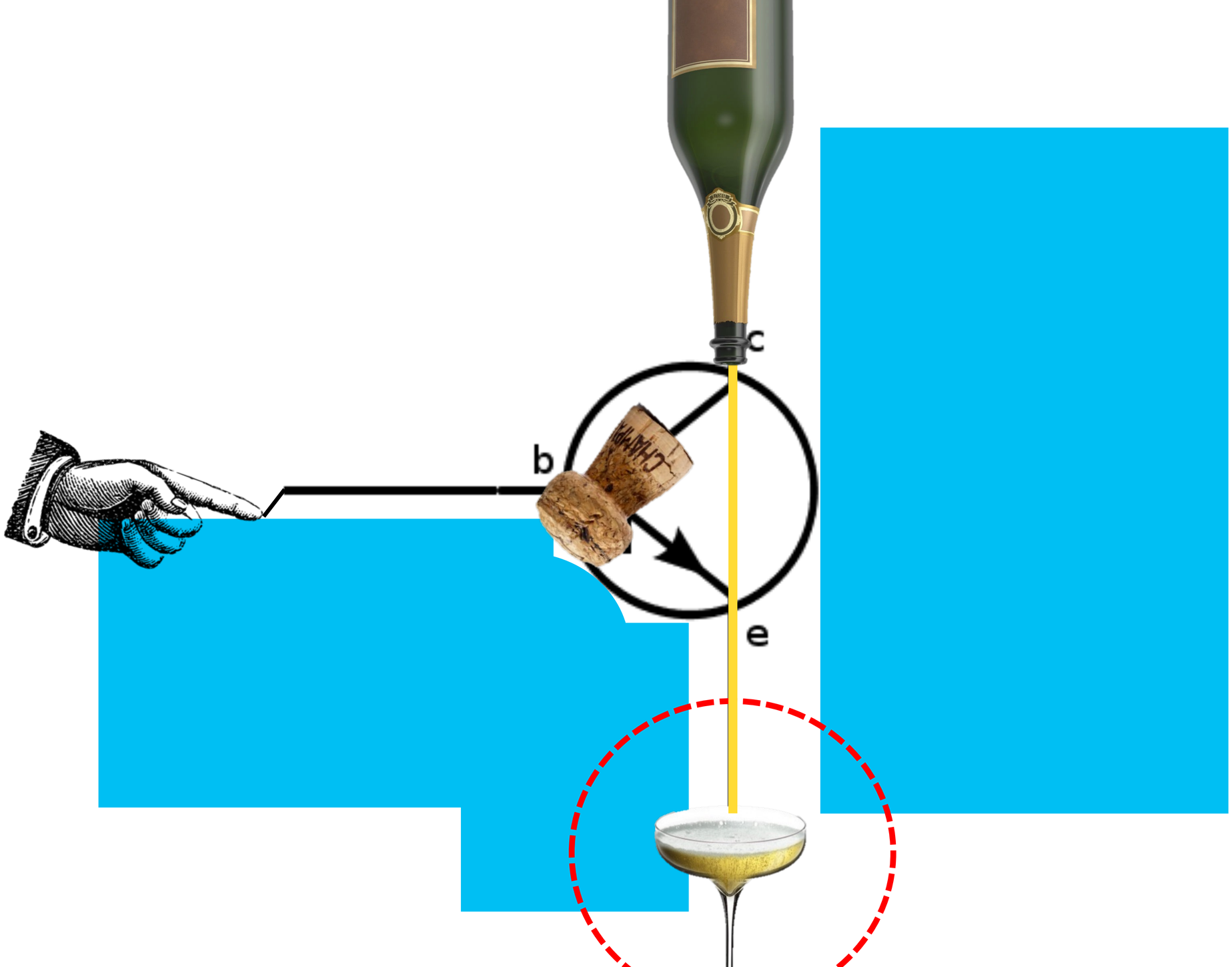
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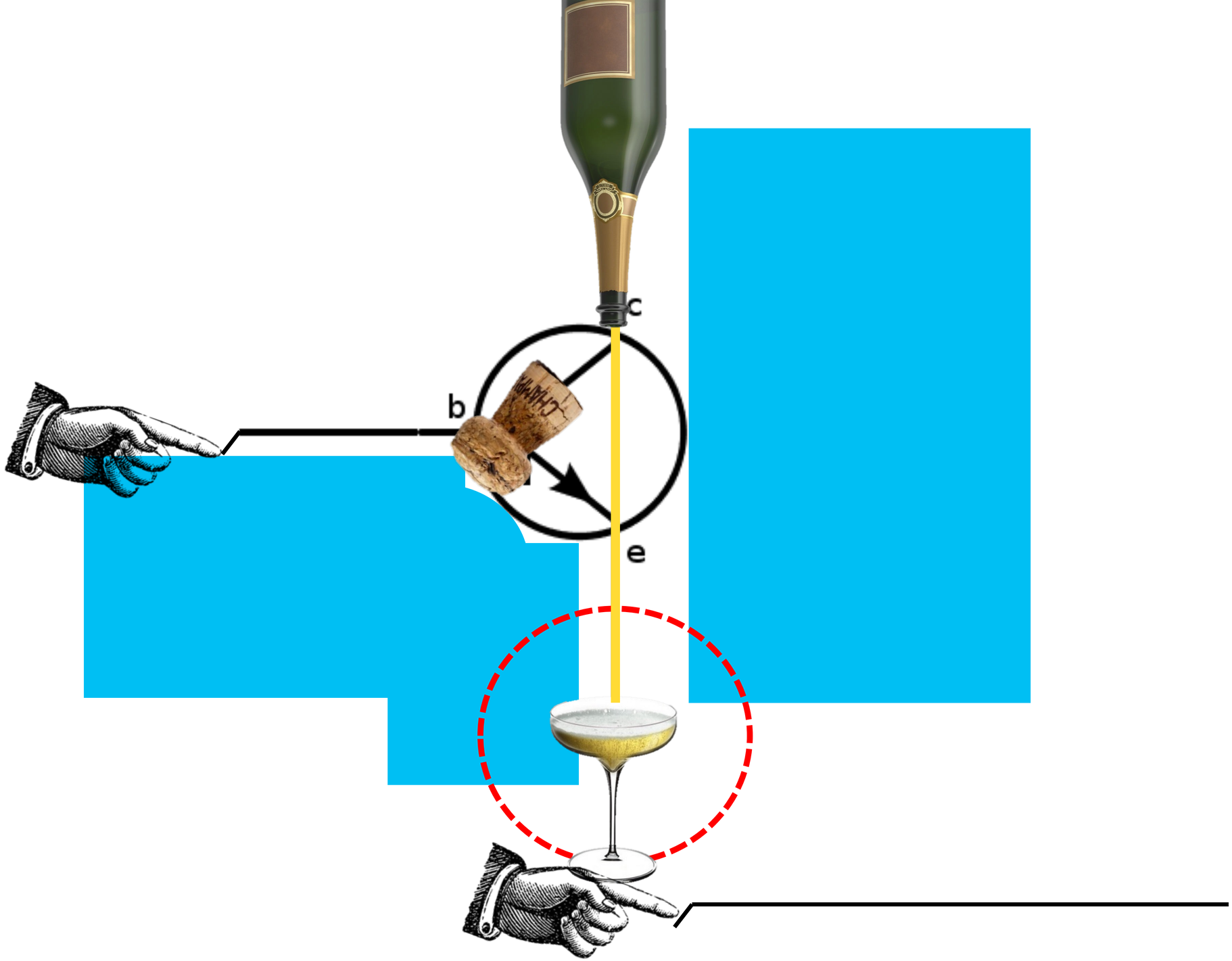
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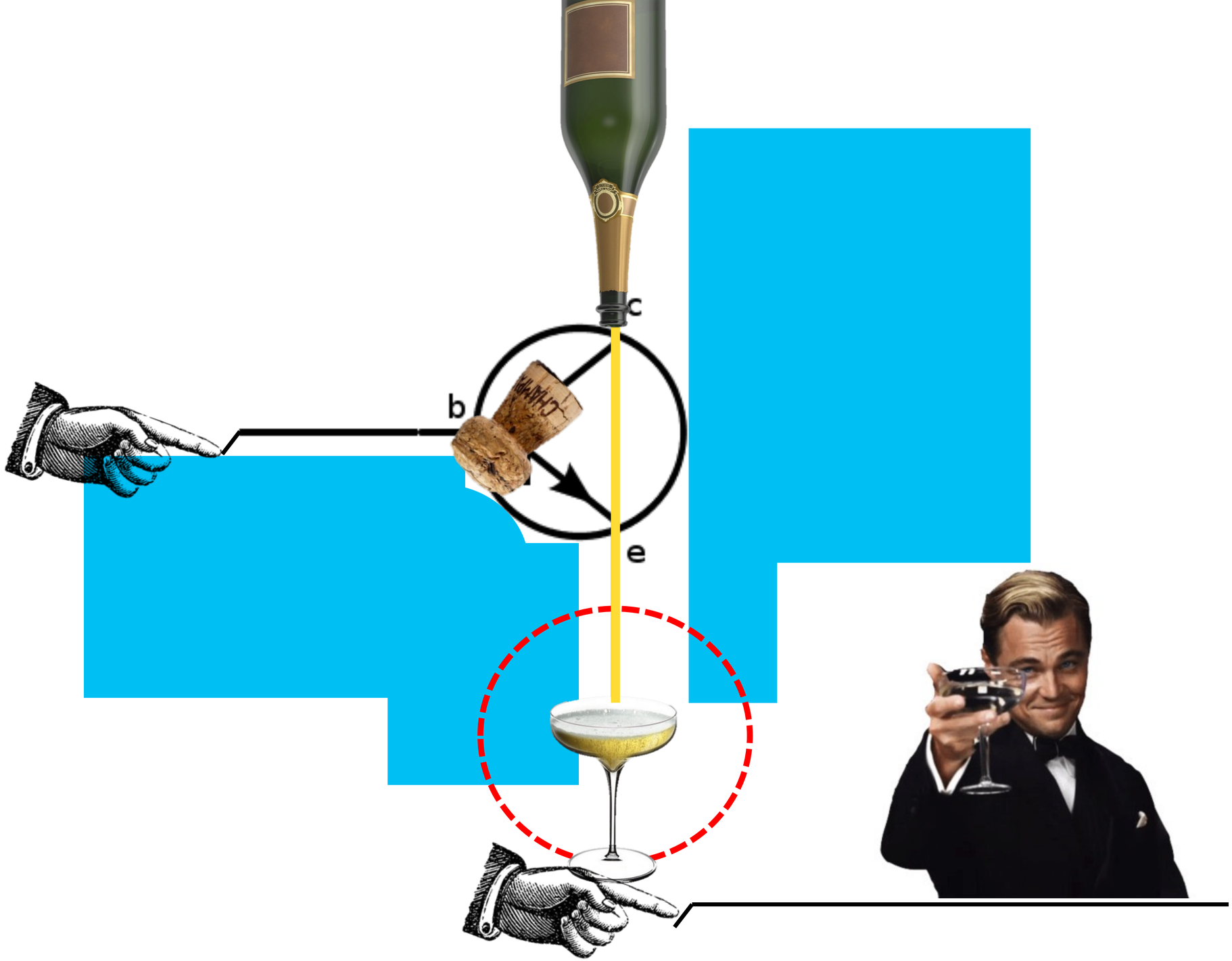
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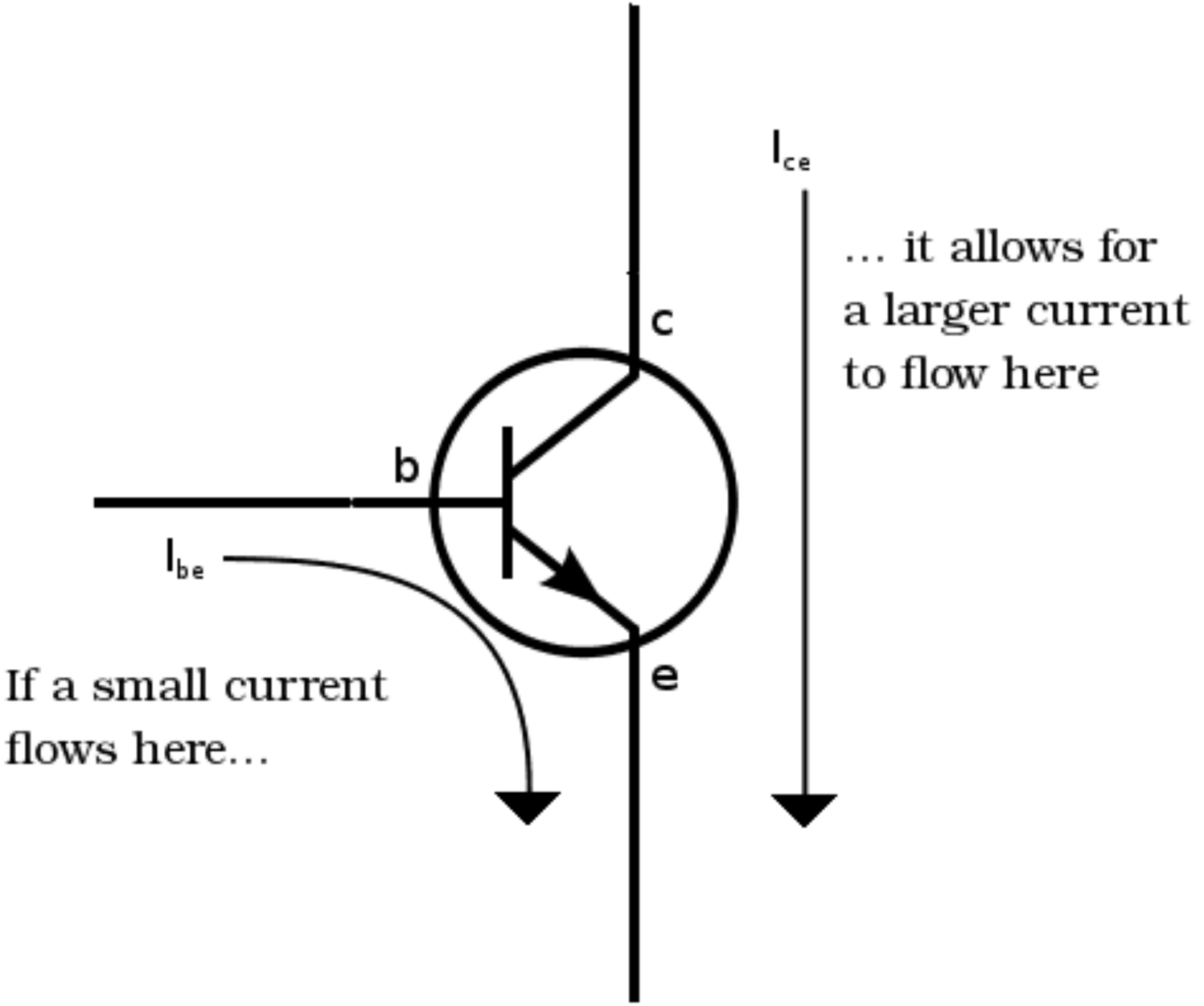
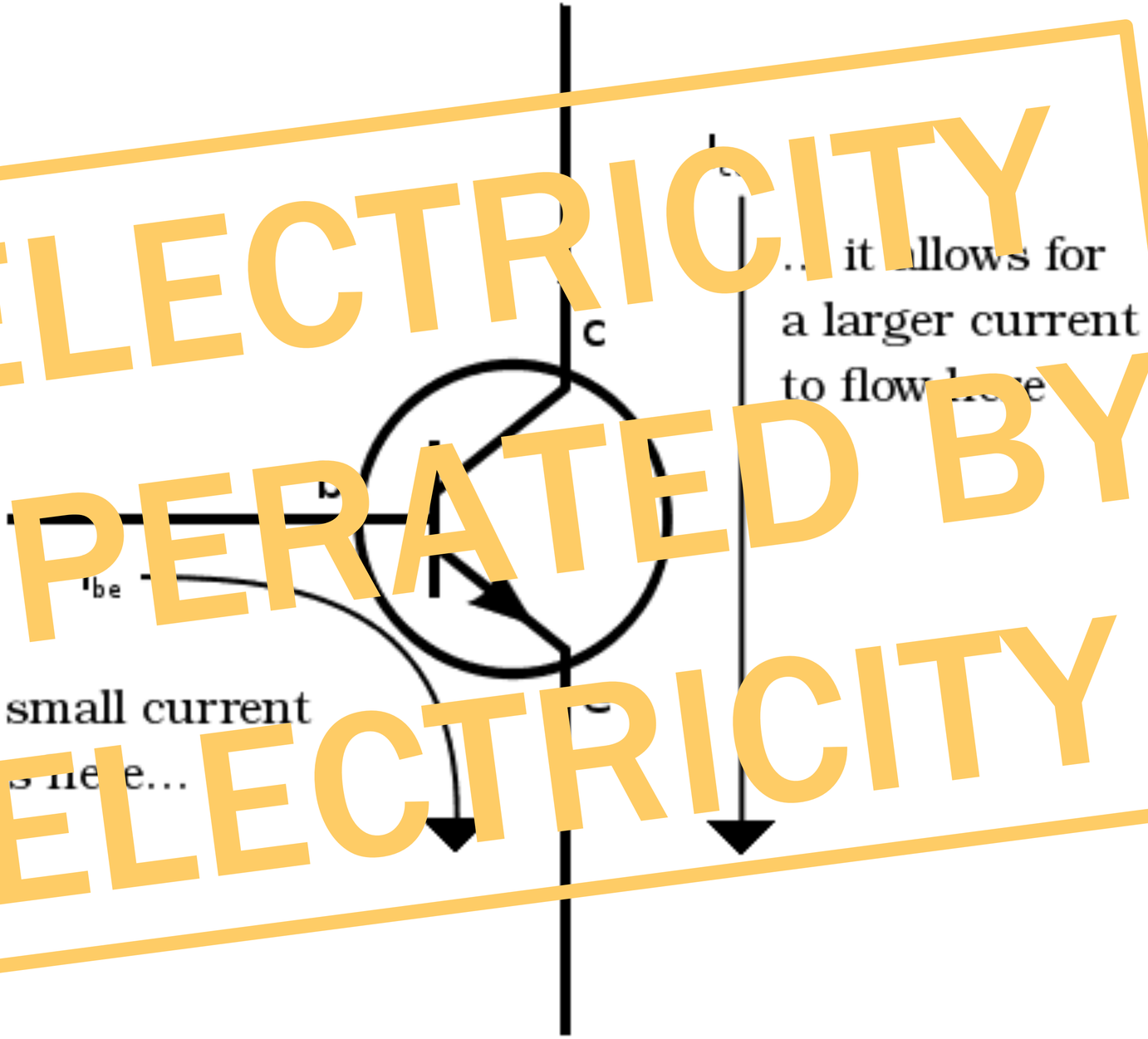

I_{ce}
… it allows for
a larger current
to flow here
c
b
I_{be}
e
If a small current
flows here…




cruzer
micro
4 GB


100%
09:45
AM WED 6/12
6410


10:00
10:00


cruzer
micro
4 GB
6410
NO
MOVING
PARTS

HELLO ELECTRONICS GOODBYE MECHANICS*

*Not really: I still need to grind my coffee beans. Also, flying.

COMPUTERS DO NOT NEED
TO BE ELECTRONIC, BUT THEY ARE
BECAUSE EVERYBODY LOVES TRANSISTORS

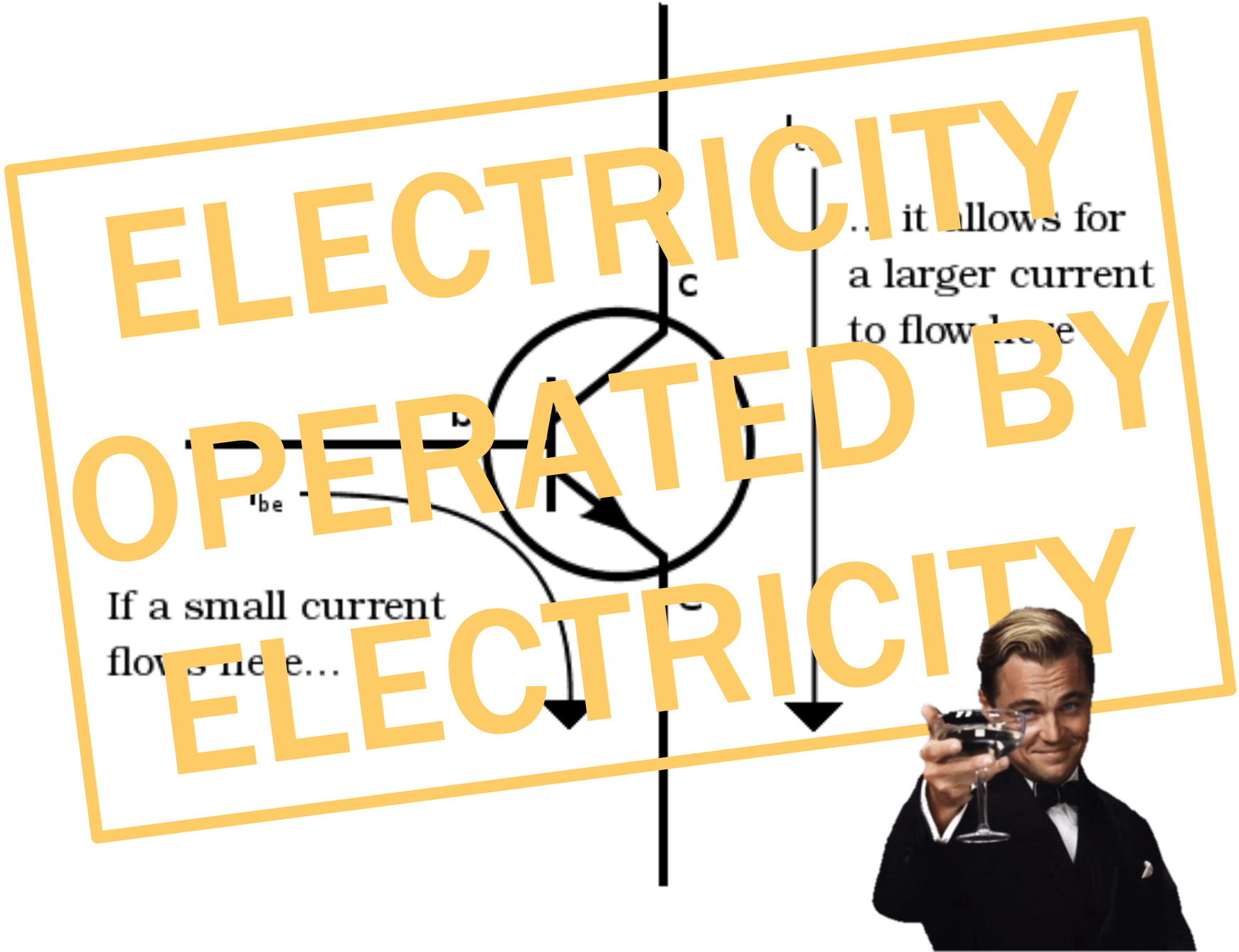

BOO
MECHANICS
BOOOO!


M·G·M PRESENTS
FORBIDDEN PLANET
AMAZING!
STARRING WALTER PIDGEON · ANNE FRANCIS · LESLIE NIELSEN
BASED ON A STORY BY IRVING BLOCK AND ALLEN ADLER
WITH WARREN STEVENS AND INTRODUCING ROBBY, THE ROBOT
SCREEN PLAY BY CYRIL HUME
PHOTOGRAPHED IN EASTMAN COLOR
DIRECTED BY FRED McLEOD WILCOX · PRODUCED BY NICHOLAS NAYFACK IN CINEMASCOPE AND COLOR
A METRO-GOLDWYN-MAYER PICTURE


BIG MACHINE.


NO INSTRUMENTALITIES.


Dubbed in Italian:
SENZA MECCANISMI.


ELECTRICITY
OPERATED BY
ELECTRICITY
c
b
be
... it allows for
a larger current
to flow here
If a small current
flows here...


Dubbed in Italian:
SENZA MECCANISMI.


NO INSTRUMENTALITIES.


NO INSTRUMENTALITIES.

“FORBIDDEN PLANET”

FIRST MOVIE EVER to depict humans traveling in a faster-than-light starship of their own creation.

FIRST MOVIE EVER to be set entirely on another planet in interstellar space, far away from Earth.

FIRST MOVIE EVER to feature a robot character with a distinct personality and an integral supporting character in the film.

FIRST MOVIE EVER to use an entirely ELECTRONIC musical score.


M·G·M PRESENTS
FORBIDDEN PLANET
AMAZING!
STARRING WALTER PIDGEON · ANNE FRANCIS · LESLIE NIELSEN
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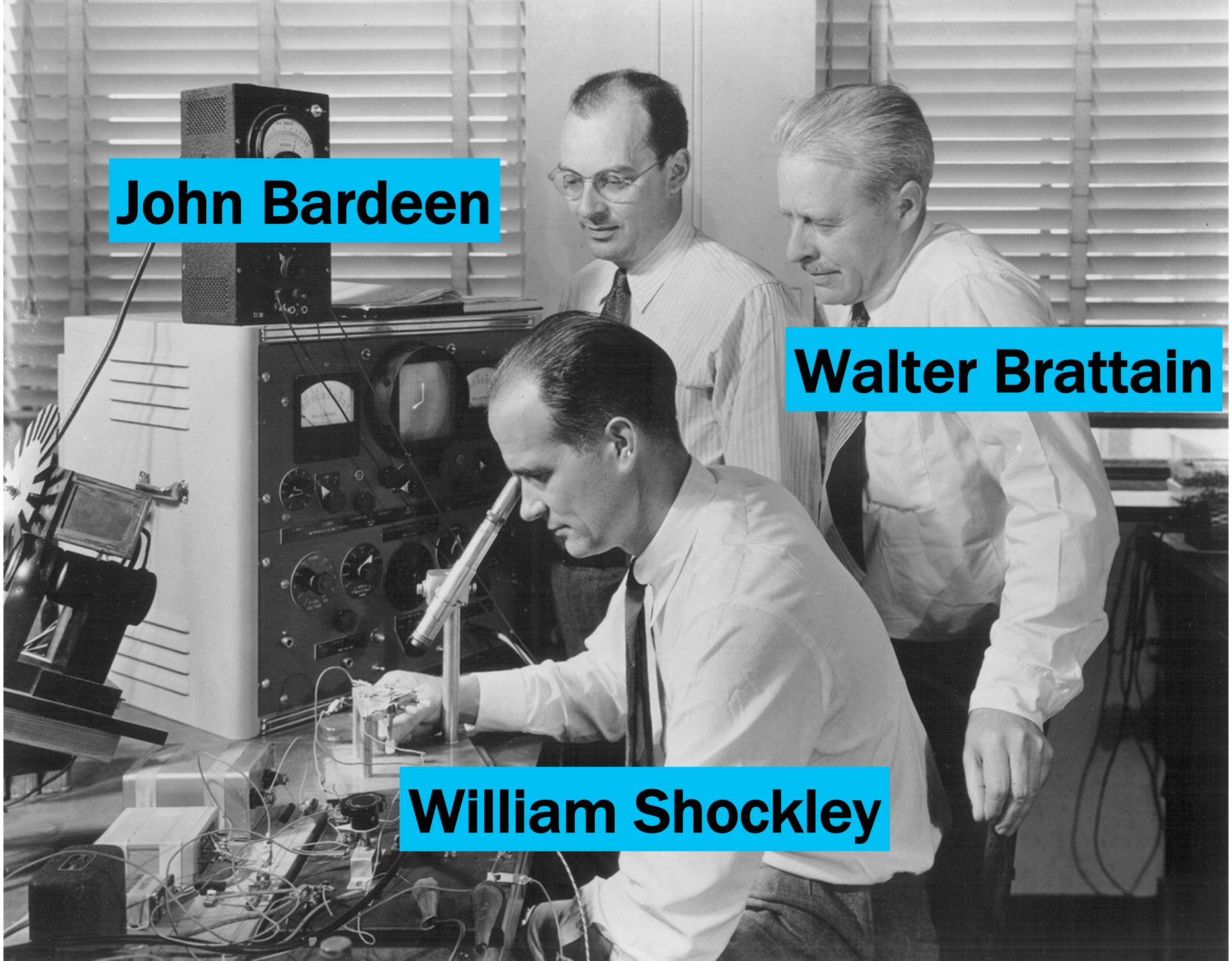
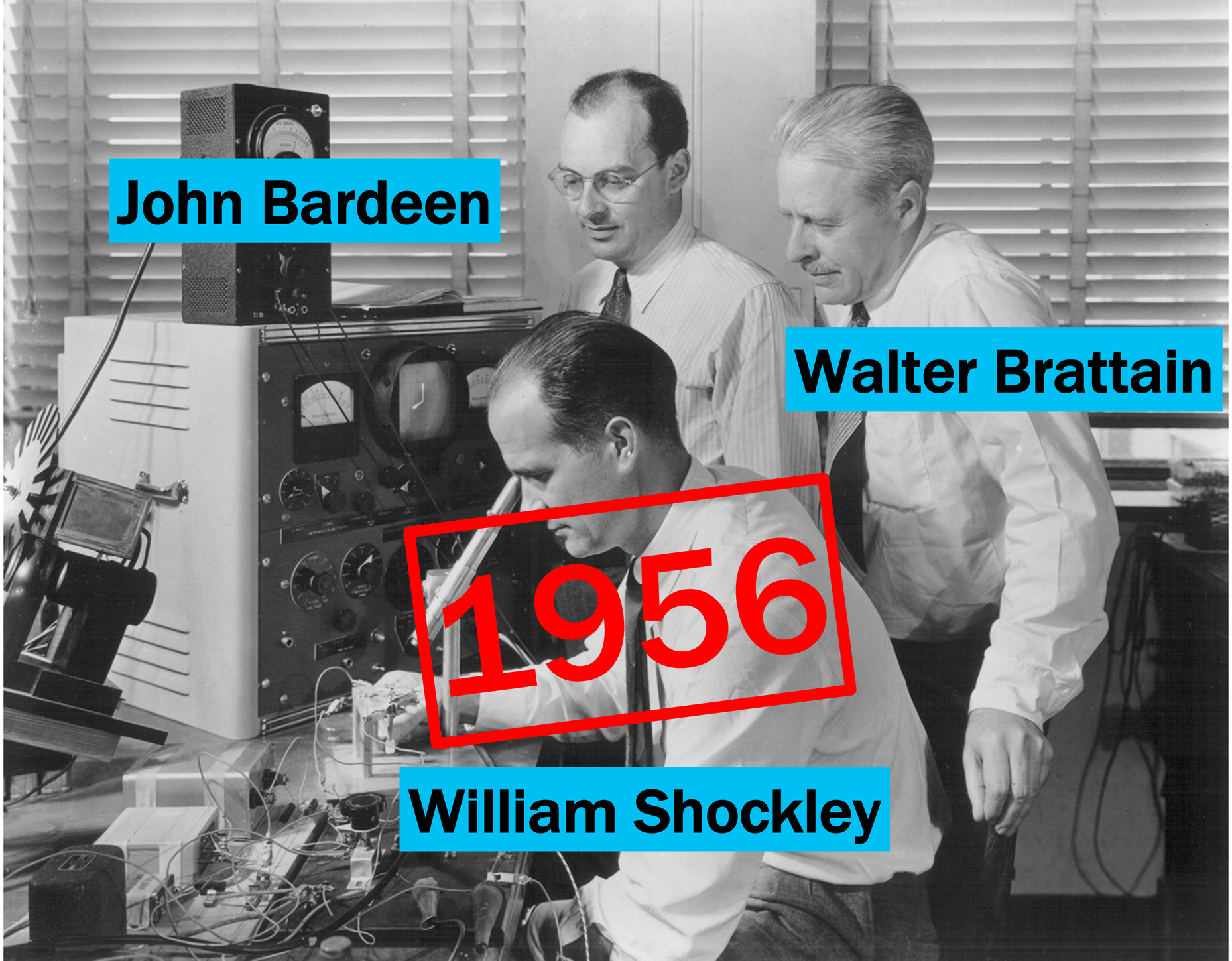
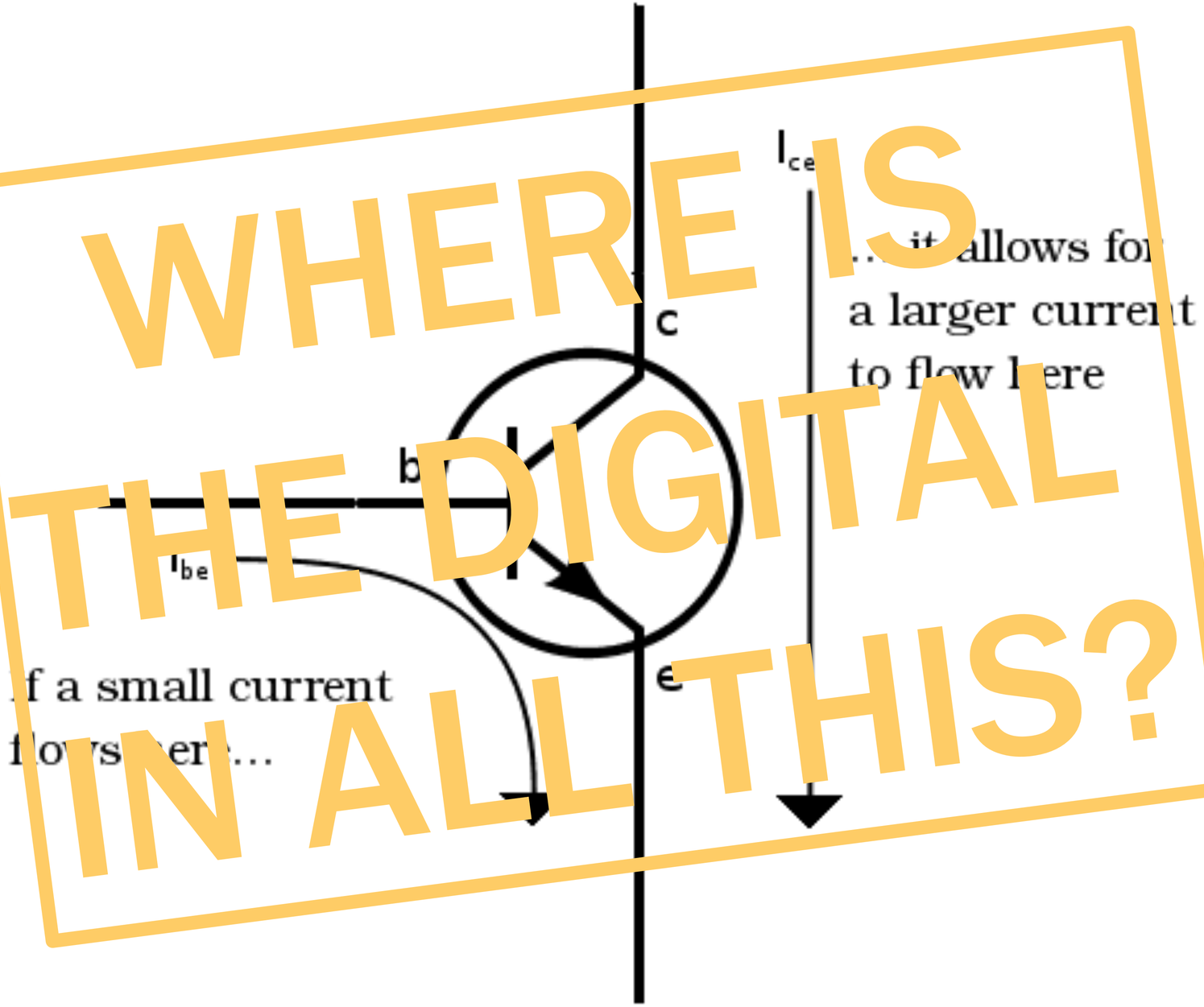
DIRECTED BY FRED McLEOD WILCOX · PRODUCED BY NICHOLAS NAYFACK IN CINEMASCOPE AND COLOR
A METRO-GOLDWYN-MAYER PICTURE


M·G·M PRESENTS
FORBIDDEN PLANET
AMAZING!
1956
STARRING WALTER PIDGEON · ANNE FRANCIS · LESLIE NIELSEN
WITH WARREN STEVENS AND INTRODUCING ROBBY, THE ROBOT
SCREEN PLAY BY CYRIL HUME
BASED ON A STORY BY IRVING BLOCK AND ALLEN ADLER
PHOTOGRAPHED IN EASTMAN COLOR
DIRECTED BY FRED McLEOD WILCOX · PRODUCED BY NICHOLAS NAYFACK IN CINEMASCOPE AND COLOR
A METRO-GOLDWYN-MAYER PICTURE


John Bardeen
Walter Brattain
William Shockley


John Bardeen
Walter Brattain
1956
William Shockley

WAIT!



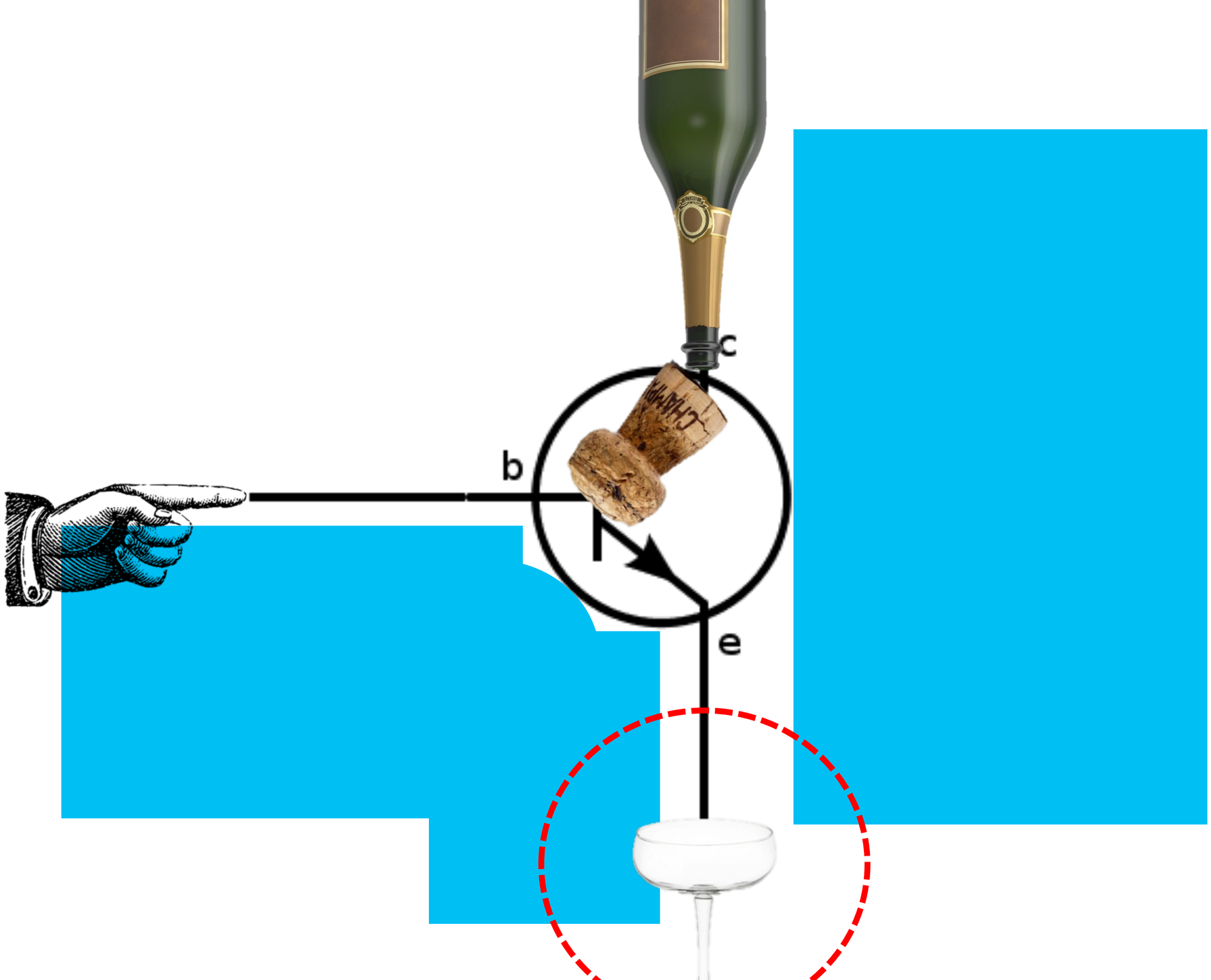
WHERE IS THE DIGITAL IN ALL THIS?

THE MOST FUNDAMENTAL ENCODING OF THEM ALL*

*No side notes here. It really is the most fundamental.

0

1


c
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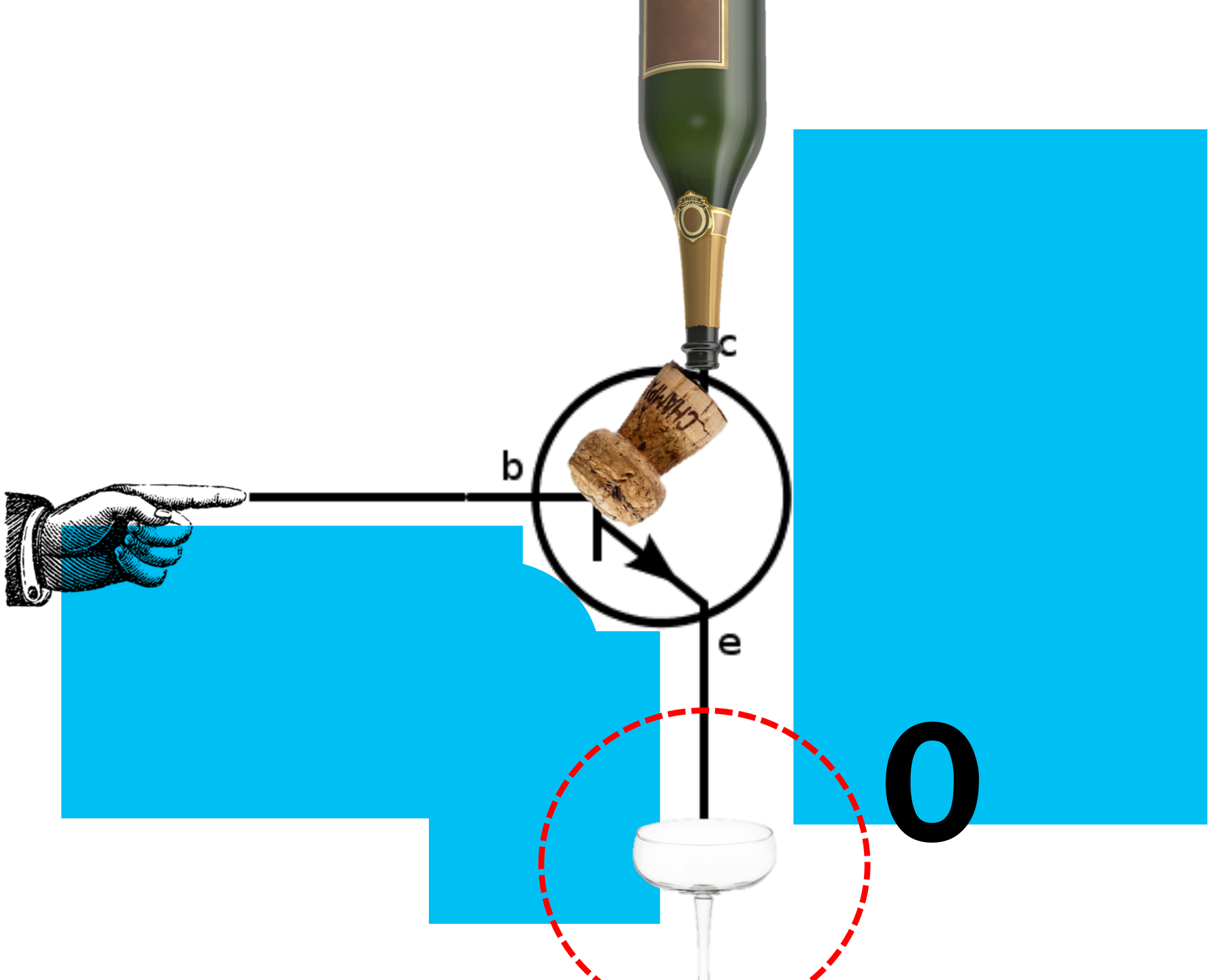
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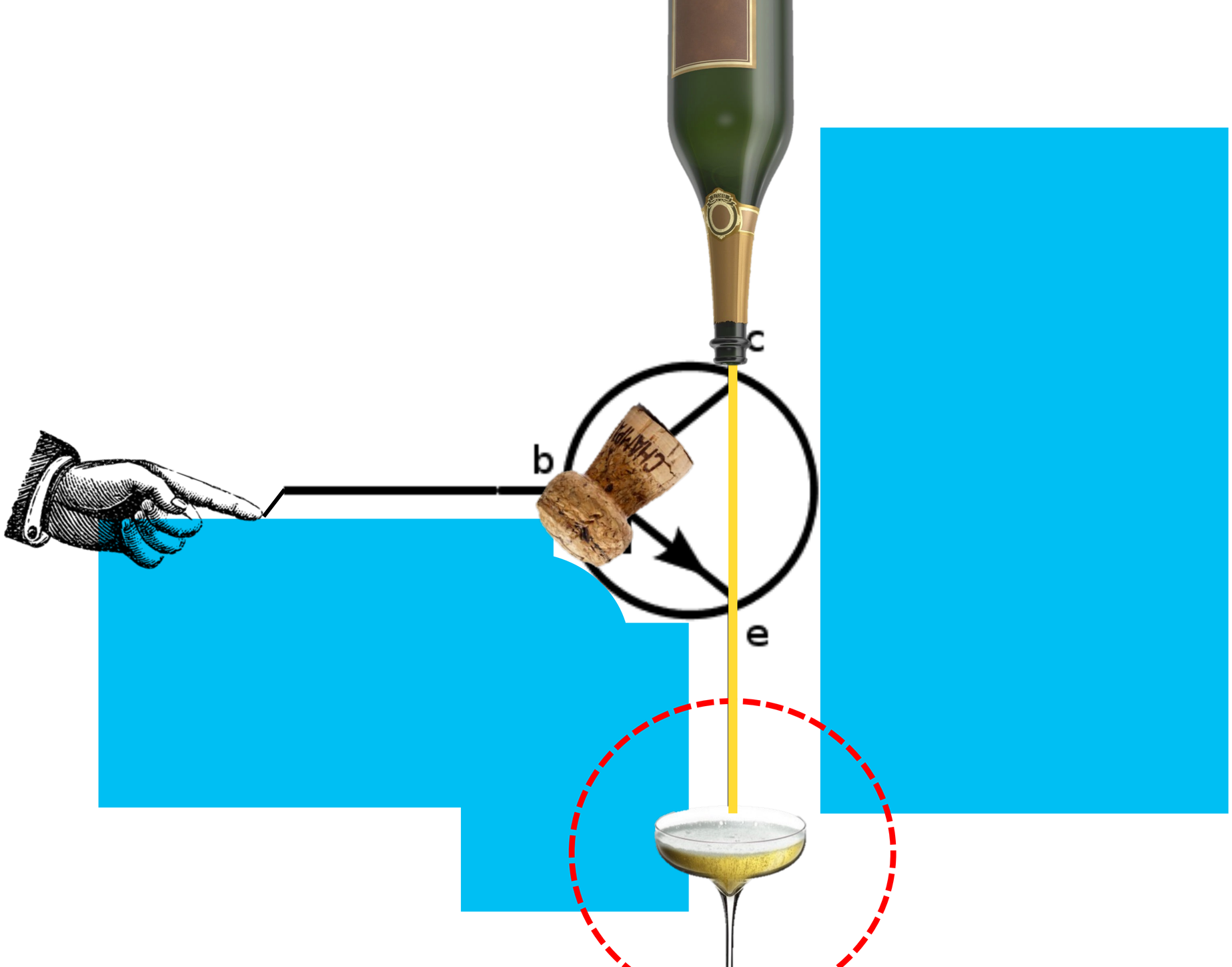
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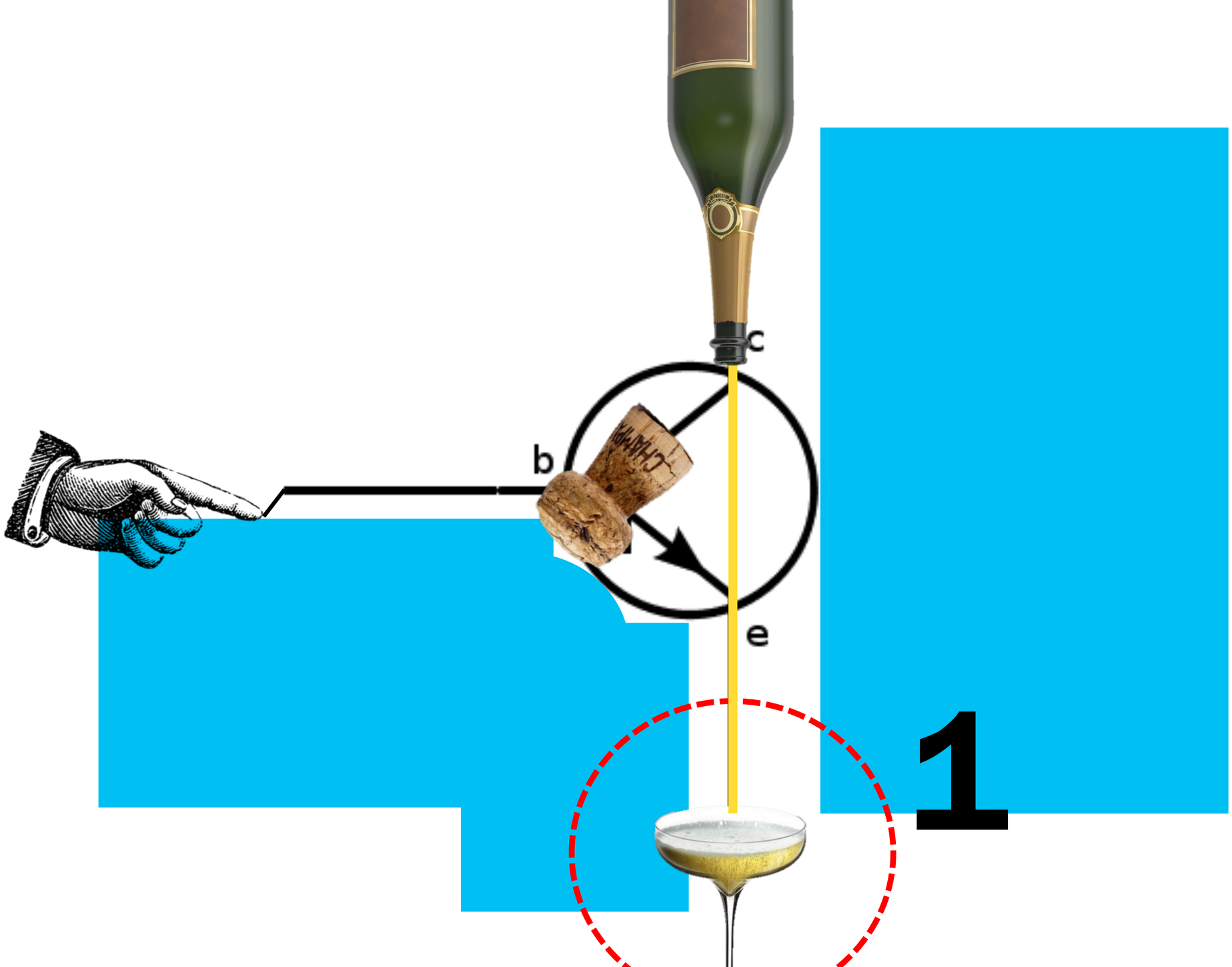
c
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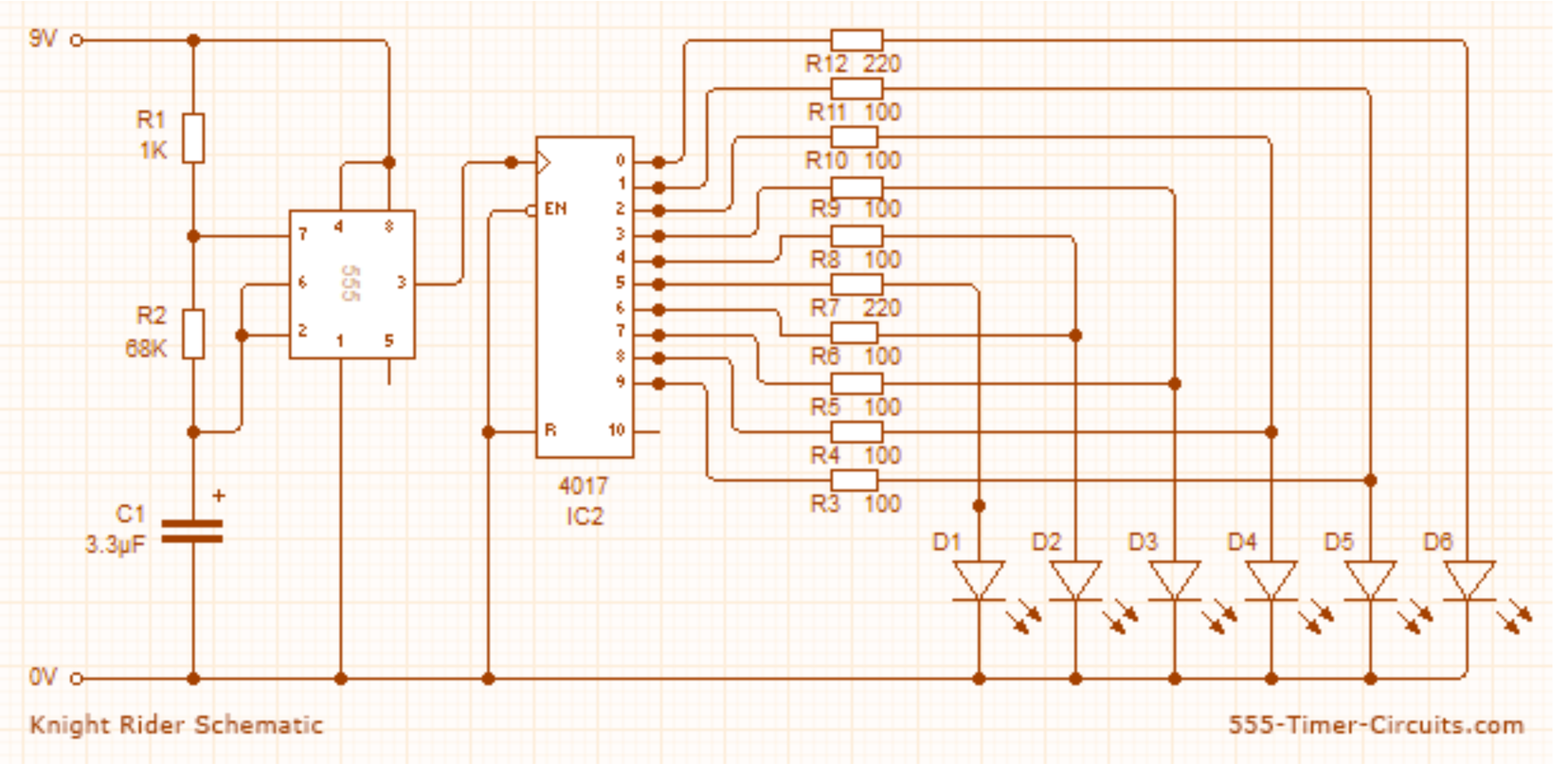
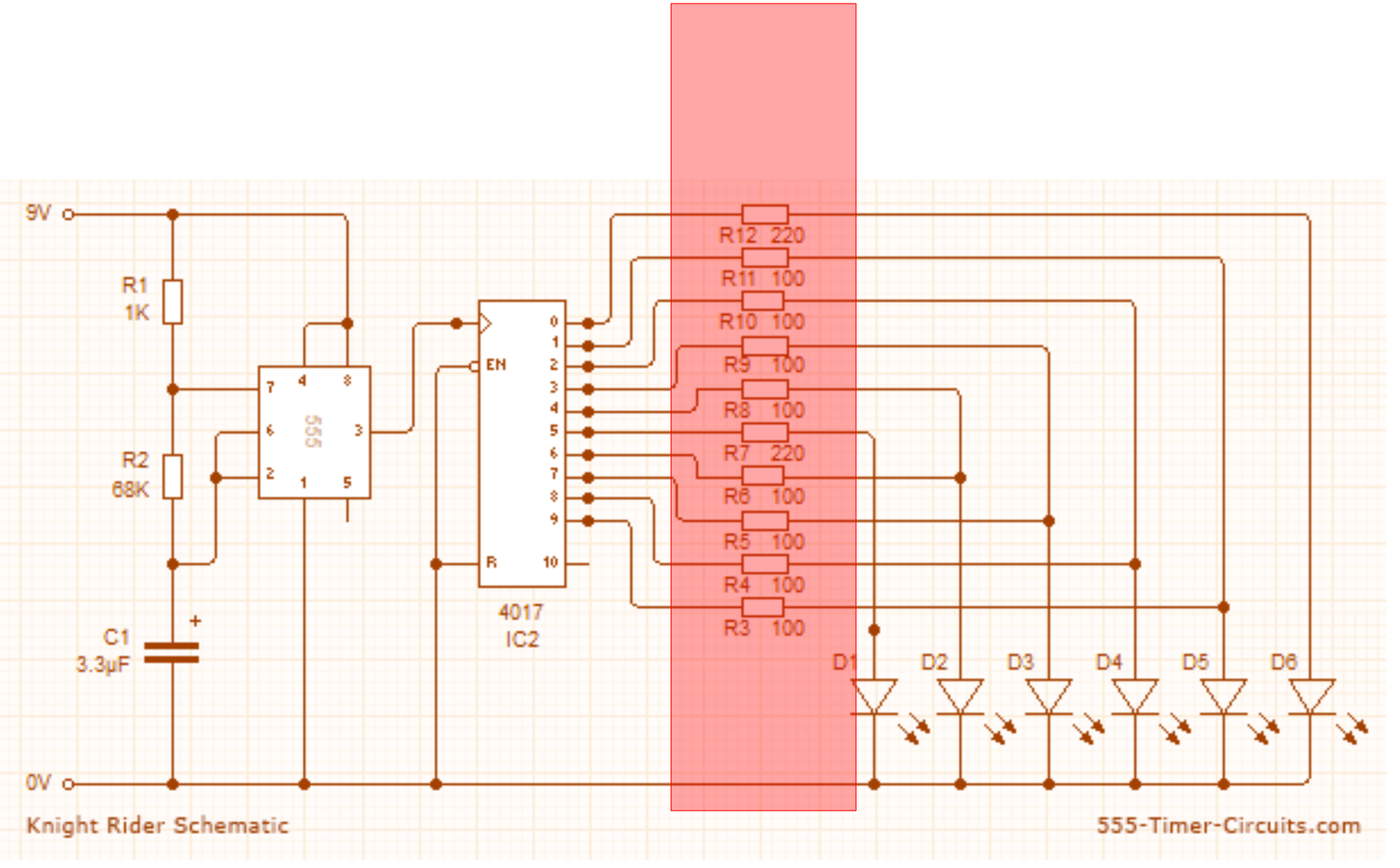
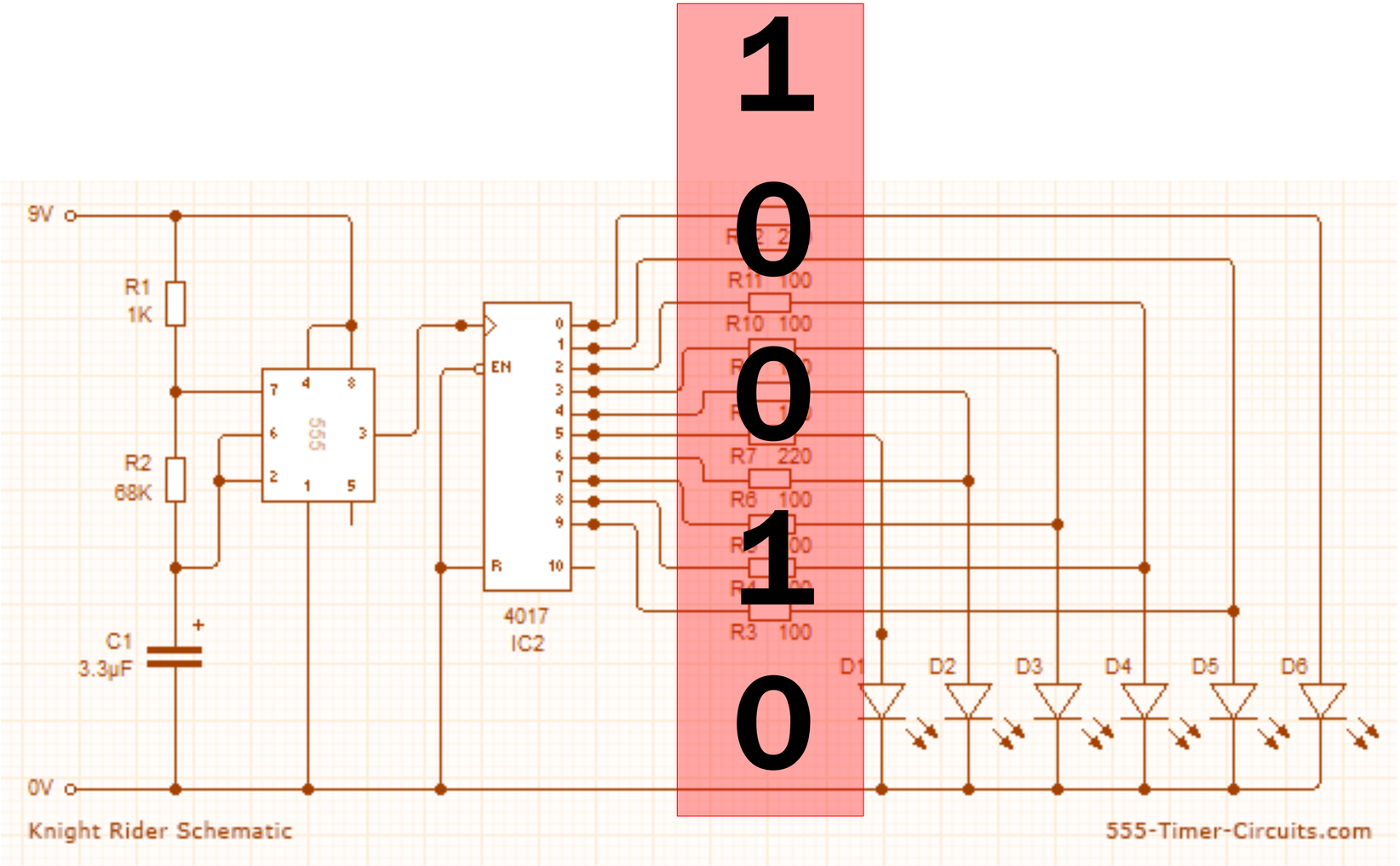
e
1


9V
R1
1K
R2
68K
C1
3.3µF
+
0V
555
4017
IC2
EN
R
R12 220
R11 100
R10 100
R9 100
R8 100
R7 220
R6 100
R5 100
R4 100
R3 100
D1
D2
D3
D4
D5
D6
Knight Rider Schematic
555-Timer-Circuits.com


9V
R1
1K
R2
68K
C1
3.3µF
+
0V
555
EN
R
4017
IC2
R12 220
R11 100
R10 100
R9 100
R8 100
R7 220
R6 100
R5 100
R4 100
R3 100
D1
D2
D3
D4
D5
D6
Knight Rider Schematic
555-Timer-Circuits.com


1
0
0
1
0
9V
0V
R1
1K
R2
68K
C1
3.3µF
555
4017
IC2
EN
R
R11 100
R10 100
R7 220
R6 100
R3 100
D1
D2
D3
D4
D5
D6
Knight Rider Schematic
555-Timer-Circuits.com

ARE THE DIGITS REALLY THERE?

DIGITS ARE IN THE

EYE OF THE BEHOLDER.

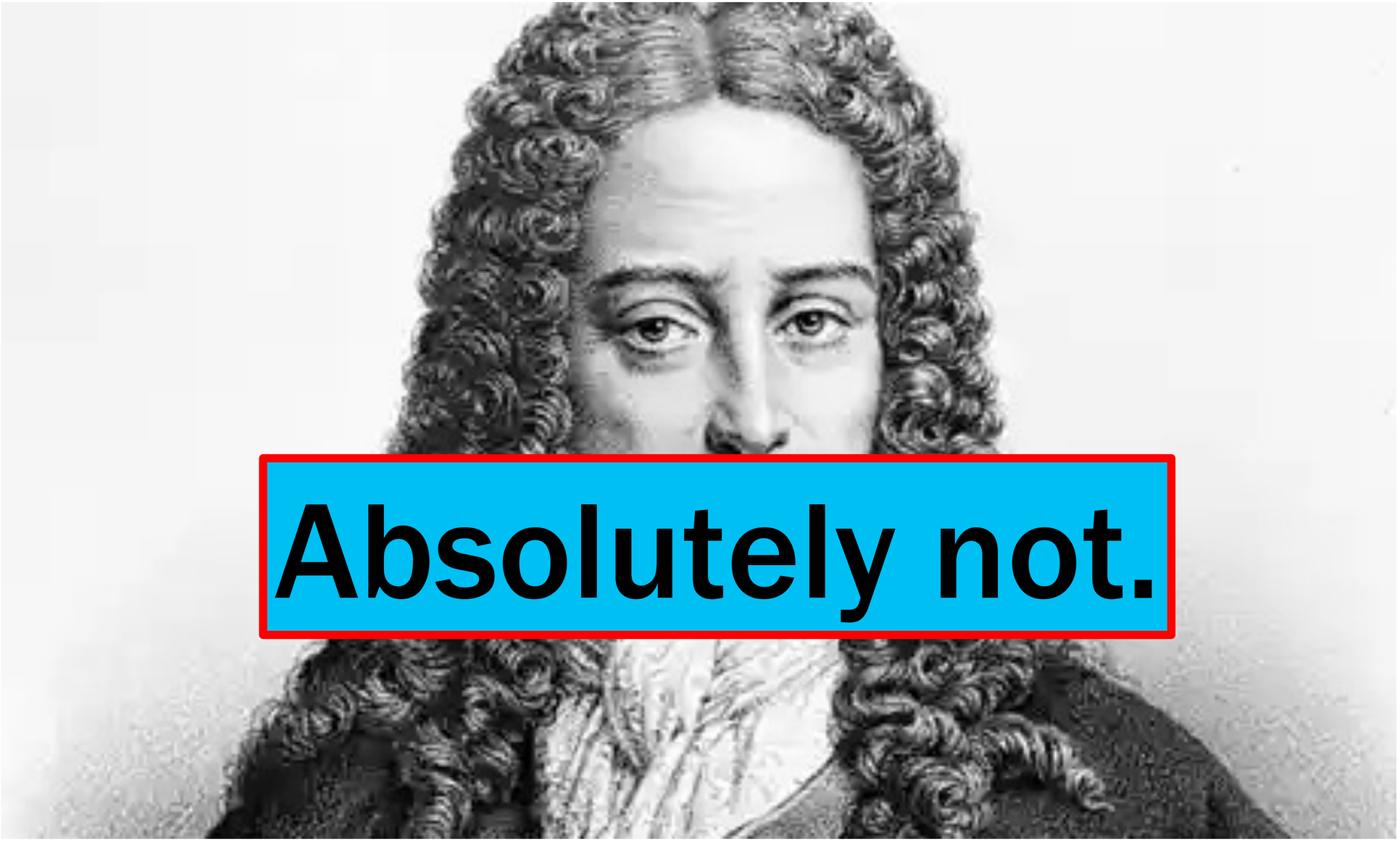
WAIT!

I promised you this.

I am giving you this.

I am giving you this.

Did I lie to you?


Absolutely not.

Gottfried Wilhelm Leibniz (1646-1716)

THE BINARY SYSTEM

{0;1}

THE DECIMAL SYSTEM

{0;1;2;3;4;5;6;7;8;9}

237

237

2 1 0

$$2 \times 10^{2} = 200$$

$$3 \times 10^{1} = 30$$

$$7 \times 10^{0} = 7$$

THE BINARY SYSTEM

{0;1}

101

2 1 0

$1 \times 2^2 = 4$

$0 \times 2^1 = 0$

$1 \times 2^0 = 1$

101
in binary
encodes
the number 5

$$101_2$$

$$=$$

$$5_{10}$$

237

2 1 0

$$2 \times 10^{2} = 200$$

$$3 \times 10^{1} = 30$$

$$7 \times 10^{0} = 7$$

What is the binary encoding of 237?

$$237 =$$

$$128 + 64 + 32$$

$$+ 8 + 4 + 1$$

(look for powers of 2)

$$237 =$$

$$2^7 + 2^6 + 2^5$$

$$+ 2^3 + 2^2 + 2^0$$

$$237 =$$

$$2^7 + 2^6 + 2^5$$

$$+ 2^3 + 2^2 + 2^0$$

(put a 1 in the positions
indicated by the exponents,
0 in theother positions)

11101101

7 6 5 4 3 2 1 0

$$11101101_2$$

$$=$$

$$237_{10}$$

No need for this.

This will do just fine.

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