

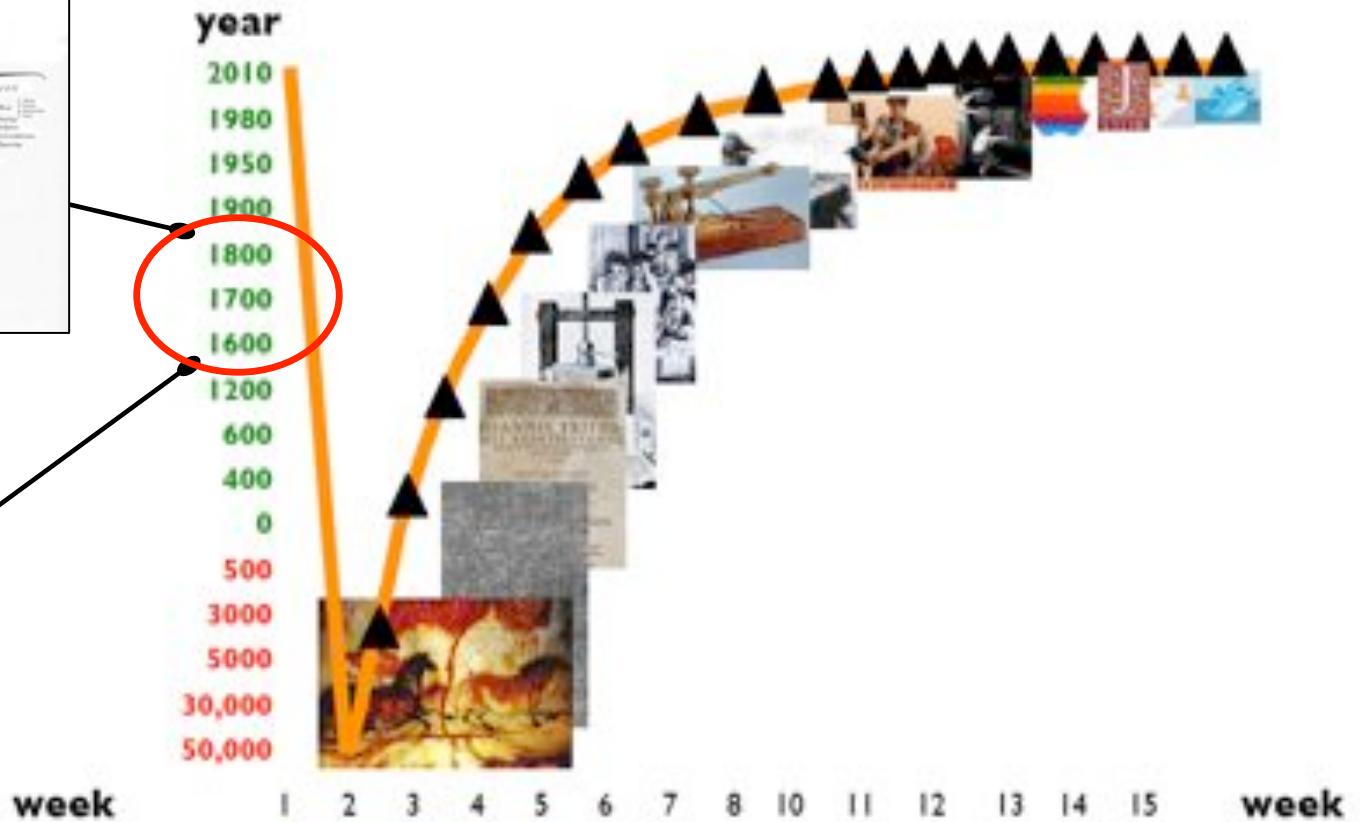
# The Organization of Knowledge

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**History of Information i103**  
**Geoff Nunberg**

**Feb. 21, 2013**





# Itinerary: 2/21

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Defining "knowledge"

The shifting frame of knowledge; from Renaissance to Enlightenment

Early reactions to "information overload"

New conceptualizations of knowledge

The material representations of knowledge: encyclopedias, libraries, museums, dictionaries



# The Emergence of the Modern "Informational System"

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Many, if not most, of the cultural phenomena of the modern world derive from [the 18th century] -- the periodical, the newspaper, the novel, the journalist, the critic, the public library, the concert, **the public museum** [*not to mention advertising, intellectual property, propaganda, the scientific society (and science itself), the modern dictionary and encyclopedia, etc.*— GN]. Perhaps most important of all, it was then that 'public opinion' came to be recognized as the ultimate arbiter in matters of taste and politics."--Tim Blanning, *The Culture of Power*

The political & social significance of "information"



# Defining "knowledge"

---



# Defining "knowledge"

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## Individual senses

*Oxford English Dictionary:*

Acquaintance with a branch of learning, a language, or the like; *His knowledge of French is excellent.*

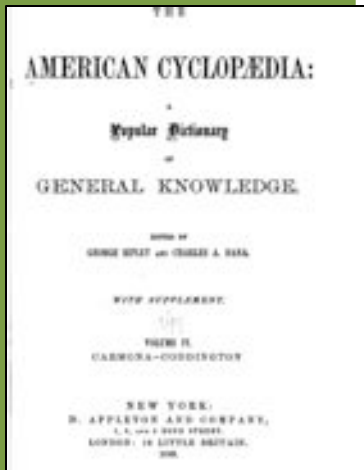
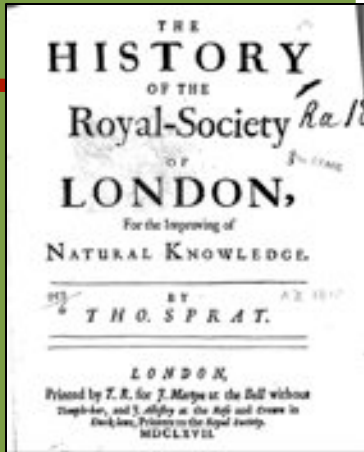
## Collective sense



The sum of what is known. *All knowledge may be commodiously distributed into science and erudition.*



# Collective knowledge: the missing roles





# What makes for "knowledge"?

What qualifies something as (collective) knowledge?

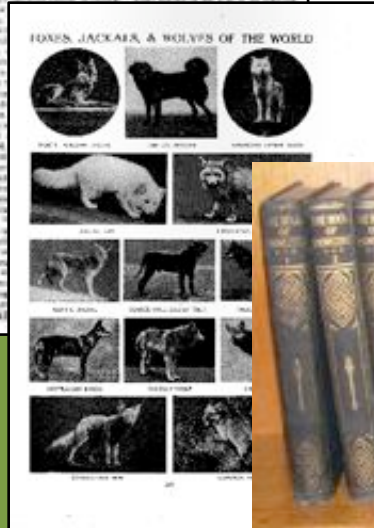
P is collectively significant

Nunberg's out of paper towels

Kimberly-Clark closed at \$59.41 yesterday."

Paper towel consumption is 50% higher in America than in Europe.

Arthur Scott introduced the first paper towel in 1931.







# **Shifting Conceptions of Knowledge, 1500-1800**

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# The archaeology of knowledge

---

How do we characterize conceptions of "knowledge" historically?

- Explicit descriptions & theories

- Models/images of knowledge in

  - Forms of institutions & practices (curriculum)

  - Material embodiments (library, museum, form of book)

  - Textual embodiments – encyclopedia, dictionary, compendium, bibliography

  - Metaphors & visualizations: field, tree, discipline, trésor, etc.



# Shifting Conceptions of Knowledge, 1500-1800

---

Varieties of Renaissance knowledge:

*scientiae/artes*: "Ars sine scientia nihil est."

Higher vs lower

General/specialized

The "universal man" (*polymathia*, *pansophia*) "A man is able to learn many things and make himself universal in many excellent arts." Matteo Palmieri, 1528

Book-learning vs knowledge of things





# The 15<sup>th</sup>-Century Curriculum

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The *enkyklios paideia* ("circle of 'learning'"):

Trivium: grammar, logic, rhetoric

Quadrivium: arithmetic, astronomy, geometry, music

The three philosophies: ethics, metaphysics, "natural philosophy"

Higher faculties: theology, medicine, law





"town and gown"

## System of knowledge is "closed"

## Organization of knowledge fixed and "natural"





# Changing Frames of Knowledge

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Within 200 years, something like the mod, system emerges.

Responses to influences that are:

Pragmatic/material

Philosophical/academic

Symbolic/political

(Not independent...)

*But how can we tell that the system of knowledge has changed?*



# Breaking with the past



It would disgrace us, now that the wide spaces of the material globe, the lands and seas, have been broached and explored, if the limits of the intellectual globe should be should be set by the narrow discoveries of the ancients.  
Francis Bacon, *The Advancement of Learning*, 1605

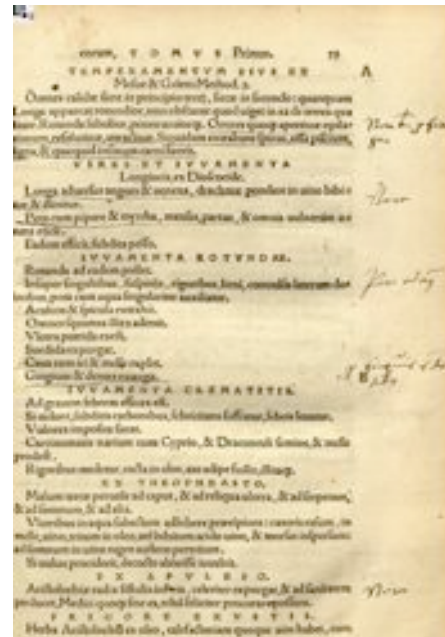






# Opening the World of Knowledge: Botany

*Herbarum vivae eicones* ("Living Pictures of Herbs") by Otto Brunfels, 1532. Matched Swiss & German plants to those known to Pliny and Discorides, ignoring differences, with residual *herbae nuda*e ("naked plants")







# Opening the world of knowledge



Valerius Cordus, *Historia plantarum* 1561 (1544), published posthumously by Conrad Gesner.

Records numerous plants not described by the ancients; emphasizes differences among similar plants.

By 1600, thousand of species are described, though in disorganized fashion.

Systems of description (not taxonomies) emerge. Plants bear four names (common, pharmacists' Latin, trad. Latin, Greek)



Drawing annotated by Gesner<sup>7</sup>





# Opening the world of knowledge



John Ray, *Historia generalis plantarum*, 1686-

Classified 6100 plant species by seeds, seeds, fruit and leaves.  
Produced first modern definition of the species.

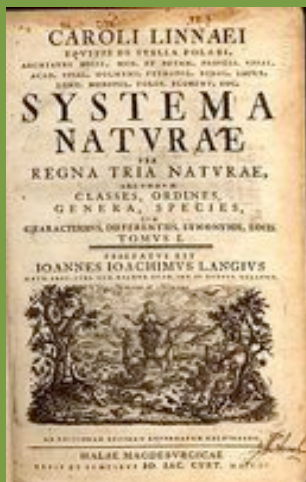
"... no surer criterion for determining species has occurred to me **than the distinguishing features that perpetuate themselves in propagation from seed**. Thus, no matter what variations occur in the individuals or the species, if they spring from the seed of one and the same plant, they are accidental variations and not such as to distinguish a species...

"I reckon all Dogs to be of one Species, they mingling together in Generation, and the Breed of such Mixtures being prolifick"





# The birth of "modern" classification



Systema naturae  
1735 19

CAROLI LINNAEI			REGNUM ANIMALE		
I. QUADRUPEDIA	II. AVES	III. AMPHIBIA	IV. PISCES	V. INSECTA	VI. VERMES
CAROLI LIN					
I. QUADRUPEDIA. <i>Corpus biferum. Pedes quatuor. Femina vivipara. Lactifera.</i>			II. AVES. <i>Corpus plerumque. Alae duae. Pedes duae. Repens officium. Femina ovipara.</i>		
ANTHROPO- MORPHIA. Homo primus a- liisque temporibus vel nulli.	Homio.	Natus in ipso.	ACQUATILIA. Aquam inter- veniens.	Piscina.	Piscina.
	Simia.	Antropotheca. Pueri etiam. Columba latitans. Pulvis terra postum.		Falco.	Falco.
	Bradypus.	Digit 3. m. l. . . . .		Parus.	Parus.
	Ursus.	Digit 3. . . . .		Corvus.	Corvus.
	Leo.	Digit 3. . . . .		Cuculus.	Cuculus.
FERA. Diversi generis a- liisque Fides antiquis, supradictis.	Tigrid.	Digit 3. . . . .	PICAE. Aquam superius compingens, conserens.	Picus.	Picus.
	Felis.	Digit 3. . . . .		Certhia.	Certhia.
	Mustela.	Digit 3. . . . .		Sitta.	Sitta.
	Didelphus.	Digit 3. . . . .		Upupa.	Upupa.
				Alpida.	Alpida.

"I know no greater man on earth." Jean-Jacques Rousseau





# The birth of "modern" classification

Plants classified into 24 classes according to length and number of stamens; further classified into orders etc. Established binary system of naming



Frontispiece to  
Linnaeus, *Hortus  
Cliffortianus* 1737



Plate 156: An illustration by Georg Dionysius Ehret for the *Hortus Cliffortianus* (1735-48) in which the Swedish plantman, Carl Linnaeus, first began to work out his 'methodus plantarum sexualis', grouping plants according to the number and arrangement of their stamens



# Organizing Knowledge Responses to Early Modern "Information Overload"

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Linnaeus, index card, ca 1760



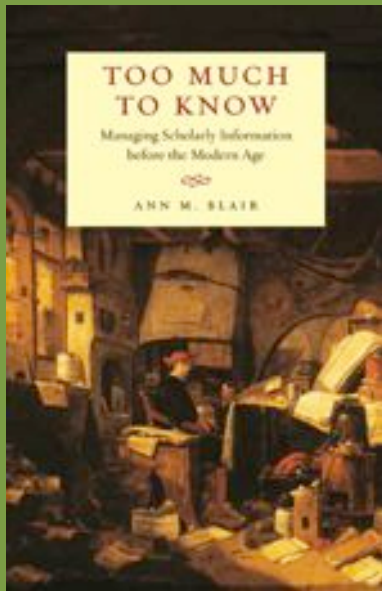
# Pragmatic Forces: Perceptions of "Information Overload"

---



Antonfrancesco Doni, 1550: there are “so many books that we do not have time to read even the titles.”

“That horrible mass of books... keeps on growing, [until] the disorder will become nearly insurmountable.” Gottfried Leibniz, 1680





# Increasing number of books

---

Number of titles printed in  
England: (from Wm. St. Clair,  
*Reading Nation*)

1630s	600
1640s	1,600
1650s	1,200
1660s	800
1670s	1,000
1680s	1,500
1690s	1,400
1700-50	500
1750-89	600
1790-1800	800
1800-1810	800
By 1827	1,000
("rising fast")	

Size of personal libraries

Personal library of typical French  
magistrate, 15<sup>th</sup> c. 60 books

Montaigne, late 16<sup>th</sup> c. 1000  
books

Montesquieu, early 18<sup>th</sup> 3000  
books



# The endless anxiety...

---

It will soon be the employment of a lifetime merely to learn [books'] names. Many a man of passable information at the present day reads scarcely anything but reviews, and before long, a man of erudition will be little better than a mere walking catalogue Washington Irving, 1822

Books are not only printed, but in a great measure written and sold by machinery.... Every little sect among us, Unitarians, Utilitarians, Anabaptists, Phrenologists, must have its periodical, its monthly or quarterly magazine, hanging out like its windmill ...to grind meal for society. Thomas Carlyle, 1840





# The endless anxiety...

---

Something has happened in the last hundred years to change the relation of the written word to daily life. Whether it is the records we have to keep in every business and profession or the ceaseless communicating at a distance which modern transport and industry require, the world's work is now unmanagable, unthinkable, without literature. ...[There is a] huge number of activities which (it would seem) exist only to bombard us with paper... Jacques Barzun, 1954

And while Mr. Reagan prospered in schools without libraries, I believe that the "information explosion" of more recent years has made school libraries necessary. This is the information age! There is an information explosion. Some students will need a longer period of time to master mathematics, science, economics, world history. 1983



# The endless anxiety...

---

Relative to your current position, an exponential curve looks just as scary wherever you get on board. G Nunberg, *floreat* 2012





# The Reorganization of Libraries



Gabriel Naudé proposes library organization scheme to “find books without labor, without trouble, and without confusion.” (1627)



Bibliothèque  
Mazarine (1643)



# Creation of "reference" works

---

Compendia and reference books (*répertoires* or *trésors*)

*Répertoires* divided into:

Dictionaries (& onomasticons); Florilegia (collections of sayings, etc).; commonplace books; miscellanies...

"I esteem these Collections extreamly profitable and necessary, considering, the brevity of our life, and the multitude of things which we are now obliged to know, e're one can be reckoned amongst the number of learned men, do not permit us to do all of ourselves." Gabriel Naudé, 1661

The *Cyclopaedia* will "answer all the Purposes of a Library, except Parade and Incumbrance." Ephraim Chambers, 1728



# Distillations



E-L. Boulée, plan  
for the  
Bibliothèque du  
Roi, 1785

Men of good will have extracted the substance of a thousand volumes and passed it in its entirety into a single small duodecimo, a bit like skillful chemists who press out the essence of flowers to concentrate it in a phial while throwing the dregs away."

Louis-Sebastian Mercier, *L'An 2440*, 1771





# Strategies for dealing with information overload

---



The most accomplished way of using books at present is twofold. Either, first, to serve them as men do Lords, learn their titles exactly and then brag of their acquaintance :—or, secondly, which is indeed the choicer method, to get a thorough insight into the Index, by which the whole book is governed and turned, like fishes, by the tail... Thus men catch knowledge by throwing their wit on the posteriors of a book, as boys do sparrows by flinging salt upon the tail."

Jonathan Swift, "Tale of a Tub," 1704

...How Index-learning turns no student pale,  
Yet holds the eel of Science by the tail.

Pope, "The Dunciad," 1728

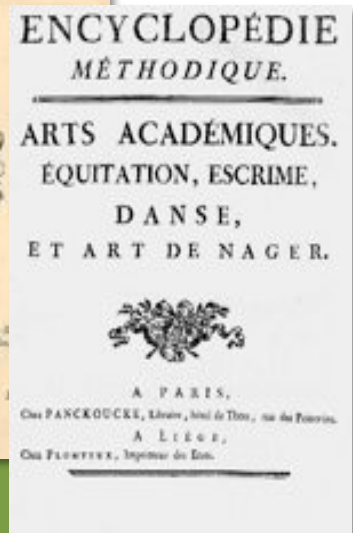
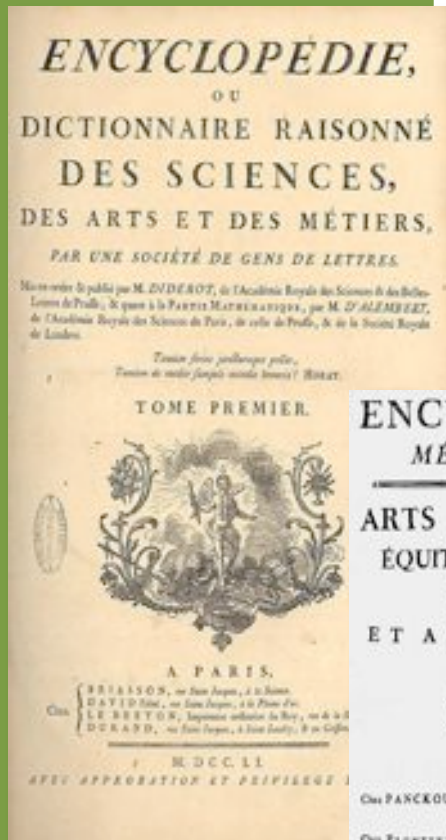


# Strategies for dealing with information overload

## Compendia and reference books (*répertoires* or *trésors*)

As long as the centuries continue to unfold, the number of books will grow continually, and one can predict that a time will come when it will be almost as difficult to learn anything from books as from the direct study of the whole universe. It will be almost as convenient to search for some bit of truth concealed in nature as it will be to find it hidden away in an immense multitude of bound volumes.

—Denis Diderot, *Encyclopédie*, 1755

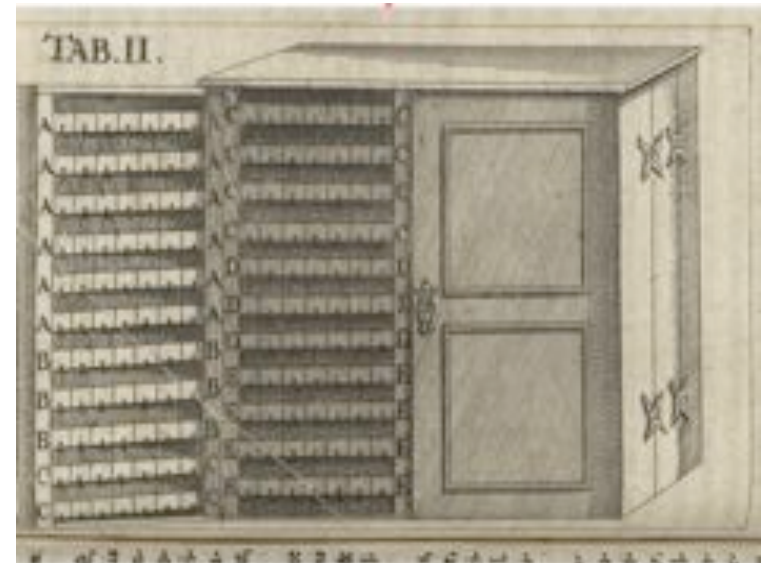
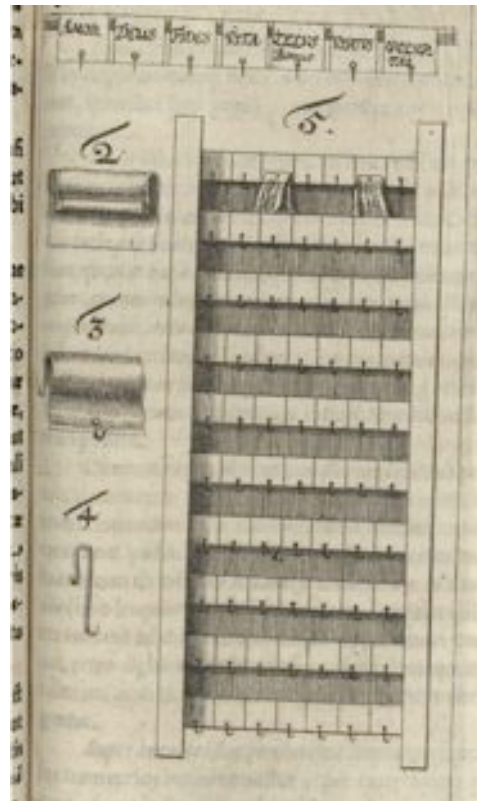






# Strategies for Dealing with Information Overload

Note-taking system described by Vincent Placcius, from *De arte excerpendi*, 1689







# **Reconceptualizations of Knowledge**

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# The Classificatory Urge: Thematic Organization

---

Vincent de Beauvais, *Speculum triplex*, 1244, in 3 divisions:

*Speculum naturale*: God, angels & devils, man, the creation, and natural history

*Speculum doctrinale*: Grammar, logic, ethics, medicine, crafts...

*Speculum historiale*: History of the world...





# New Schemes of Organization: Philosophical Influences

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Francis Bacon's scheme puts man at the center:

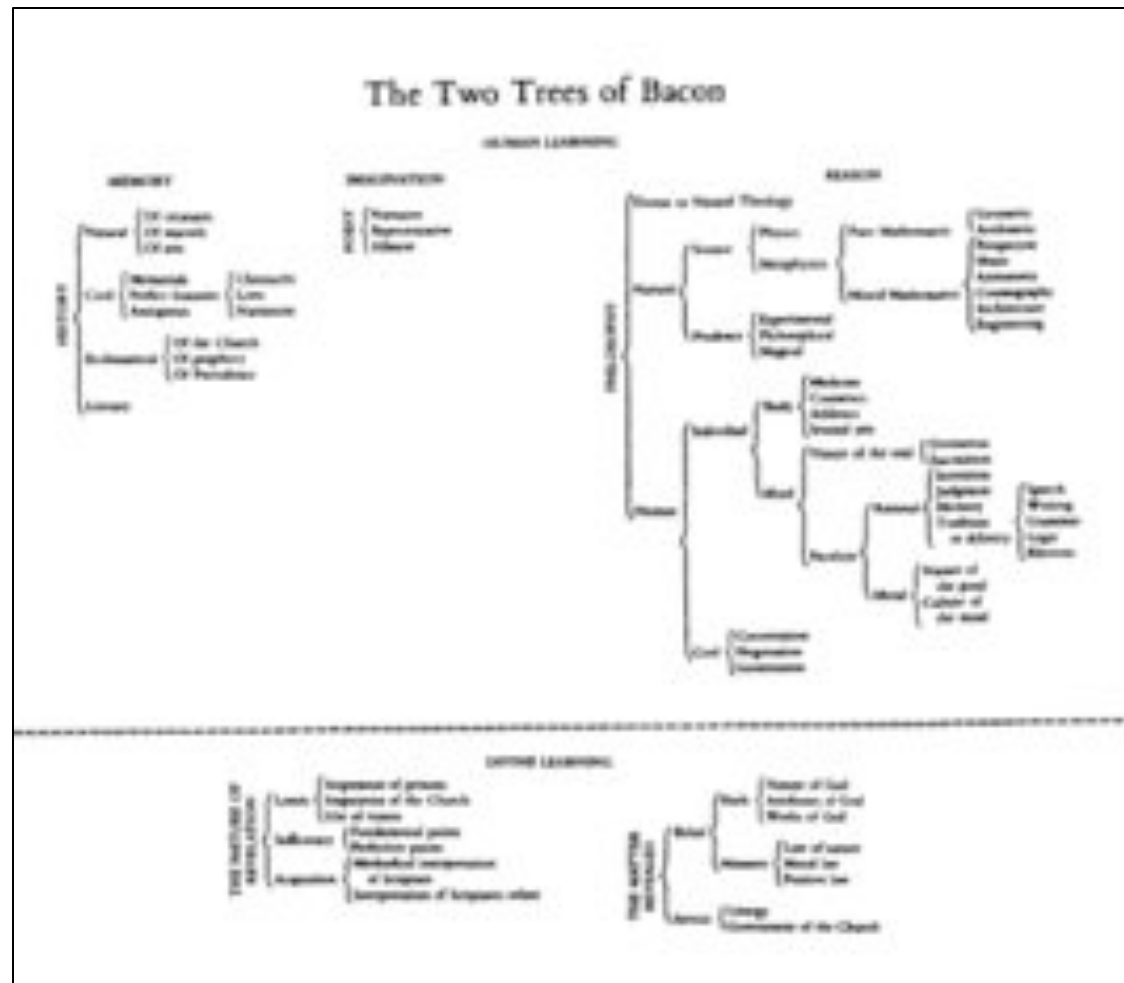
Nature (astronomy, meteorology, etc.).

Man (anatomy, powers, actions),

Man acting on nature (medicine, visual arts, arithmetic),,,

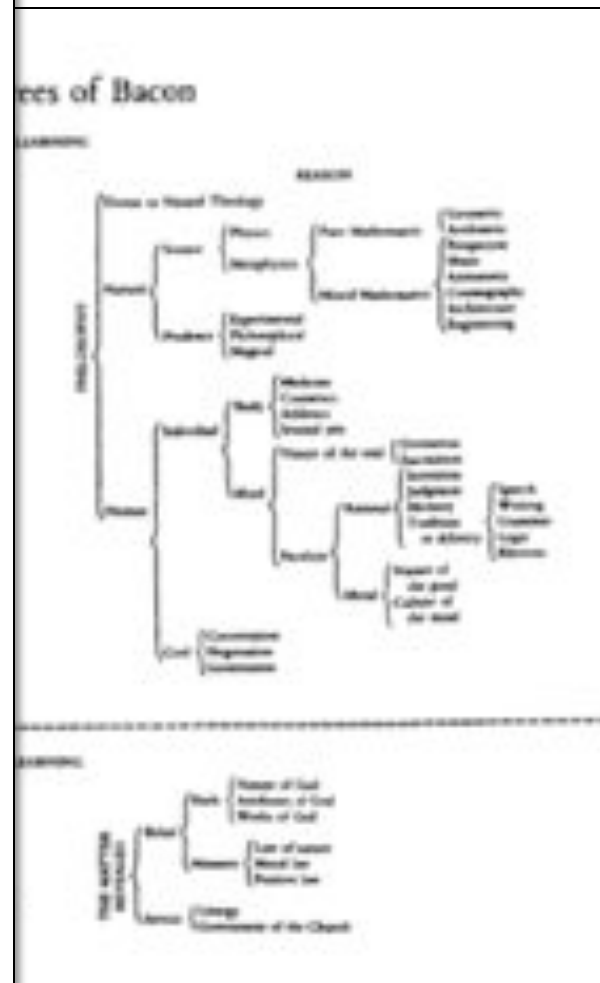


# The Tree of Bacon

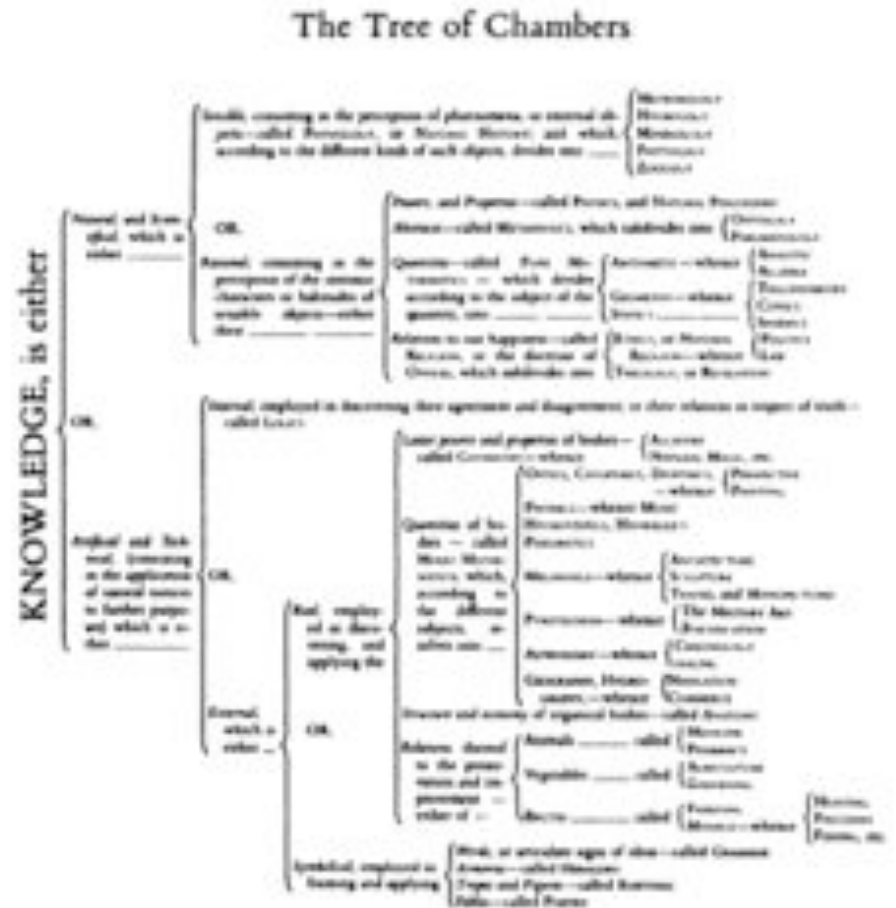




# The Tree of Bacon



## IN FOUR VOLUMES.













# The Encyclopédie

First vol. appears in 1751; last in 1772



Denis Diderot





# The Enlightenment Plan

---



Jean d'Alembert

The tree of human knowledge could be formed in several ways, either by relating different knowledge to the diverse faculties of our mind or by relating it to the things that it has as its object. ... But how could there not be arbitrariness? Nature presents us only with particular things, infinite in number and without firmly established divisions. Everything shades off into everything else by imperceptible nuances.

D'Alembert, Preliminary Discourse to the *Encyclopédie*



# The "objectivity" of knowledge

---



Jean d'Alembert

[T]he encyclopedic arrangement of our knowledge ... consists of collecting knowledge into the smallest area possible and of placing the philosopher at a vantage point, so to speak, high above this vast labyrinth, whence he can perceive the principle sciences and the arts simultaneously. From there he can ...discern the general branches of human knowledge, ...and sometimes he can even glimpse the secrets that relate them to one another. It is a kind of world map which is to show the principle countries, their position and their mutual dependence, the road that leads directly from one to the other.



# A “true scheme” of knowledge?

---

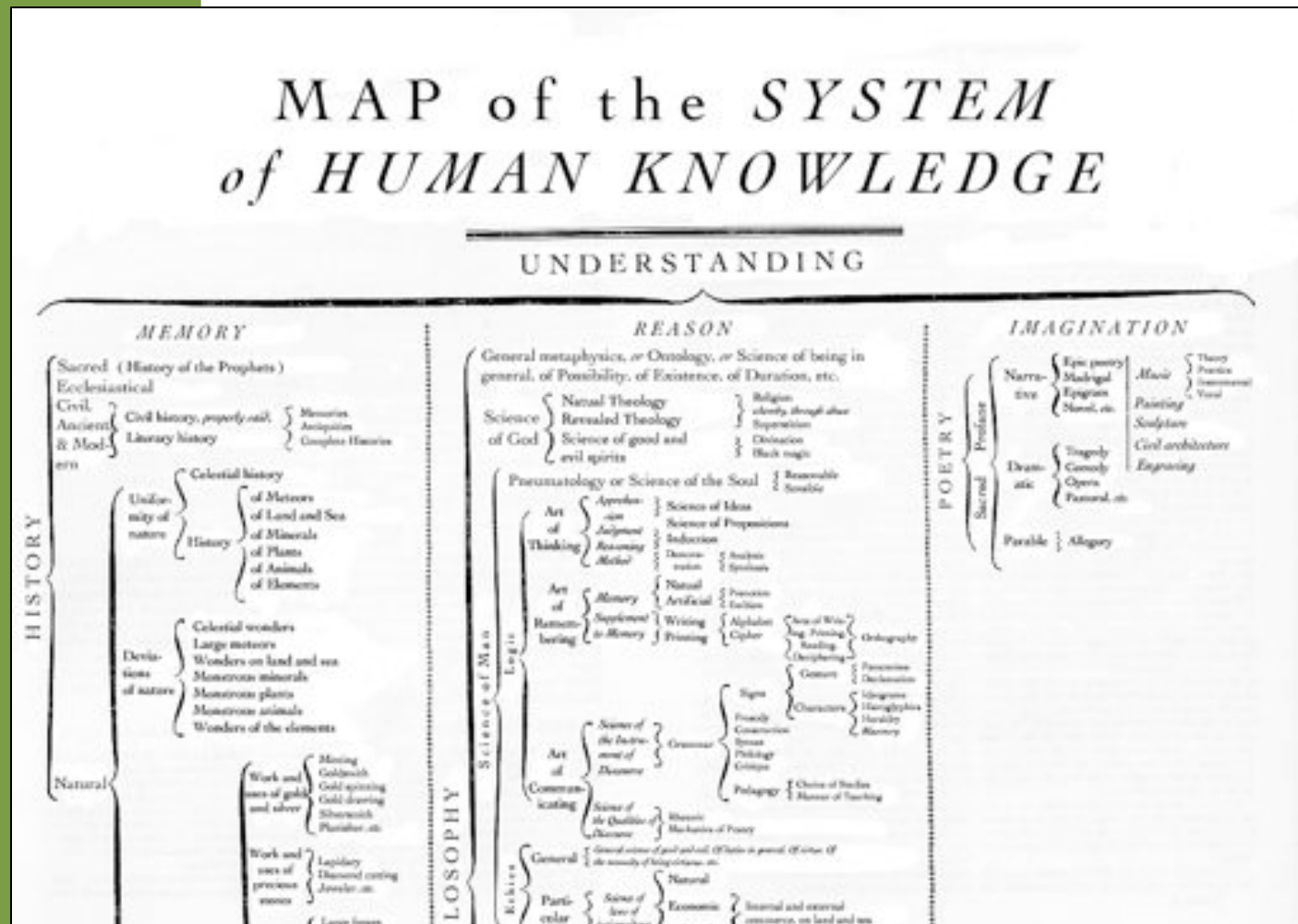
... a certain Chinese encyclopaedia entitled 'Celestial Empire of benevolent Knowledge'. In its remote pages it is written that the animals are divided into: (a) belonging to the emperor, (b) embalmed, (c) tame, (d) sucking pigs, (e) sirens, (f) fabulous, (g) stray dogs, (h) included in the present classification, (i) frenzied, (j) innumerable, (k) drawn with a very fine camelhair brush, (l) et cetera, (m) having just broken the water pitcher, (n) that from a long way off look like flies.

...there is no classification of the Universe not being arbitrary and full of conjectures

Jorge Luis Borges

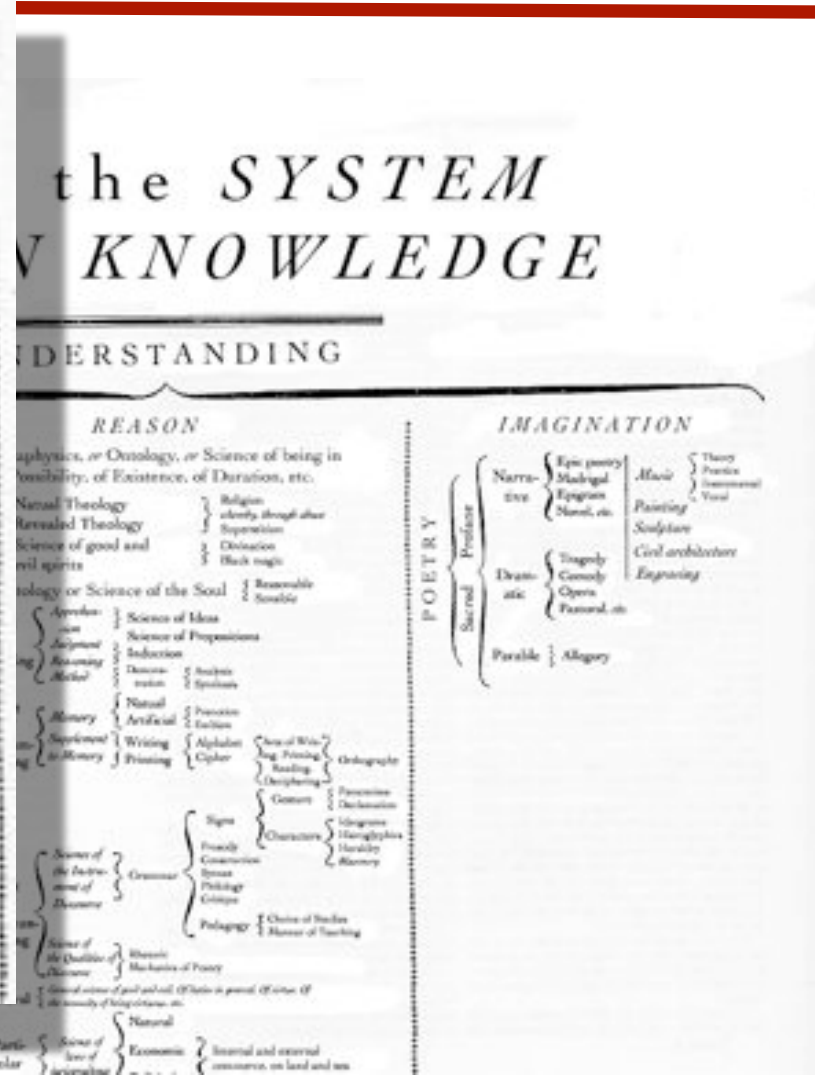
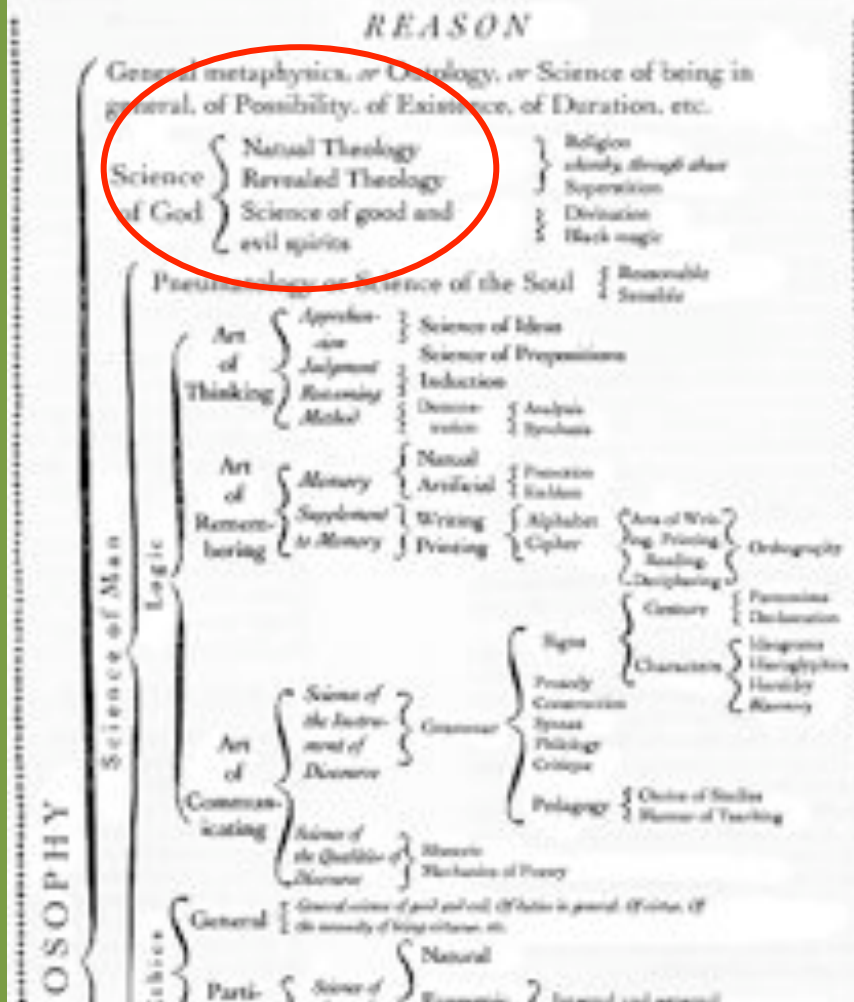


# The Tree of Diderot & D'Alembert





# The Tree of Diderot & D'Alembert





# The Tree of Diderot & D'Alembert

## ESSAI D'UNE DISTRIBUTION GÉNÉALOGIQUE DES SCIENCES ET DES ARTS PRINCIPAUX.

Selon l'Explication détaillée du Système  
des Connaissances Humaines dans le Discours  
préliminaire des Editeurs de l'Encyclopédie  
publiée par M. Diderot et M. d'Alembert,  
Weimar, 1769

Art of Remembering.

Natural.

Artificial.

Prenotion.

Emblem.

Supplement to Memory.

Writing.

Printing.

Alphabet.

Cipher.

Arts of Writing, Printing, Reading  
(process) | Reading, Deciphering.

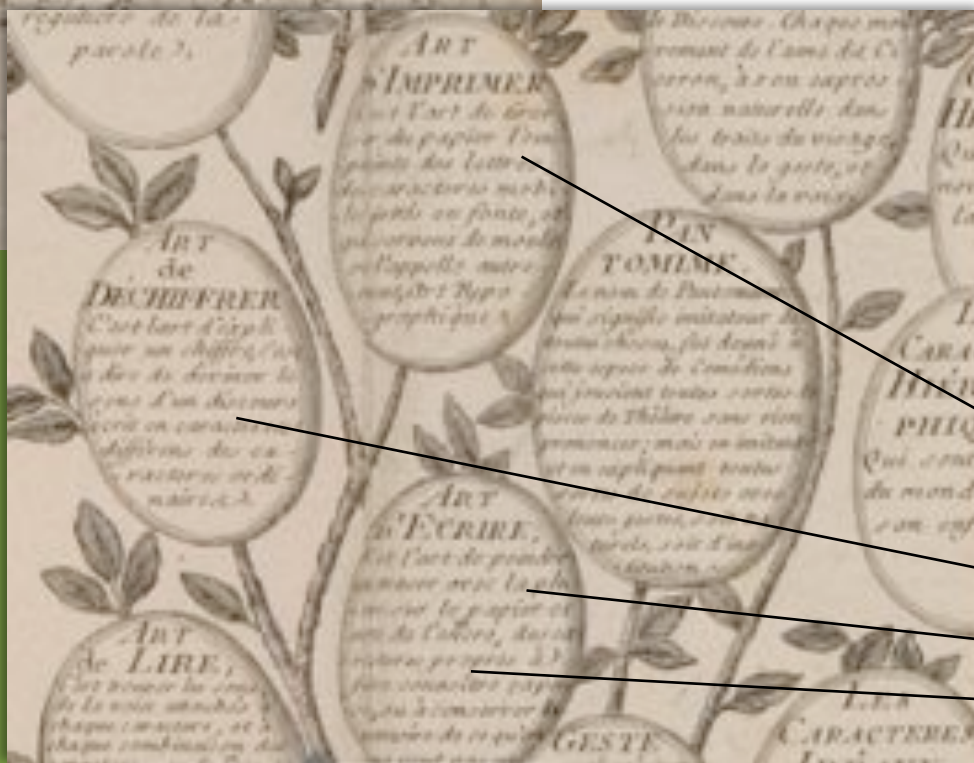
Orthography.

Art of printing

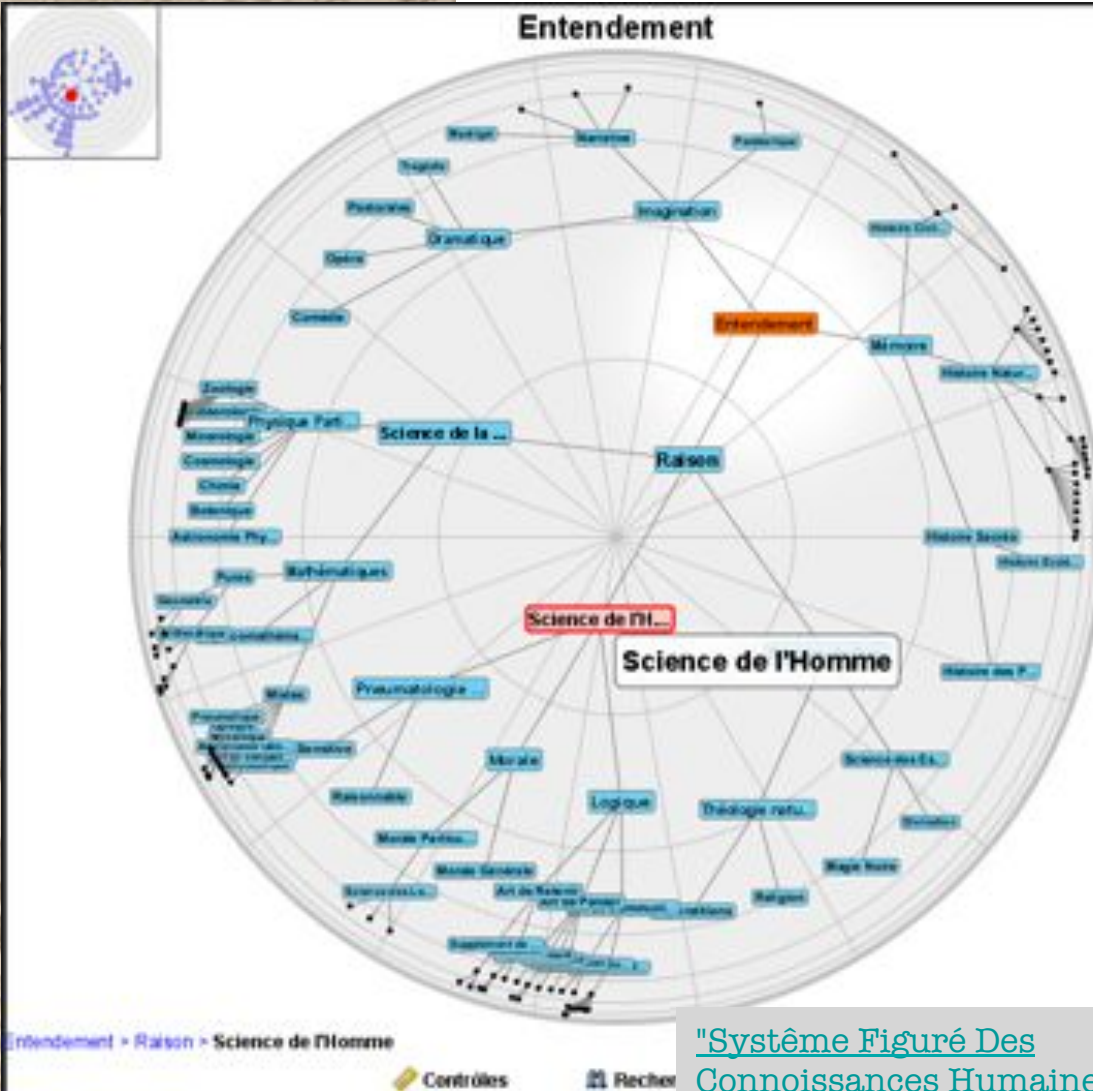
Art of deciphering

Art of writing

Art of reading







on l'Explication détaillée du Système  
 aissances Humaines dans le Discours  
 inaire des Editeurs de l'Encyclopédie  
 ée par M. Diderot et M. d'Alembert,  
 Weimar, 1769

ory.

of Writing, Printing, Reading  
cess)| Reading, Deciphering.

### Orthography.

Art of printing

## Art of deciphering

## Art of writing

## Art of reading

## "Système Figuré Des Connoissances Humaines"

<http://goo.gl/xiBcR>



# "Sciences, Arts Libéraux, Arts Mécaniques"



Formier



Economie Rustique (silk-making)





# "Sciences, Arts Libéraux, Arts Mécaniques"



...the advantage that the *liberal* arts have over the *mechanical* arts, because of their demands upon the intellect and because of the difficulty of excelling in them, is sufficiently counter-balanced by the quite *superior* usefulness which the latter for the most part have for us....while justly respecting great geniuses for their enlightenment, society ought not to degrade the hands by which it is served"

d'Alembert, Preliminary Discourse to the Encyclopédie



Economie Rustique (silk-making)

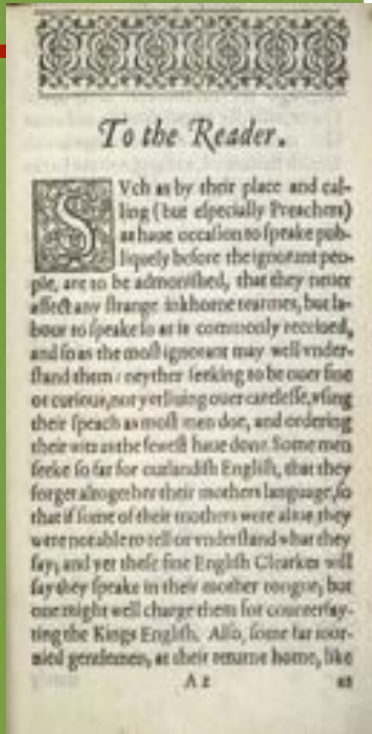


# Organizing the Trésor

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# The Emergence of Alphabetical Order



Advertisement to  
Cawdrey's Table  
Alphabetically

If thou be desirous (gentle Reader) rightly and readily to vnderstand, and to profit by this Table, and such like, then thou must learne the Alphabet, to wit, the order of the Letters as they stand, perfectly without booke, and where euery Letter standeth: as (b) neere the beginning, (n) about the middest, and (t) toward the end. Nowe if the word, which thou art desirous to finde, begin with (a) then looke in the beginning of this Table, but if with (v) looke towards the end. Againe, if thy word beginne with (ca) looke in the beginning of the letter (c) but if with (cu) then looke toward the end of that letter. And so of all the rest. &c.

Rob't Cawdrey, *A table alphabetically conteyning and teaching the true writing, and vnderstanding of hard usuall English wordes, borrowed from the Hebrew, Greeke, Latine, or French, &c* 1604

What is this???



# The Emergence of Alphabetical Order

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## **Practical advantages of alphabetical order:**

Facilitates access to particular entries (assuming a certain mode of reading)

Philosophically modest

"It might be more for the general interest of learning, to have the partitions thrown down, and the whole laid in common again, under one undistinguished name."

Ephraim Chambers





# The impulsion to structure



The Grand Larousse was everything to me; I would take down a volume at random, behind the desk, on the next-to-last shelf. A-bello, belloc-Ch, or Ci-D. . . (these associations of syllables had become proper names that denoted the sectors of universal knowledge: there was the Ci-D region, the Pr-Z region, with their flora and fauna, their cities, their great men and their battles). ... Men and beasts were there in person -- the engravings were their bodies, the text was their souls, their unique essences. Jean-Paul Sartre, *Les Mots*





- • Adult contemporary music
- Adult oriented pop music
- Adult standards
- Afiropop
- Arab pop
- Austropop
- Baroque pop
- Britpop
- Bastard pop
- Brazilian pop
- Bubblegum pop
- Chinese pop
- Contemporary Christian
- Country pop
- Dance-pop
- Disco
- Disco polo
- Dream pop
- Electropop/Technopop
- Eurobeat
- Euro disco
- Europop
- Experimental pop music
- French pop
- Greek Laika pop
- Hindi pop
- Hong Kong and Cant
- Hong Kong English pi
- Hot Adult Contempor

# Wikipedia: The logical end of destructuring?

**Ilma Julieta Urrutia Chang** was Guatemala's national representative for the major beauty pageants in 1984.

**The N battery is a type of battery.** It has a battery. It has a diameter of 12 mm and a height of 30.2 mm. For a typical alkaline battery, the N size weighs 9 grams.

**A System Requirements Specification** (SRS) is a document where the requirements of a system that is planned to be developed are listed.

**Protestants in Eritrea** are about 91,232, which are 2% of the population.

Categories: 1926 births | 1991 deaths | African American musicians | American jazz bandleaders | American jazz composers | American jazz trumpeters | American songwriters | Avant-garde trumpeters | Bebop trumpeters | Cool jazz trumpeters | Deaths from stroke | Deaths from respiratory failure | People with sickle-cell disease | Grammy Award winners | Grammy Lifetime Achievement Award winners | Columbia Records artists | Capitol Records artists | Hard-bop trumpeters | Musicians from Illinois | Juilliard School of Music alumni | Miles Davis | Modal jazz trumpeters | People from Madison County, Illinois | People from St. Clair County, Illinois | Rock and Roll Hall of Fame inductees | St. Louis music | Third Stream trumpeters | Deaths from pneumonia | Burials at Woodlawn Cemetery (The Bronx) | Infectious disease deaths in California



# Material Representations of Knowledge

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# Material Representations of Knowledge

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Leiden University Library, 1610





# Material Representations of Knowledge



Curriculum mirrored in  
form of library  
(bibliographies)



Leiden University Library, 1610



# Knowledge and the "Virtuosi"

"He Trafficks to all places, and has his Correspondents in every part of the World; yet his Merchandizes serve not to promote our Luxury, nor encrease our Trade, and neither enrich the Nation, nor himself. A Box or two of Pebbles or Shells, and a dozen of Wasps, Spiders and Caterpillars are his Cargoe. He values a Camelion, or Salamander's Egg, above all the Sugars and Spices of the West and East-Indies... He visits Mines, Cole-pits, and Quarries frequently, but not for that sordid end that other Men usually do, viz, gain; but for the sake of the fossile Shells and Teeth that are sometimes found there." (Mary Astell, *Character of a Virtuoso*, 1696)





# Representations of Knowledge: The Kunstkammer

Organization of knowledge mirrored in form of  
Kunstkammer, cabinets of curiosities,  
Wunderkammer, etc.



Museum Wormianum, 1655





# Representations of Knowledge: The Kunstkammer



Natural History Cabinet, Naples, 1599





# Representations of Knowledge: The Studiolo



Studiolo of Francesco I  
Florence (1570)



Kunstkammer, 1636



# Representations of Knowledge: The Studiolo



Studiolo of Federico da Montefeltro  
Urbino (ca. 1460) with wood intarsia  
(inlay)



# Representations of Knowledge: The Kunstschränk

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The Kunstschränk (art cabinet or art shrine)





# From Cabinets to Museums

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Kunstkammers first made available for public viewing in mid-17<sup>th</sup>. C (Kunstmuseum Basel, 1661)

Public museums in 18<sup>th</sup> c:

British Museum, 1759, containing cabinet of curiosities assembled by Hans Sloan, ms collections, Royal Library. Later: collections of antiquities, etc.



Montague House, home of original British Museum in Bloomsbury

Uffizi Gallery, Florence, 1765

Belvedere Palace, Vienna, 1781

Louvre Palace opened to public in 1793 with royal collections; augmented by Napoleon





## 17th c. Galleries

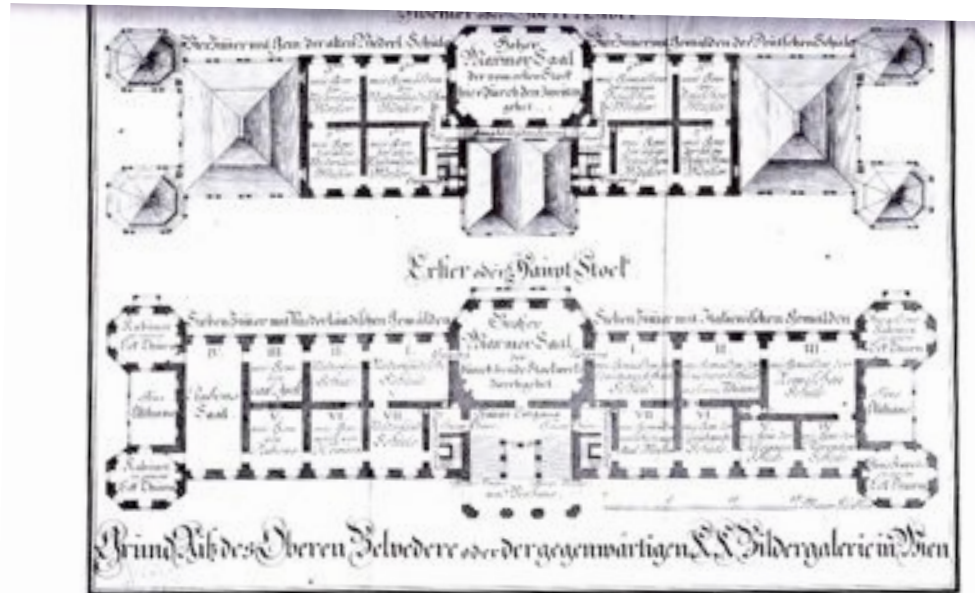


23. *The Imperial Gallery in Prague*, by Johann Bretschneider, 1714. The paintings are arranged according to the visual and decorative effect.



# 18th c. Galleries

Painting  
Galleries,  
Schloss  
Belvedere,  
Vienna, 1781



29 Histories of Art were created in many of the galleries of Europe. This plan of the paintings gallery in the Schloss Belvedere in 1778, shows how the works were grouped by country, and within that, by date, by (geographical) school, or by individual artist. This is in marked contrast to the form of display shown in Plate 23.



Rationalizing the organization of the  
trésor





## Readings for Feb. 26

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McArthur, Tom. 1986. *Worlds of Reference*. Cambridge: Cambridge University Press. Chs. 12, “The Legislative Urge” and 14, “Thematic Lexicography,” pp. 121-127 and 139-143 in the reader.

Johnson, Samuel. 1755. “Preface” to the *Dictionary*.

Johnson, Samuel. 1785 (1755). *A Dictionary of the English Language*. Slide hand icon at the bottom and page forward/back until you come to the definition of dictionary.)



## Homework for Feb. 26

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Read the descriptions of the procedures Johnson followed in compiling his dictionary in Macarthur and in Johnson's Preface. How might the procedures have been different if he had had modern technologies at his disposal—a networked computer, substantial corpora of online literature and texts, and so forth. Can the entire procedure of lexicography be crowd-sourced, à la the Urban Dictionary? Do you think we still require professional lexicographers?

Answer *some* of these questions in no more than 500 wds