

CSCI 1377

Tools for Thought

Reading I

Technology of the Written Word

“Writing, Phaedrus, has this strange quality, and is very like painting; for the creatures of painting stand like living beings, but if one asks them a question, they preserve a solemn silence.”

— Plato, *Phaedrus* (370 BCE)

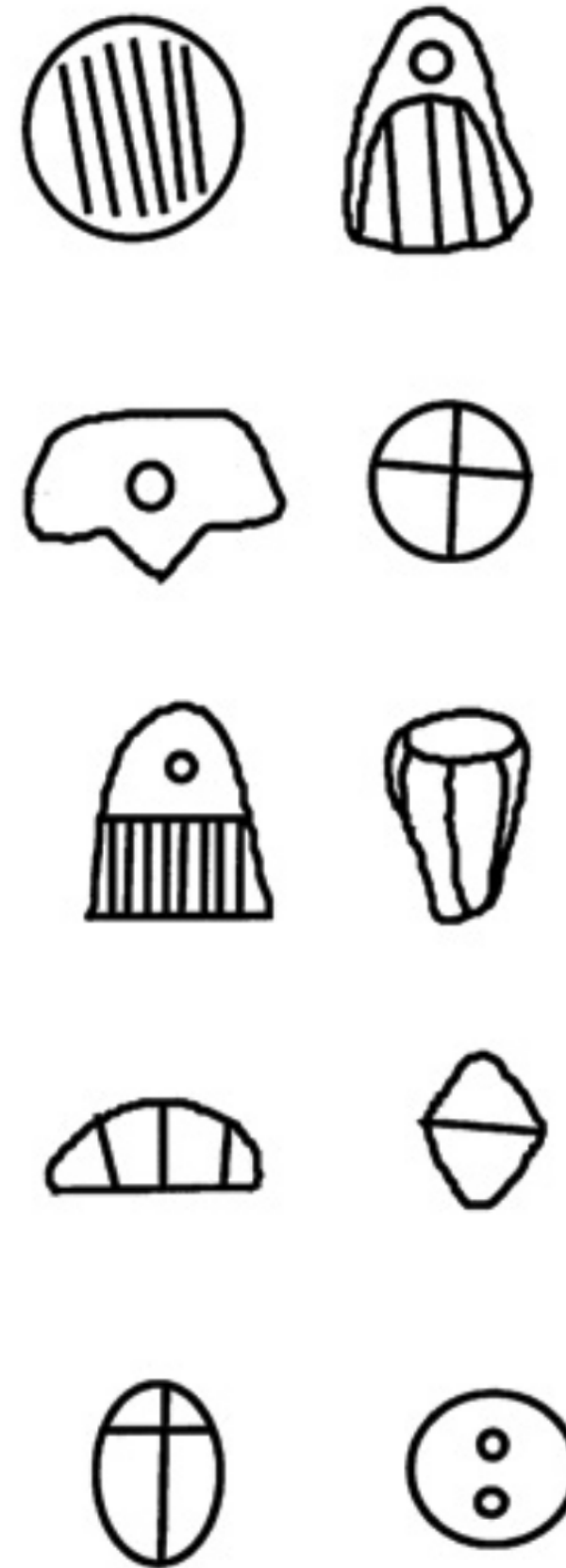
Ancient cultures developed physical records as mnemonics

Notches



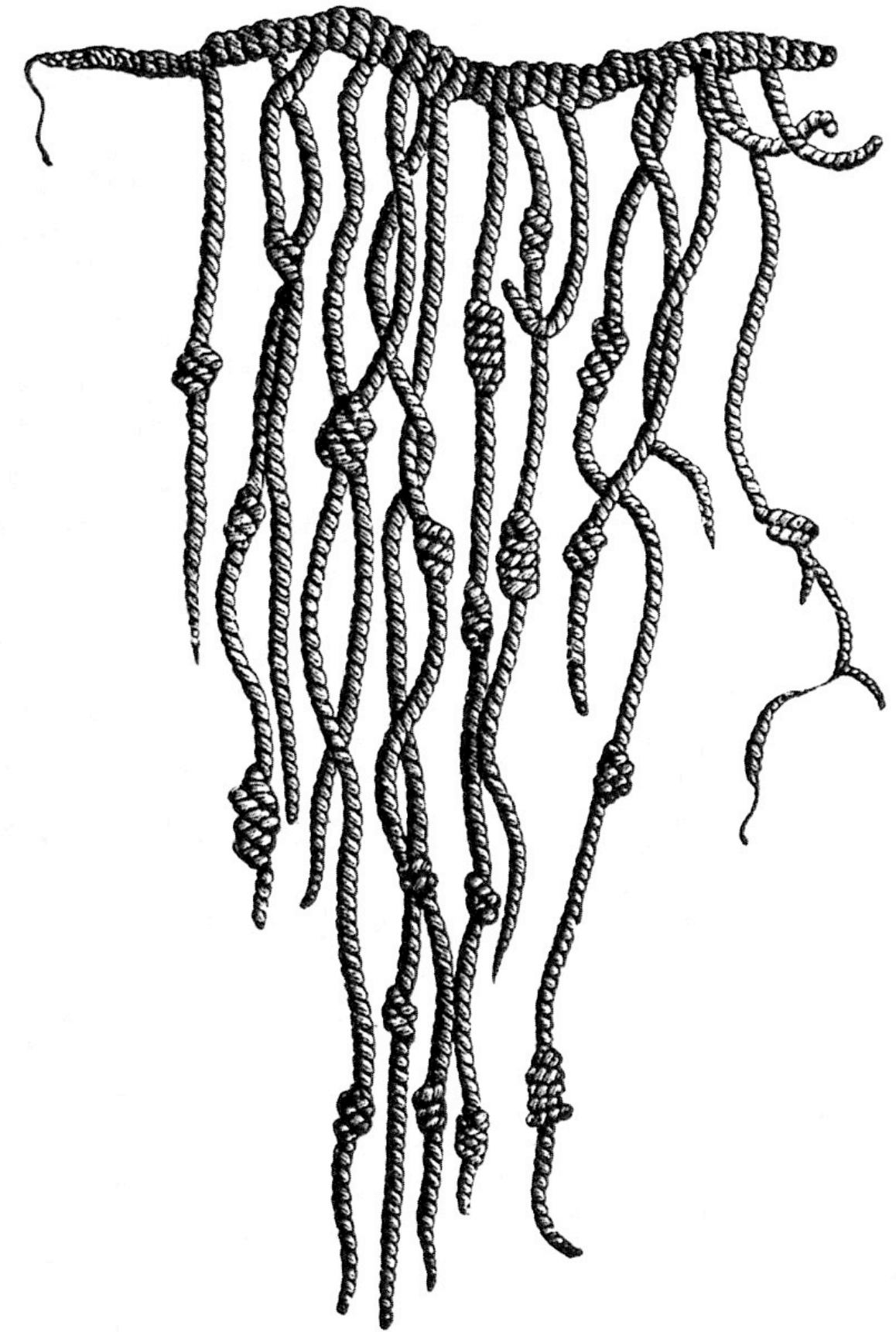
Ishango bone
(~20k years old)

Tokens



Middle Eastern clay tokens
(~8000 BCE)

Knots



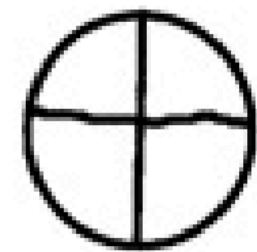
Incan *quipu*
(~1300 BCE)

“Complete” writing developed from symbols



By Marie-Lan Nguyen, Public Domain,
via Wikimedia Commons

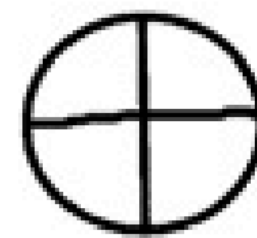
clay token



(8000–3000 BC)



pictogram incised in clay



(Archaic Uruk, c. 3000 BC)



cuneiform sign



(Lagesh, c. 2400 BC)

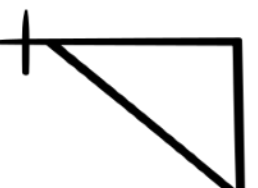
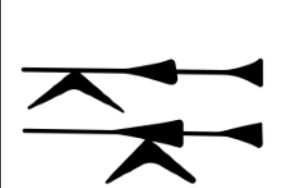
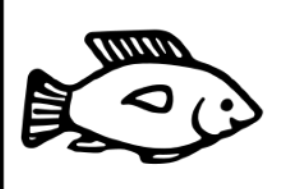
- “Complete writing must have as its purpose communication
- Complete writing must consist of artificial graphic marks on a durable surface;
- Complete writing must use marks that relate conventionally to articulate speech in such a way that communication is achieved.”

Complaint tablet to Ea-nāsir



Complaint about delivery
of the wrong grade of copper
*About 1750 BC (Old Babylonian
period), from Ur*
ME 131236

Symbols increasingly abstracted away from depictions

	<i>Fish</i>	<i>Bird</i>	<i>Ax</i>	<i>Arrow</i>	<i>Bottle</i>
MESOPOTAMIA					
					
					
EGYPT					
					
					
CHINA					
					

Pictogram: symbol which visually resembles a physical object

“Fish” is a symbol which looks like a fish

Ideogram: symbol which denotes an idea or concept

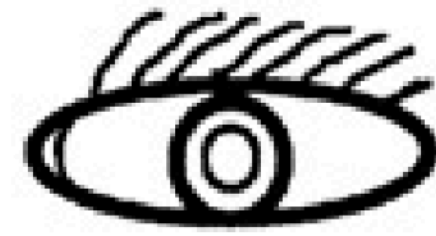
“Fish” is a symbol which is not clearly a fish

Symbols increasingly denoted linguistic elements

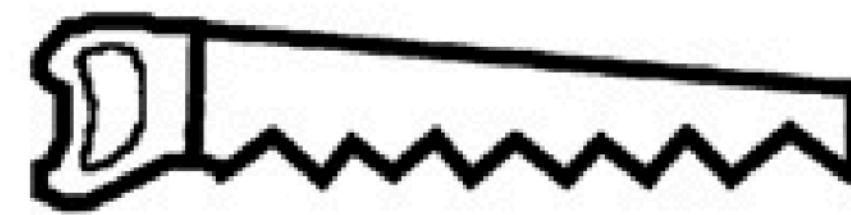
Rebus principle

[logoconsonantal]

Repurpose symbol
as phonetic marker



eye



saw



bill

Morphemes

[logosyllabic]

Symbols represent
concepts like “plural”

人们

rén -men

Eventually, some scripts became fully phonetic

Phonograms: symbols which represent speech sounds

Syllabaries: symbols represent syllables

こんにちは世界

ko - n - ni - chi - wa - se - kai

Alphabets: symbols represent consonants and vowels

“Hello world”

hɛ'ləʊ wɜ:ld

“Γεια σου κόσμε”

'ja su 'kozme

“The most remarkable fact about the alphabet no doubt is that it was invented only once.”

— Walter Ong

Korean alphabet (hangul) was *commissioned*



King Sejong

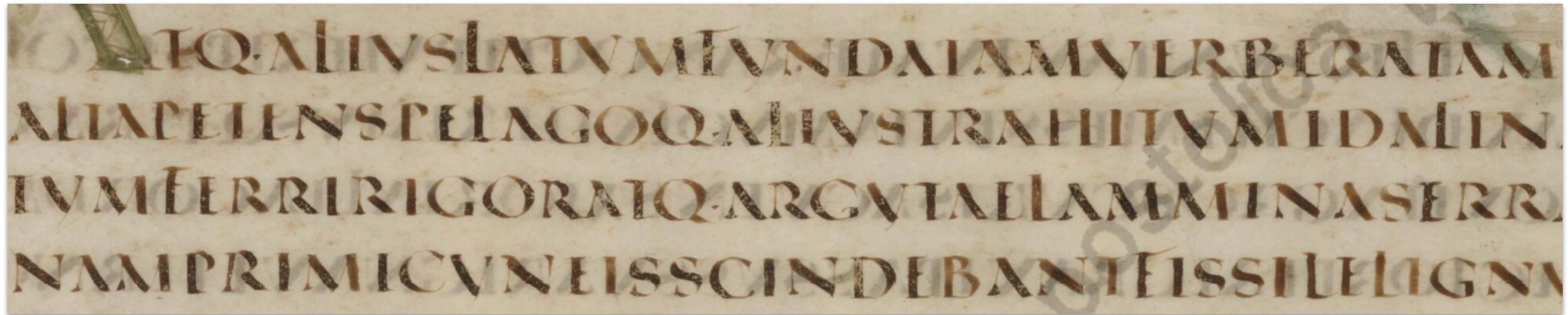
“The sounds of our country's language are different from those of [China] and are not confluent with the sounds of characters. Therefore, among the ignorant people, there have been many who, having something they want to put into words, have in the end been unable to express their feelings. I have been distressed because of this, and have newly designed twenty-eight letters, which I wish to have everyone practice at their ease and make convenient for their daily use.”

— Hunminjeongeum (1446)

Korean alphabet (hangul) was *commissionsed*

+	ㄱ g	ㄴ n	ㄷ d	ㄹ r	ㅁ m	ㅂ b	ㅅ s	ㅇ o
ㅏ a	가 ga	나 na	다 da	라 ra	마 ma	바 ba	사 sa	아 a
ㅑ ya	가 gya	나 nya	다 dya	라 rya	마 mya	바 bya	사 sya	아 ya
ㅓ eo	거 geo	너 neo	더 deo	러 reo	머 meo	버 beo	서 seo	어 eo
ㅕ yeo	겨 gyeo	녀 nyeo	더 dyeo	려 ryeo	머 myeo	버 byeo	서 syeo	여 yeo
ㅗ o	고 go	노 no	도 do	로 ro	모 mo	보 bo	소 so	오 o
ㅛ yo	고 gyo	노 nyo	도 dyo	로 ryo	모 myo	보 byo	소 sya	오 yo
ㅜ u	구 gu	누 nu	두 du	루 ru	무 mu	부 bu	수 su	우 u

Silent reading pushed *scriptio continua* towards modern text



Vergilius Augusteus, circa 15 AD. Public domain, via Wikimedia Commons

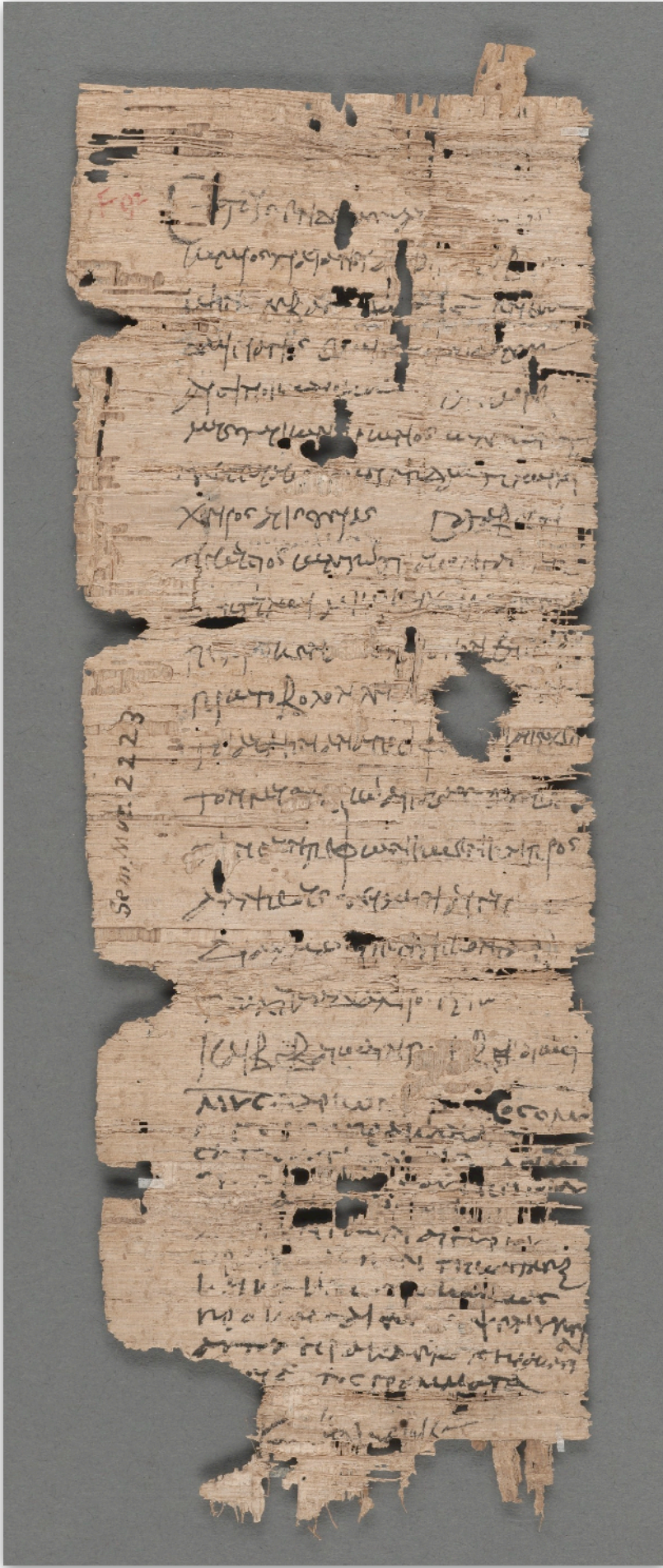
This program first binds `x` to a value of `5`. Then it creates a new variable `x` by repeating `let x =`, taking the original value and adding `1` so the value of `x` is then `6`. Then, within an inner scope created with the curly brackets, the third `let` statement also shadows `x` and creates a new

Scripts are a technology for representing language as images

- Modern scripts evolved through several stages of representation
 - Pictograms → Ideograms → Logograms → Phonograms
 - Typography slowly co-evolved over the last ~2,000 years
 - There is no final form of language, and pictograms are on the rise! 🤖
- Non-phonographic scripts require creative input methods
 - Ex: Chinese characters (人们) can be written as Pinyin (rénmen), Zhuyin (ㄖㄣˊ ㄇㄣˋ), Cangjie (人中戈尸 → 们), Wubi (人立 → 们)
- Languages exhibit slight variation in reading speeds
 - English vs. Chinese is 978 vs. 255 characters/min, while 1.49 vs. 1.67 texts/min

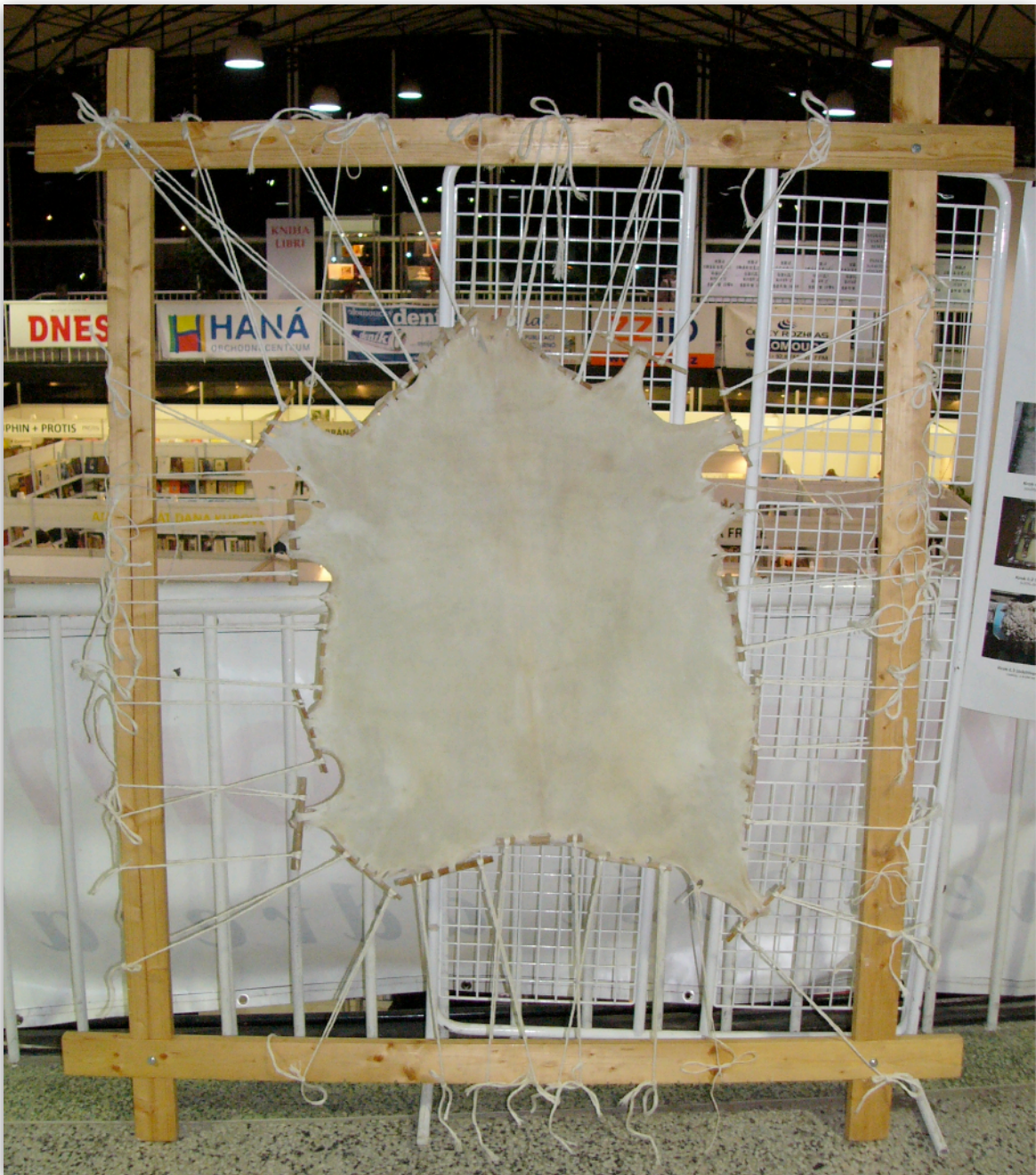
Sheets supplanted tablets

Bill of sale (126 CE)
on papyrus



By Mystharion, son of Heron - Houghton Library, Harvard University, Public Domain

Goatskin parchment



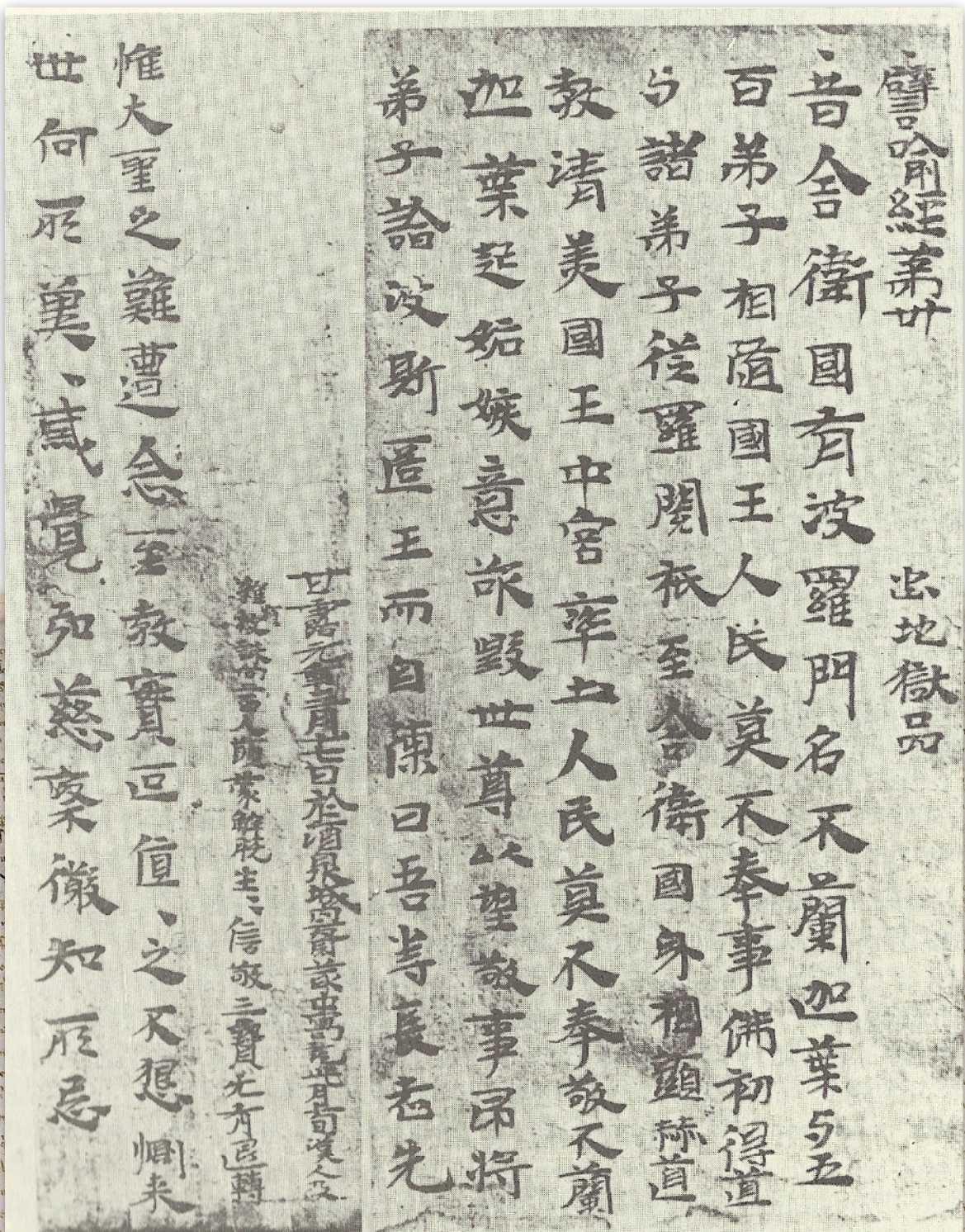
By Michal Mañas, CC BY 2.5

Magna Carta (1215 CE) on vellum



All images via Wikimedia Commons

Pi Yu Jing (c. 256 CE)
on paper

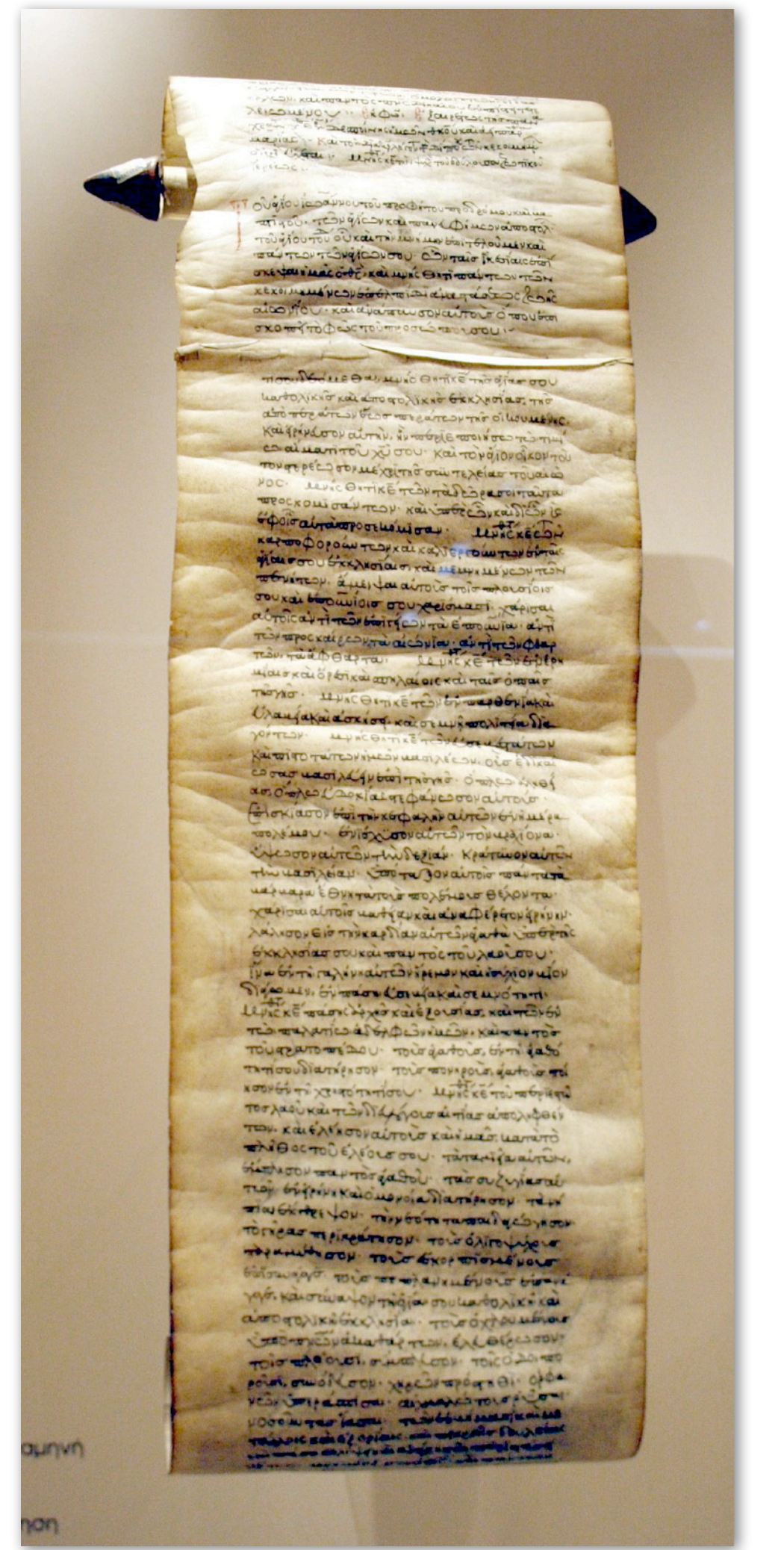


Chris55, Public Domain

Long texts were made into scrolls...

Isaiah Scroll (c. 150 BCE)

G.dallorto, Attribution, via Wikimedia Commons



Photographs by Ardon Bar Hama, Public domain, via Wikimedia Commons

...then the codex supplanted the scroll



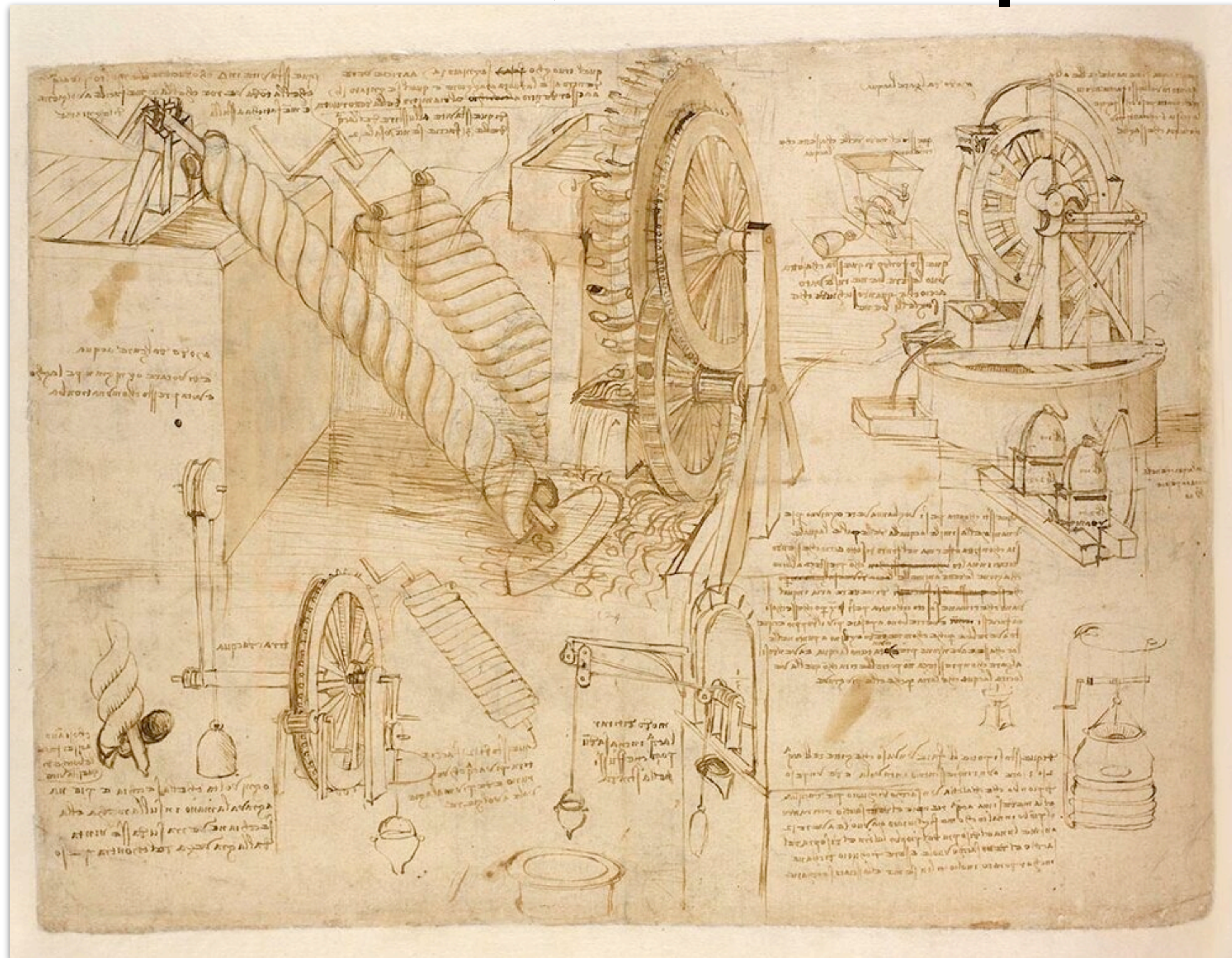
Codex Gigas (c. 1222 CE)

Kungl. biblioteket, Attribution,
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“You who long for my little books to be with you everywhere and want to have companions for a long journey, buy these ones which parchment confines within small pages: give your scroll-cases to the great - one hand can hold me.”

— book advert (c. 85 CE)

Codex Atlanticus, drawn with sepia ink



Scribes copied manuscripts for dissemination



Assyrian scribes

from Hugo Rydén et al. 1982, via Wikimedia Commons



15th c. Burgundian scribe

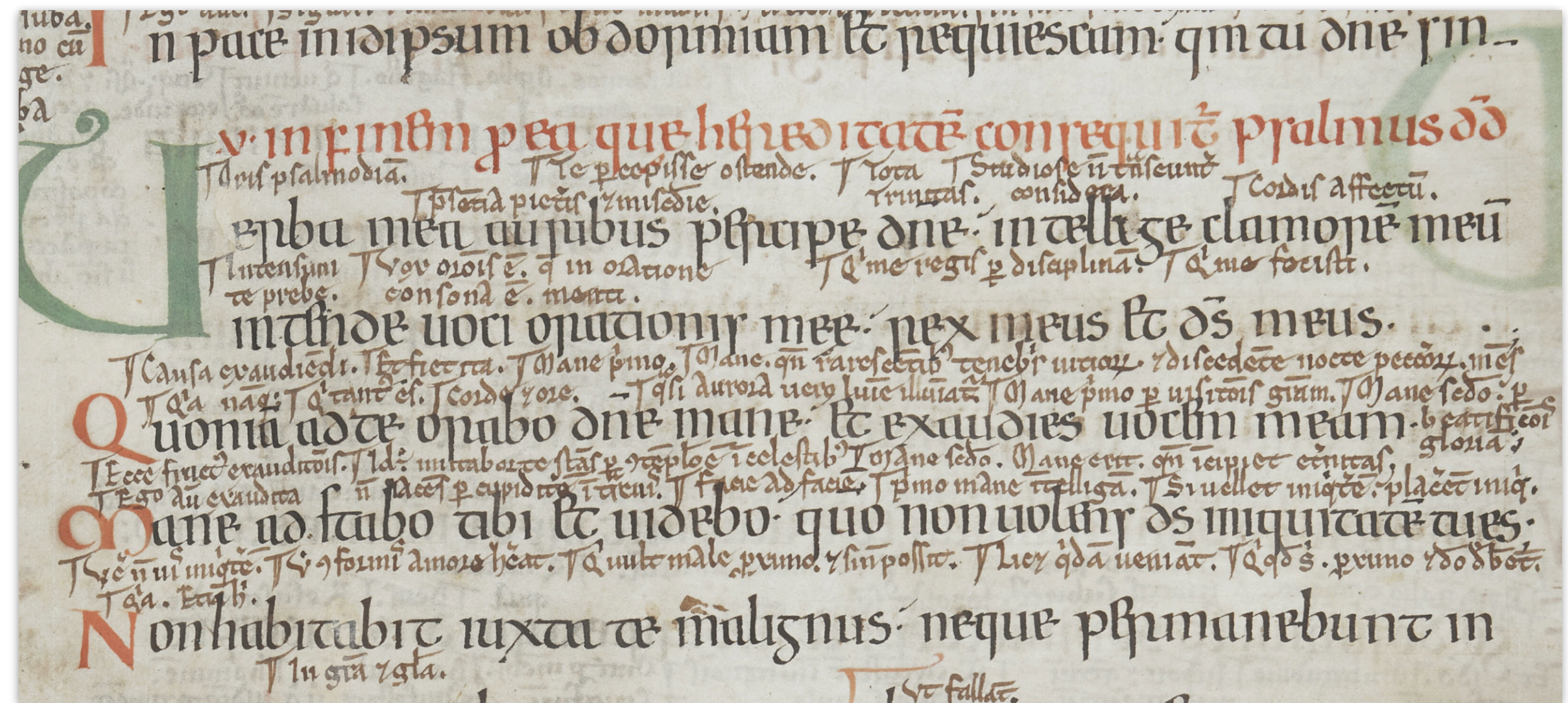
Jean Le Tavernier, Public domain, via Wikimedia Commons

Manuscripts were creatively laid out and embellished



Drop capitals

National Library of Wales, CC0, via Wikimedia Commons



Interlinear gloss

via The British Library

More on this
next week...



The psychology of reading

Reading consists of saccades and fixations

<https://youtu.be/eBts0Q4eMaY>

Word recognition can become automatic

Quick: recognition improves with practice following power law of learning

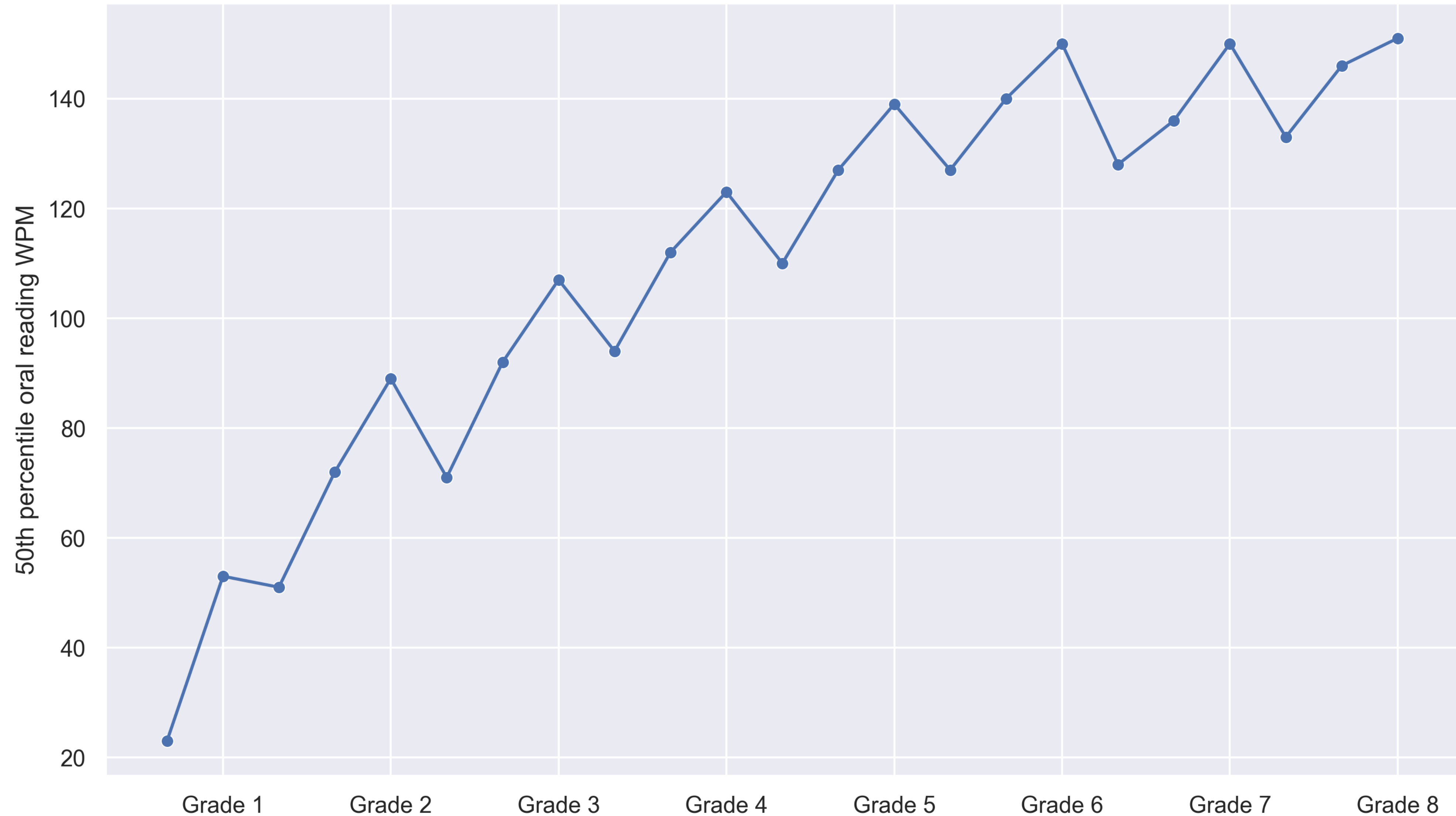
Effortless: can perform other tasks concurrently with little penalty

Autonomous: happens without deliberate thought

Unaware: not conscious of the process occurring

Reading speed follows the power law of practice!

Change in oral reading fluency for American students, circa 2005



Hasbrouck and Tindal. "Oral Reading Fluency Norms: A Valuable Assessment Tool for Reading Teachers" 2011

Learning to read is a complex process

- Alphabetic decoding: learning to sound out a word from letters
 - Study: children do not spontaneously induct this principle (train: fat/bat, test: fun/bun)
 - Study: phonographic writing systems can assist in reading logographic systems (Pinyin → Simplified Chinese)
- Direct recognition of words is supported at older ages through recognition of morphemes
 - e.g. “darkness” = dark + ness
- The reading wars: phonics or whole-language?