A Brentanist Framework for Symbolic Intentionality & Symbolic Technologies

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Overall Project

Brentanist framework

for symbolic technologies
& (mechanical) computation

Analysis of division of labor between humans and machines when using symbolic technologies

"Symbolic Technologies"

Woelert (2017):

"material artifacts that are designed and employed to aid, structure, and guide processes of thinking"

Donald (2010):

"specifically designed to represent, communicate and store knowledge"

"Symbolic Technologies"

Extended definition:

immaterial artifacts (e.g. algorithms, theories, etc.),
not only to represent, communicate and store,
but also used to *process*, *manipulate*, and *transform*
information, symbols, and knowledge
(e.g. calculators, computers, etc.).

Why the 19th century?

How humans use symbols
&
How machines use symbols

are questions for 19th century paradigms

Why the 19th century?

Scientific Psychology
&
Computers

are 19th century innovations

Why the 19th century?

Thomas de Colmar's (1820) Arithmometer

Babbage's (1830's) Difference & Analytical Engines

Boole's (1847) binary logical Algebra

Alfred Smee's (1851) "Electro-Biological" artificial neural networks and Relational Machine

William Jevons' (1869) "Logic Piano"

Pierce & Marquand's (1886) Logic Machine

exceeding probably all London, and the very attempt to move its respective parts upon each other, would inevitably cause its own destruction. Nevertheless, those lesser machines containing but a few elements, exemplify the principles of their operation, and demonstrate those laws of
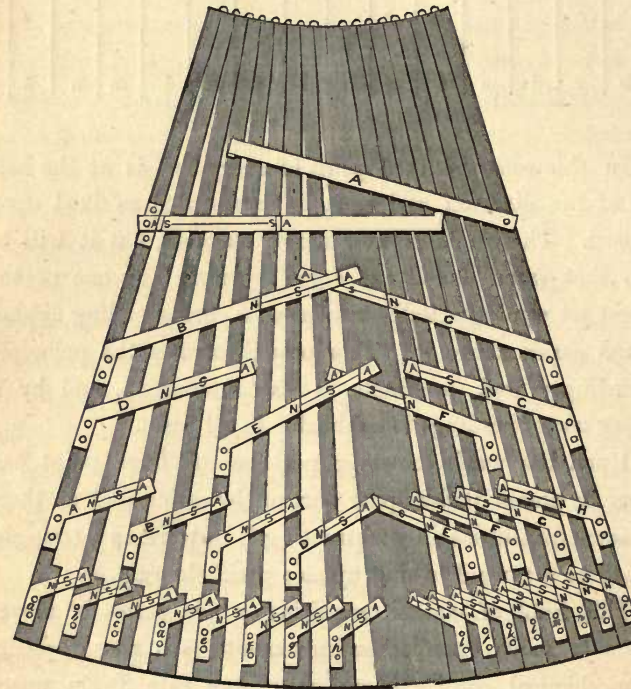
RELATIONAL MACHINE.

Fig. 8.

induction, deduction, and relation, the right use of which cannot fail to render our thoughts more accurate, and our language more precise.

I have also devised a relational slate which the student

Why the 19th century?

Brentano and Wundt established two influential paradigms for scientific psychology in 1874

The concept of intentionality was re-introduced in contemporary philosophy by Brentano in 1874

Assumption

Intentionality is the "mark of the mental", distinguishing human thinking from mechanical information processing.

Every mental act has intentionality, machines cannot have intentionality

Problem

However,

we outsource our thinking

to computers every day.

How is this possible?

When and why should we trust this?

Intentionality

"Every mental phenomenon is characterized by what the Scholastics of the Middle Ages called the intentional (or mental) inexistence of an object, and what we might call, though not wholly unambiguously, reference to a content, direction towards an object (which is not to be understood here as meaning a thing), or immanent objectivity."

(Brentano 1874, 124)

Symbolic Intentionality

"We improperly present that of which we have no precisely corresponding presentation
and often can have none.
We name it, but we do not quite even understand the name while we name it."

(Brentano EL 80/13060,
tr. Rollinger 2009, 81)

Symbolic Intentionality

"Symbolic presentations:
by this we mean those presentations
which occur only as signs for others"

(Stumpf Q 11/II, 504;
tr. Rollinger 1999, 301)

Symbolic Intentionality

"A symbolic or improper presentation is […]
a presentation through signs.
When content is not given directly to us as what it
is, but only indirectly through signs that
characterize it unambiguously, we have […]
a symbolic presentation of it."

(Husserl 1891, 215; 2003, 205)

Symbolic Intentionality

"Such concepts, which we do not present properly,
but can grasp only through words,
are called symbolic concepts."
"*Solche Begriffe, die wir uns nicht eigentlich vorstellen,
sondern nur durch Worte fassen können, heißen
symbolische Begriffe*"

(Bolzano *Wissenschaftslehre*, 478, § 90)

Symbolic Intentionality

god

other minds

external world

greater numbers

Symbolic Intentionality

theology
(most of) psychology
all the natural sciences
mathematics

Brentano on Mathematics

"Mathematics reveals in a clear and understandable way the fundamental nature of all true scientific investigation. There is no better field of study for gaining one's first clear view of laws, deduction, hypothesis, and many other important logical concepts."

(Brentano 1874, 34; 1995, 21)

Brentano on Mathematics

"Mathematics proves to be
the indispensable adjunct of all sciences,
at every level of exactitude and
in all kinds of different circumstances."

(Brentano 1874, 93; 1995, 53)

Brentano on Mathematics

"Hence mathematics is not an inductive, but a purely deductive, and in this sense, a priori science. Indeed, were it not, then there would be no science at all, neither deductive nor inductive. Because it is not induction that sanctions deduction, but deduction, and specifically mathematical deduction, that sanctions all rational scientific justified induction."

(Meg 40025 f.)

Brentano on Mathematics

"mathematics, *as well as every inductive science*, would be impossible without acknowledging the analytic (non-inductive) character of mathematics"

(Brentano to Vailati, 7 April 1900)

Brentanists on Mathematics

Carl Stumpf

1870 *Über die Grundsätze der Mathematik*

1880s Lectures on Psychology and Logic

1939 *Erkenntnislehre*

Brentanists on Mathematics

Edmund Husserl

1887 *Über den Begriff der Zahl*

1891 *Philosophie der Arithmetik*

1900 *Prolegomena zur reinen Logik*

⋮

Brentanists on Mathematics

Brentano

Stumpf

Husserl

Brentanists on Mathematics

Christian von Ehrenfels

1885 *Größenrelationen und Zahlen*
1891 "*Zur Philosophie der Mathematik*"
1922 *Das Primzahlengesetz*

Brentanists on Mathematics

Brentano

Stumpf

Ehrenfels Husserl   Kerry

Brentanists on Mathematics

Brentano

Stumpf

Ehrenfels Husserl   Kerry
Höfler Hillebrand

A Brentanist Philosophy of Mathematics

Mathematics in the School of Brentano:

analytic, deductive, a priori;

the model science,
the foundational science
and the exemplar of symbolic intentionality

Symbolic Intentionality

"In propositions that involve higher numbers, already with 7 + 5 = 12, there is a further difference in that we do not present larger numbers in a complete and proper way, by considering every unit for itself. We use signs, such as "12" [or] "7" for the concepts that we do not completely and exactly think of."

(Stumpf 1887, 87)

A priori & a posteriori

"7 + 5 therefore leads to a doubtlessly
a posteriori foundation,
because it could not be performed with direct
number presentations"

(Ehrenfels 1891, 325)

A priori & a posteriori

We need aides for our memory:
"*Hülfsmittel für das Gedächtniss*"

(Ehrenfels 1891, 326)

We need symbolic technologies
to store and *process* information

A priori & a posteriori

"The use of logarithmic tables is
the most obvious example in this category.

Here we even use the results of
foreign labor
and thereby acknowledge
deductions as correct,
which we never carried out ourselves."

(Ehrenfels 1891, 329)
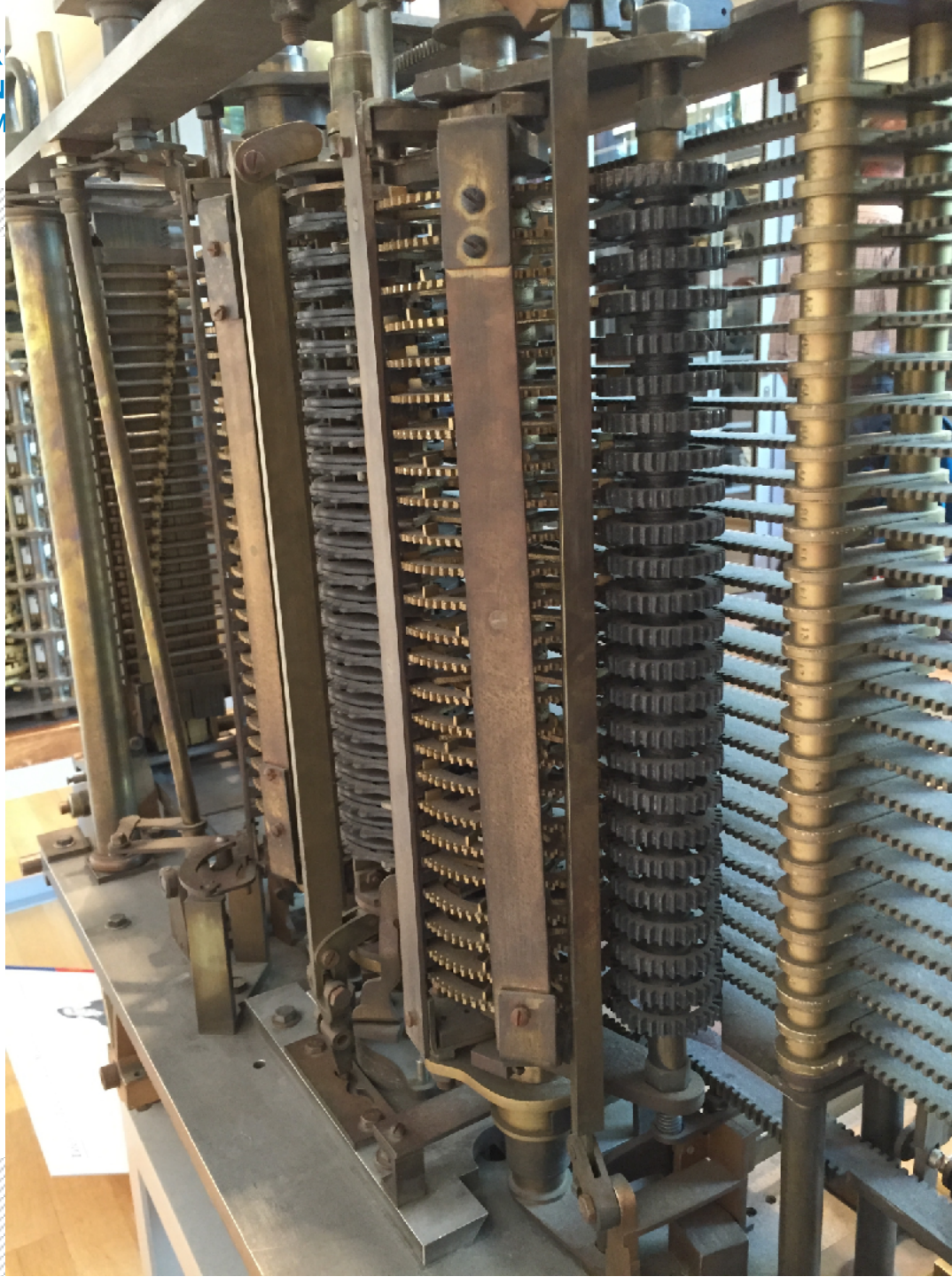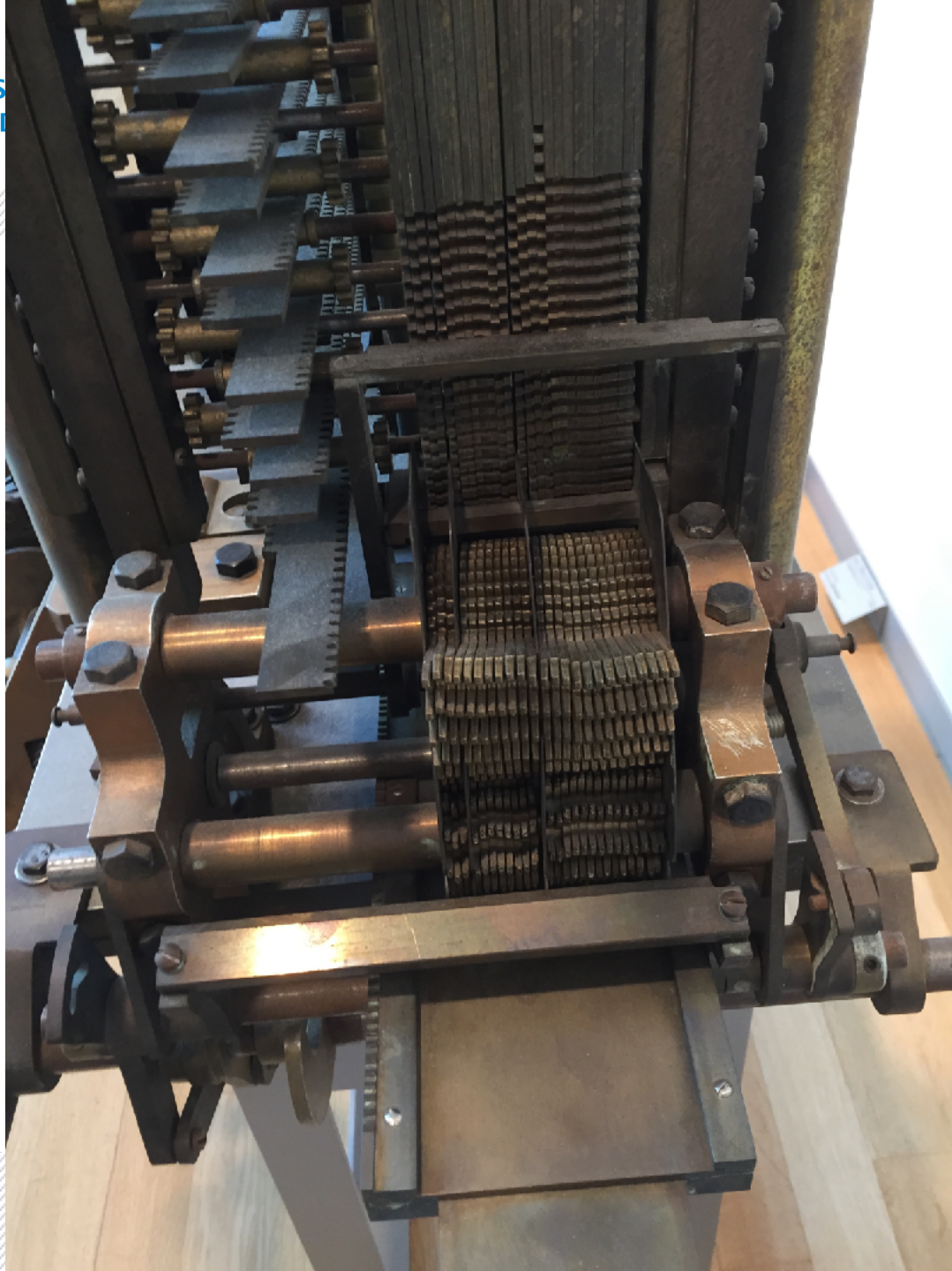
Questions

Can machines think?

Turing

"Can Machines Think?"
Computing Machinery and Intelligence (1950)

Turing

"I propose to consider the question,
'Can machines think?'

This should begin with definitions
of the meaning of the terms
'machine' and 'think'."

Turing

"Instead of attempting such a definition
I shall replace the question by another,
which is closely related to it and is
expressed in relatively unambiguous words."

Turing

"The original question
'Can machines think?'
I believe to be too meaningless
to deserve discussion."

School of Brentano

Can supply an operational definition that works well enough to make the question meaningful?

School of Brentano

Symbolic Intentionality
Symbolic Technologies

Brentanist Philosophy of Computation

School of Brentano

Research within the framework:
- A sign system for symbolic intentionality
- Mechanizing symbolic intentionality /
symbolic technologies
- Validity of computing with symbolic technologies
- Trusting symbolic technologies

School of Brentano

A sign system for symbolic intentionality:
- the Brentanist ideal of a *characteristica universalis*
- parallelism between psychological and linguistic structures in the School of Brentano
- scientific applicability of a *characteristica universalis*

School of Brentano

Mechanizing symbolic intentionality /
symbolic technologies:
Brentanist cognitive model of counting /calculating
Classifying calculators based on Brentanist model
Brentanist perspective on extended mind

School of Brentano

Validity of computing with symbolic technologies:

Numerals as tools to construct number concepts
Husserl's "doubling of all pure mathematical concepts"
Denkökonomie: how do our psychological limits determine our algorithms and supportive devices?
The epistemic role of calculating/computing machines

School of Brentano

Trusting symbolic technologies:
justifying symbol manipulation to gain knowledge,
symbols as tools: how numbers and mathematics extend our natural reach,
ethical concerns of outsourcing cognitive tasks to machines (acting by proxy)

Husserl on symbolic technologies

"The machine clearly does not think,
it does not understand itself
nor the meaning of its performance"

(Husserl 1900, 68)

Husserl on symbolic technologies

"however, could not our thought-machine function in a similar manner, where the real course of one kind of thought would always have to be recognized as correct by the insight in its logical lawfulness brought forward in another?"

(Husserl 1900, 68)

Husserl on symbolic technologies

"Science also has a subjective side. […]
Here belong the modern methods of calculation
with calculating machines, logarithmic tables, etc."

(Husserl *Logik* 1902/03, 294)

Husserl on symbolic technologies

"A four-dimensional creature would naturally have completely different methods of calculation, it would not write on two-dimensional tablets, etc. All these methods are thus empirically founded, and insofar not only the physical, but also the psychical constitution plays a role, we can say that they are psychologically founded."

(Husserl *Logik* 1902/03, 294)

Husserl on symbolic technologies

"Symbols serve the economy of mental achievement as tools and machines do the economy of mechanical achievement."

(Husserl *Semiotik*, 350; tr. 29)

Husserl on symbolic technologies

"the system of general arithmetic,
the most wonderous mental machine"

"*das System der allgemeinen Arithmetik,
dieser wunderbarsten geistigen Maschine*"

(Husserl *Semiotik*, 350; tr. 30)

Husserl on symbolic technologies

"What we do due to
epistemological reasons
[*Erkenntnisgründen*],
the mechanism of reproduction does
due to blind causality."

(Husserl *Semiotik*, 364; tr. 42 f.)

Husserl on symbolic technologies

"What we do due to
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[*Erkenntnisgründen*],
the mechanism of reproduction does
due to blind causality."

(Husserl *Semiotik*, 364; tr. 42 f.)

… but so do we, most of the time!

Husserl on symbolic technologies

We operate according to
"blind psychological rules"
"*blinde psychologische Gesetze*"

(Husserl *Hua XII*, 357)

Husserl on symbolic technologies

"One must not confuse
the fact that we use surrogate presentations
with the knowledge of this usage.
The latter lacks in many,
if not most, cases"

(Husserl *Hua XII*, 357)

Husserl on symbolic technologies

The symbolic technique is the same in mind and machine

Husserl on symbolic technologies

The symbolic technique is the same
in mind and machine
but minds can critically reflect
on their symbolic information processing

Husserl on symbolic technologies

"You know from your own experience that we perform additions, multiplications, etc., with decimal numbers purely mechanically, if we don't even use machines to infer the results. And the machines don't think for themselves, in the machines no thoughts correspond to the signs."

(Husserl *Logik 1896*, 247)

Husserl on symbolic technologies

"To every correct rule-based inference then corresponds a result, that must yield a correct proposition when evaluated conceptually. This is due to the precise parallelism between cognitive and symbolic operations."

(Husserl *Logik* 1896, 248)

Husserl on symbolic technologies

For calculations we don't need the concepts, just the signs and their rules

This possibility depends of a full parallelism between concepts and signs.

(Husserl *Logik* 1902/03, *Hua Mat II*, 232)

Husserl re-used these passages in the logic lectures of 1908/09 (F I 1/175-179)

(*Hua XXIV*, 434-439)

Husserl on symbolic technologies

"If we have the multiplication tables, if we have even learned them by heart, then we do not actually need to think at all any more for each multiplication falling under them. We do not need any insight. We look at the tables. The external mechanical subsumption procedure takes the place of genuine thinking."
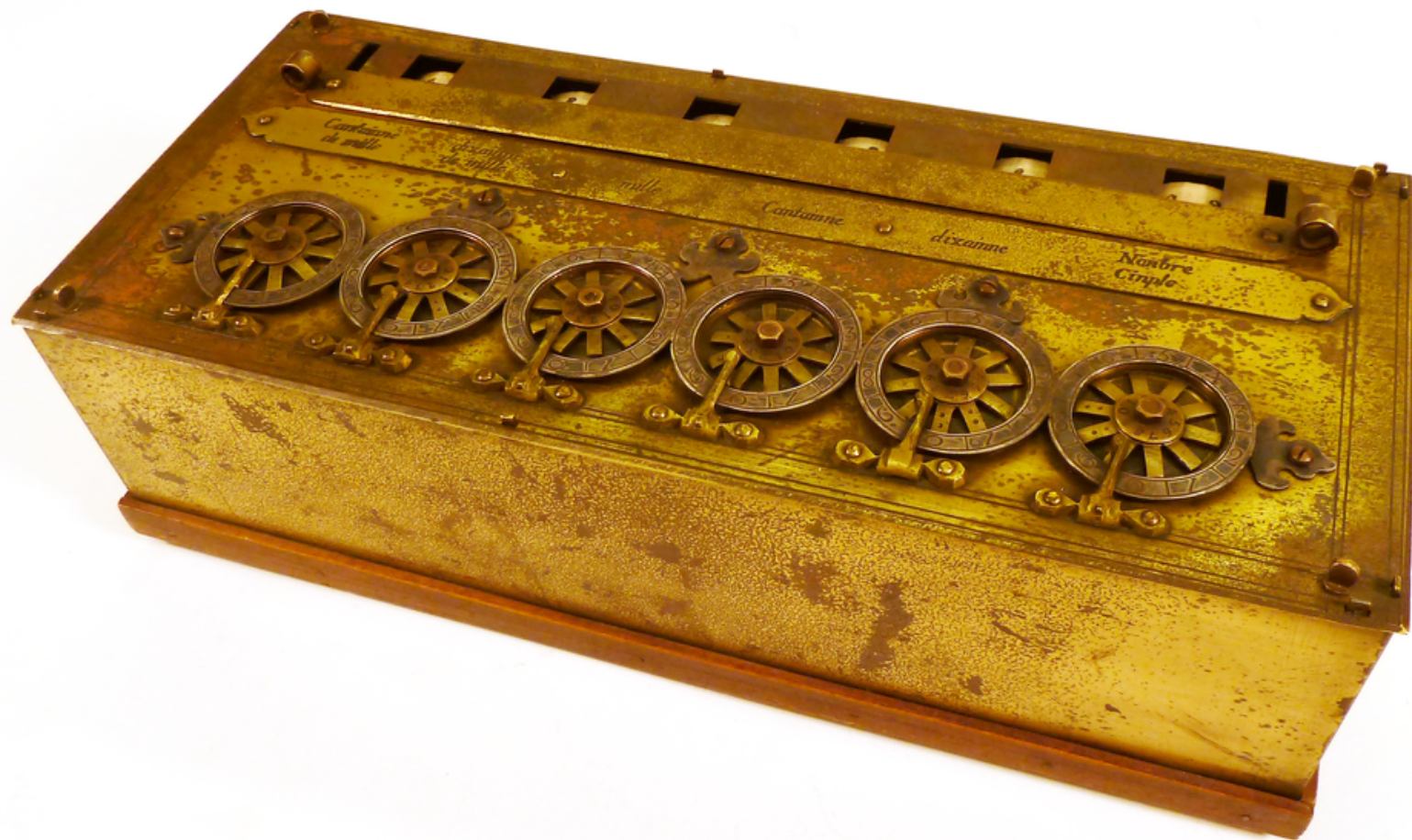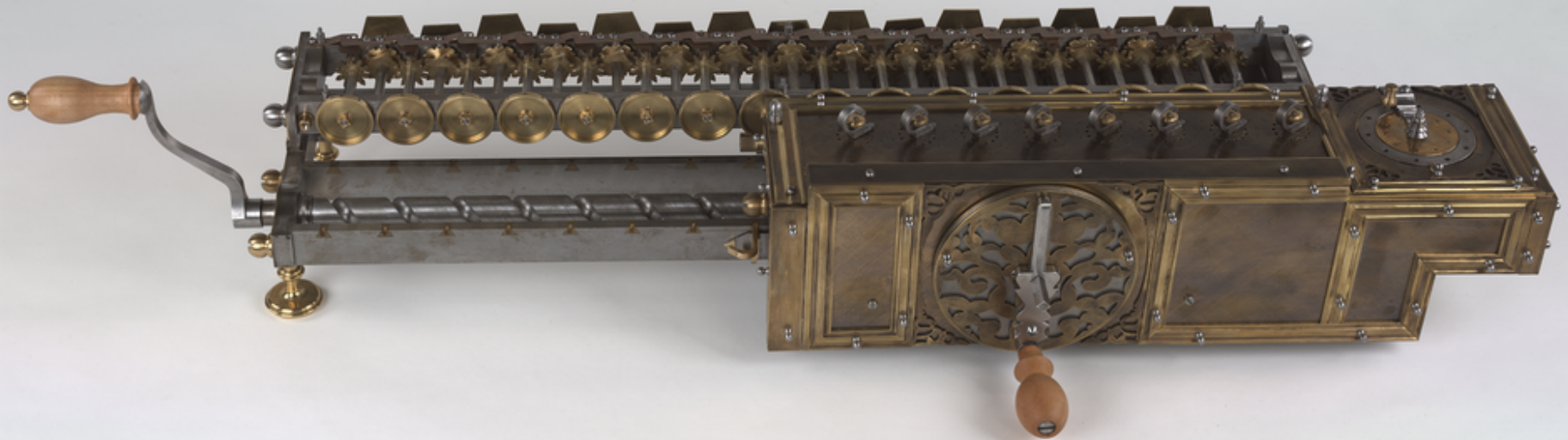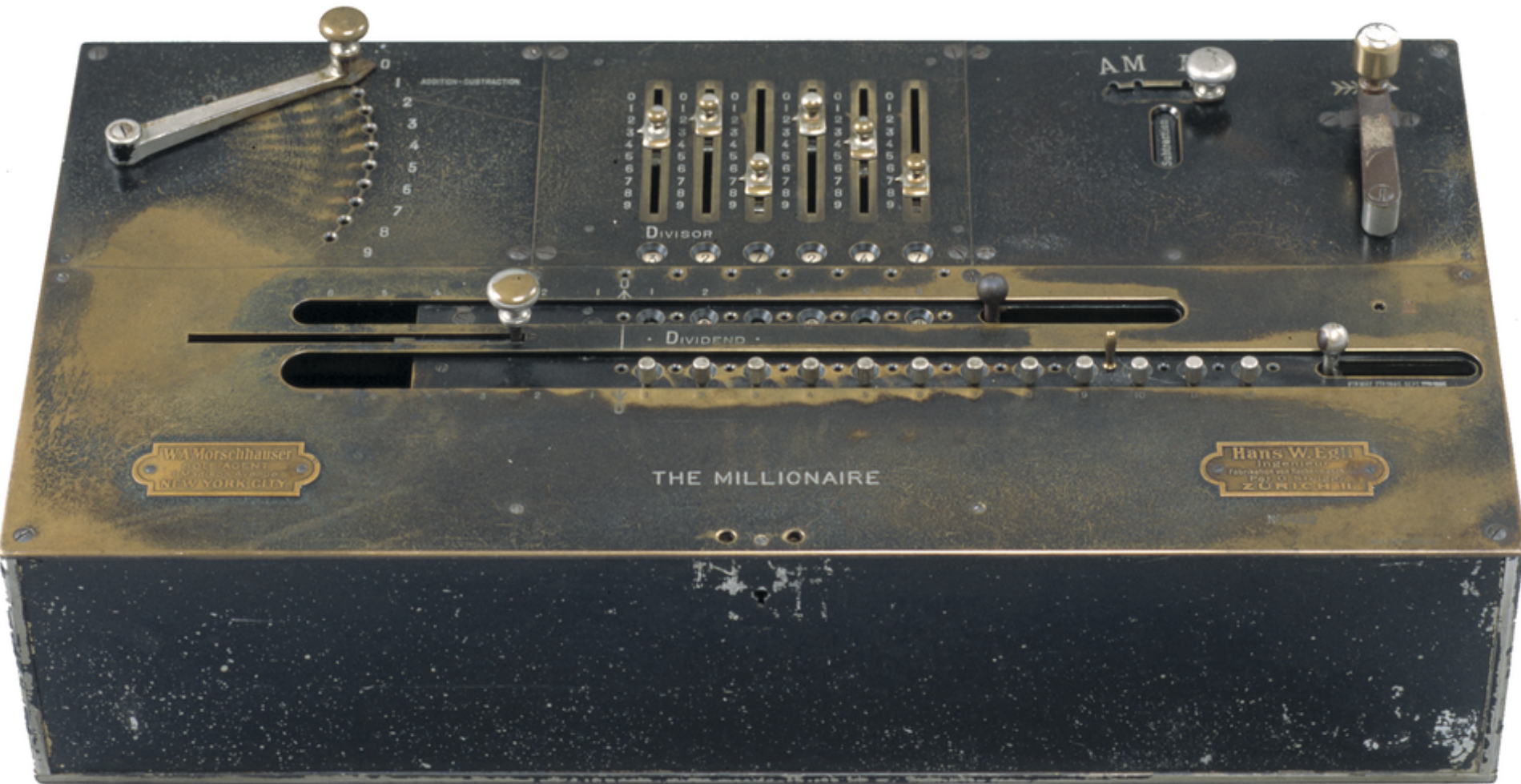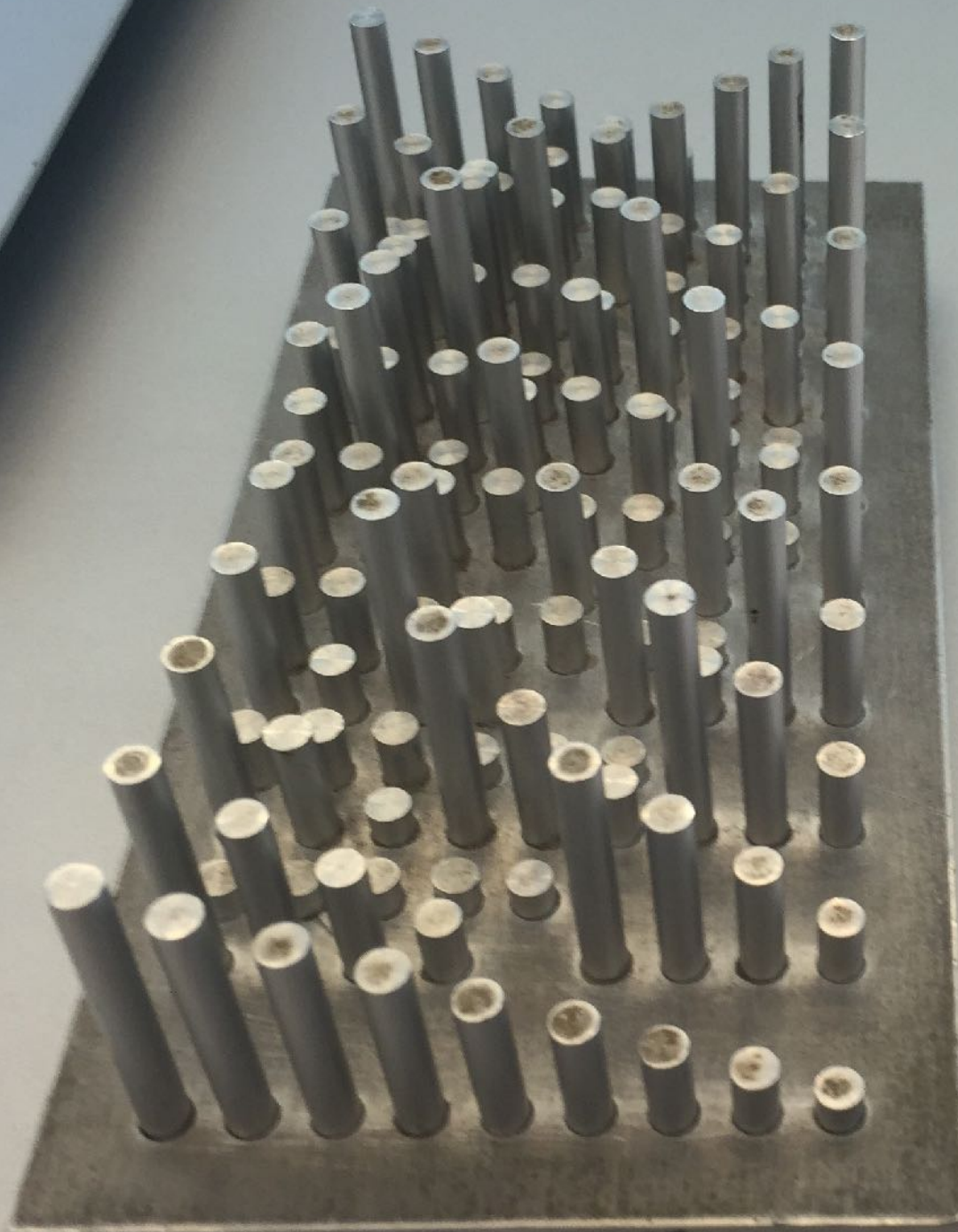
(Husserl *Logik 1906-07*, 30)
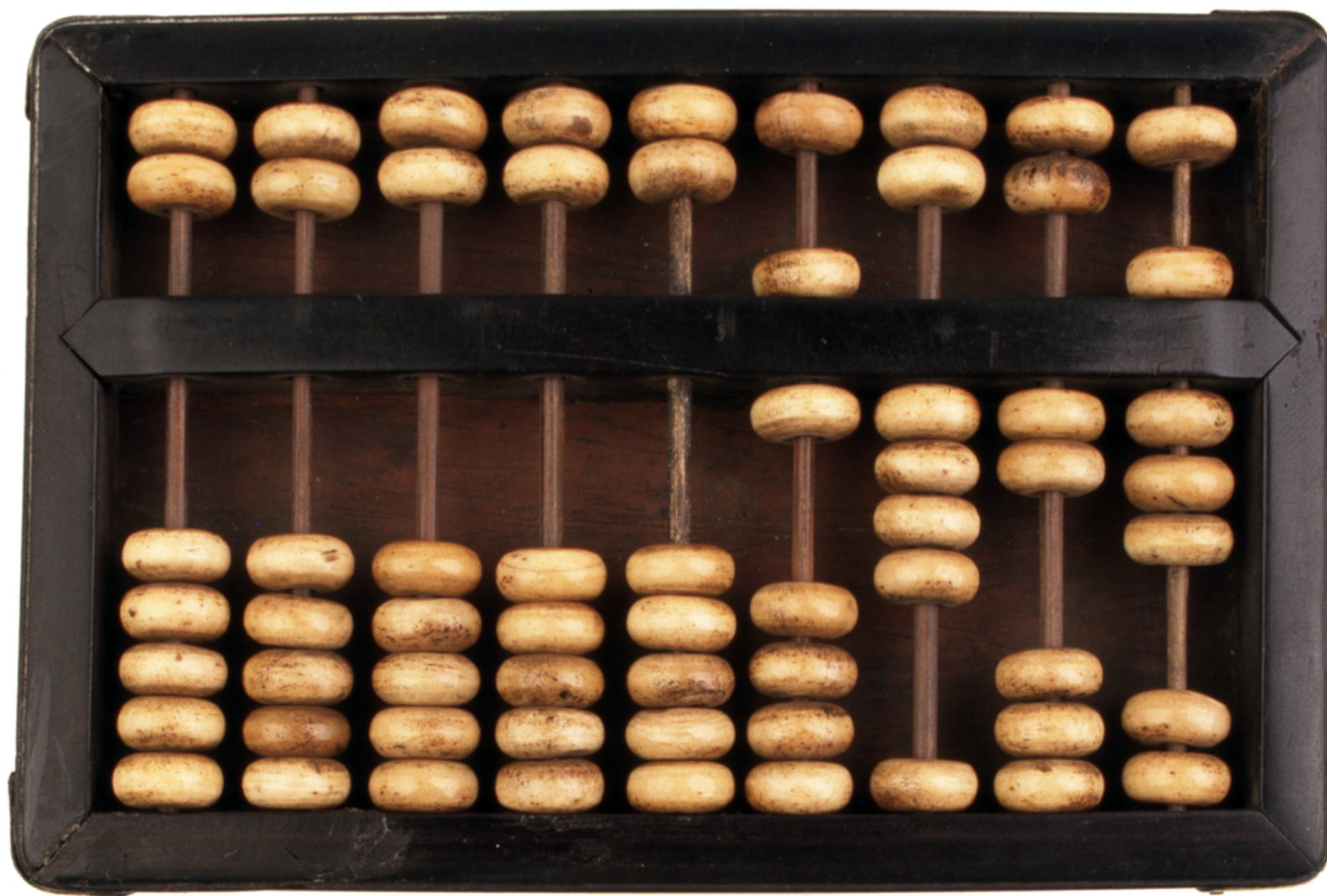
Direct multiplication

Luigi Torchi (1834)
Timoleon Maurel (1842)
Edmund Barbour (1872)
Ramón Verea (1878)
Léon Bollée (1889)
Otto Steiger (1892)

THE MILLIONAIRE

Husserl on symbolic technologies

Scientific methods:
"shortcuts and surrogates …
used to economize thought"

"*denkökonomische Abbreviaturen und Surrogate*"

(Husserl *Prolegomena*, §9)

Husserl on Cognitive Tools

Scientific methods:
"their practical application does the work of validation without its insightful cognitive load."

"bei ihrer praktischen Verwendung zwar die Leistung, aber nicht den einsichtigen Gedankengehalt von Begründungen in sich schließen"

(Husserl *Prolegomena*, §9)

Husserl on symbolic technologies

Scientific methods:
"algorithmic methods, whose peculiar function is to spare us as much genuine deductive mental work as possible by artificially arranged mechanical operations on sensible signs."

(Husserl *Prolegomena*, §9)

Husserl on symbolic technologies

"Here also belong what are literally mechanical methods - one may think of the apparatus for mechanical integration, calculating machines etc."

(Husserl *Prolegomena*, §9)

Husserl on Cognitive Tools

"Calculation is a blind procedure with symbols, according to mechanically reiterated rules for the transformation and transposition of the signs in the respective algorithm. […] The whole procedure spares us and surrogates for a manifold of pure deductions, but it is itself not one."

(Husserl Hua CW V, 55f.)

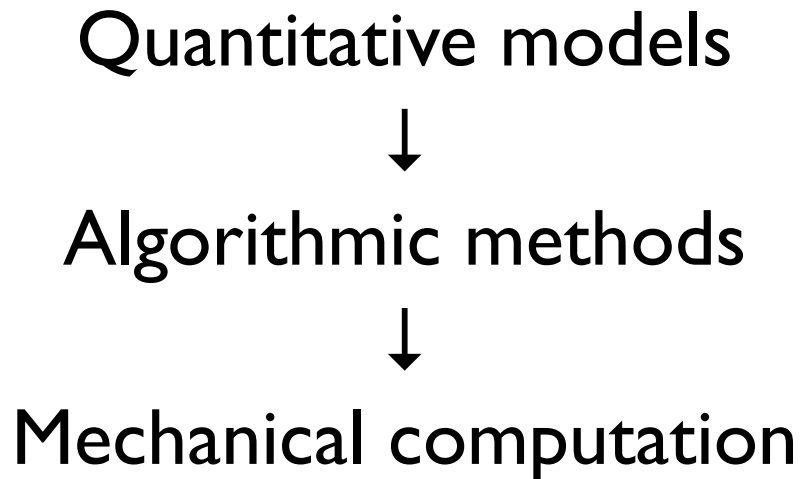# Husserl on symbolic technologies

Mathematisation

↓

Technisation

↓

Mechanisation

Husserl on symbolic technologies

Quantitative models
↓
Algorithmic methods
↓
Mechanical computation

Husserl on symbolic technologies

"the system of general arithmetic,
the most wondrous mental machine"

"*das System der allgemeinen Arithmetik,
dieser wunderbarsten geistigen Maschine*"

(Husserl *Semiotik*, 350; tr. 30)

Husserl on symbolic technologies

"Are science and its method not like an obviously very useful and reliable machine, that anyone can learn to operate correctly, without in the least understanding the inner possibility and necessity of this accomplishment?"

(Husserl *Crisis*, 52)

Husserl on symbolic technologies

"I am responsible for my actions and
must be able to justify myself and give an
ultimate justification from autonomous insight

"*l e t z t e Rechenschaft aus autonomer Einsicht.*"

(Husserl *Grenzprobleme* (1916-18), 272)

Husserl on symbolic technologies

"If I were to apply this principle with full rigor, then I would not be allowed to use any logarithmic table, any calculating machine, without having knowledge in all seriousness of the theory. I rely - and not without justification - on indirect testimony, on good authorities or on the reasonable presupposition that it will all work out in practice."

(Husserl *Grenzprobleme* (1916-18), 272)

Husserl on symbolic technologies

"It would certainly be even better,
if I would not require such testimony.
But is that even possible in principle?"

(Husserl *Grenzprobleme* (1916-18), 273)

Husserl on symbolic technologies

"Science, according to its own conception,
is as infinite as the world and can only be realised
in the finitude of a scientific community *in stages*
and by using *symbolic aids* [*Hilfsmittel der Symbolik*],
by sharing the lived insights among a
communicative scientific community."

(Husserl *Grenzprobleme* (1916-18), 273 n.)

Husserl on the Ethics of Cognitive Tools

"Thinking becomes a thinking with surrogates, that has its own evidence in the context of this technique, its on goals, its own tasks and solutions, which diverge from the evidence of goals, tasks, solutions, that were originally indicated by such words and symbols."

(Husserl *Hua* XXIX, 35)

Husserl on symbolic technologies

"Hence technization and specialization are necessary and at the same time –if the counter-movement aimed at clarification up to the universal horizon, i.e. the philosophical domain, is lacking– then this is a decay."

(Husserl *Hua* XXVII, 209)

Husserl on symbolic technologies

In order to understand the world
and act ethically in it,
we need to understand the symbolic technologies
we use in our daily lives and scientific praxis
and the theories on which these are based.

Husserl on symbolic technologies

In order to understand the world
and act ethically in it,
we need to understand the symbolic technologies
we use in our daily lives and scientific praxis
and the theories on which these are based.
Their origin lies in the 19th century.