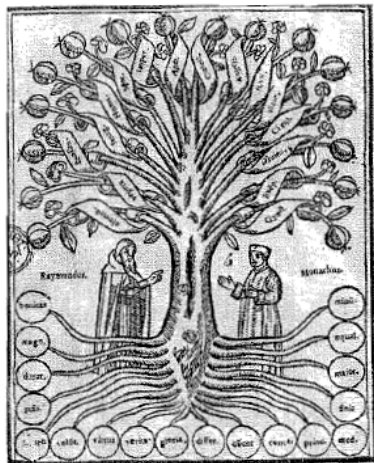




# The Organization of Knowledge



5 TREE OF KNOWLEDGE, TITLE-PAGE OF R. LULL, *ARBOR SCIENTIAR*  
(1515: RPR. 1635): COPY IN CAMBRIDGE UNIVERSITY LIBRARY (P\*3.32)

**History of Information i218**  
**Geoff Nunberg**

**Feb. 18, 2015**



## Midterm exam



80 minute, in-class exam March 19. It will include three essay questions, two chosen from a list of questions provided in advance. There will also be short-answer sections asking you to identify quotations, people, dates, images, and other aspects of the course. Some of these will be chosen from a set given in advance, others will not be on the study guide. Exam questions will be based on material covered in readings (including Thurs readings!), slides, lectures and class discussion. We will provide a study guide around March 12.



## Midterm Essay (by request)

---

Students can ask to submit a paper instead of a midterm exam. This paper will be a 2000 word essay in response to one of a list of essay questions. There will be a list of topics on the bcourses by Feb 27 and, if you wish to write an essay, you must let us know in writing which one you propose to write by March 5, providing a brief outline including sources. We will let you know if you may proceed by March 9. The paper is due at 9 a.m. on the morning of the midterm (March 19). If you do not submit by that time, you should take the midterm exam, which starts at 9:30. **No late papers will be accepted.**

Guidelines on form, etc. posted on bcourses



# Midterm paper

---

## **Midterm paper (optional)**

2000-wd paper in response to one of a list of essay questions. Details on bcourses.

Essay prompts posted by March 1.

Paper outline w/ sources due March 9; our reply returned by March. Not all outlines will be accepted.

Paper due by March 19 at 9:30 AM BEFORE beginning of exam. **No late papers accepted**; if you haven't finished by then, take the exam.

Guidelines on form, etc. posted on bcourses



## Itinerary: 2/26

---

Defining "knowledge"

The shifting frame of knowledge; from  
Renaissance to Enlightenment

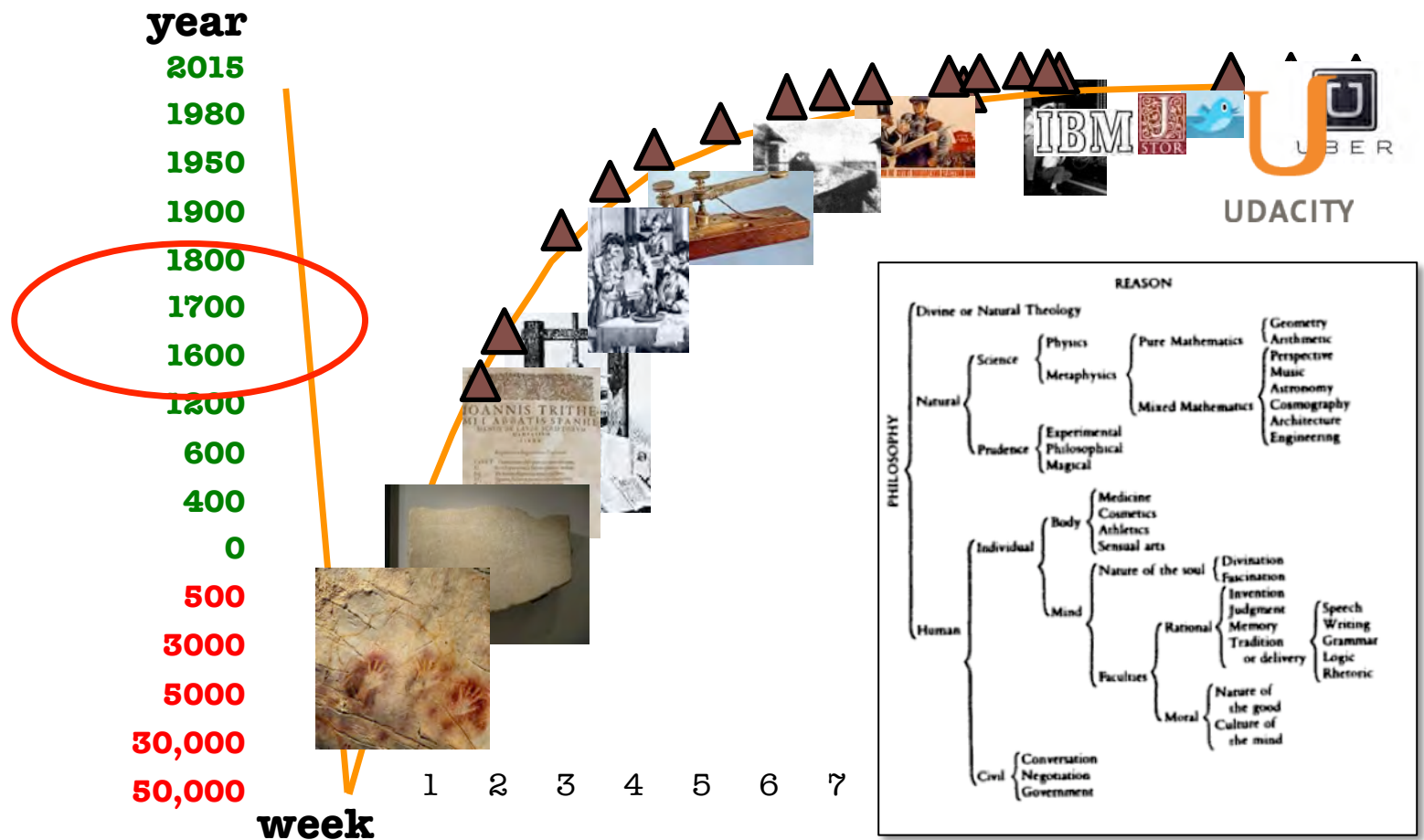
Early reactions to "information overload"

New conceptualizations of knowledge

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



# Organizing Knowledge





# The Emergence of the Modern "Informational System"

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, the decimal system 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 Emergence of the Modern "Informational System"

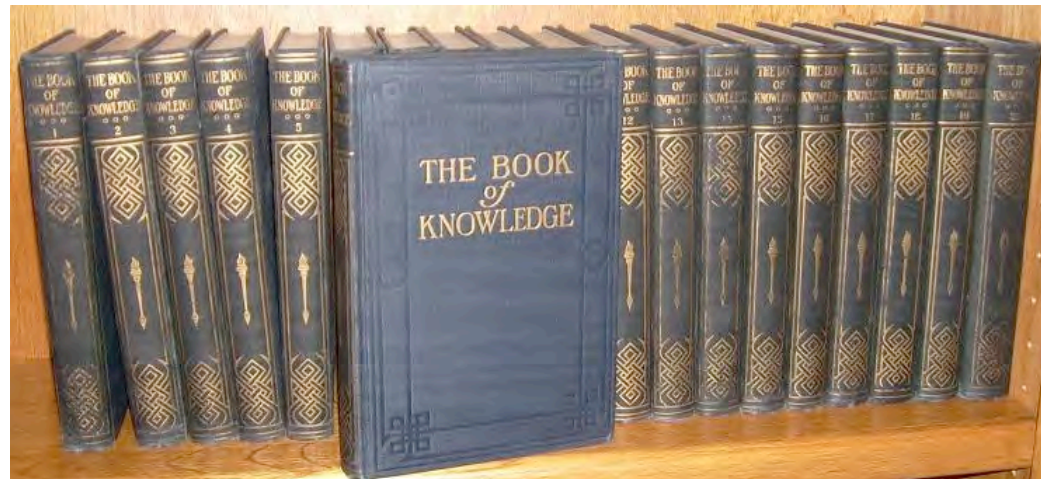
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--Tim Blanning, *The Culture of Power*



# Defining "knowledge"

---





# Defining "knowledge"

## Individual senses

*Oxford English Dictionary:*

- Acquaintance with a branch of learning, a language, or the like

*His knowledge of French is excellent.*

- The fact or state of having a correct idea or understanding of something.

*He has a considerable knowledge of alarm systems.*

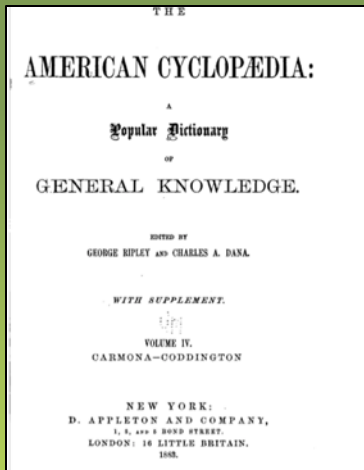
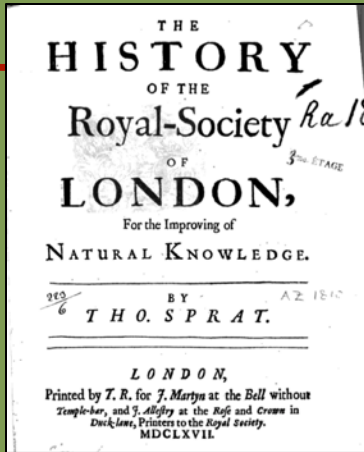
## Collective sense



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

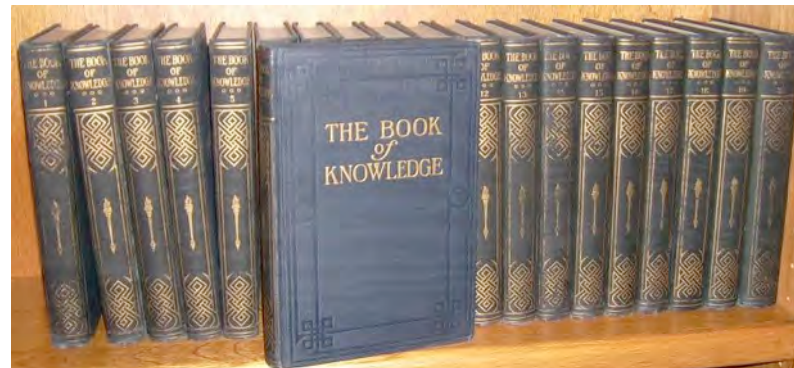


# Collective knowledge: the missing roles



Collective sense: knowledge as a three-place relation

The sum of what is known [about X] [by Y]





# What makes for "knowledge"?

What qualifies something as (collective) knowledge?

P is collectively significant

*Nunberg's out of paper towels.*

*Kimberly-Clark closed at \$108 yesterday.*

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

*Arthur Scott introduced the first paper towel in 1931.*



## THE WONDER MEN OF FLORENCE

There is a little town in Tuscany called Siena, a tranquil & a dry place, sitting in the sun. Lovers of beautiful things have a warm feeling for Siena; here in the thirteenth century were shown the first, earlier manifestations of that spiritual force called the Renaissance.

The house-wards of the Alps lay behind as heavily as wings, and leading of "This light men's heart only in the lines like we and, because the heavy spirit he touched it seems, the great Italia touched the sun to melt the lead out in a back to the world."

PICTURES

## STORIES

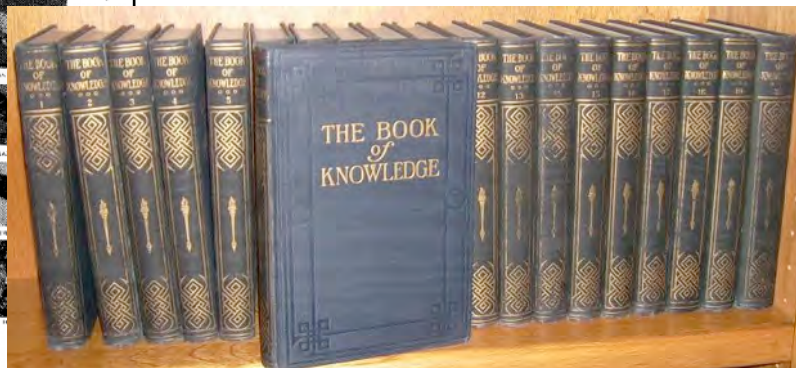
The Great Stories of the World That Will Be Told For Ever



## WILLIAM TELL

We do not know whether he lived or not; but he is the hero of the story which is told in the book. He was a Swiss man who lived in the thirteenth century. He was a great hunter and a great marksman. He was the first man to use the crossbow.

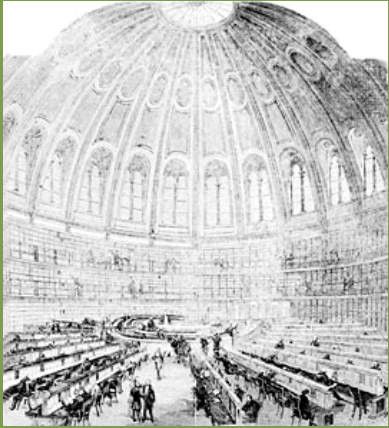
## FOXES, JACKALS, & WOLVES OF THE WORLD





# Features of Systems of knowledge

---



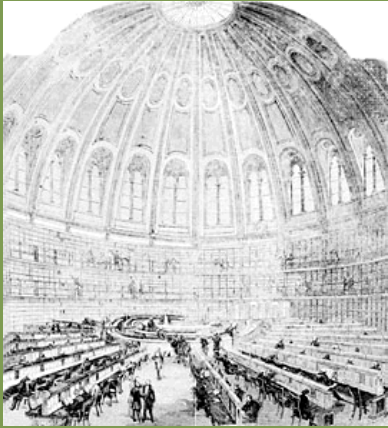
Boundaries

Conceptual organization/classification system

Social organization



# Features of Systems of knowledge



Boundaries

Conceptual organization/classification system

Social organization



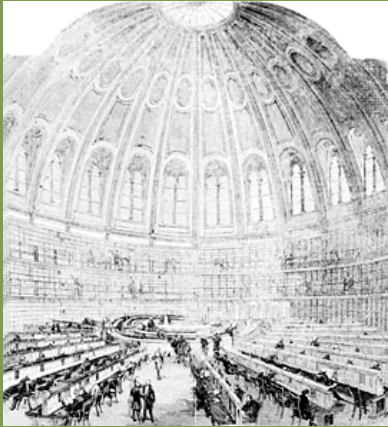


# Features of Systems of knowledge

Boundaries

Conceptual organization/classification system

Social organization: who does the knowing?





# **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)

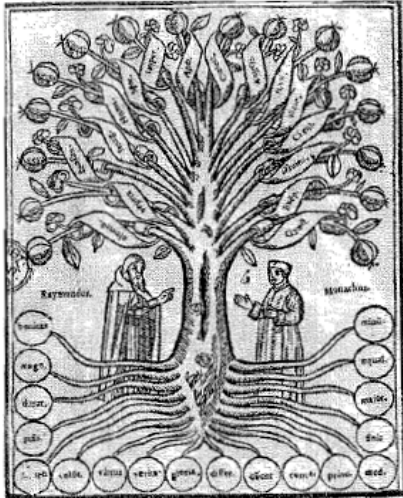
  - Material embodiments (library, museum)

  - Textual embodiments – encyclopedia, dictionary, compendium, bibliography

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



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



5 TREE OF KNOWLEDGE, title-page of R. LULL, ARBOR SCIENTIARUM (1515; RPE. 1635); COPY IN CAMBRIDGE UNIVERSITY LIBRARY (P\*.3.52)

System of knowledge is "closed"; built around classical sources and religious texts

Organization of knowledge is fixed and "natural"

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

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



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

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Trivium: grammar, logic, rhetoric

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# Changing Frames of Knowledge

---

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

Responses to influences that are:

- Pragmatic/material

- Philosophical/academic

- Symbolic/political

- (Not independent...)



## 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





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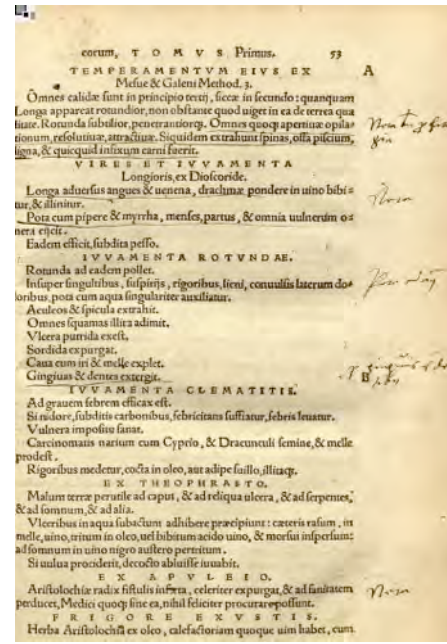
What are these?

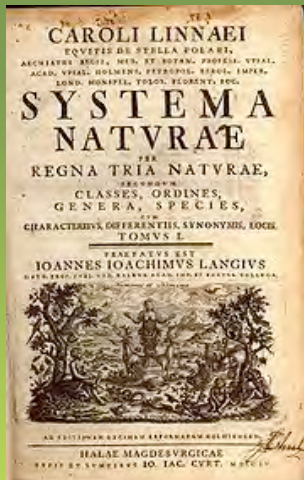




# Opening the World of Knowledge: Botany

*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")

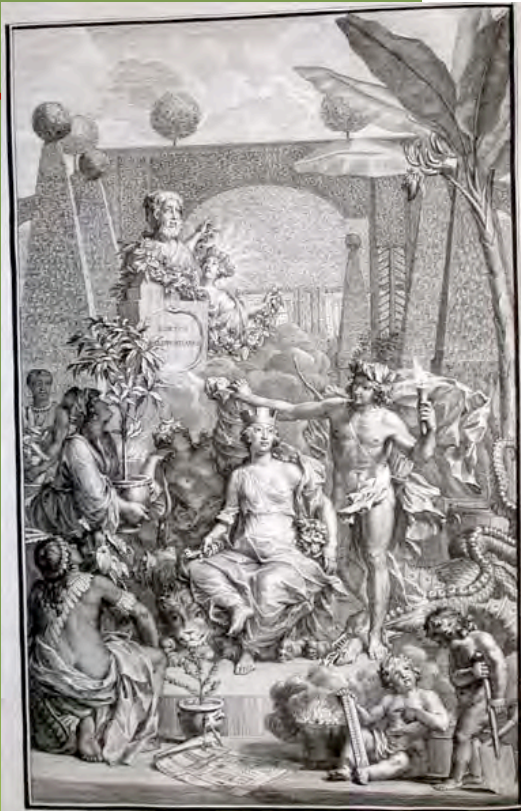


[illegible]



# 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

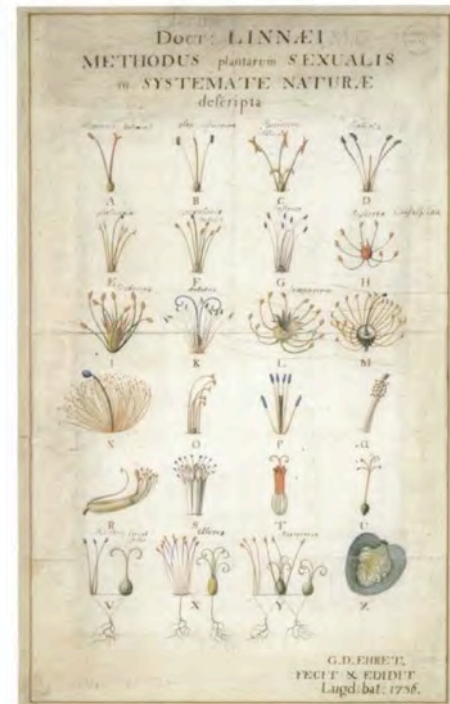
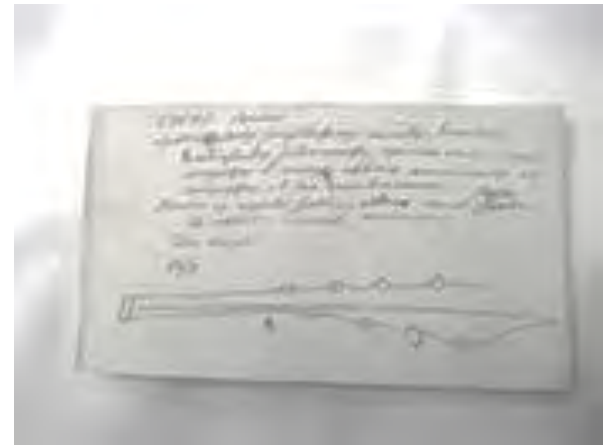


Plate 156: An illustration by Georg Dionysius Ehret for the *Hortus Cliffortianus* (1735–48) in which the Swedish plantsman, Carl Linnaeus, first began to work out his 'methodus plantarum sexualis', grouping plants according to the number and arrangement of their stamens



# Organizing Knowledge Responses to Early Modern "Information Overload"

---



Linnaeus, index card, ca 1760



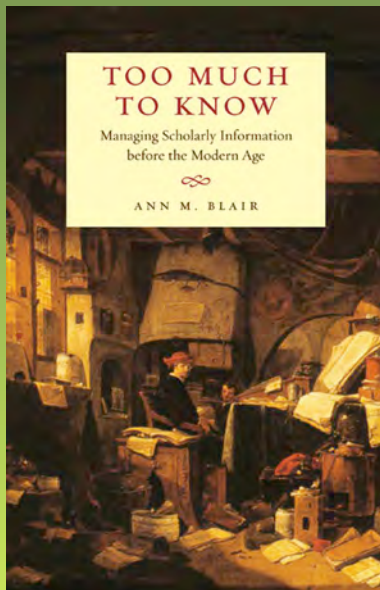
# Pragmatic Forces: Perceptions of "Information Overload"

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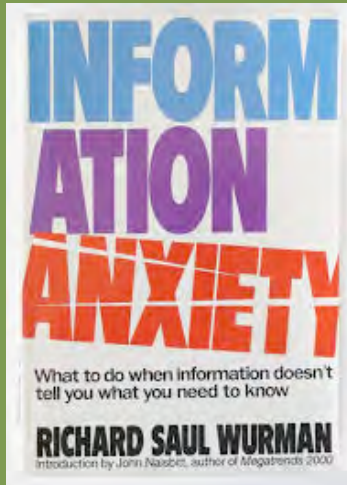
Antonfrancesco Doni, 1550: there are “so many books that we do not have time to read even the titles.”

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





# The endless anxiety...



DECEMBER 20, 2007, 5:52 PM

## Is Information Overload a \$650 Billion Drag on the Economy?



World of Psychology

## Overcoming Information Overload

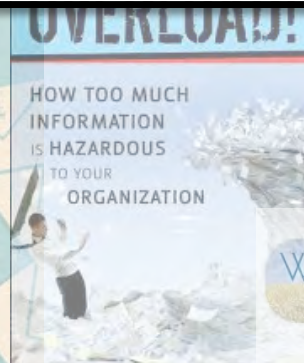
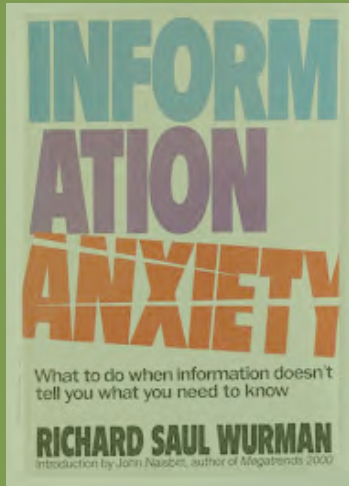
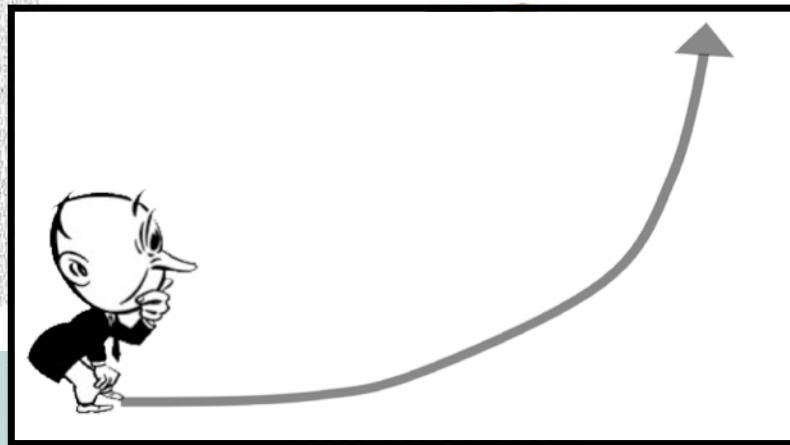
By MARGARITA TARTAKOVSKY, M.S.  
Associate Editor

« Blog Index



# The endless anxiety...

An exponential curve looks just as scary wherever you get on board.



World of Psychology

**Overcoming Information Overload**

By MARGARITA TARTAKOVSKY, M.S.  
Associate Editor

« Blog Index



# **Confronting the Explosion**

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# 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



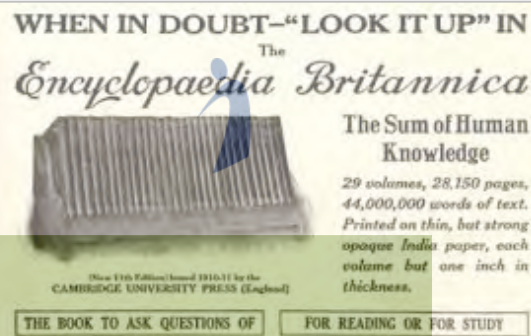
Compendia and reference books (*répertoires* or *trésors*)

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





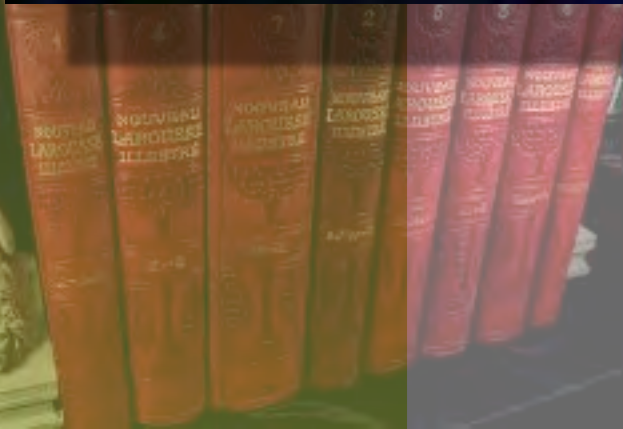
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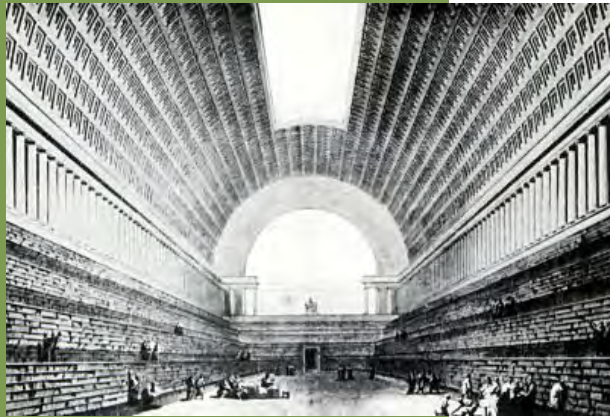
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## Distillations



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."

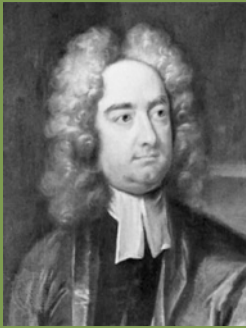
Louis-Sebastian Mercier, *L'An 2440*, 1771





# 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, ..., 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

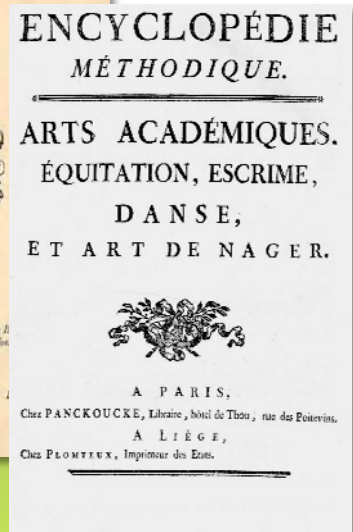
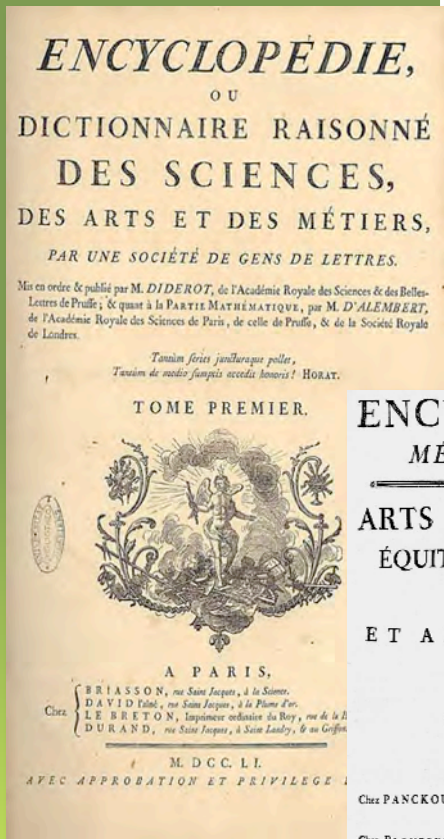


# Strategies for dealing with information overload

## 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.

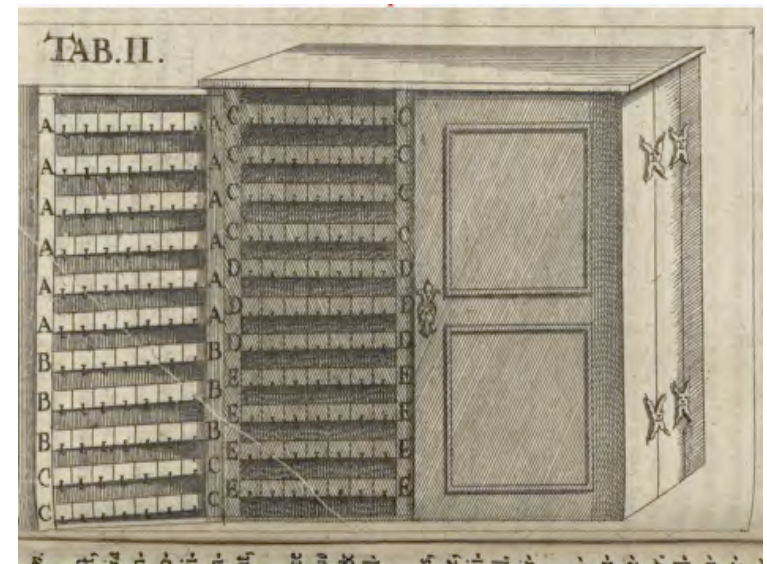
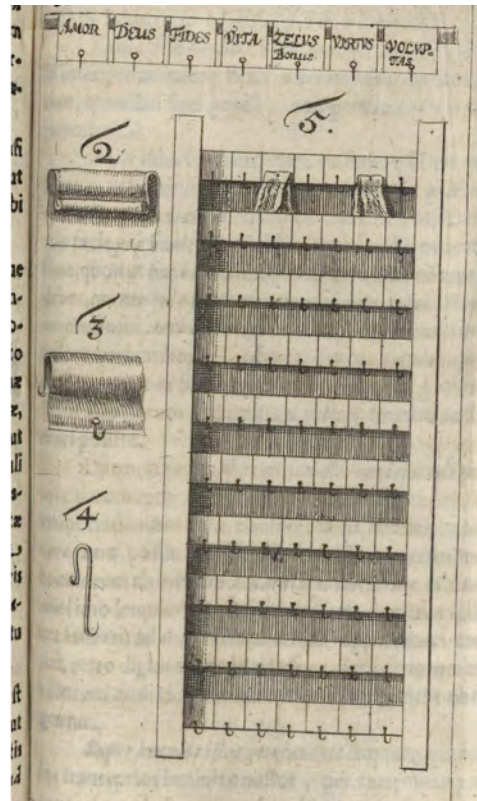
—Denis Diderot, *Encyclopédie*, 1755





# 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:

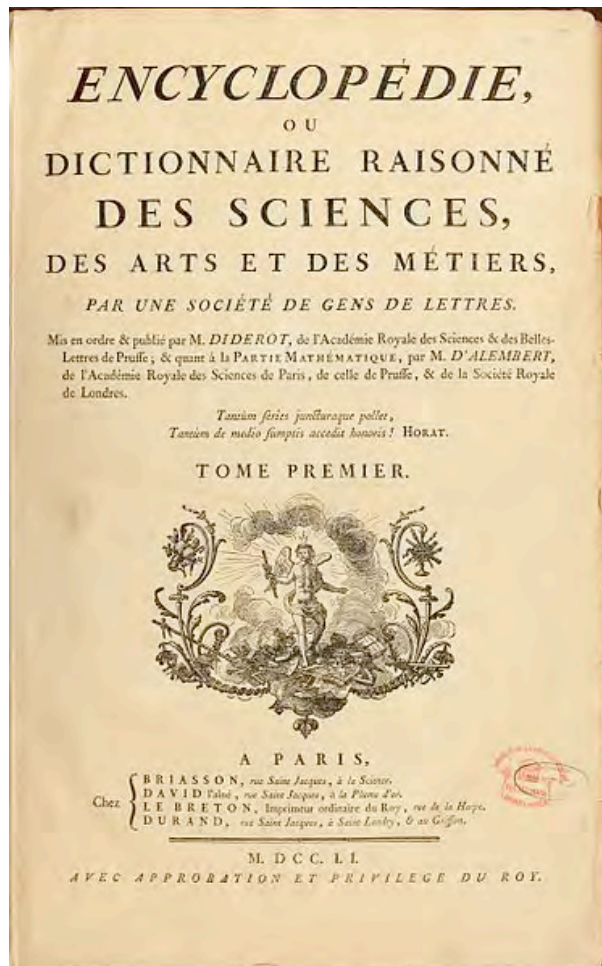
Nature (astronomy, meteorology, etc.).

Man (anatomy, powers, actions),

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



# The Encyclopédie



Denis Diderot



## The modern condition: An infinity of orders



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*

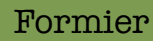


## The infinity of orders

---

... 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

In the wonderment of this taxonomy, the thing we apprehend in one great leap, the thing that... is demonstrated as the exotic charm of another system of thought, is the limitation of our own, the stark impossibility of thinking *that*. —Michel Foucault

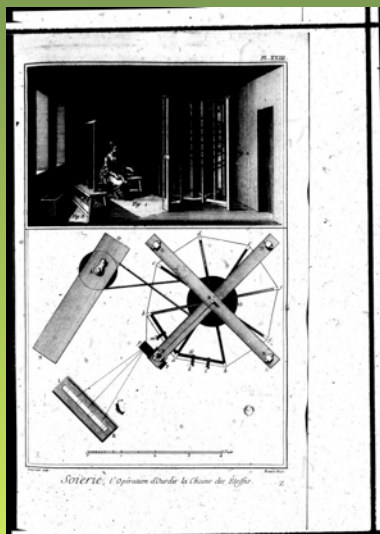




# "Sciences, Arts Libéraux, Arts Mécaniques"

...the advantage that the *liberal* arts have over the *mechanical* arts, because of their demands upon the intellect... 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)



# The age of specialization

## scientist, n.

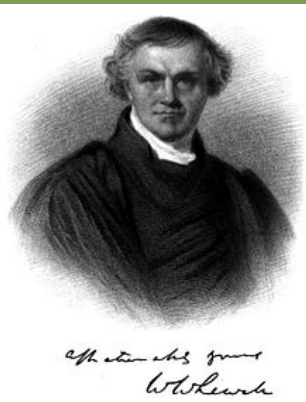
1. A person who conducts scientific research or investigation; an expert in or student of science, esp. one or more of the natural or physical sciences.

Thesaurus »

*computer, earth, mad, natural, rocket scientist, etc.: see the first element.*

It is possible that the 'ingenious gentleman' referred to in quot. 1834 is Whewell himself.

1834 W. WHEWELL in *Q. Rev.* 51 59 Science..loses all traces of unity. A curious illustration of this result may be observed in the want of any name by which we can designate the students of the knowledge of the material world collectively. We are informed that this difficulty was felt very oppressively by the members of the British Association for the Advancement of Science, at their meetings..in the last three summers...



William Whewell  
1794-1866



# The age of specialization

---

## specialist, n

2.a. In general use, one who specially or exclusively studies one subject or one particular branch of a subject.

1867 H. Spencer First Princ. (ed. 2) ii. i. §36 130  
Even the most limited specialist would not describe as philosophical, an essay which [etc.].



# **Schemes of Organization**

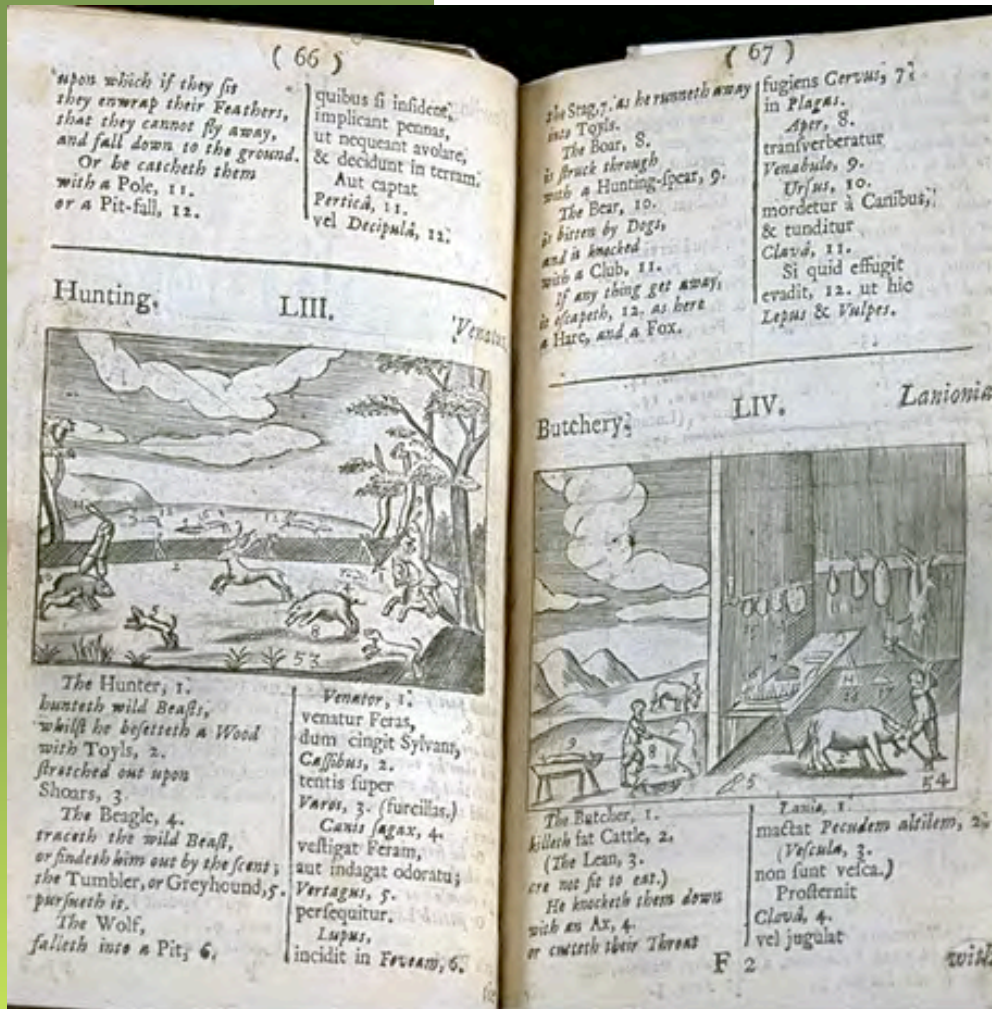
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# New Schemes of Organization: Didactic Objectives

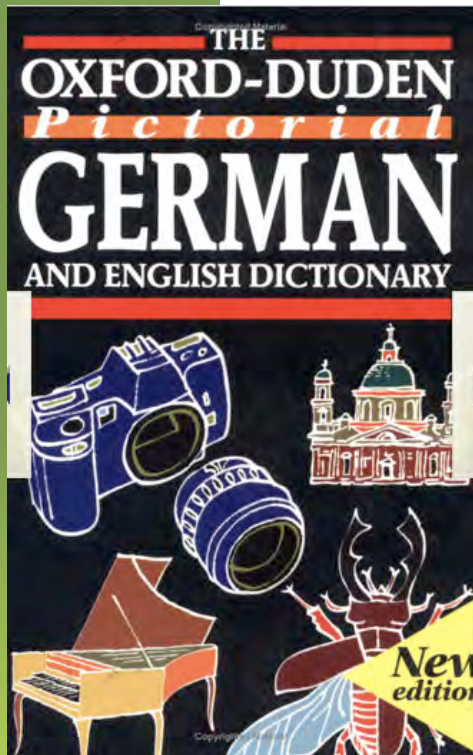
Comenius (Amos Komensky),  
*Orbis sensualium pictus*, 1658

1. Elements, firmament, fire, meteors
2. Waters, earths, stones, metals,
3. Trees, fruits, herbs, shrubs
4. Animals
5. Man and his body...
20. Providence, God and the angels,,,





# Contextual organizations





# Roget's System

Peter Marc Roget: 1779-1869



*P. M. Roget.*

## THESAURUS OF ENGLISH WORDS AND PHRASES

CLASSIFIED AND ARRANGED  
SO AS  
TO FACILITATE THE EXPRESSION OF IDEAS  
AND ASSIST IN  
LITERARY COMPOSITION.

BY  
PETER MARK ROGET, M.D., F.R.S.

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS;  
MEMBER OF THE SENATE OF THE UNIVERSITY OF LONDON;  
OF THE LITERARY AND PHILOSOPHICAL SOCIETIES ETC. OF MANCHESTER, LIVERPOOL,  
BRISTOL, QUEBEC, NEW YORK, HAMBURG, VIENNA, AND STOCKHOLM.

Author of  
THE "SEAGRAM TREATISE ON ANIMAL AND VEGETABLE PSYCHOLOGY,"  
ETC.

"It is impossible we should thoroughly understand the nature of the things, and  
first properly consider and arrange the THINGS SIGNIFIED." — "Eusebii Hieronymi"

FOURTH EDITION, ENLARGED AND IMPROVED.

## PLAN OF CLASSIFICATION.

	Sect.		Nos.
CLASS. I. ABSTRACT RELATIONS	1. EXISTENCE	- -	1 to 8
	2. RELATION	- -	9—24
	3. QUANTITY	- -	25—57
	4. ORDER	- -	58—83
	5. NUMBER	- -	84—105
	6. TIME	- -	106—139
	7. CHANGE	- -	140—152
	8. CAUSATION	- -	153—179
II. SPACE.....	1. GENERALLY	- -	180—191
	2. DIMENSIONS	- -	192—239
	3. FORM	- -	240—263
	4. MOTION	- -	264—315
III. MATTER.....	1. GENERALLY	- -	316—320
	2. INORGANIC	- -	321—356
	3. ORGANIC	- -	357—449
IV. INTELLECT.....	1. FORMATION OF IDEAS	- -	450—515
	2. COMMUNICATION OF IDEAS	- -	516—599
V. VOLITION.....	1. INDIVIDUAL	- -	600—736
	2. INTERSOCIAL	- -	737—819
VI. AFFECTIONS.....	1. GENERALLY	- -	820—826
	2. PERSONAL	- -	827—887
	3. SYMPATHETIC	- -	888—921
	4. MORAL	- -	922—975
	5. RELIGIOUS	- -	976—1000



# Visualizing Knowledge

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# Visualizing 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 principal countries, their position and their mutual dependence, the road that leads directly from one to the other.

# CYCLOPÆDIA: OR, AN UNIVERSAL DICTIONARY OF ARTS AND SCIENCES.

CONTAINING  
AN EXPLANATION of the TERMS, and an ACCOUNT  
OF THE SEVERAL SUBJECTS,  
IN THE  
LIBERAL AND MECHANICAL ARTS,  
AND THE  
SCIENCES, HUMAN and DIVINE.

Intended as a COURSE of ANCIENT and MODERN LEARNING.

By E. CHAMBERS, F.R.S.

*Perferis ut apes in falibus omnia libant,  
Jovis hoc—* LUCRET.

WITH THE  
SUPPLEMENT,  
AND  
MODERN IMPROVEMENTS,  
Incorporated in one ALPHABET.

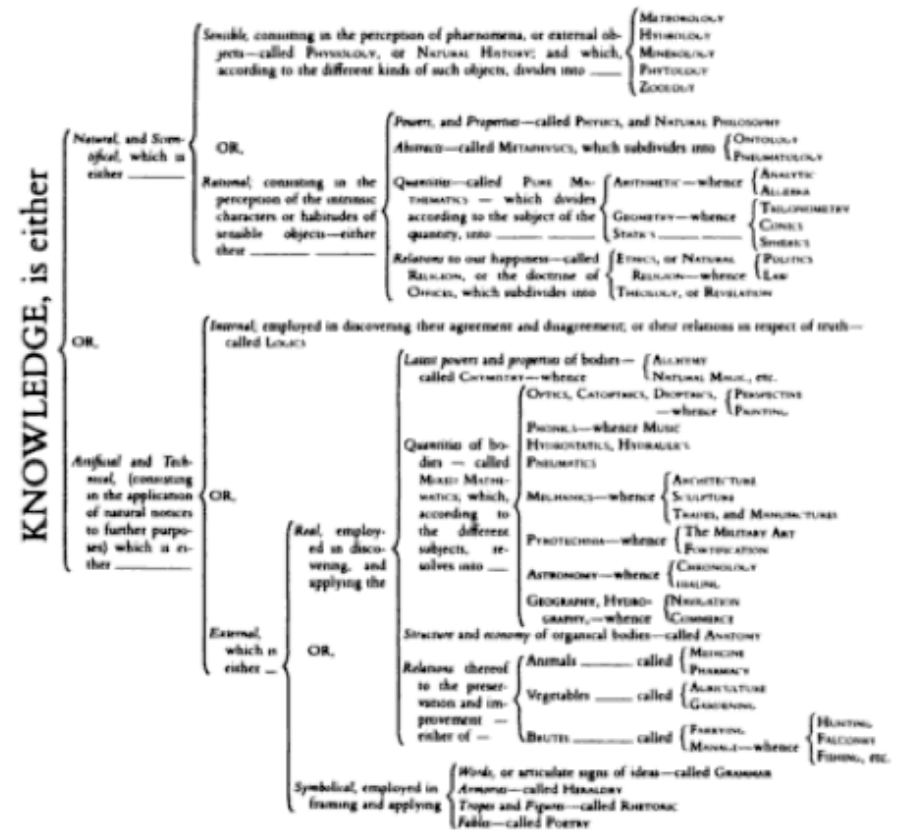
By ABRAHAM REES, D.D.

IN FOUR VOLUMES.



## Chamber's Cyclopædia, 1728

### The Tree of Chambers





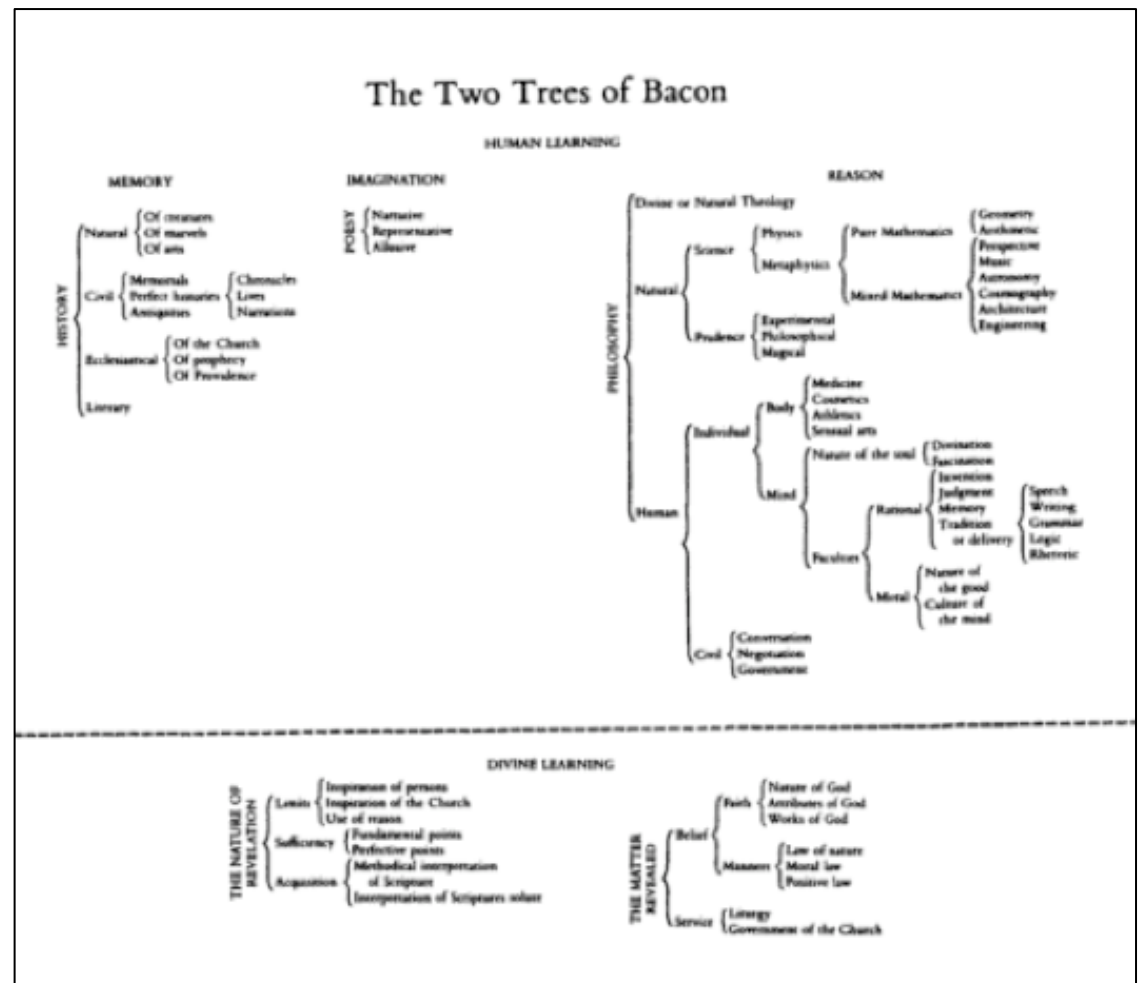
# Picturing knowledge







# The Tree of Bacon



**THE NATURE OF REVELATION**

- Leads
  - Inspiration of persons
  - Inspiration of the Church
  - Use of reason
- Sufficiency
  - Fundamental points
  - Perfective points
- Acquisition
  - Methodical interpretation of Scripture
  - Interpretation of Scripture's sense

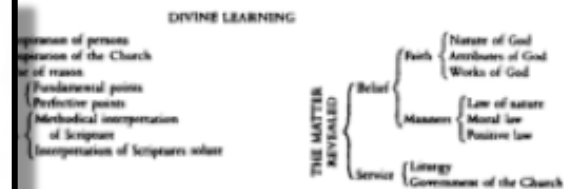
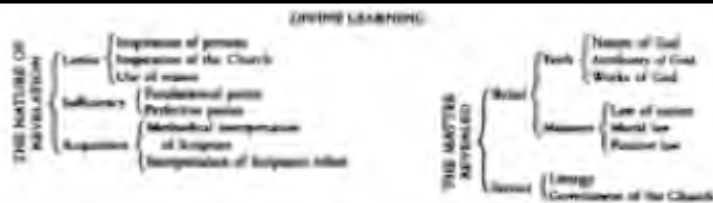
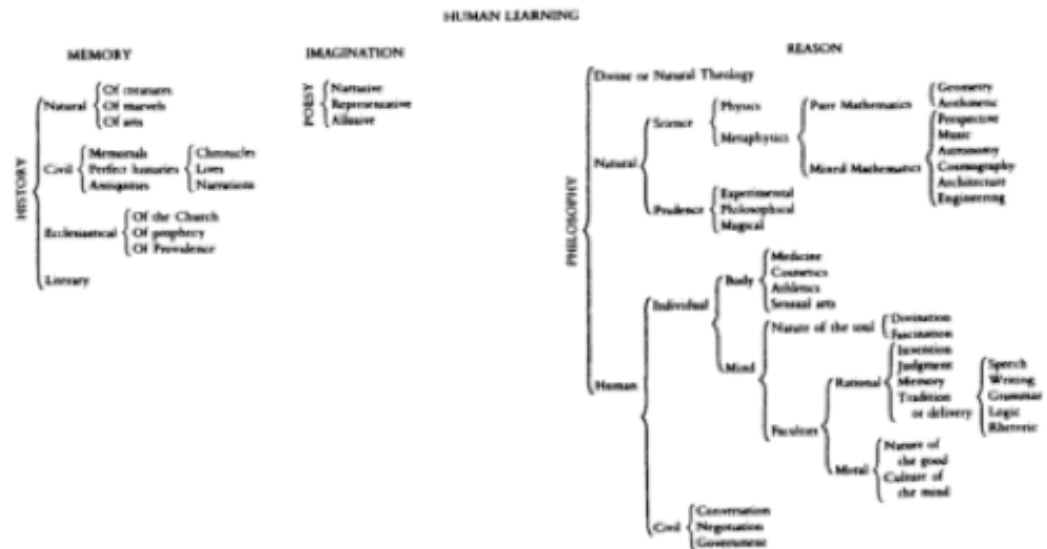
**THE MATTER REVEALED**

- Belief
  - Faith
    - Nature of God
    - Attributes of God
    - Works of God
- Manners
  - Law of nature
  - Moral law
  - Positive law
- Service
  - Liturgy
  - Governance of the Church



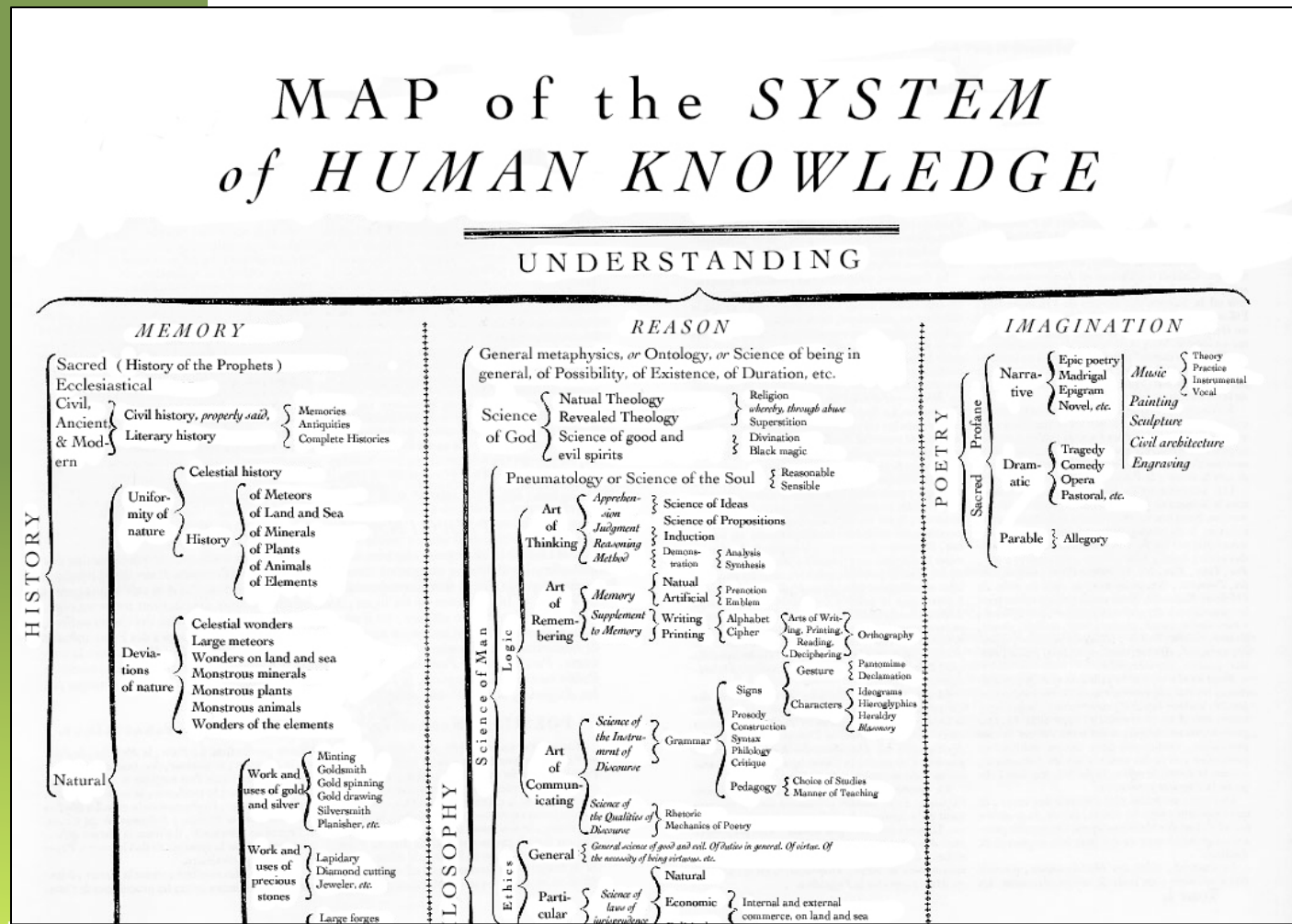
# The Tree of Bacon

## The Two Trees of Bacon



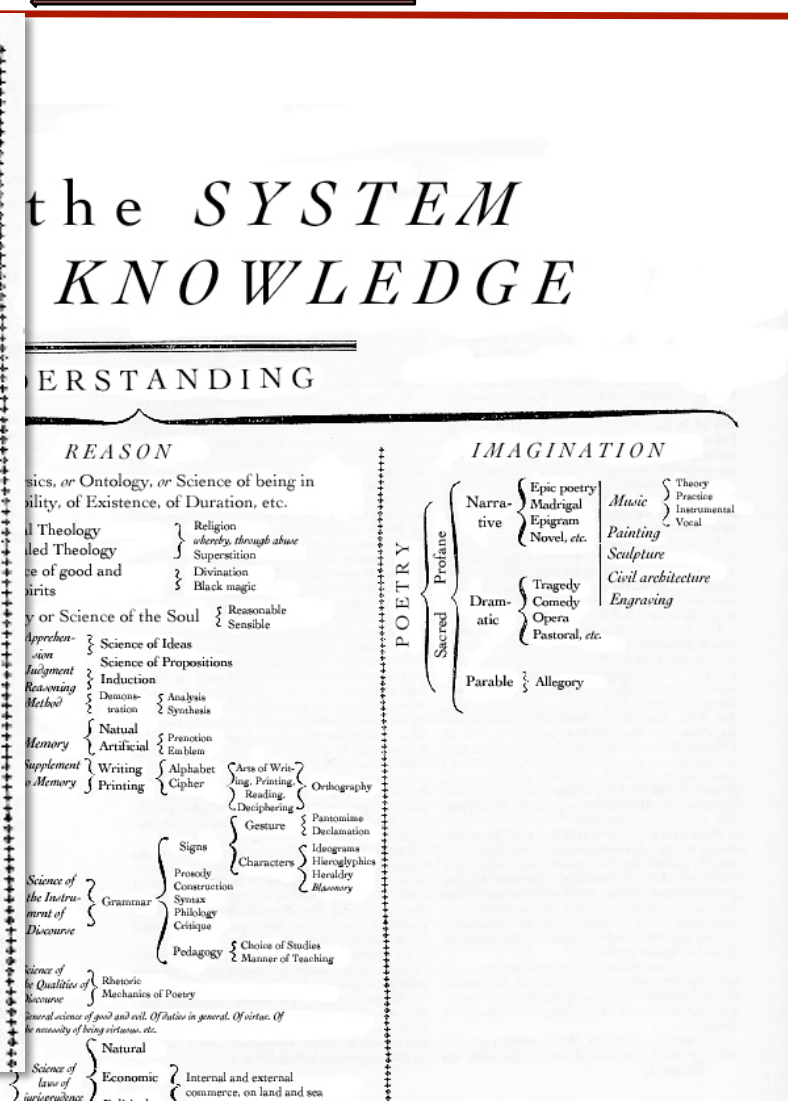
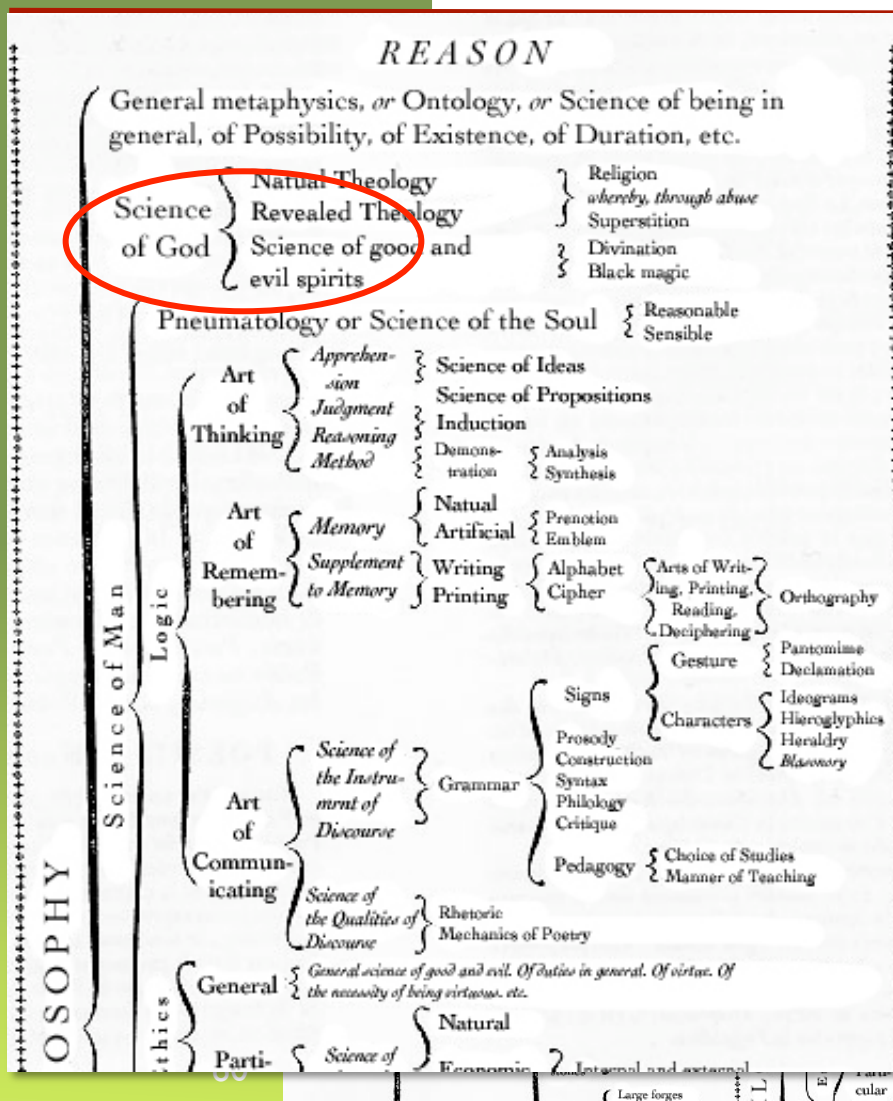


# The Tree of Diderot & D'Alembert





# The Tree of Diderot & D'Alembert



# 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.

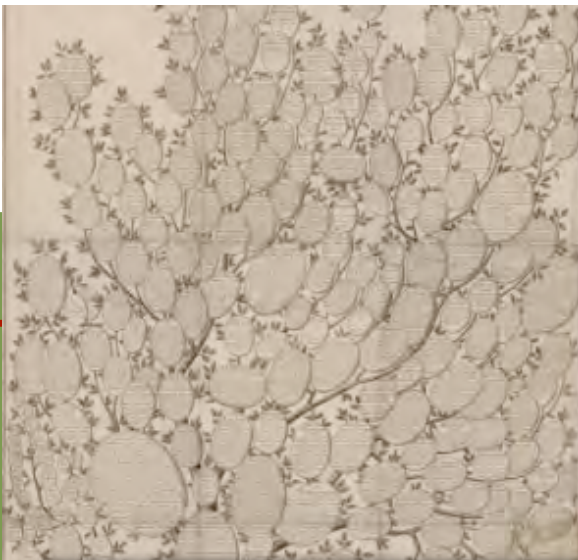
Orthography.

Art of printing

Art of deciphering

Art of writing

Art of reading



## Science de l'Homme



Recher

<http://goo.gl/a8FMf>

## Art of reading



# Material Representations of Knowledge

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# Material Representations of Knowledge, 1

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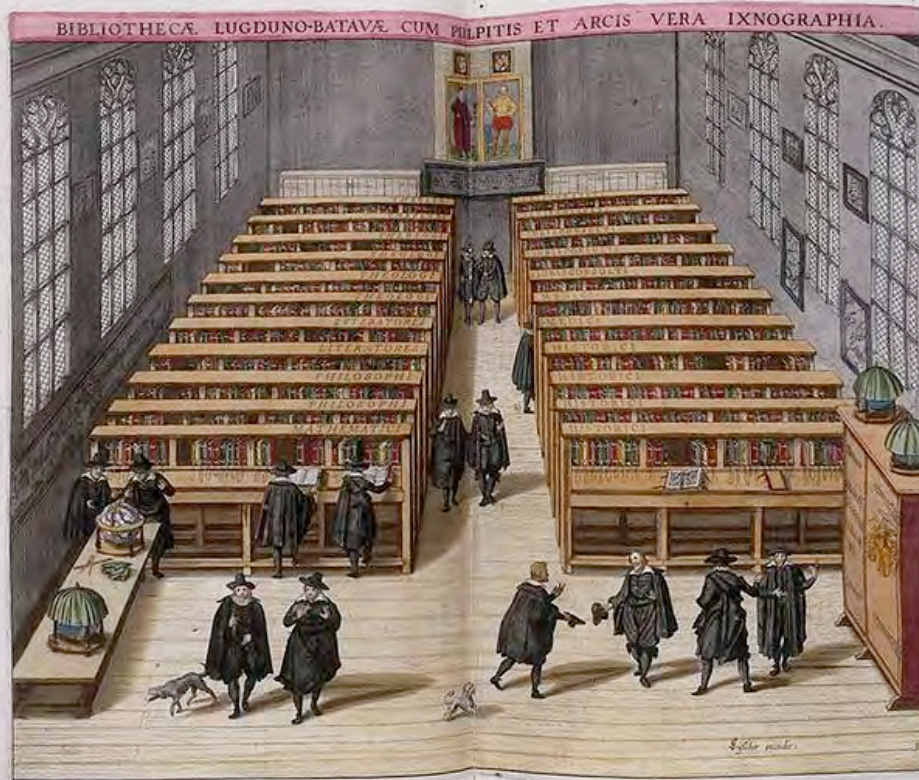
## Knowledge and the role of the "trésor"

Libraries, anthologies, dictionaries, in a word "treasuries" [trésors], alongside of encyclopedic collections, delimit a vast territory on which are cast the signs required for knowledge, the expression of identities, and communication among the members of the group.

-Alain Rey, "Les trésors de la langue,"  
1986



# Material Representations of Knowledge

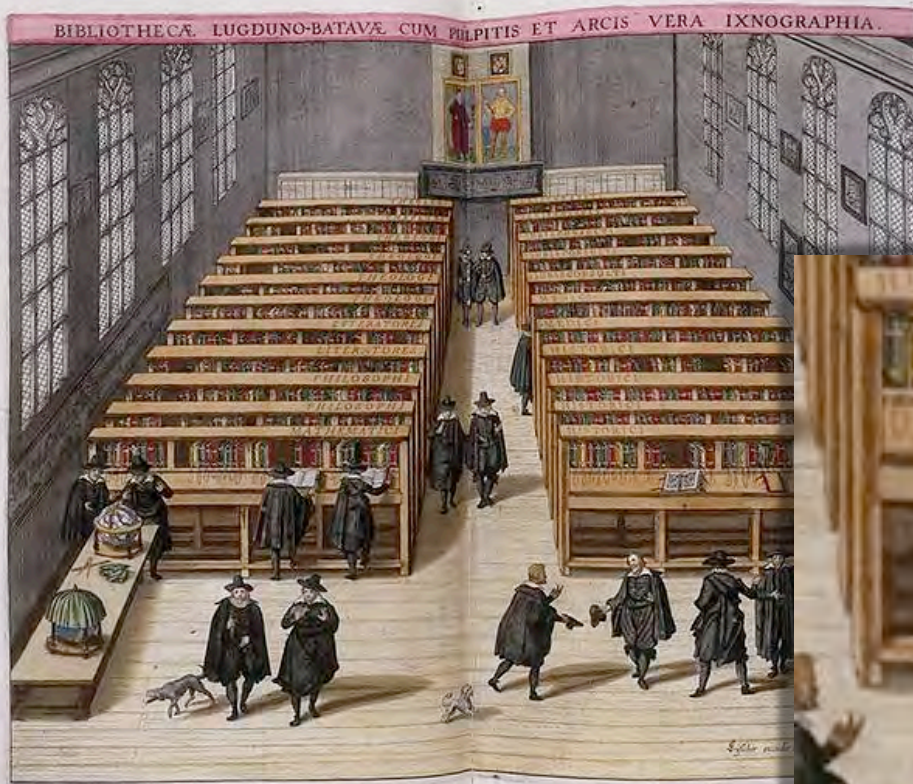


Curriculum mirrored in  
form of library  
(bibliographies)



# Material Representations of Knowledge

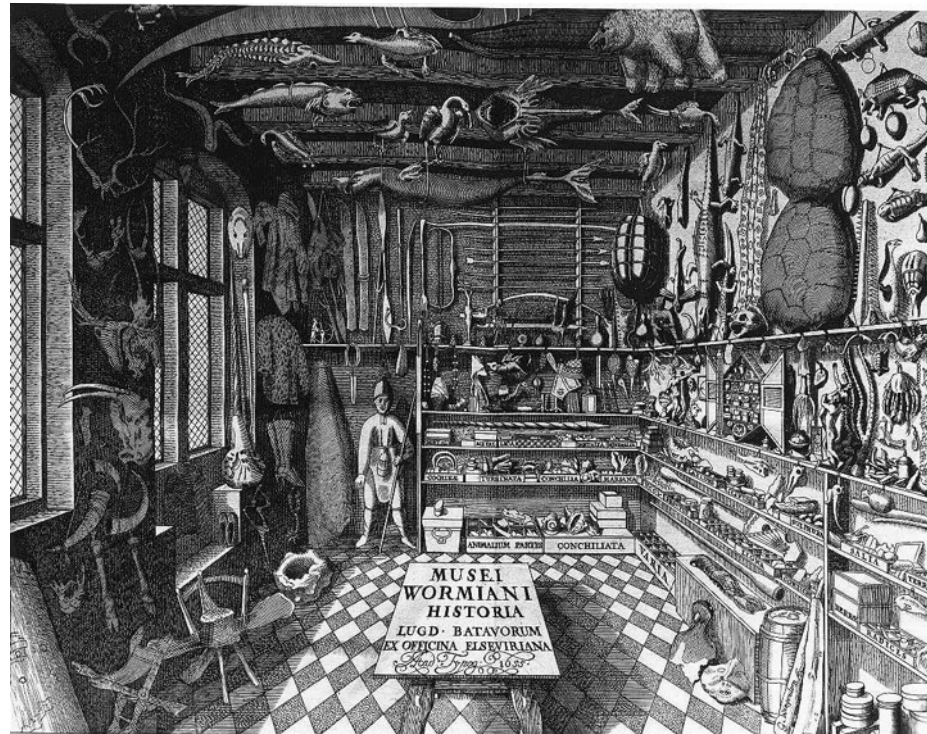
Curriculum mirrored in form of library (bibliographies)





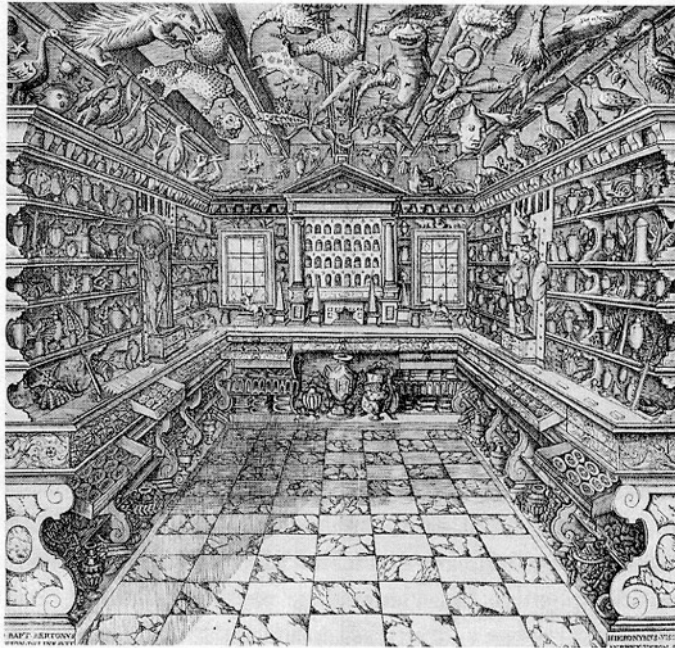
# Representations of Knowledge: The Kunstkammer

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





# The Kunstkammer & Wunderkammer



Kunst- und Wunderkammer of Emperor Rudolf II, ca 1610



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

The Kunstschränk (art cabinet or art shrine)





# Representations of Knowledge: The Kunstschränk



French Reliquary, 1330



Presentation of the Pomeranian Kunstschränk, Anton Mozart 1615



# From Cabinets to Museums

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.  
Uffizi Gallery, Florence, 1765



Belvedere Palace, Vienna, 1781

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

Montague House, home of original British Museum in Bloomsbury



## 17th c. Galleries



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



# 17th c. Galleries

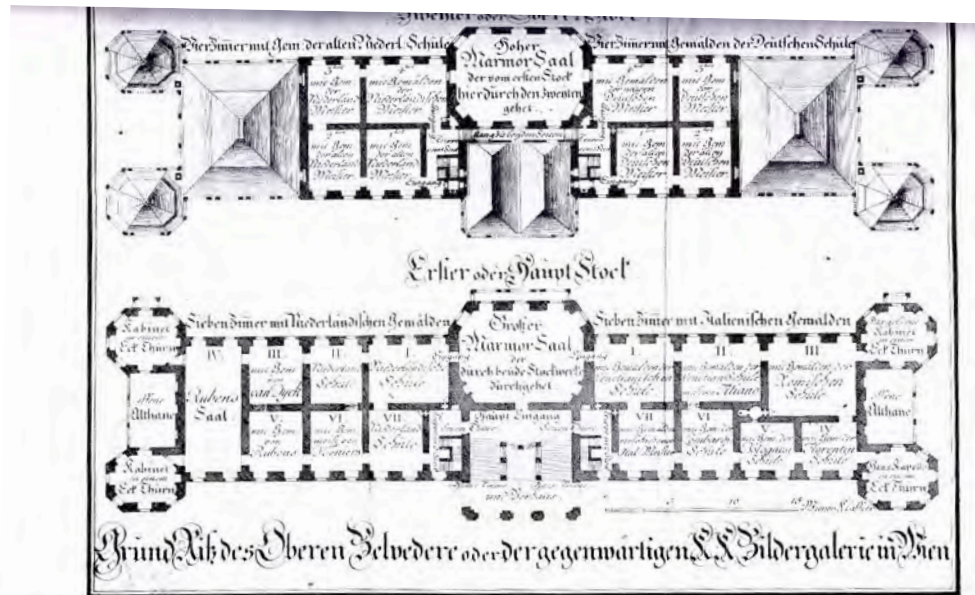


Gallery of Cornelis  
van der Geest,  
1628



# 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



# Modern Salon Style



Daumier, Salon de 1867



Walker Museum,  
Minneapolis



## Readings for 3/3

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### **Required Reading:**

Henry George, "The Western Union Telegraph Company and the California Press," San Francisco, April 21 1869. Source: bCourses

Green, Norvin. 1883. "The Government and the Telegraph, " North American Review 137: 422-434. Source: Hathi Trust  
[hyperlink (Links to an external site.)]

Hubbard, Gardiner G. 1883. "Government Control of the Telegraph, " North American Review 137: 521-534. Source: Hathi Trust

### **Additional Reading**

"Electro-Magnetic Telegraphs," H. Rpt 753 (to Accompany Bill H.R. 713) 25th Congress, 2nd Session, April 6, 1838

Alexander Graham Bell, "To the Capitalists of the Bell Telephone Company," Kensington (UK), March 25, 1878

Samuel Colt & William Robinson, "To the Public," New York, May 20, 1846



## Assignment for 3/3

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Green and Hubbard argue over whether the government or private industry is better suited to protecting communication channels from abuse. Which one has the better argument and in what ways might it be applicable to today's communication challenges?