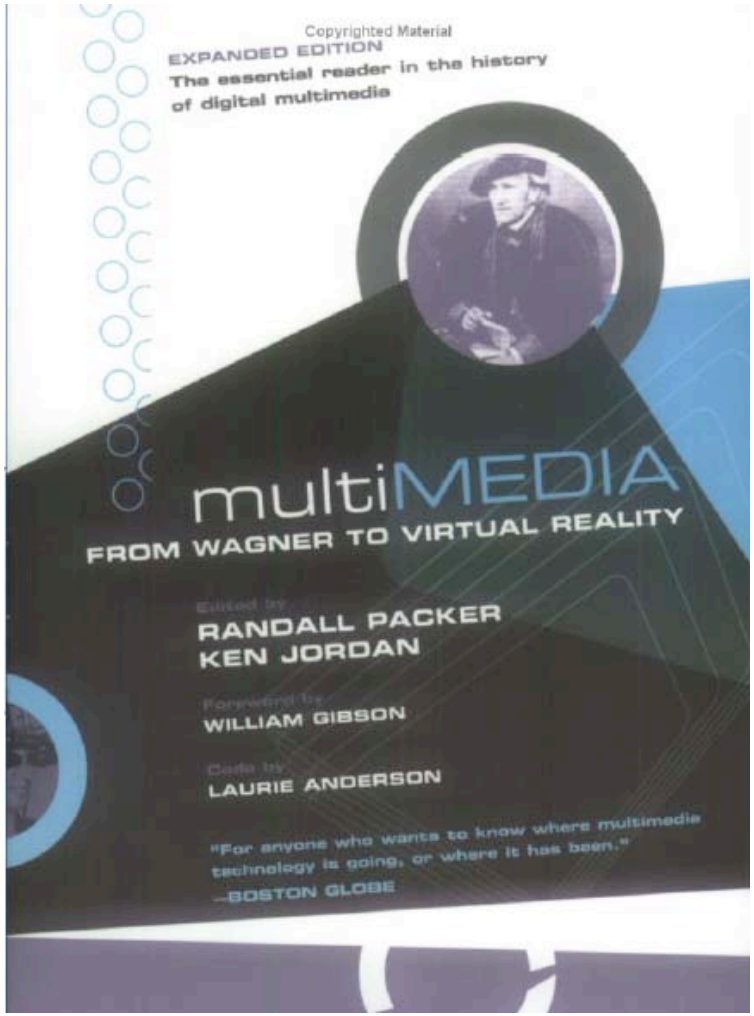
Département Informatique, CNAM

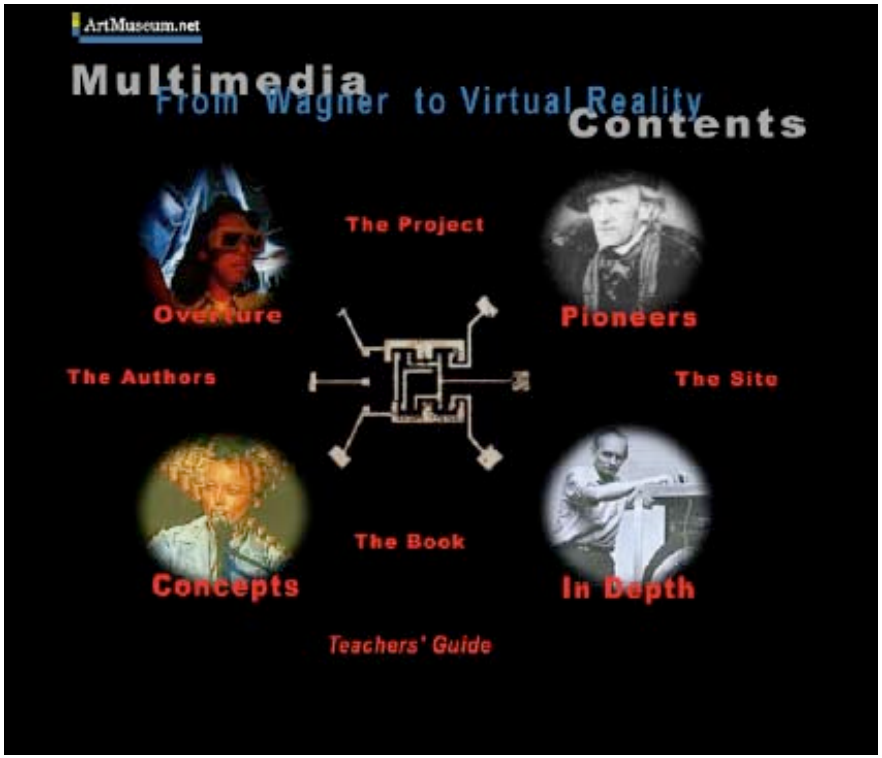
Multimédia & interaction humain-machine
2004-2005

Généralités introductives

P. Cubaud

1. Convergence des medias
2. Interactivité
3. Hypermedia
4. Immersion / simulation





http://www.artmuseum.net/w2vr/

1. Convergence des médias

le dessin
l'écrit
les machines à enregistrer
- **le livre imprimé, la bibliothèque**
- **le son, le disque**
- **la photographie**
- **le cinéma**

les télécommunications
- **télégraphe**
- **téléphone**
- **FAX**

la radiodiffusion
la télévision

⇒le numérique
- **telos**
- **stenos**
- **cryptos**

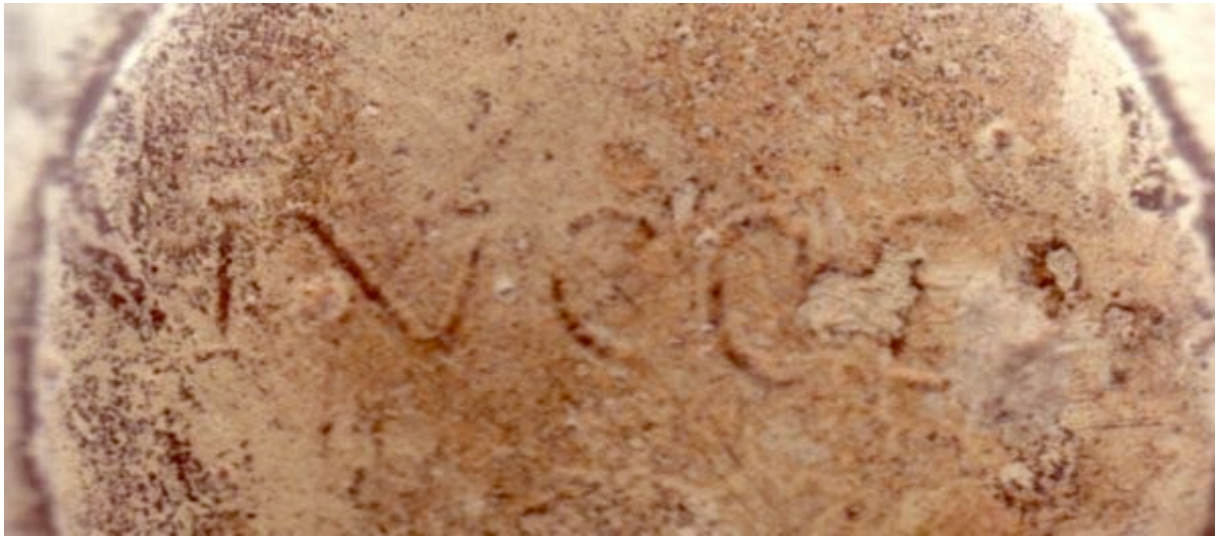
Le dessin

Lascaux -15000

L'alphabet (Byblos, -1500)

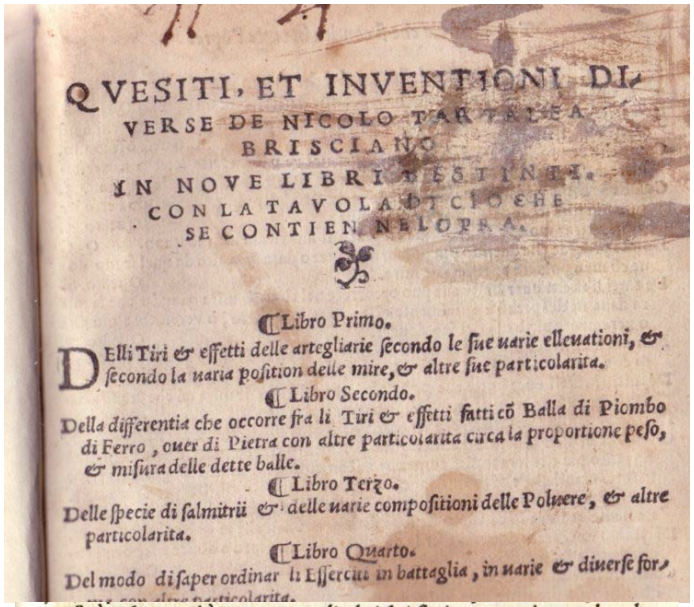
Fig. 32. — Alphabet latin archaïque

Ch. HIGOUNET. L'écriture. Que-sais-je n°653, 10ème ed., 1997. (p. 71)



Les supports flexibles

Exposition "Les 3 révolutions du livre" Musée des Arts & Métiers, Nov. 2002
http://livre.museum.cnam.fr



QVESITI, ET INVENTIONI DI-
VERSE DE NICOLO TARTALEA
BRISCIANO
IN NOVE LIBRI DESTINTI.
CON LA TAVOLA DI CIOCHE
SE CONTIEN NELOPERA.

¶ Libro Primo.

DElli Tiri & effetti delle artegliarie secondo le sue uarie elleuationi, & secondo la uaria position delle mire, & altre sue particolarita.

¶ Libro Secondo.

Della differentia che occorre fra li Tiri & effetti fatti cõ Balla di Piombo di Ferro, ouer di Pietra con altre particolarita circa la proportione peso, & misura delle dette balle.

¶ Libro Terzo.

Delle specie di salmitrii & delle uarie compositioni delle Polnere, & altre particolarita.

¶ Libro Quarto.

Del modo di saper ordinar li Esserciti in battaglia, in uarie & diuerse for-

censo è cubo equal à numero con li altri dui suoi compagni quando, che melli mandareti, hor su ui uoglio lassare compare, gionto che sia in Inghelsterra ue scriuero. NICO. Andati messer compare che Iddio ue dia el bon uiazzo, & ui prego che me scriuati subito che ui sete agionto, come haueti detto. M. RICAR. Faro senza fallo.

Fine delli, quesiti & inuentioni diuerse de Nicolo Tartalea Brisciano.

REGISTRO DI TVTTA L'OPERA.

A B C D E F G H I K L M N O P Q R S T V X Y Z.

AA BB CC DD EE FF GG HH II KK.

Tutti sono Duerni.

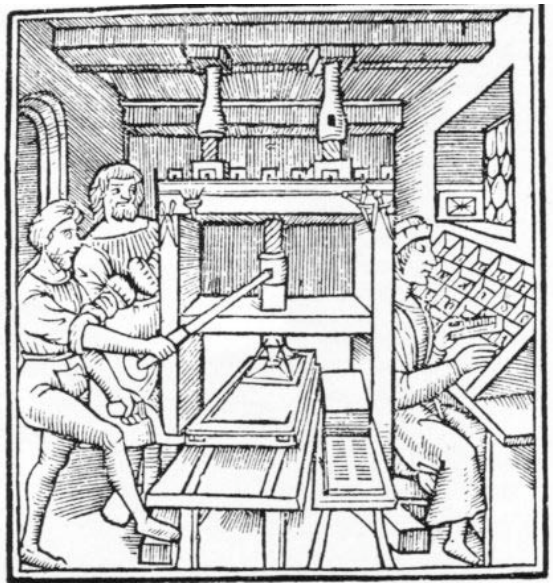
Stampata in Venetia per Venturino Ruffinelli ad instantia et requisitione, & à proprie spese de Nicolo Tartalea Brisciano Autore. Nel mese di Luio L'anno di nostra salute. M. D. X L V I.

A gauche : première page (incipit) A droite : dernière page (colophon)

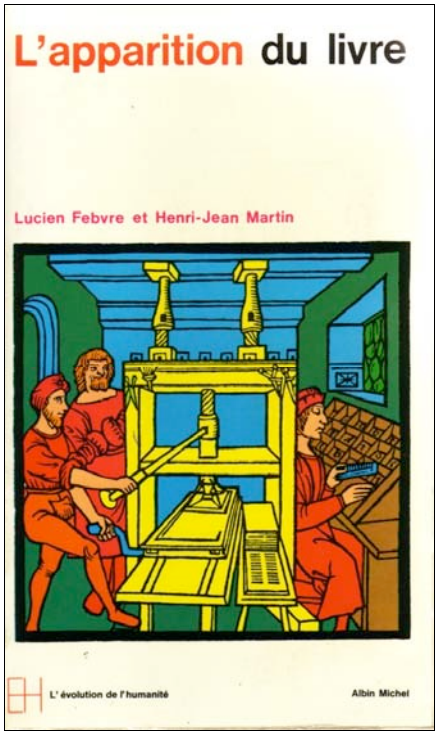
N. TARTAGLIA. Quesiti, et inventiono diverse. Venise, 1546 (coll. de l'auteur)

L'imprimerie (ca. 1450)

Presse typographique à deux coups, 1529

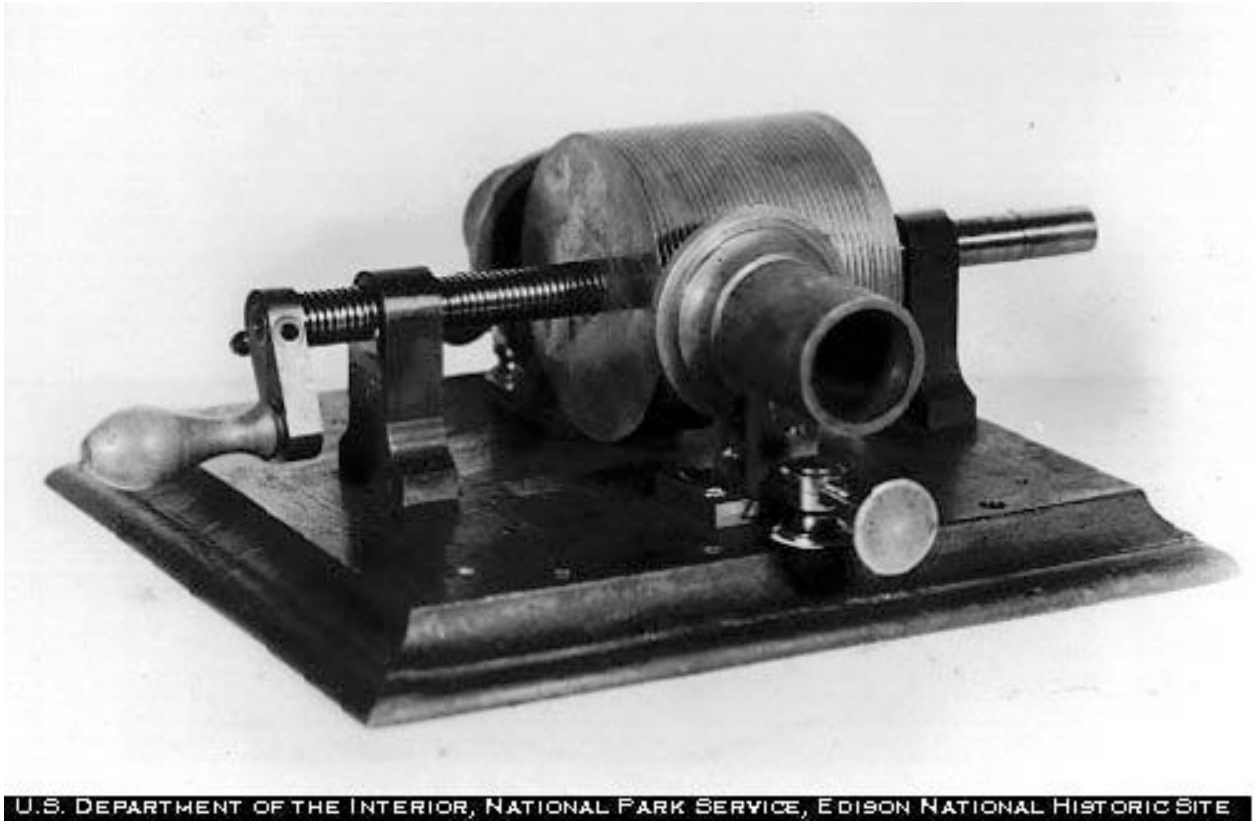


M. AUDIN. Histoire de l'imprimerie - Radioscopie d'une ère : de Gutenberg à l'informatique. Picard, 1970 (p. 100)



1877 : Ch. Cros et Th. Edison
le disque

Charles Cros par Nadar

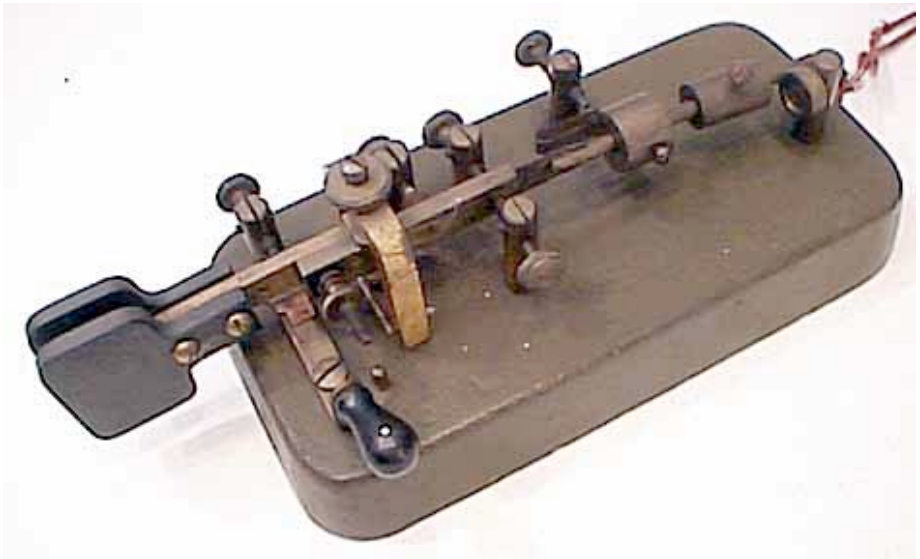


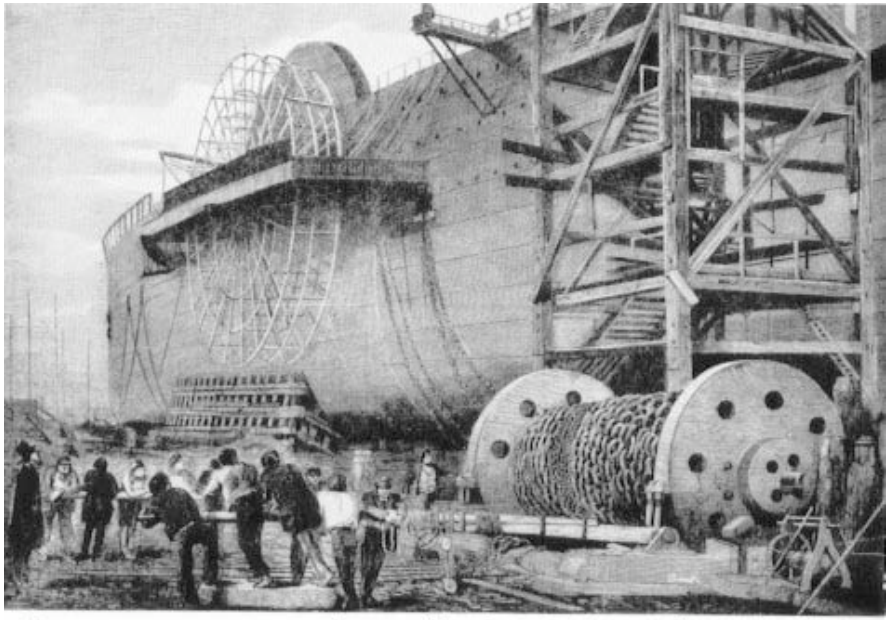
U.S. Department of the Interior, National Park Service, Edison National Historic Site

1839 - DAGUERRE - Le Daguerréotype

1895 - Auguste et Louis LUMIERE (Lyon)- Le cinématographe

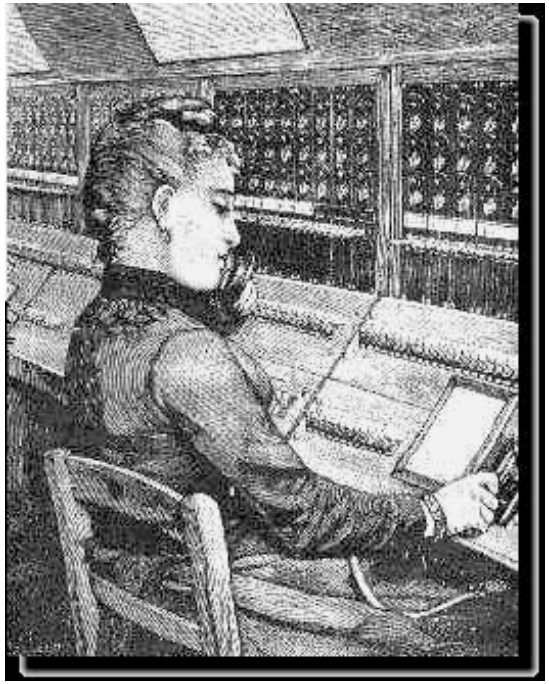
Télégraphe

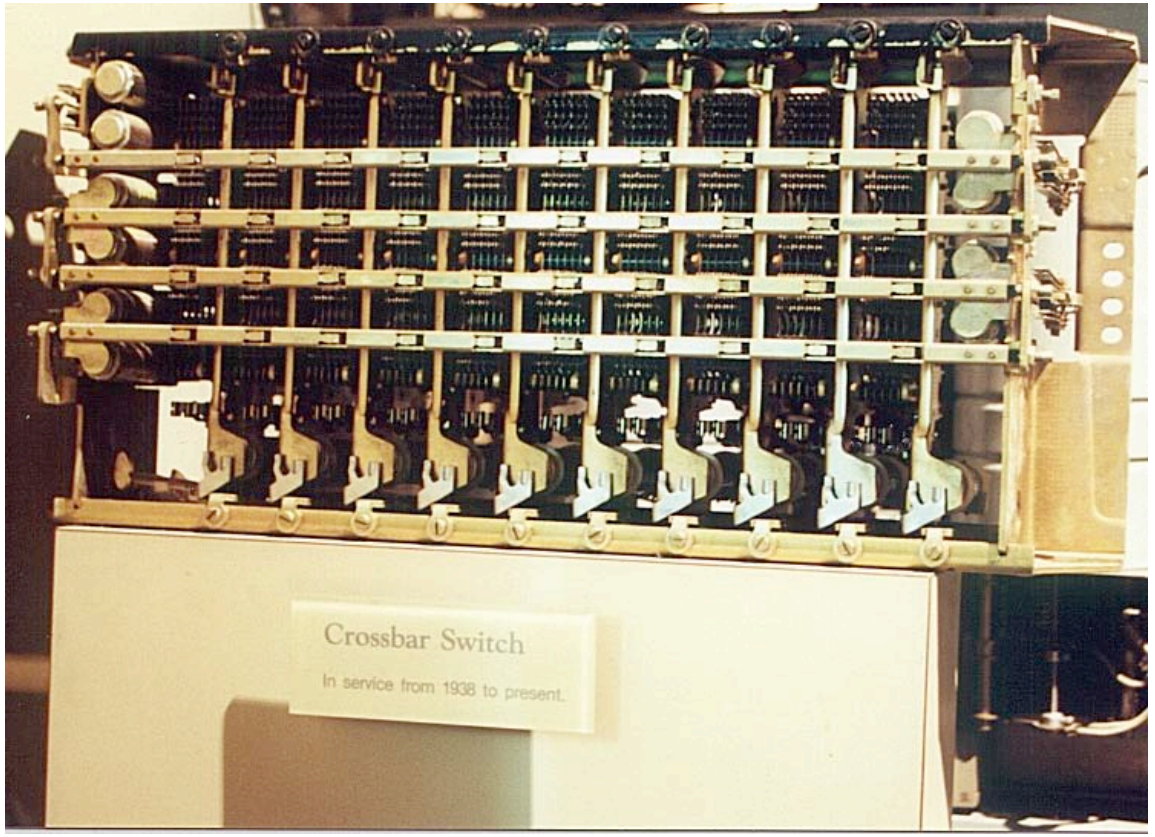




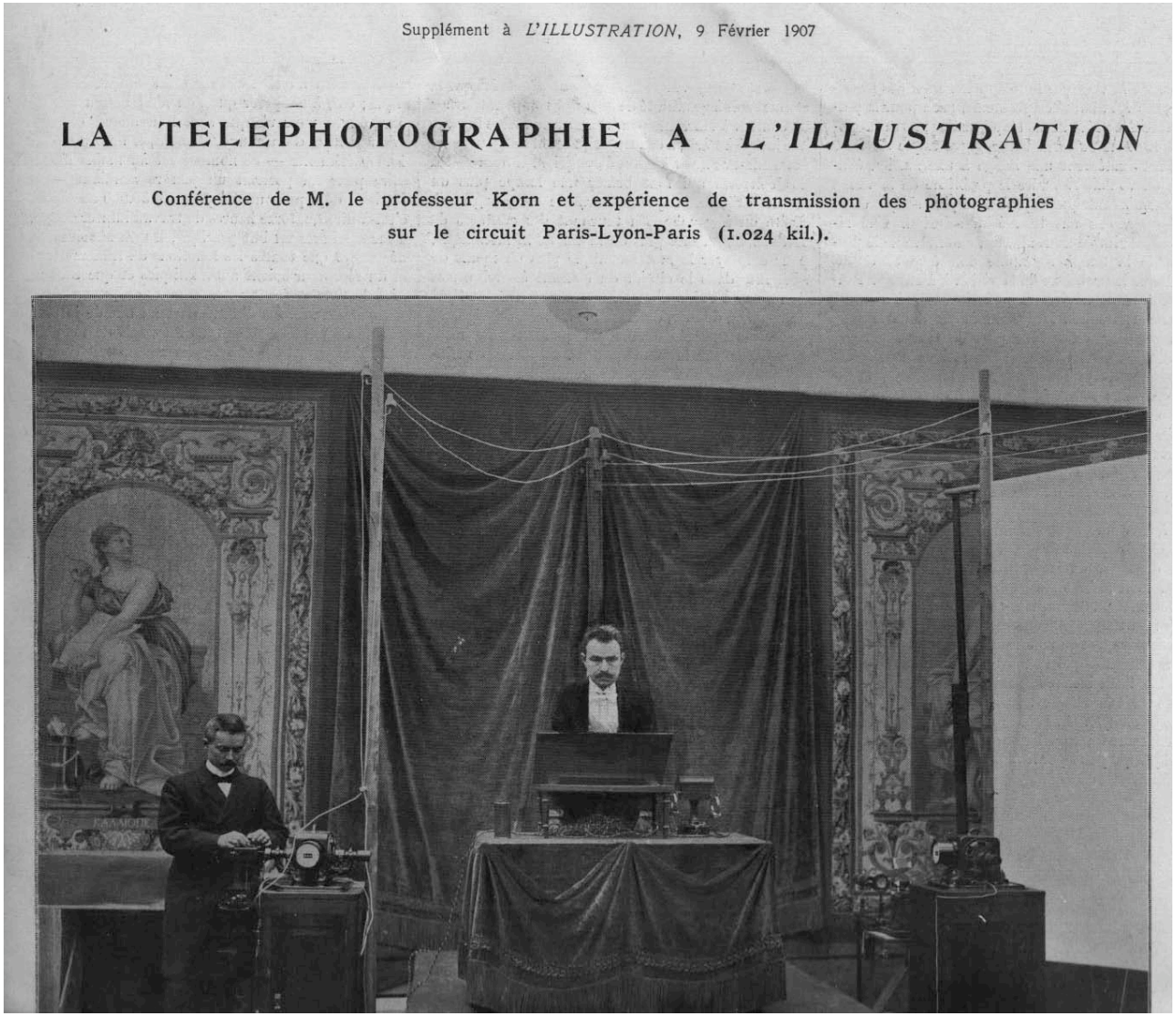
Contemporary newspaper picture of the Great Eastern under construction

Téléphone





1904 - La télécopie



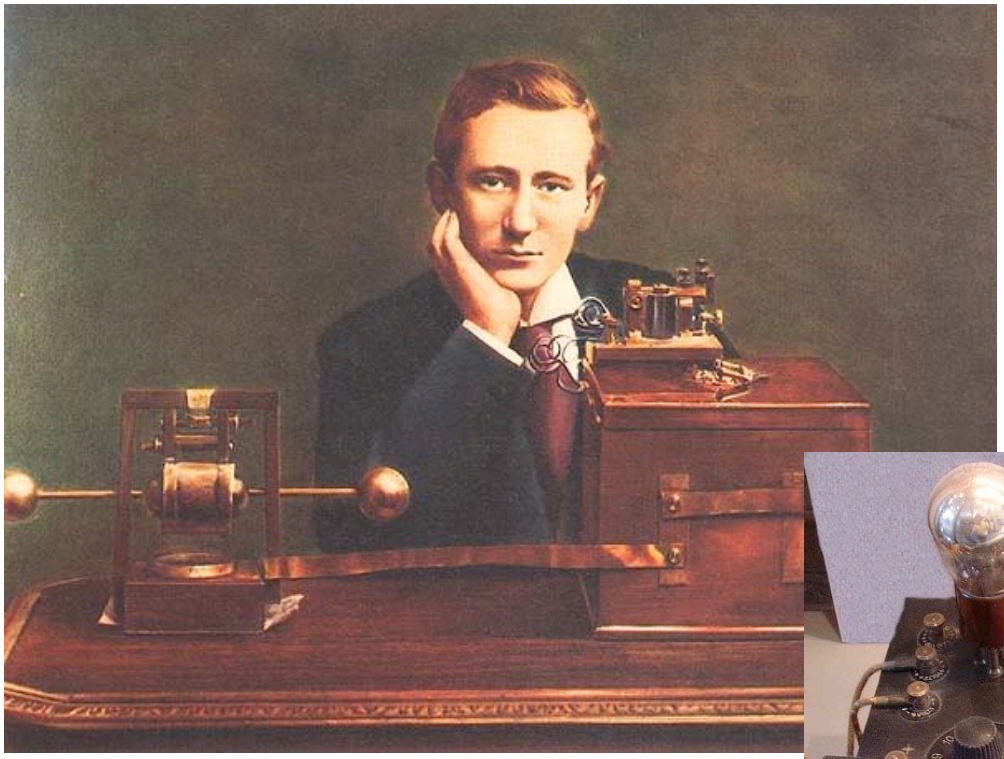
Supplément à *L'ILLUSTRATION*, 9 Février 1907

LA TELEPHOTOGRAPHIE A *L'ILLUSTRATION*

Conférence de M. le professeur Korn et expérience de transmission des photographies sur le circuit Paris-Lyon-Paris (1.024 kil.).

12 minutes, 13x24 cm, 2 lignes/mm

la radio



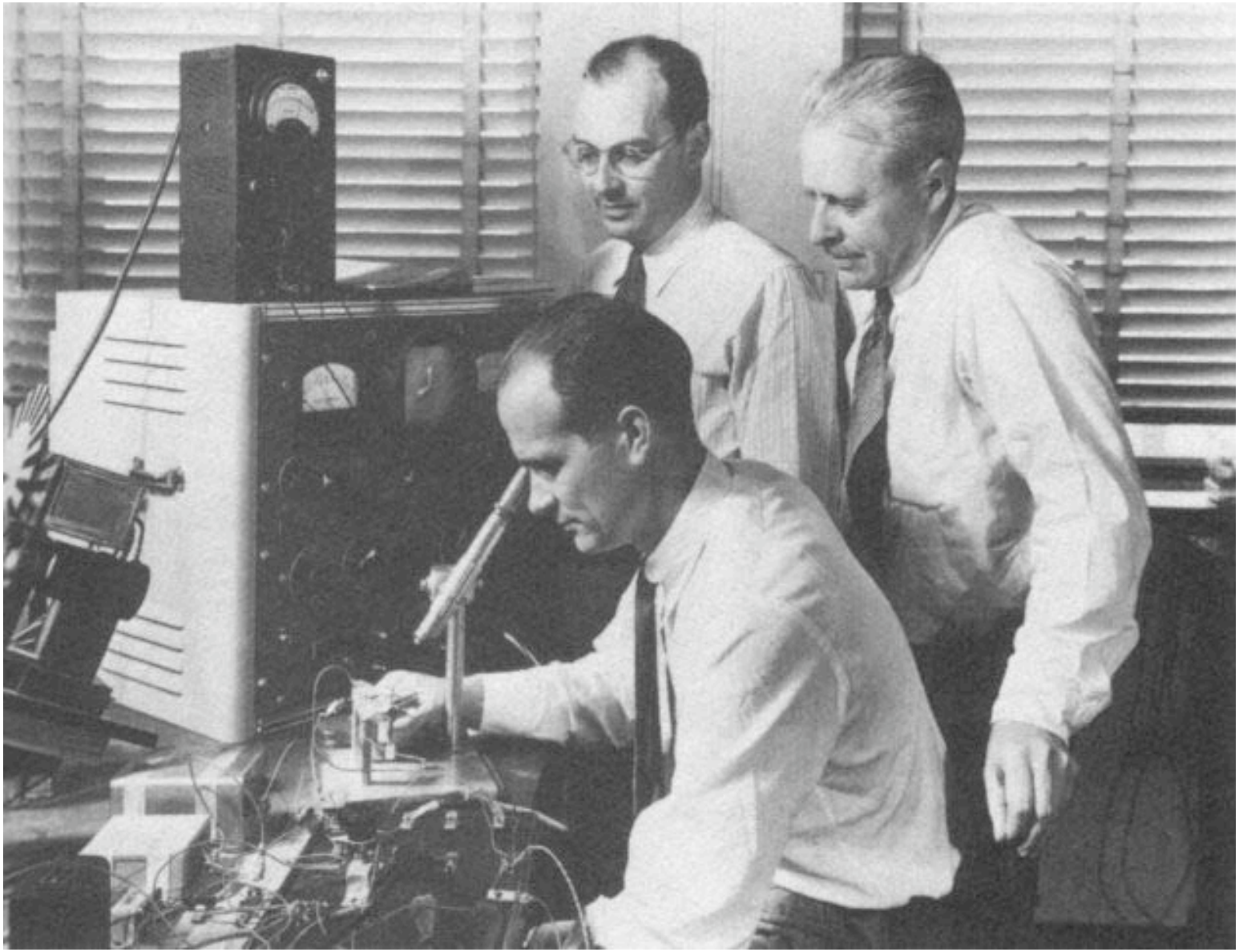
La télévision

1946 - RCA - Modèle 630TS (écran de 10 pouces)

l’informatique

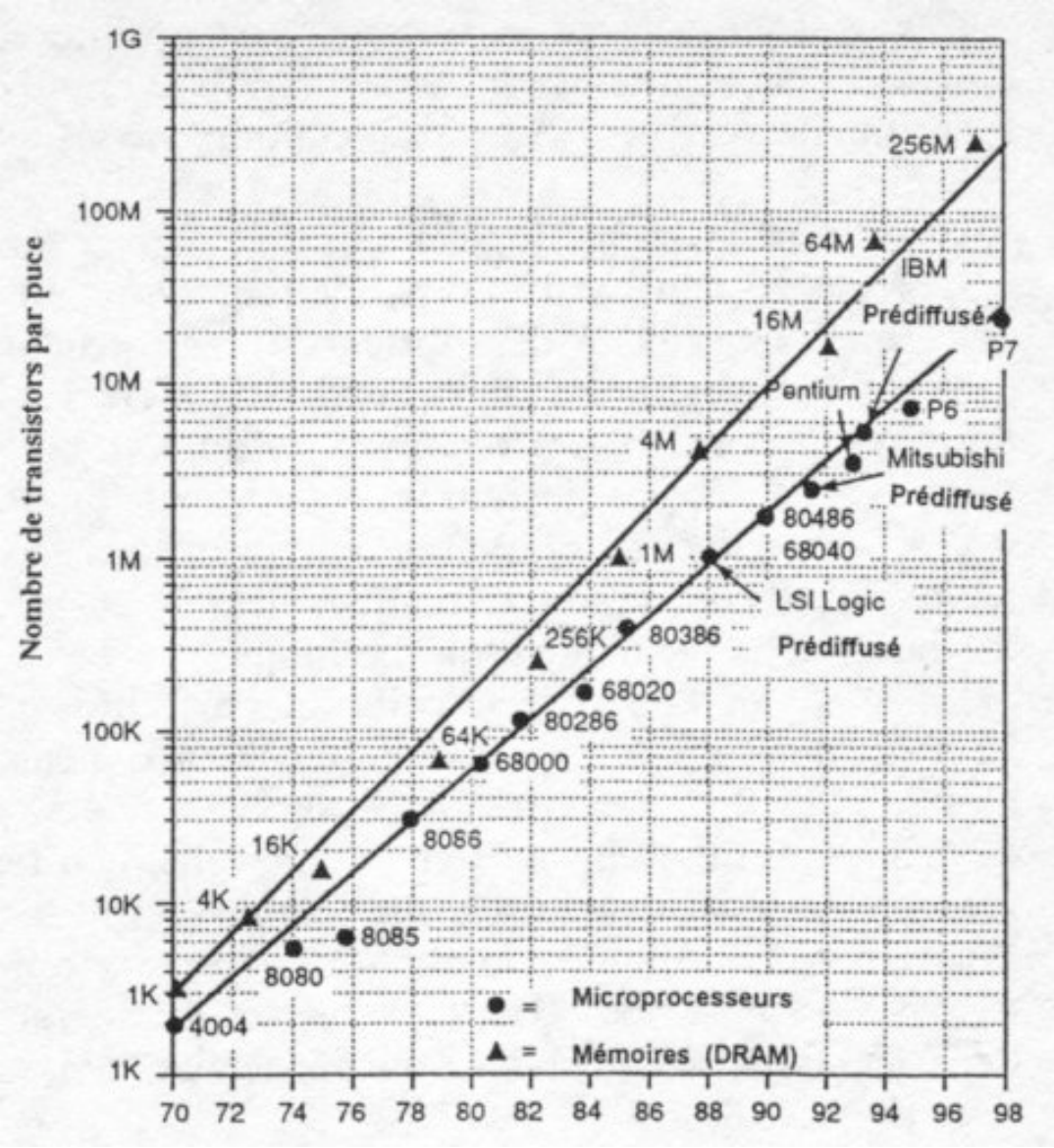
Electronic Numerical Integrator And Computer

Cadencé par une horloge à 0.1 MHz
Addition : 0.2 ms
Multiplication : 3 ms
Division : 30 ms
20 cases mémoires de 10 chiffres
18000 tubes
70000 résistances, 10000 condensateurs, 6000 interupteurs
Consommation de 140 KW
35 m de long, 3 m de haut, 12 cm de profondeur, 30 tonnes



Shockley (assis), Bardeen (gauche) et Brattain (droite) - Bell Labs, Murray Hill, , New Jersey (1947)

La « loi » de Gordon Moore



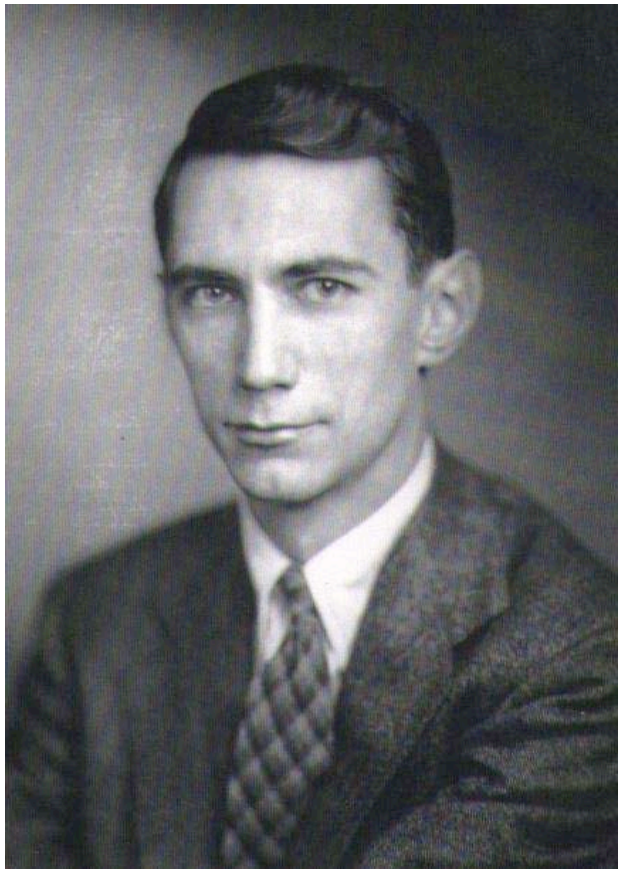
Densité mémoire : x 1.5 / an

Densité microprocesseur : x 1.35 / an

Date	Finesse gravure	Nbre transistors	Surface puce	Nbre E/S
1998	0.25 µm	256 M	320 mm2	1500
2001	0.18	1 G	500	2000
2004	0.12	4 G	1000	3500

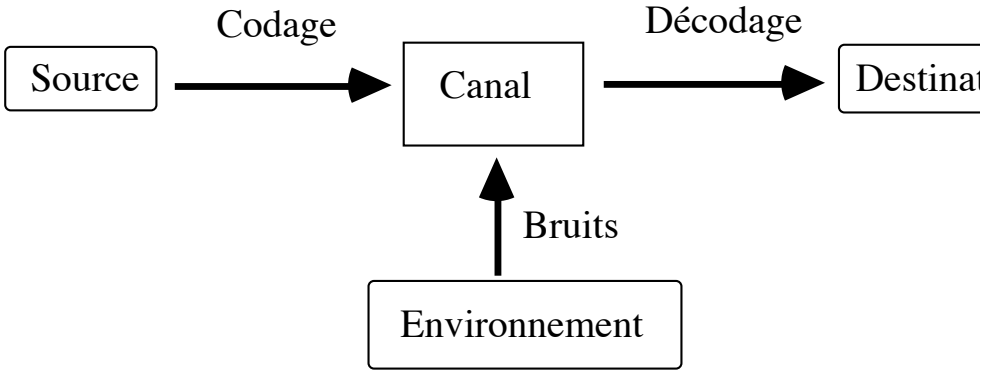
J-P. DAUVIN et al.
Les composants électroniques et leur industrie. Que-sais-je n°1080, 1995.

telos : la transmission (sans perte)



http://www.research.att.com/~njas/doc/shannon.html

Modèle de Shannon pour la communication :

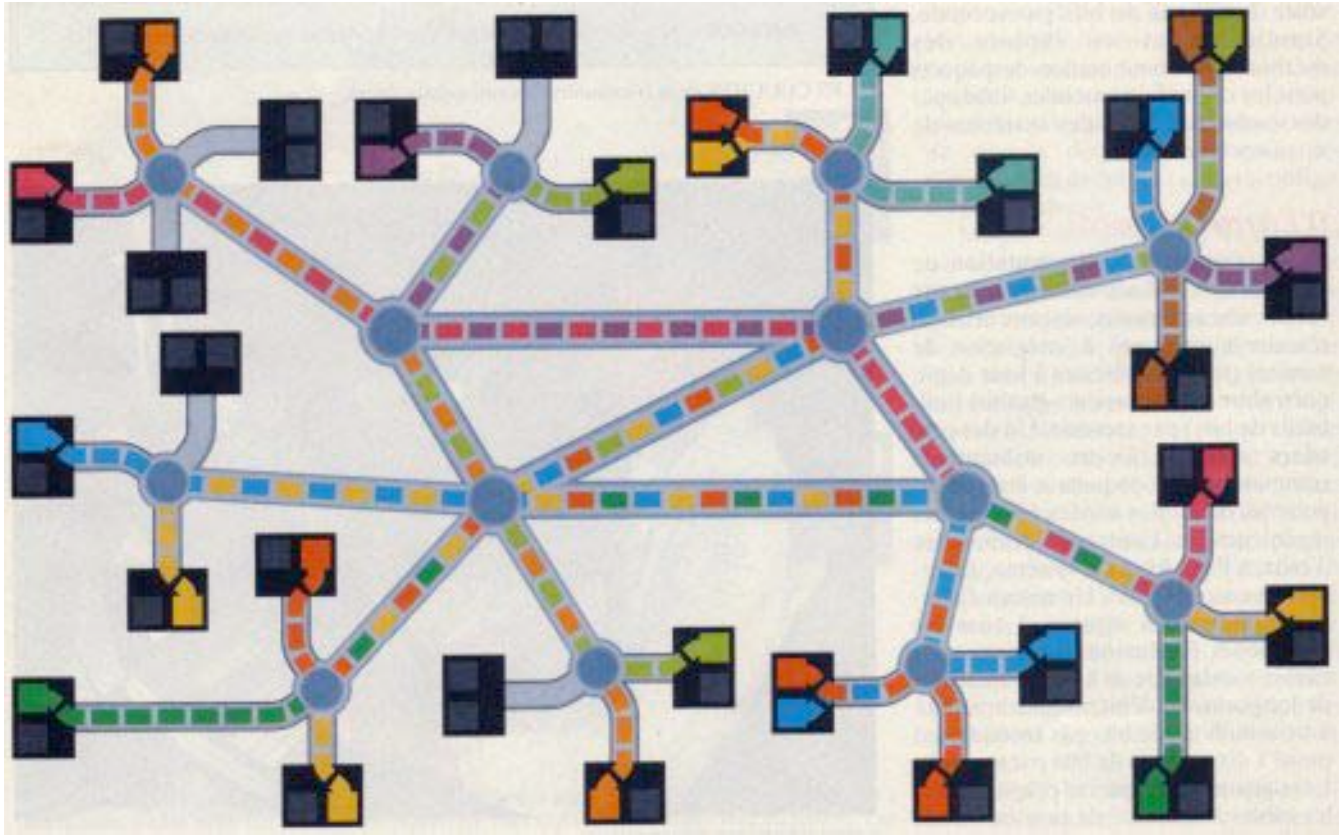


=> théorème de Shannon

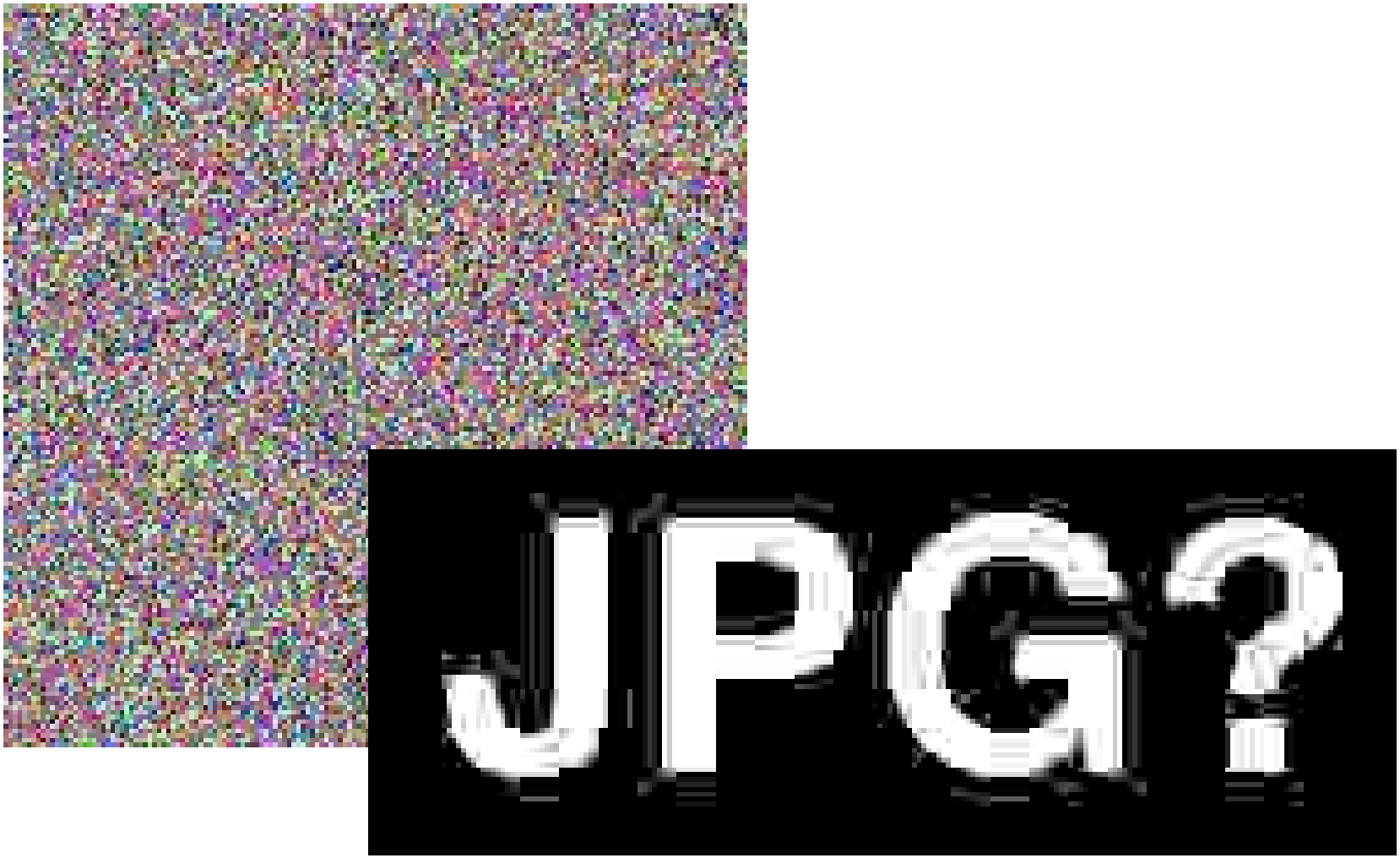
$$C = B \cdot \log(1 + S/N)$$

P. Baran. Commutation par paquets (1965)

l'information de routage est contenu dans les paquets et ne provient pas de circuits extérieurs



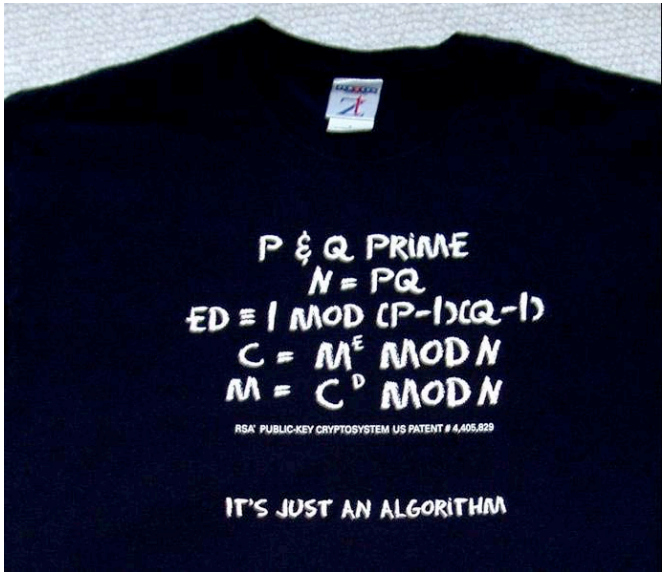
stenos : la compression



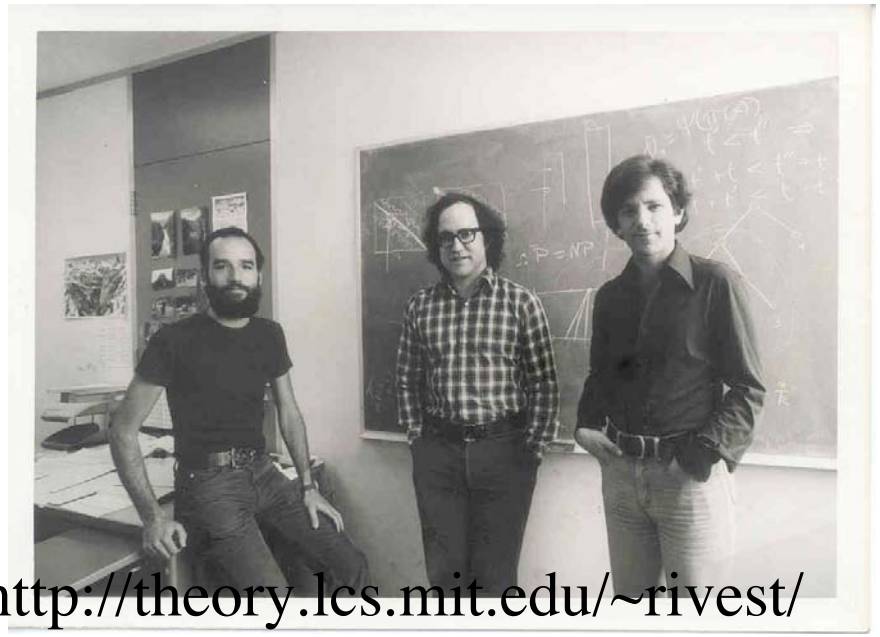
cryptos

1976 : Diffie & Hellman

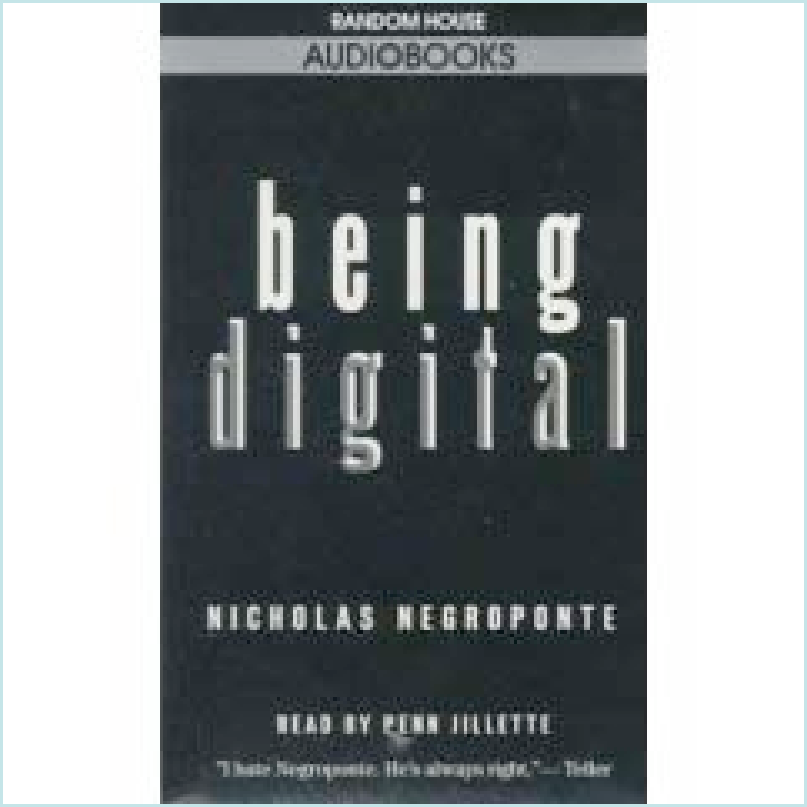
1978 : R.S.A.

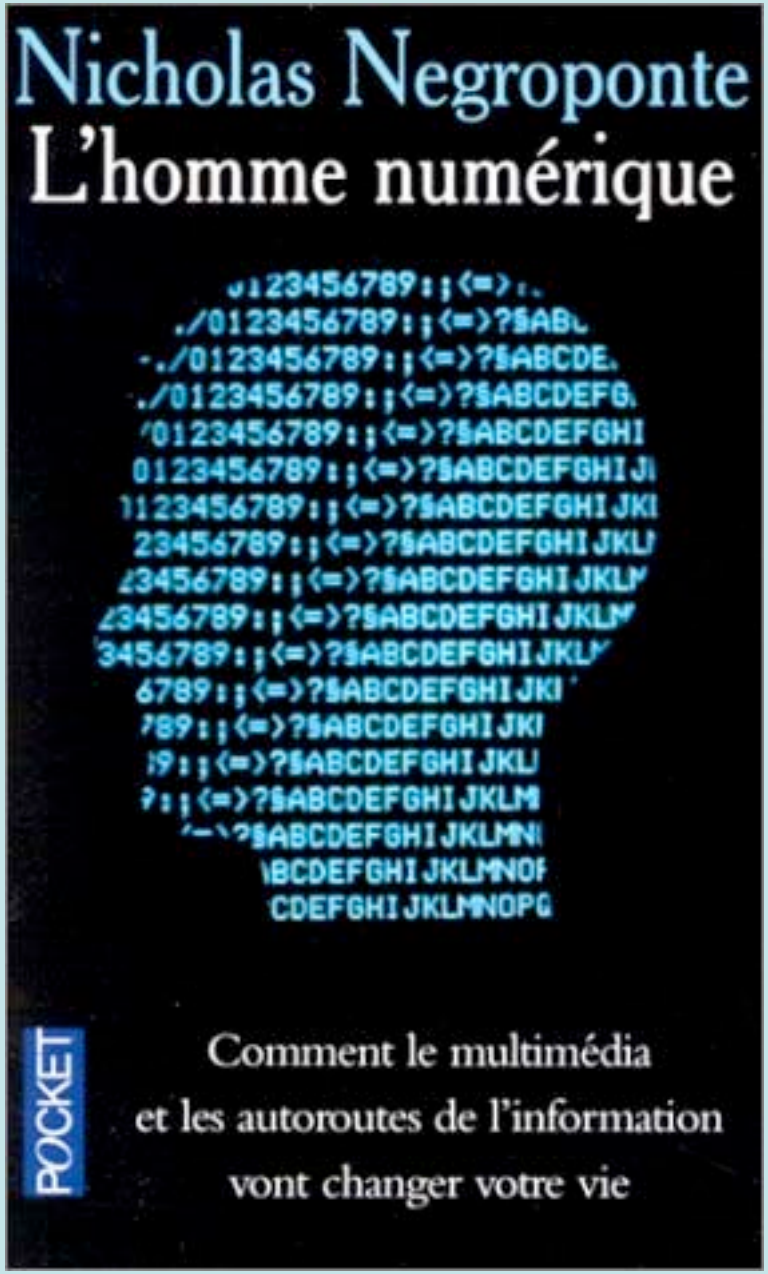


http://w1tp.com/enigma/



http://theory.lcs.mit.edu/~rivest/

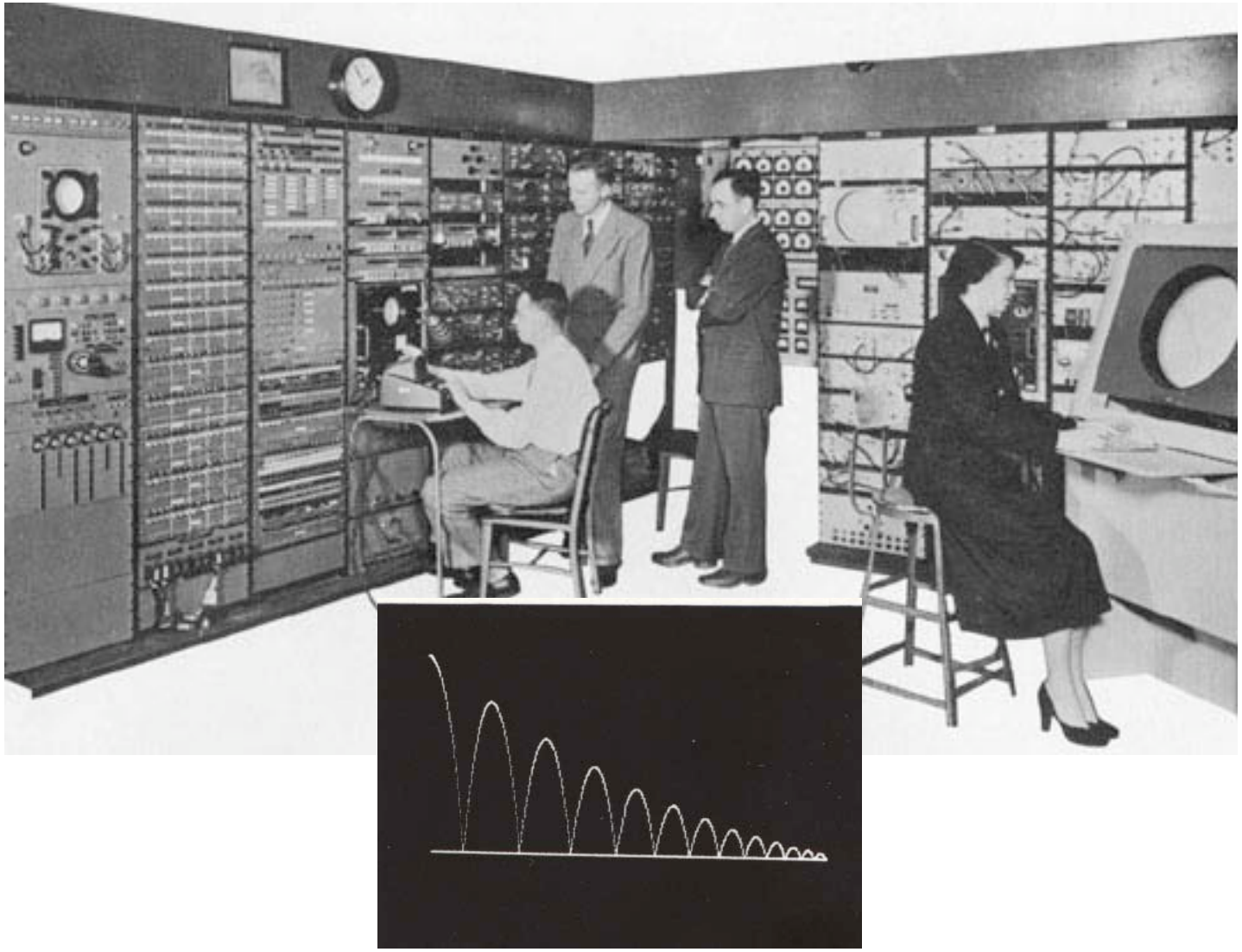

RANDOM HOUSE
AUDIOBOOKS
being digital
NICHOLAS NEGROPONTE
READ BY PENN JILLETTE


Nicholas Negroponte
L'homme numérique
POCKET
Comment le multimédia
et les autoroutes de l'information
vont changer votre vie

2. Interactivité

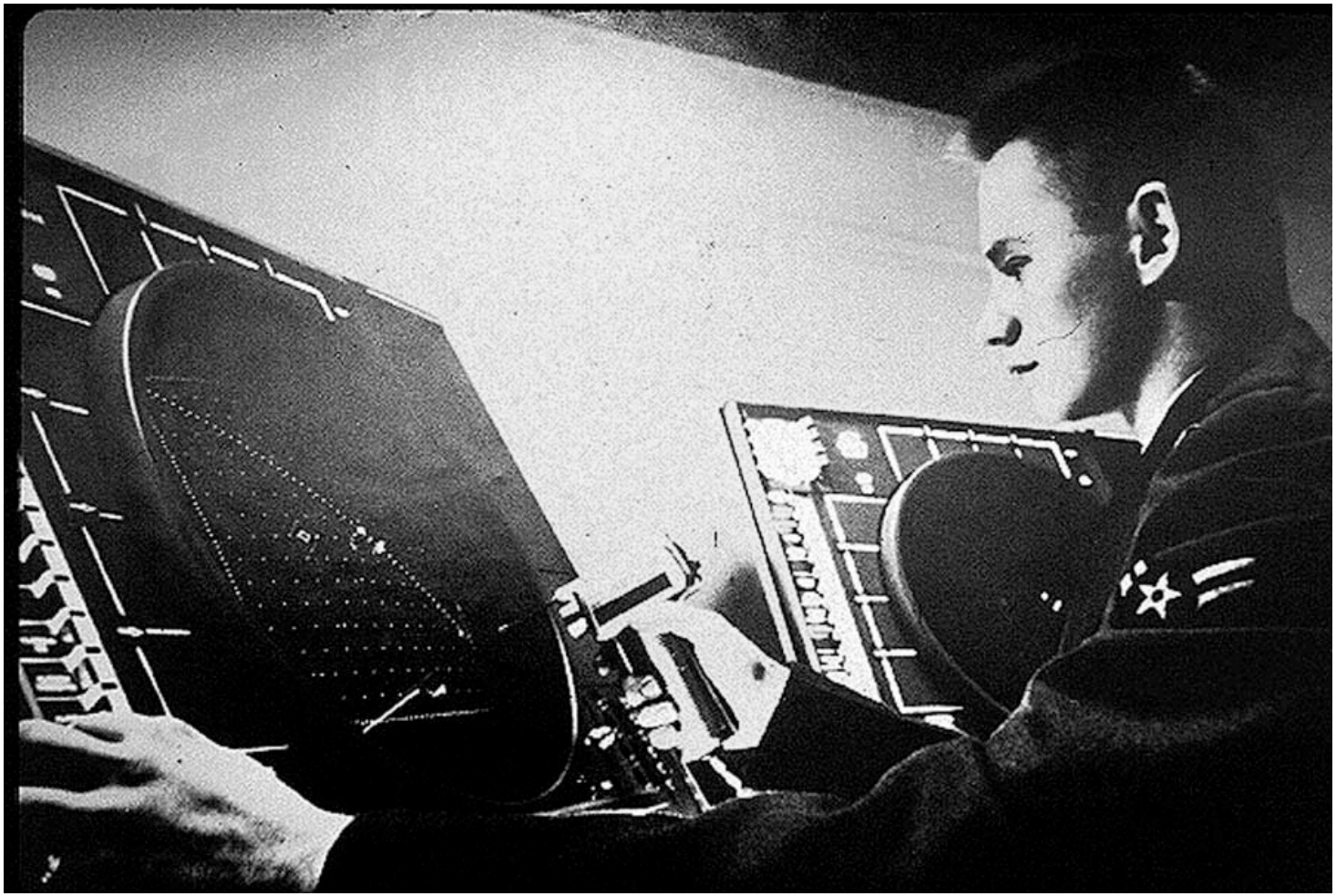
en MM le contenu dépend du lecteur

- **(le livre à système)**
- **(1000 milliards de poëmes)**
- **le time sharing**
- **la station individuelle : Licklider**
- **l'augmentation : Engelbardt**
- **Alto**
- **les GUIs WIMP**
- **le collaboratif : ex xerox**
- **le tel. portable**
- **rea. augmentée ?**
- **le post WIMP ?**



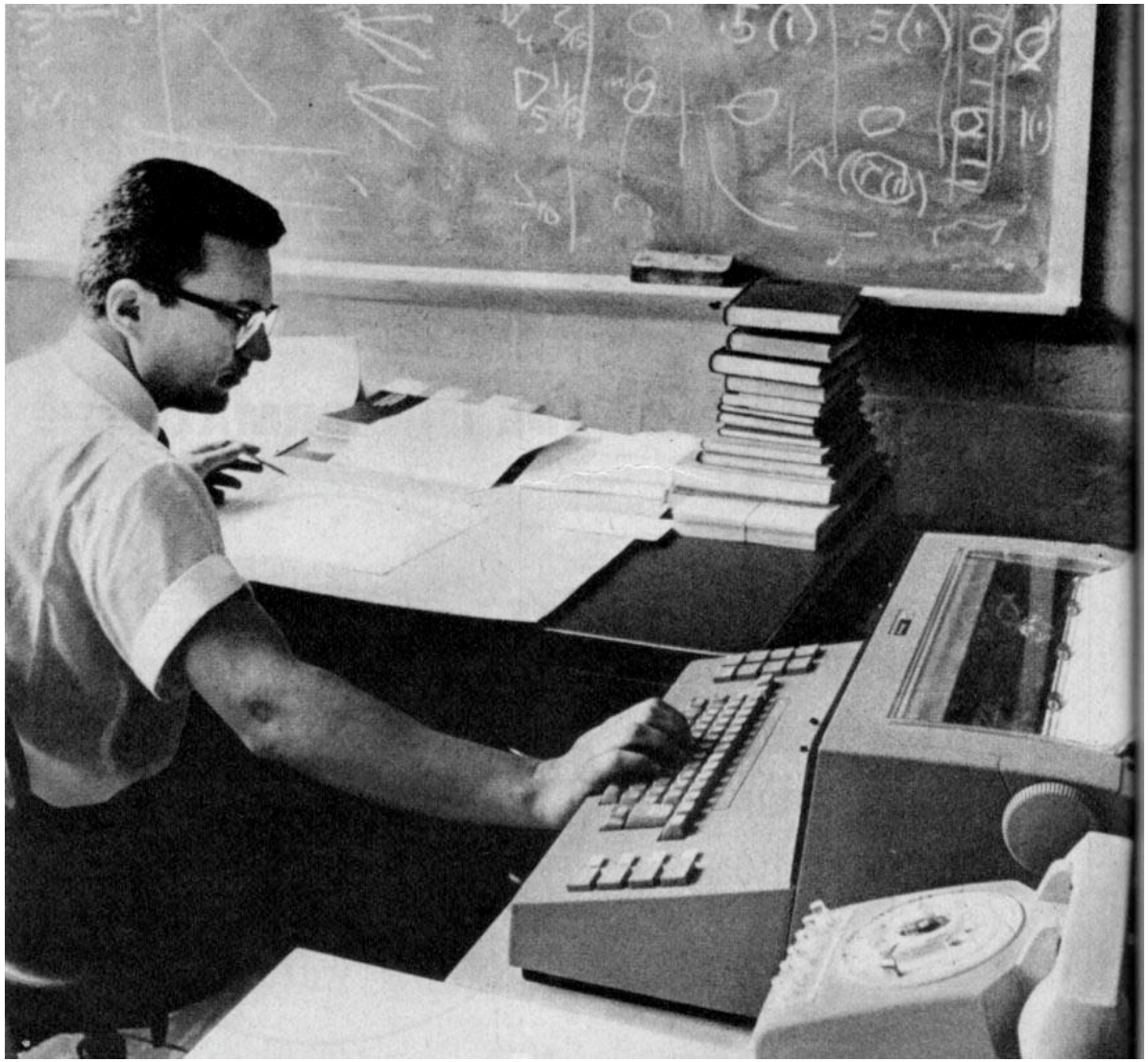
1949-51 - Projet WHIRLWIND

Le système SAGE et le temps réel (1950)



1961 - Yvan SUTHERLAND (MIT) - Sketchpad sur TX2
en 1h, un pavage de 900 hexagones = 2j dessin prof.

Le temps partagé (time sharing) : MIT, 1959-1964

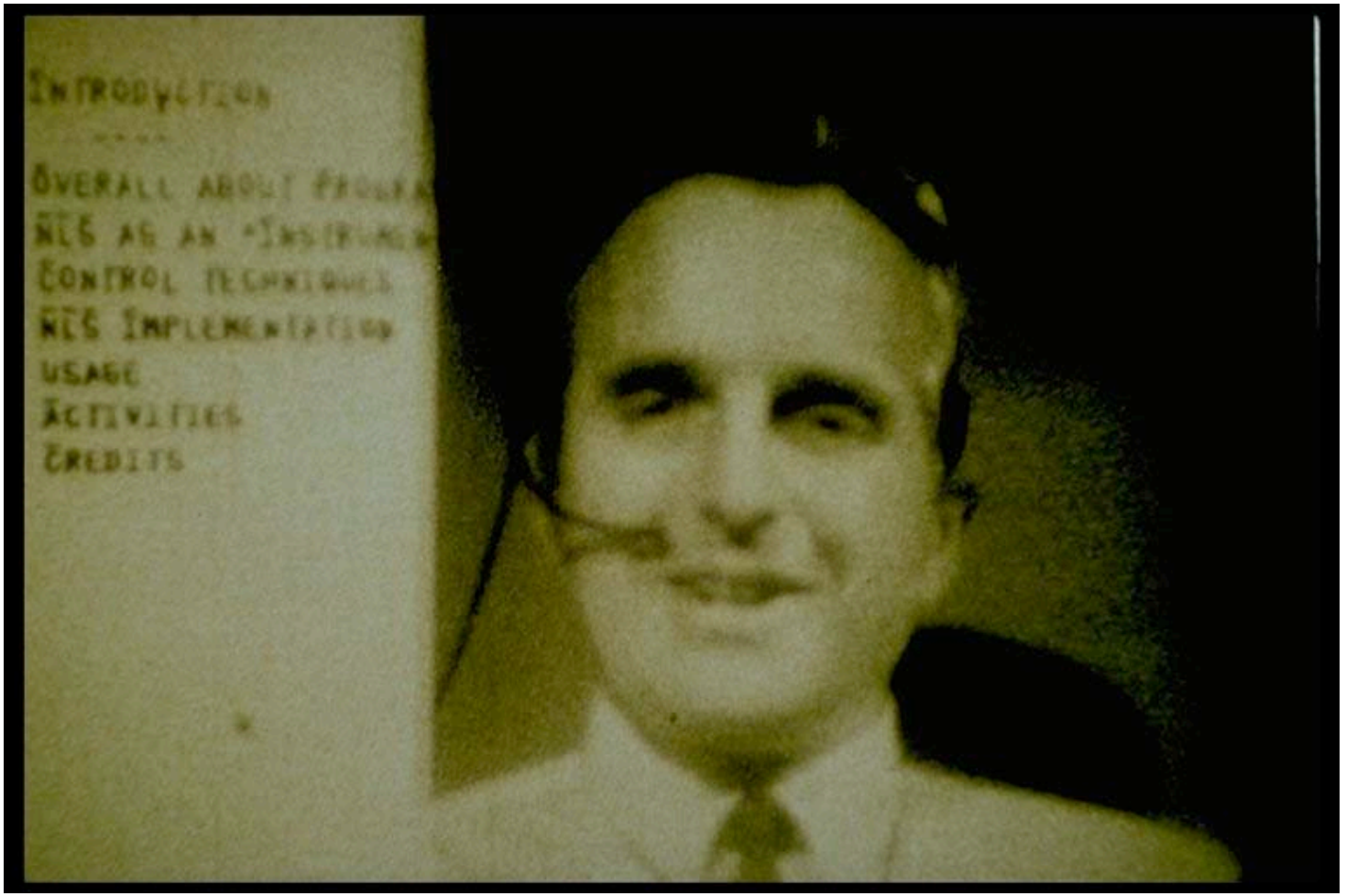


J.C.R. Licklider (1960)
“man-computer symbiosis”

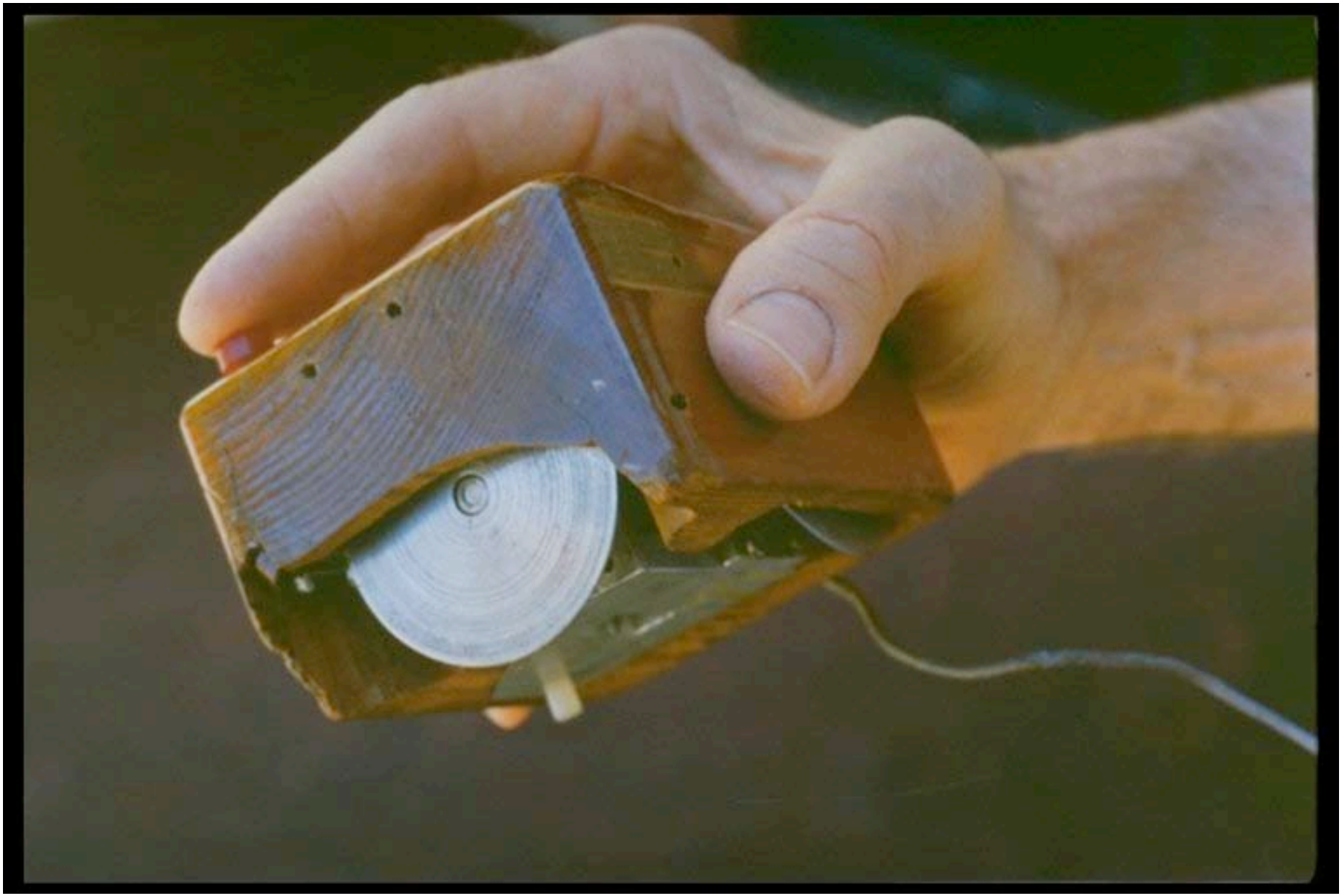
“The hope is that, in not too many years, human brains and computing machines will be coupled together very tightly and that the resulting partnership will think as no human brain has ever thought and process data in a way not approached by the information-handling machines we know today.”

Douglas Engelbart : "augmenting human intellect"(1963)

The mother of all demos



"A Research Center for Augmenting Human Intellect," Douglas C. Engelbart, and William K. English, AFIPS Conference Proceedings of the 1968 Fall Joint Computer Conference, San Francisco, CA, December 1968, Vol. 33, pp. 395-410



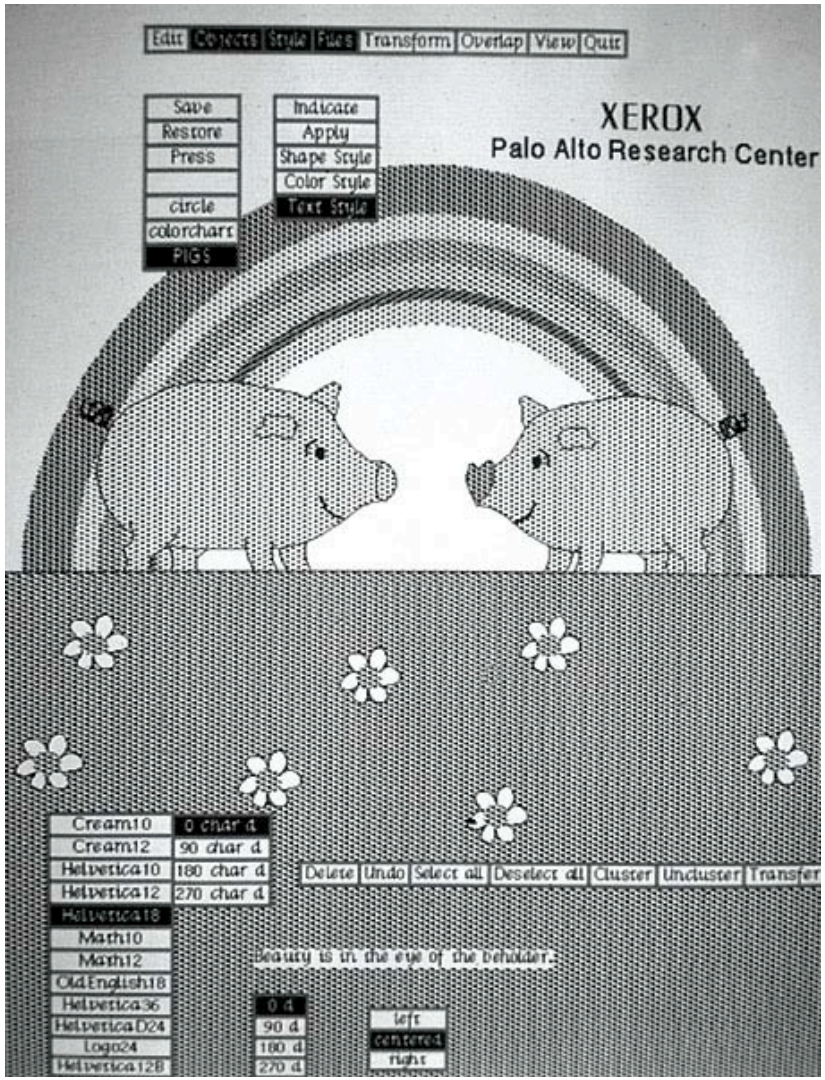
1973

L'ordinateur de bureau Alto

Laboratoire d'informatique du XEROX PARC
B. LAMPSON, Ch. THACKER, R. TAYLOR

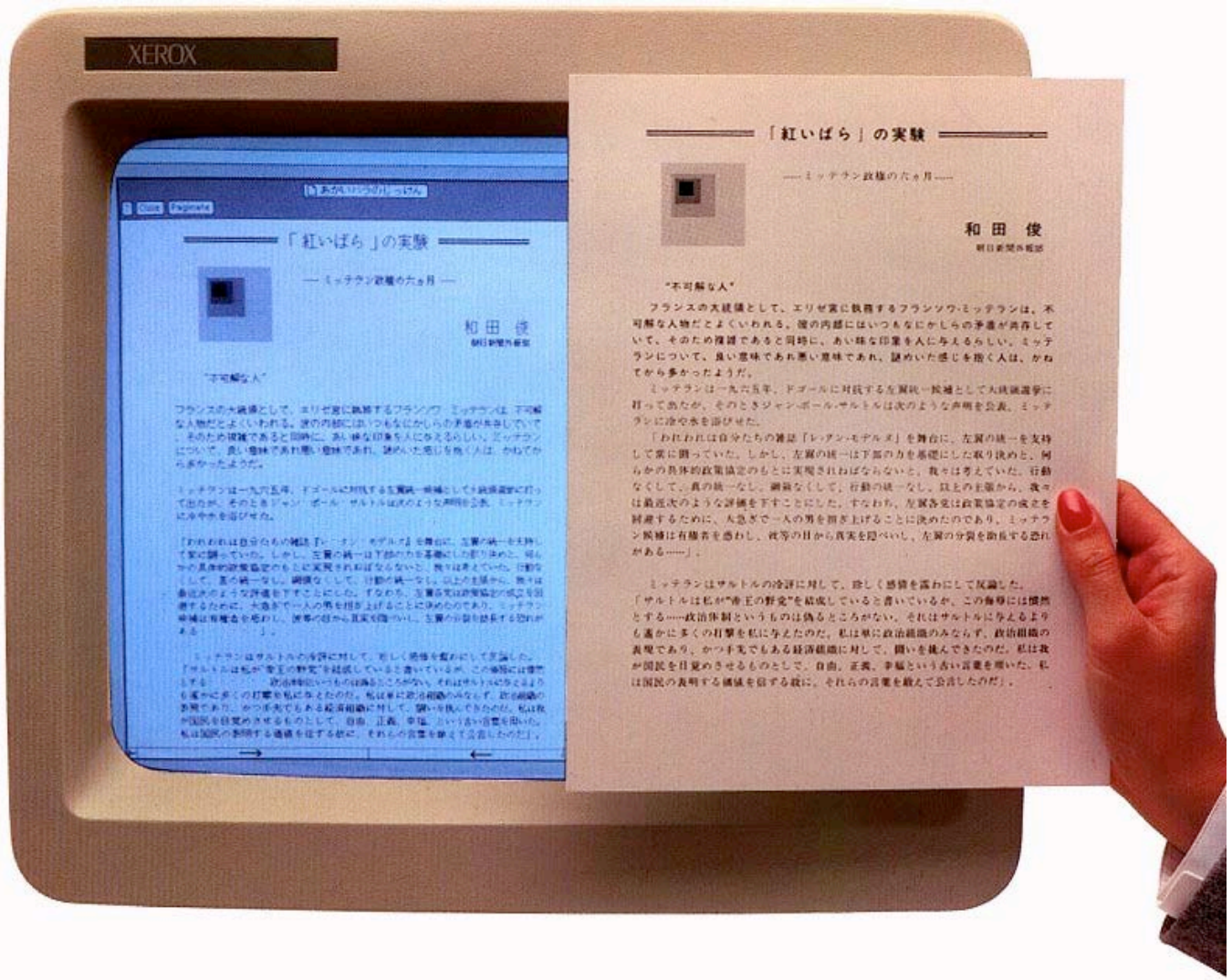
- OS temps partagé + interface graphique multi-fenêtres
- Ecran N&B 606 x 808 pixels (80 ppi)
- Clavier séparé, reconfigurable, mesure de force et durée
- Souris 3 boutons
- 2 disques durs de 3 Mo pour le stockage local
- Ethernet
- Imprimante laser

Interface WIMP



http://toastytech.com/guis/

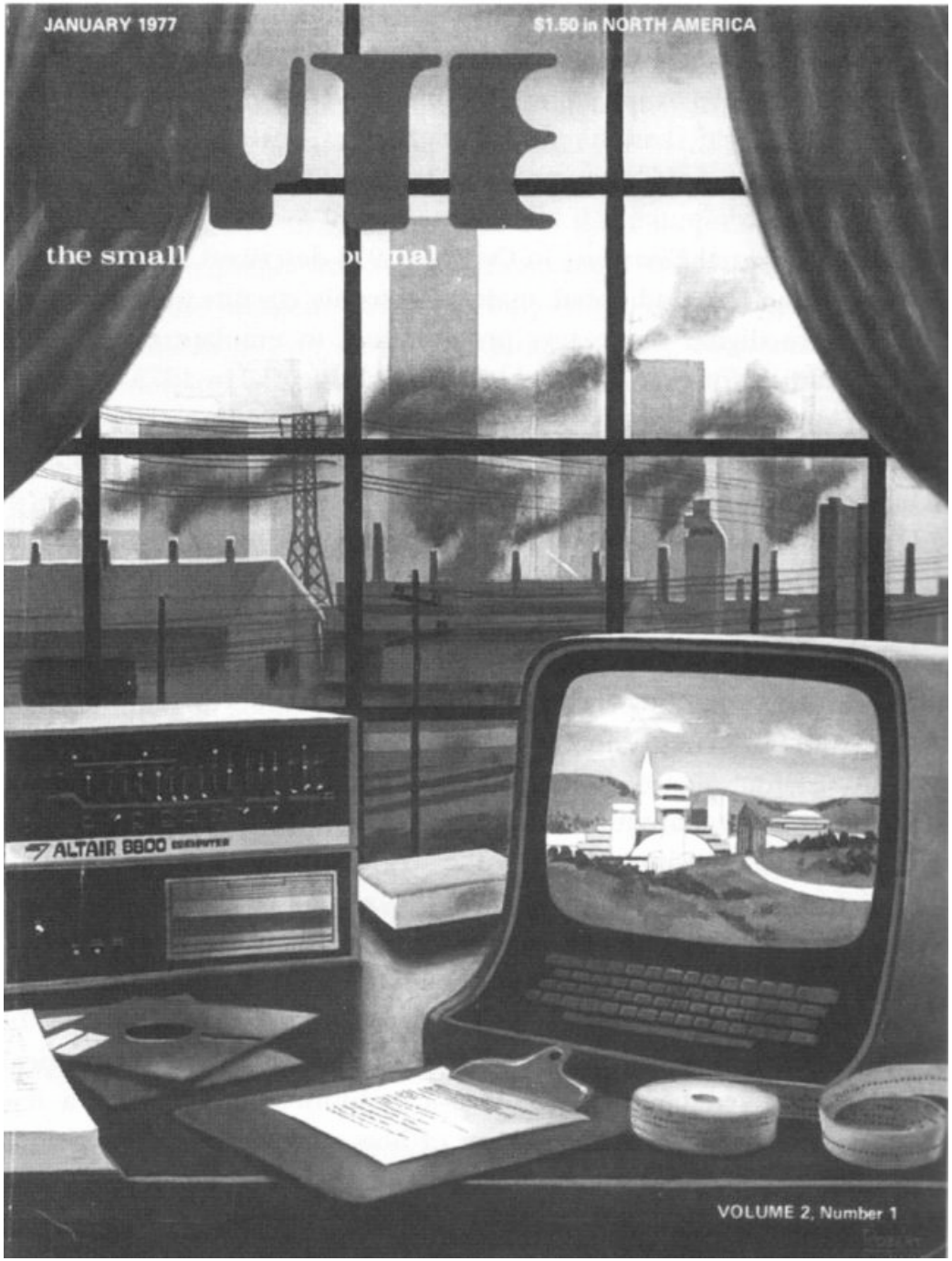
Xerox Star et le WYSIWYG (1977)



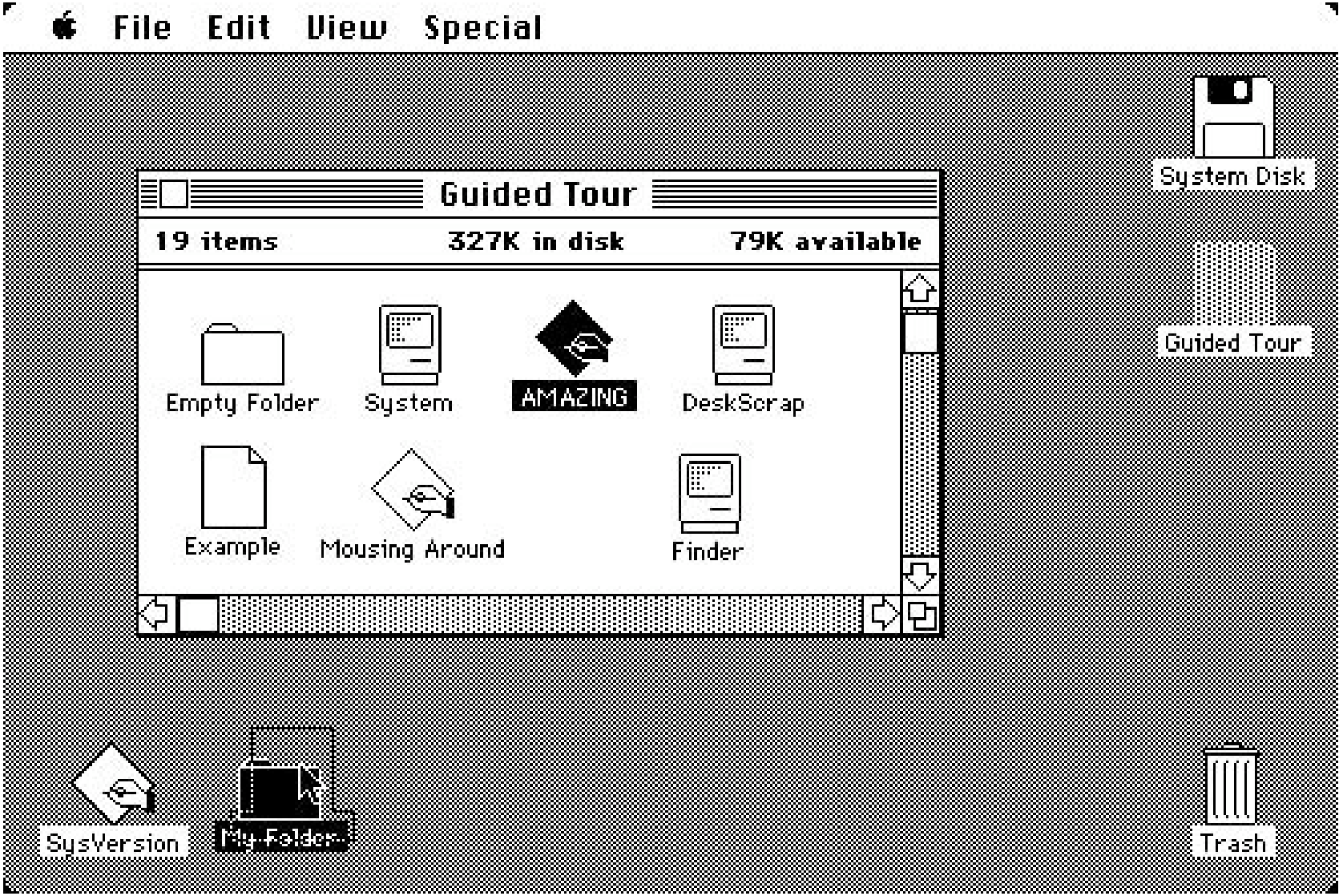
http://toastytech.com/guis/

Les micro-ordinateurs

1977

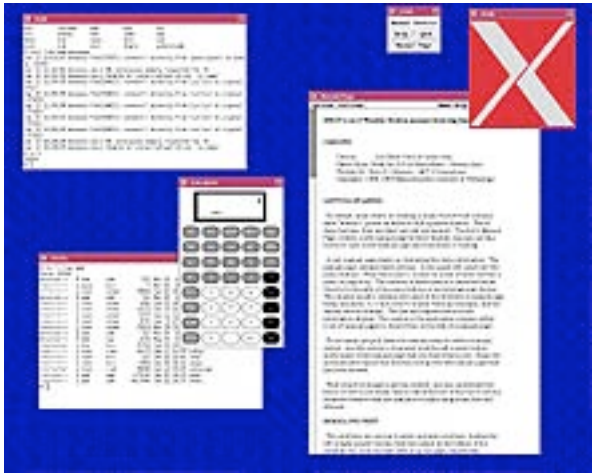


Apple : MacIntosh (1/1984)



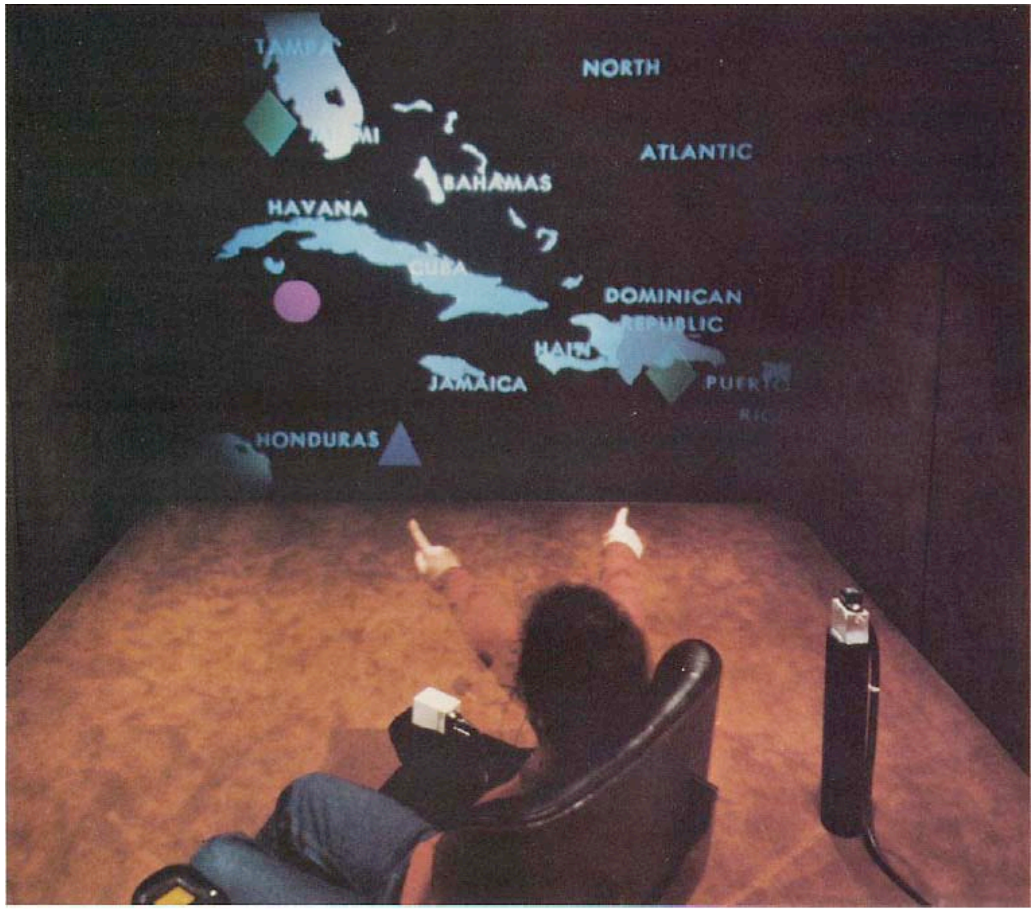
http://toastytech.com/guis/

X Window (X11.1 : 9/1987)

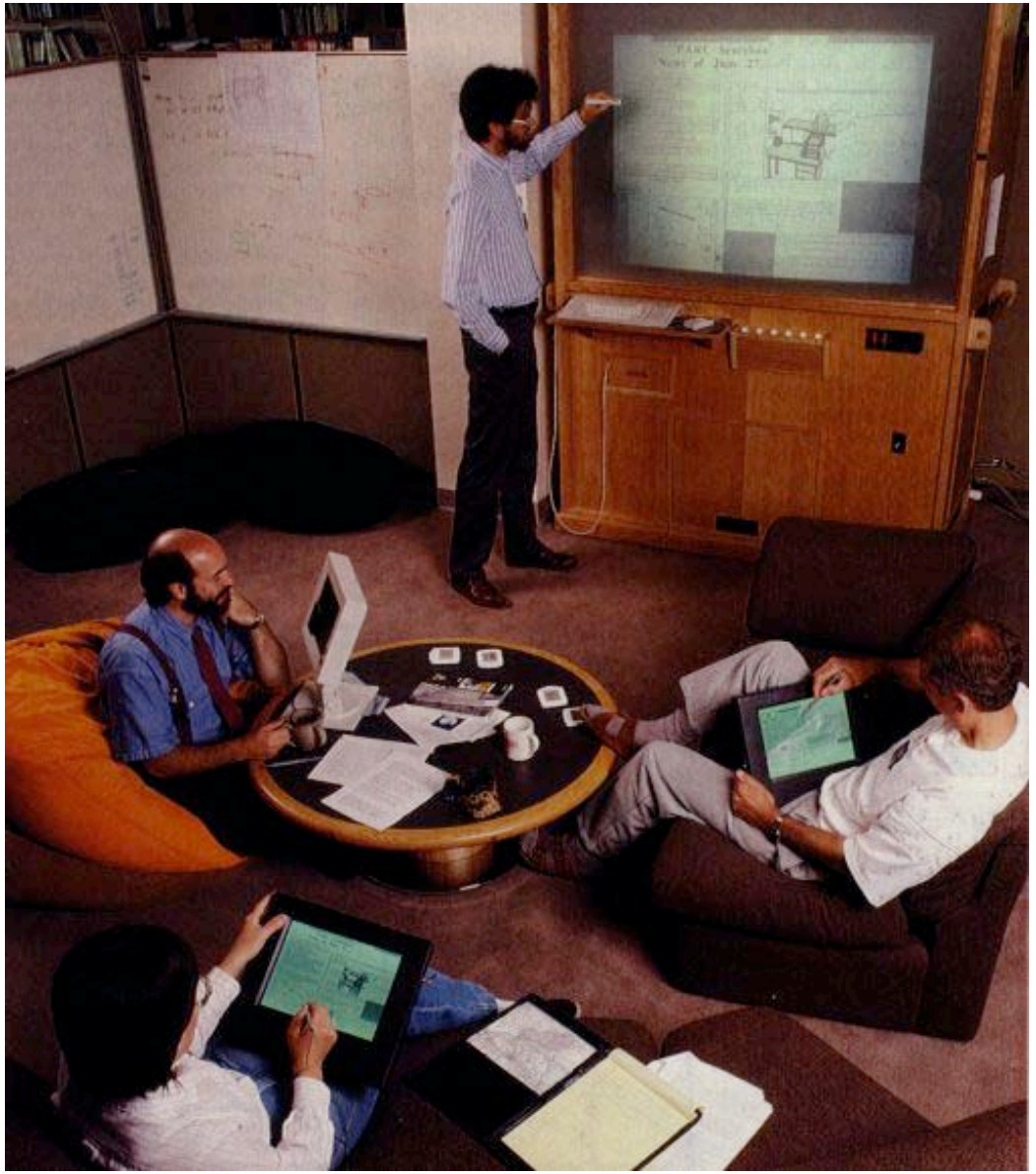


NeXTSTEP (0.8 : 10/1988)

Apple Aqua (1/2000)

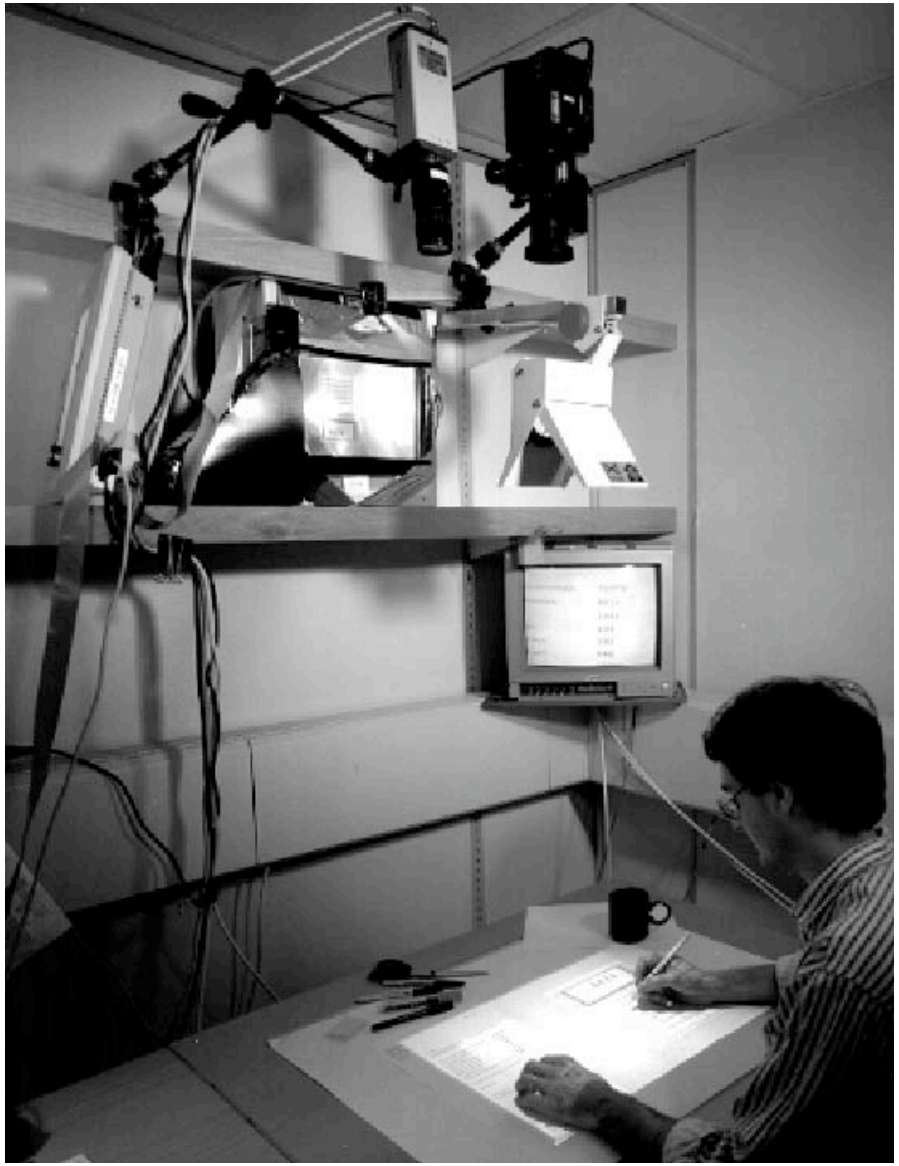


"put that there" - R.A. Bolt - MIT, 1978

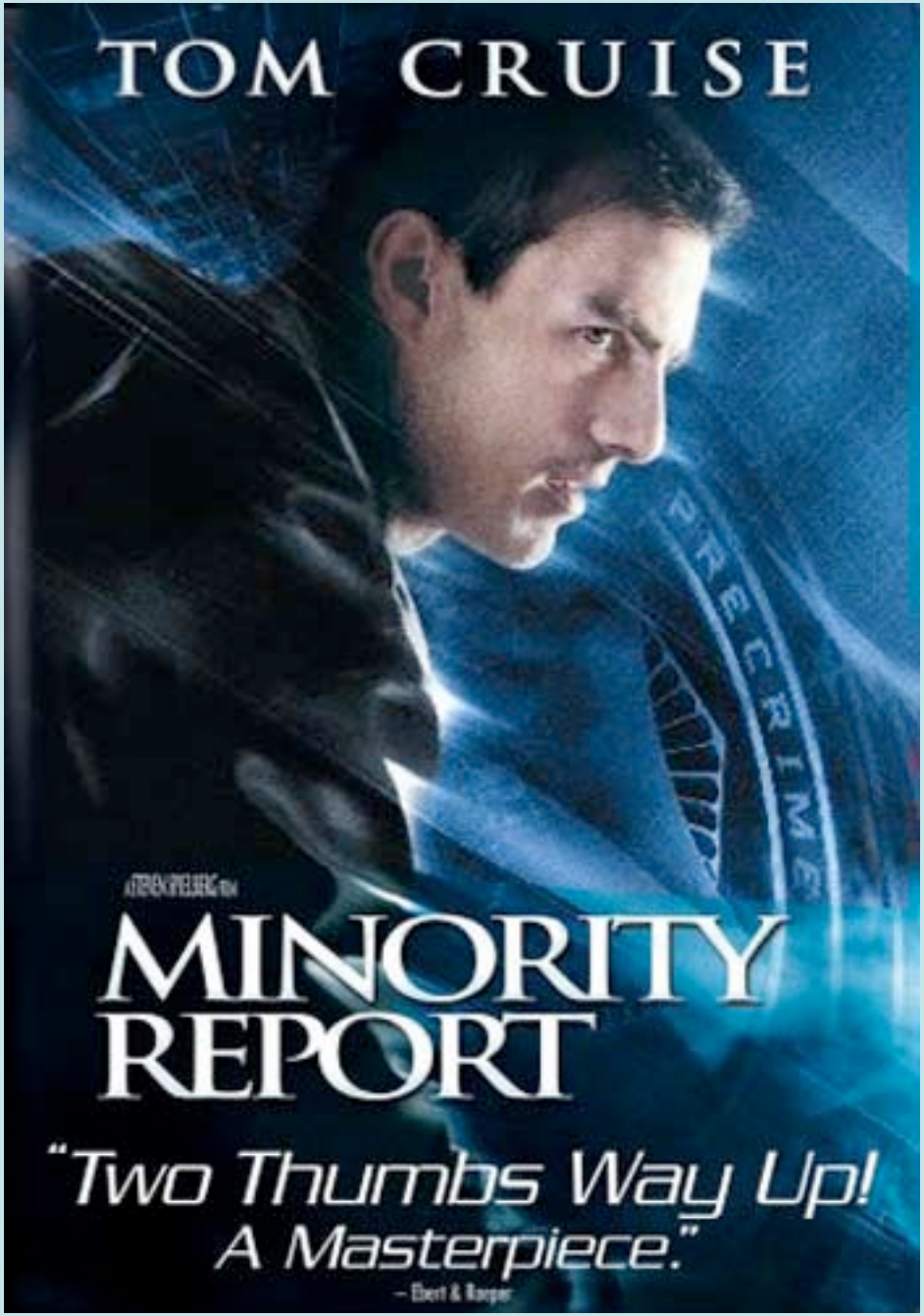


M. Weiser, PARC Xerox, ca. 1990

La réalité augmentée



Pierre Wellner. *Interacting with paper on the DigitalDesk.*
Comm. ACM, july 1993.


TOM CRUISE
PRECRIME
MINORITY REPORT
"Two Thumbs Way Up!
A Masterpiece."

3. Hypermédia

coexistence de plusieurs média

- **le livre à planches**
- **l'index, l'encyclopédie**
- **Otlet**
- **MEMEX**
- **Ted Nelson**
- **hypercard**
- **le web**
- **le DVD / MPEG4**
- **smil et al.**

; *parsemées en dessous de glandes jaunes à forte ;* calice *très velu* N ;

feuilles à pétiole allongé ; fleur
dâtres en dehors ; fruits noirs.
[Bois, champs ; fl. rougeâtres ;

non
ıtes ;
sans
R, P ;
ɔuges.

= Fleurs *verdâtres.*

: Grappes de fleurs et de fruits *pendantes* RB ;

fleurs ayant éta
[Bois, haies ;
nâtres ; 3-10

: Grappes de fleurs et de fruits *dressées* A ; fruits sans goût acide ;

= Fleurs *rougeâtres ou d'un rouge brun*, dressées avant la formation des fruits, à étamines presque aussi longues que les pétales P ;

rameau de la grap
à sépales dressés.
noirâtres ; 2-12 d. ; a

SAXIFRAGÉES

calice à 5 divisions ; 10 étamines ; fruit divisé en 2 loges.....

e jaunâtre, à 4 divisions CH, rarement 5 ; ordinairement 8 étamines ; fruit noi
XIFRAGE. —

urs roses ou violettes, rarement blanches.....

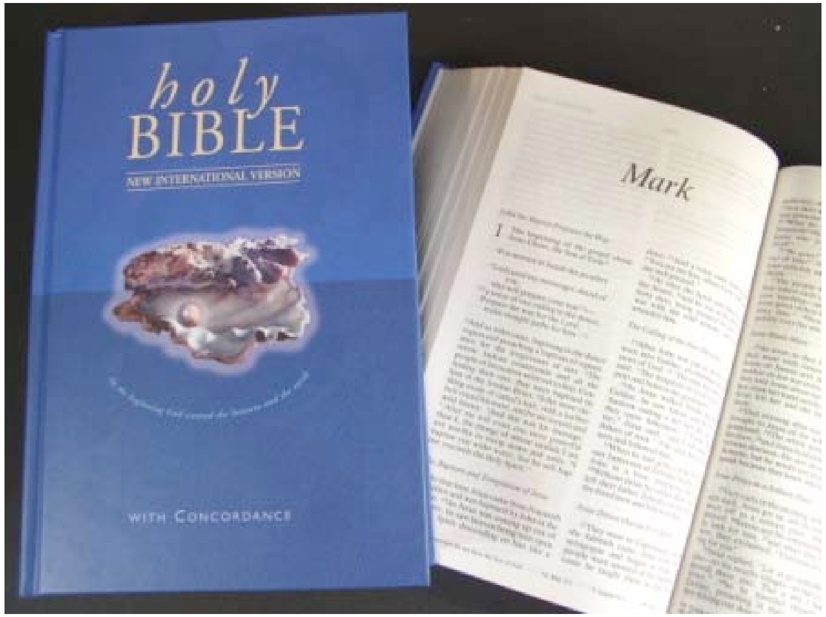
ıt un bord cartila-
t, en même temps
ement denticulées ;
ɔas le dixième de la
: de la feuille.

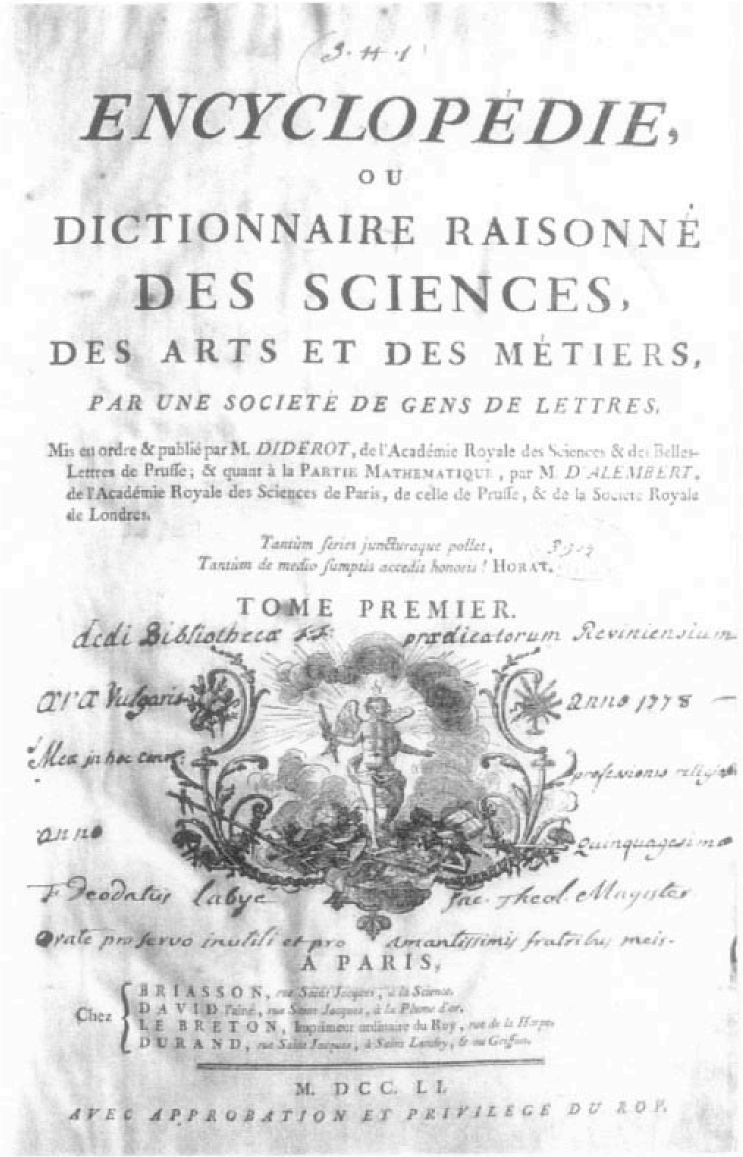
⊙ Pétales *roses, plus courts que le calice* qui est d'un noir rougeâtre.

⊙ *Pas à la fois ces caractères.*

: Feuilles, en général, de *plus de 4 mm.* de largeur et nairement de plus de 10 centimètres.....

: Feuilles, en général, de *moins de 4 mm.* de largeur e ordinairement de moins de 10 centimètres.....





ENCYCLOPÉDIE,

OU

DICTIONNAIRE RAISONNÉ DES SCIENCES, DES ARTS ET DES MÉTIERS,

PAR UNE SOCIETÉ DE GENS DE LETTRES.

Mis en ordre & publié par M. DIDEROT, de l'Académie Royale des Sciences & des Belles-Lettres de Pruſſe; & quant à la PARTIE MATHEMATIQUE, par M. D'ALEMBERT, de l'Académie Royale des Sciences de Paris, de celle de Pruſſe, & de la Societé Royale de Londres.

Tantùm series juncturaque pollet,
Tantùm de medio ſumptis accedit honoris! HORAT.

TOME PREMIER.

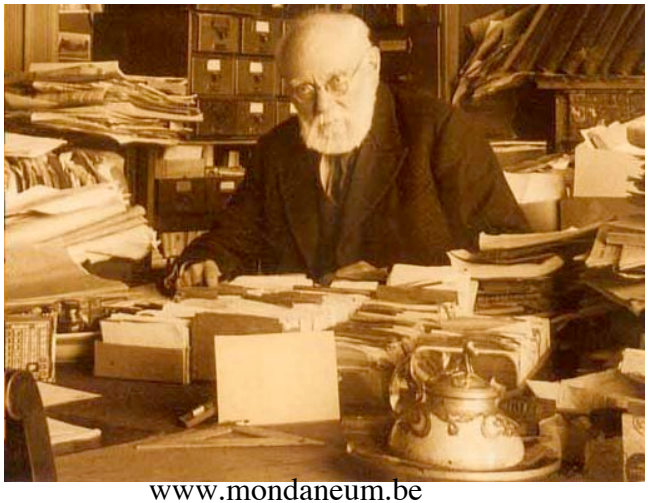
A PARIS,

Chez
BRIASSON, rue Saint Jacques, à la Science.
DAVID l'aîné, rue Saint Jacques, à la Plume d'or.
LE BRETON, Imprimeur ordinaire du Roy, rue de la Harpe.
DURAND, rue Saint Jacques, à Saint Landry, & au Griffon.

M. DCC. LI.

AVEC APPROBATION ET PRIVILEGE DU ROY.

Paul OTLET : « un internet de papier »



www.mondaneum.be

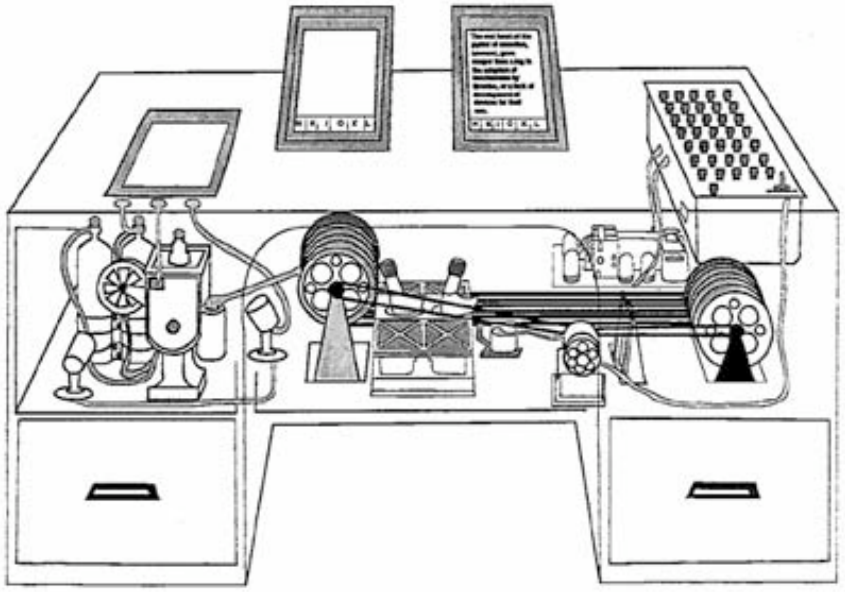
4. Organisation rationnelle des livres et des documents. Biblio-technie, Biblio-Economie
  41. Principes généraux
    413. Moyens matériels : matrices et outillages, installations
      413.13. Inventions à faire

8 - Télélecture - comme application particulière de la télévision.
1° Donner des textes en lecture à distance.
2° Permettre à chacun par un dispositif approprié de prendre connaissance à distance de textes publiquement exposés à cet effet.
3° Permettre la vision à distance des textes de livres disposés sur les rayons d'une bibliothèque ou des feuilles réunies en dossier dans les classeurs.

9 - Téléscription - (...) d'ajouter à distance des inscriptions à des textes existants

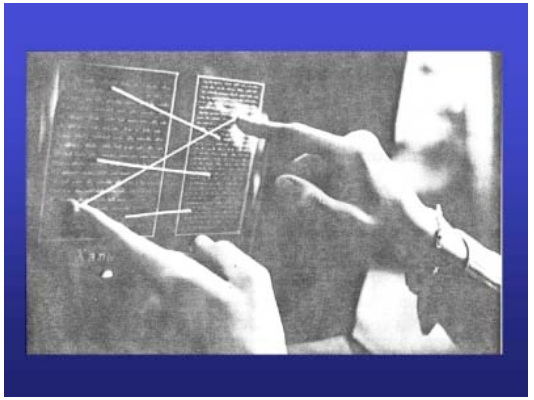
P. OTLET Traité de documentation. le livre sur le livre, théorie et pratique.
Bruxelle, van Keenberghen, 1934. réimpr. Liège, C.L.P.C.F., 1989 (p. 289 et suiv)

Vanevar BUSH : MEMEX



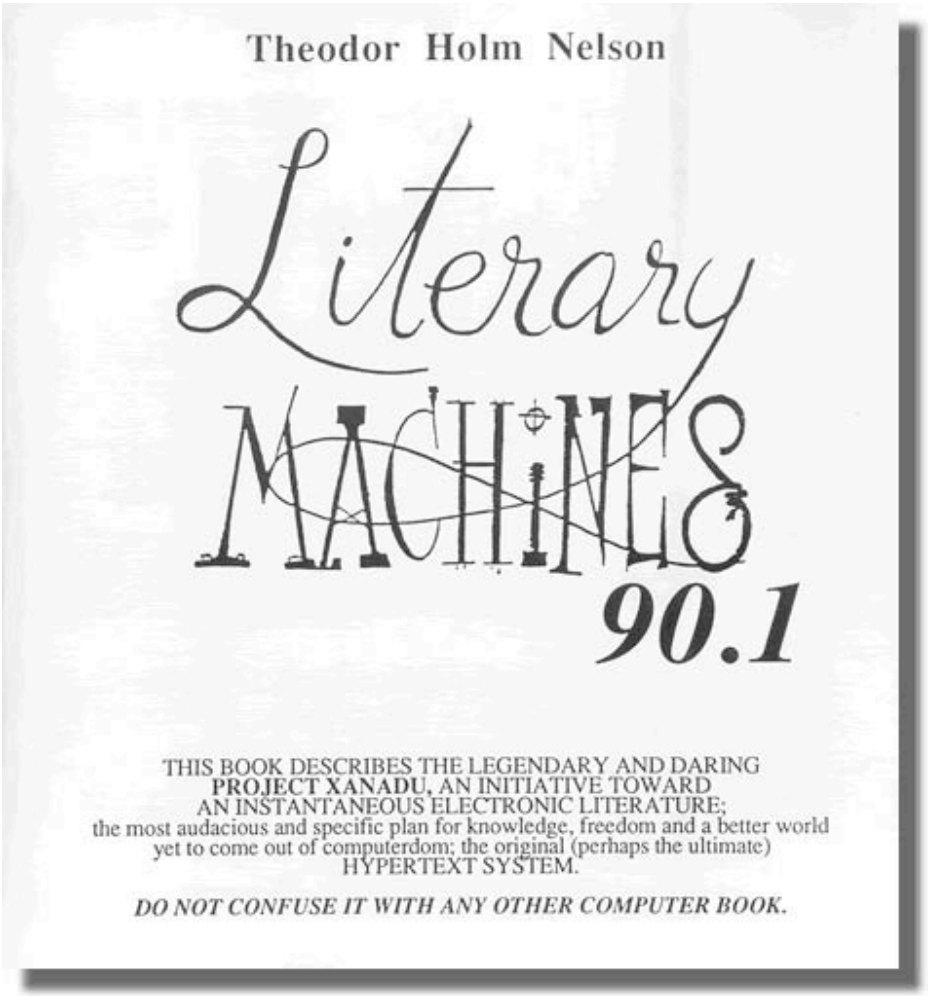
http://www.theatlantic.com/unbound/flashbks/computer/bushf.htm

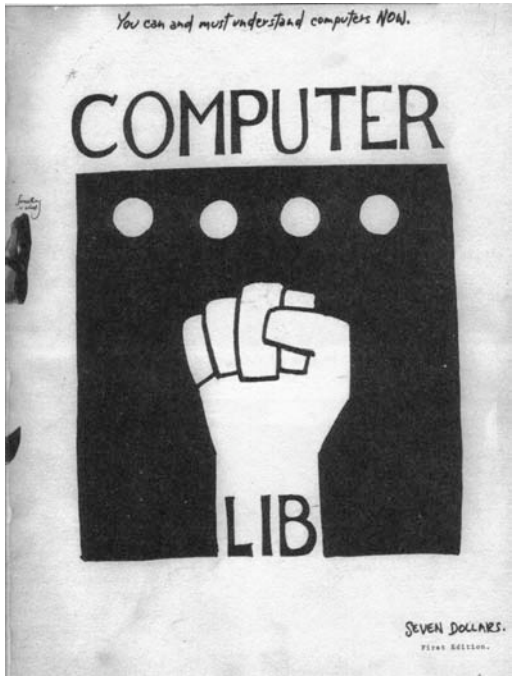
Ted Nelson (Xanadu et l'hypertexte)



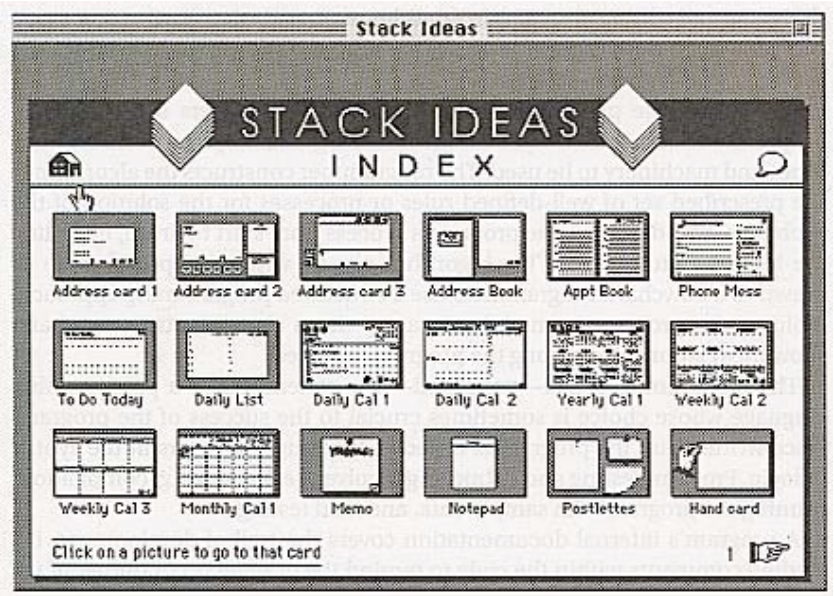
http://www.bootstrap.org/colloquium/session_09/session_09_nelson.html

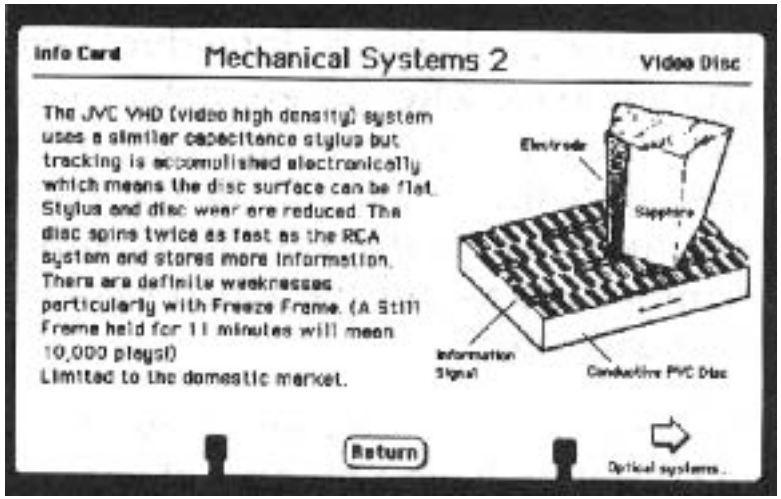
...by 'hypertext' I mean nonsequential writing - text that branches and allows choice to the reader, best read at an interactive screen. (20th ACM Conf. 1965)





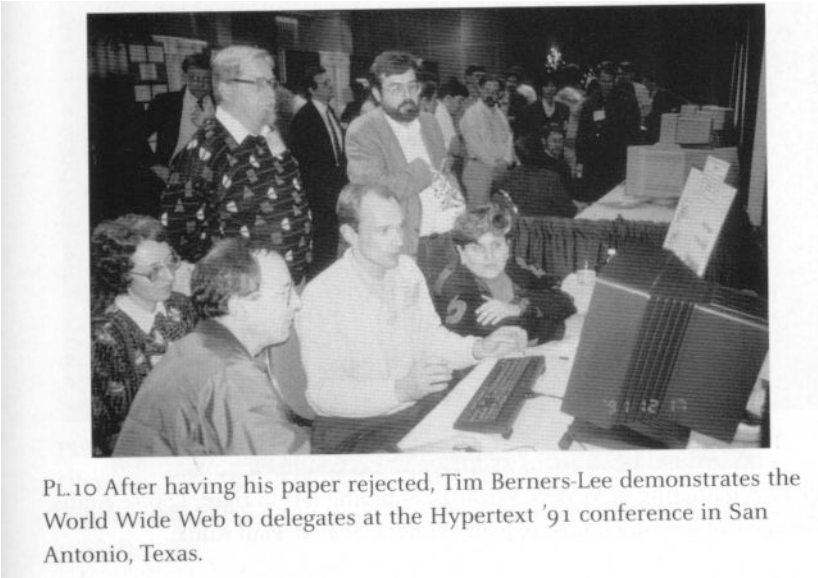
Apple hypercard - 1987 Bill Atkinson





http://www.folklore.org/index.py

Le World-Wide-Web



PL.10 After having his paper rejected, Tim Berners-Lee demonstrates the World Wide Web to delegates at the Hypertext '91 conference in San Antonio, Texas.

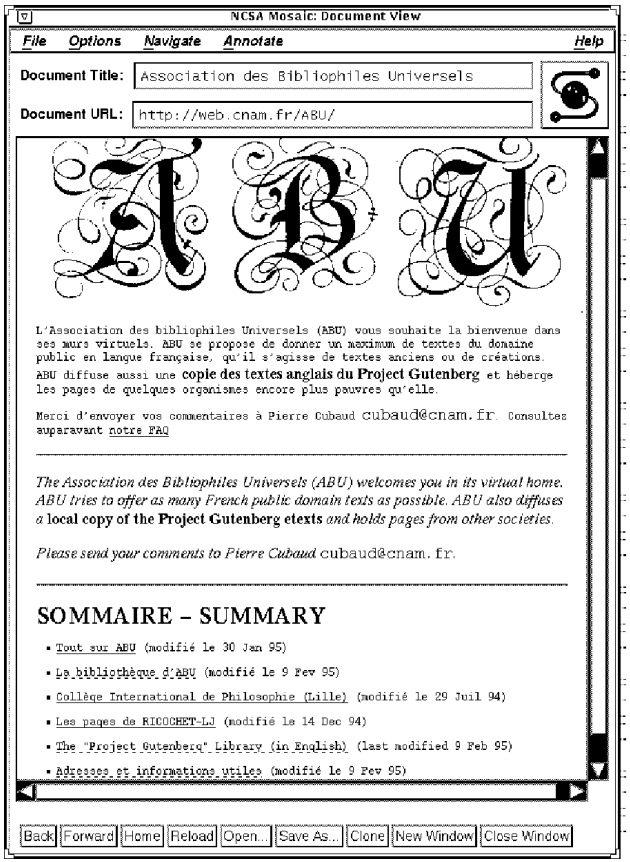
J. GILLIES, R. CAILLIAU. *How the web was born*. Oxford U. Press, 2000.

```
Date: Fri, 19 Feb 1993 09:16:11 +0100
From: Stephane Bortzmeyer <bortz@cnam.cnam.fr>
Subject: comp.infosystems.wais #758 - New X-based
information systems browser available.
Je viens de le rapatrier dans ~ftp/incoming/xmosaic-
0.8.tar.Z. Mais je n'ai pas le temps de l'installer
dans l'immediat. Si quelqu'un l'a...
```

Packet Count by Service

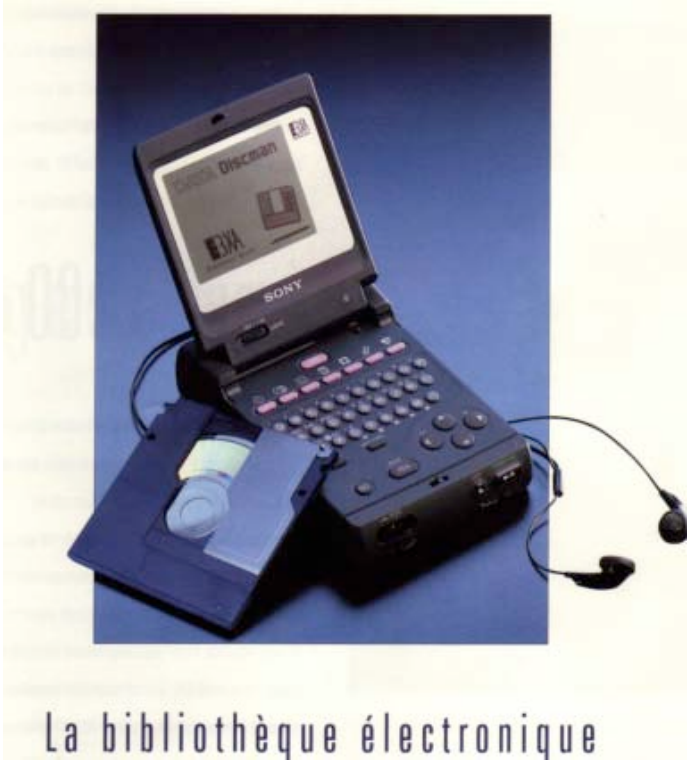
Date	ftp	gopher	www	z.39.50
Dec 1992	6,581,977,950	146,666,950	323,850	10,447,750
Jan 1993	7,350,390,050	187,225,100	511,450	12,502,550
Feb 1993	7,724,768,500	256,061,750	1,969,900	16,575,600
Mar 1993	9,009,608,450	327,717,650	11,294,550	19,506,350
Apr 1993	8,964,047,250	362,609,650	23,988,250	27,044,700
May 1993	8,770,114,800	427,431,800	49,340,000	19,374,200
Jun 1993	8,887,261,050	452,723,300	100,493,200	22,054,300
Jul 1993	9,417,707,000	541,610,600	138,925,550	21,687,700
Aug 1993	10,084,911,100	589,286,650	145,908,300	22,188,150
Sep 1993	10,425,439,550	762,736,250	214,267,950	29,200,000
Oct 1993	11,654,250,600	962,541,300	354,115,000	35,074,250
Nov 1993	12,631,179,400	1,121,316,450	512,805,100	31,658,600
Dec 1993	12,713,435,800	1,148,324,150	685,153,950	29,648,100
Jan 1994	12,932,460,700	1,383,479,450	822,317,950	37,510,800
Feb 1994	13,574,303,450	1,472,386,850	1,105,399,700	32,606,000
Mar 1994	15,692,853,250	1,757,346,750	1,597,847,800	31,654,400
Apr 1994	15,615,201,500	1,872,741,250	2,035,281,650	31,726,150
May 1994	17,116,010,000	1,990,558,500	2,589,730,950	31,146,150
Jun 1994	16,310,408,300	2,012,045,400	3,060,869,850	36,281,300
Jul 1994	16,146,166,250	1,979,391,550	3,355,432,550	37,126,100
Aug 1994	18,160,551,300	2,355,422,400	4,187,132,200	50,777,950
Sep 1994	20,119,437,650	2,695,472,350	5,082,138,200	53,662,850

Statistics provided by Merit NIC Services machine
Graph by: James E. Pitkow, pitkow@cc.gatech.edu

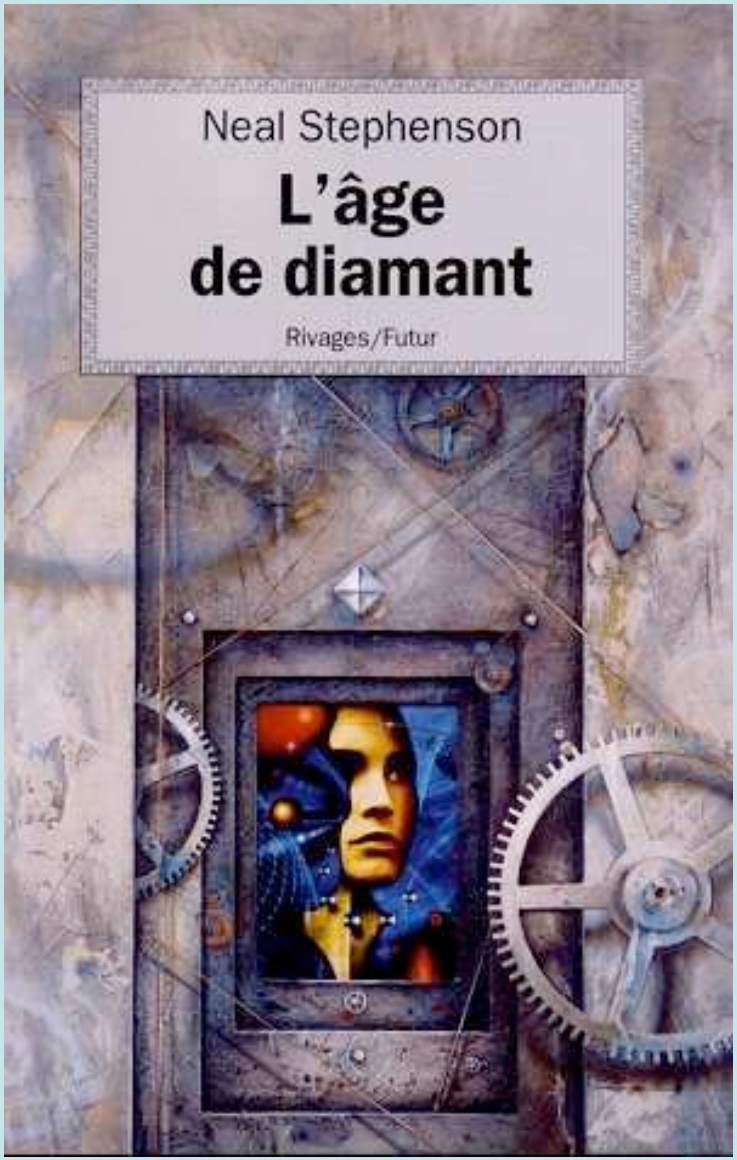


Le site ABU en 1995 (client XMosaic sur station Sun)

le livre électronique ?

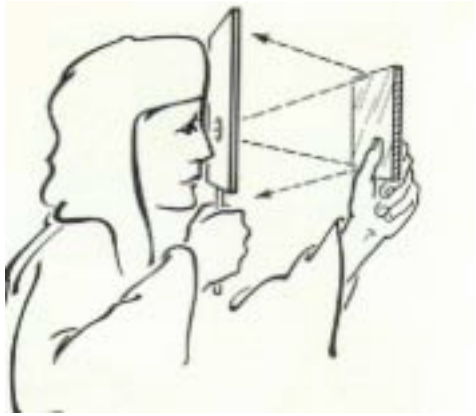


SONY data discman (ca 1992)


Neal Stephenson
L'âge de diamant
Rivages/Futur

4. Immersion par la simulation

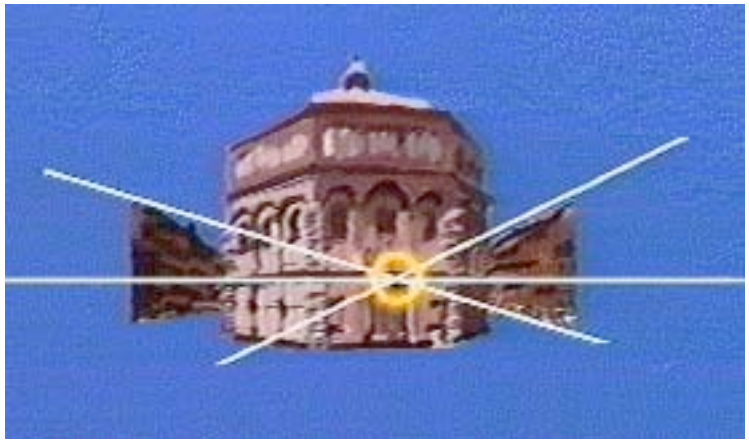
- **la perspective**
- **les panoramas**
- **l'opéra**
- **le panneau de contrôle synoptique**
- **le simulateur de vol**
- **le jeu video**
- **la vision en relief**
- **le son multipiste**
- **l'image de synthèse**
- **la réalité « virtuelle »**
- **la visualisation d'info**

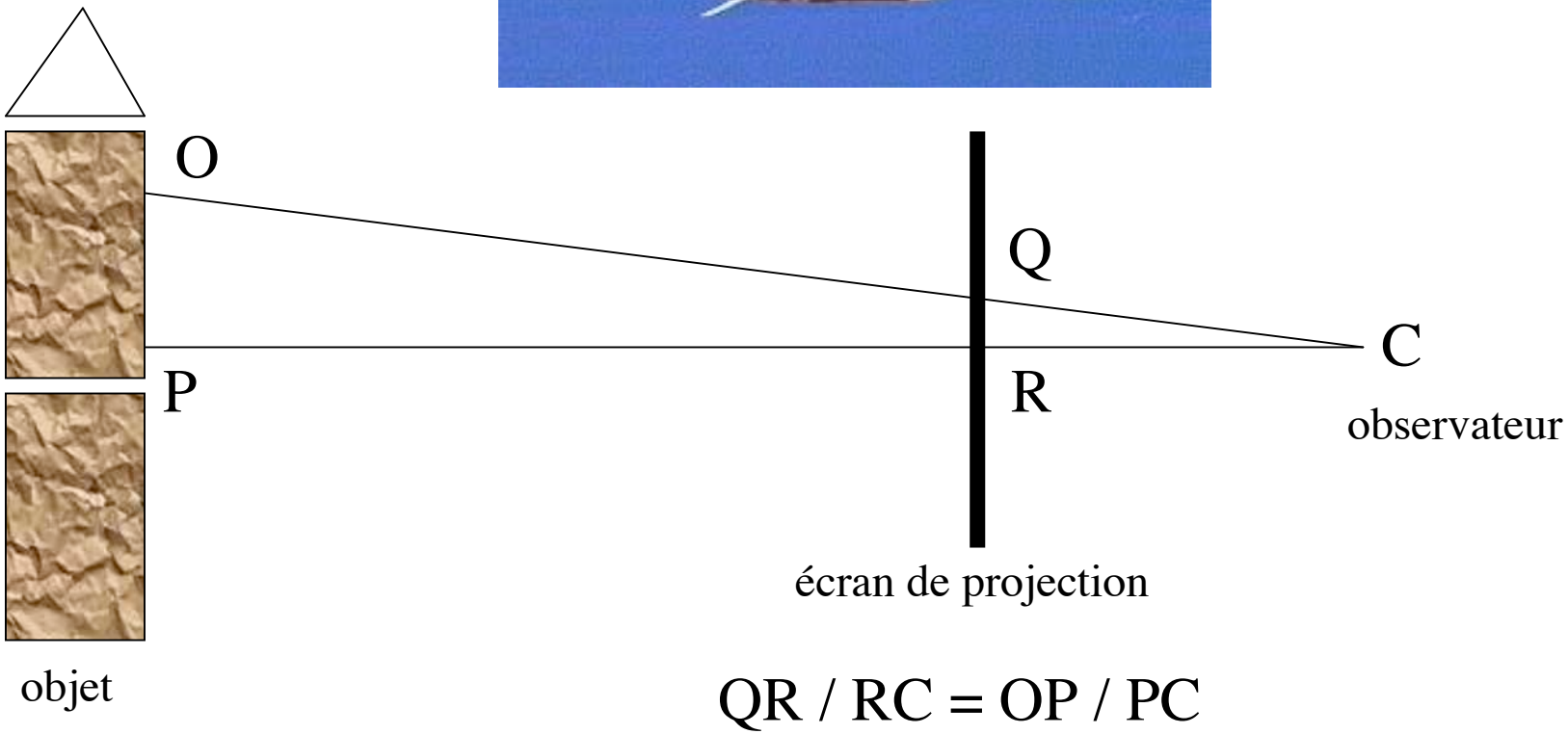


http://www.kap.pdx.edu/trow/winter01/perspective/

ca 1415 - Filippo BRUNELLESCHI - L’image calculée

Calcul de la position sur le dessin





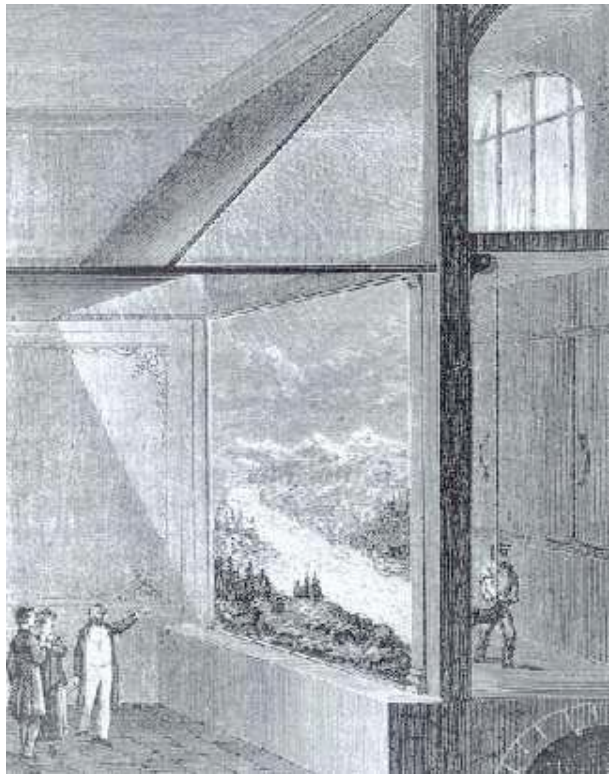
$$QR / RC = OP / PC$$

German opera composer Richard Wagner believed that the future of music, music theater, and all the arts, lay in an embrace of Gesamtkunstwerk or total artwork, a fusion of the arts that had not been attempted on this scale since the classic Greeks. In 1849, Wagner wrote the essay, The Art-work of the Future, defining the synthesis of the arts in which opera served as a vehicle for the unification of all the arts into a single medium of artistic expression.

The Festpielhaus (Festival House) Theater opened in 1876 in Bayreuth, Germany, where Wagner applied his theatrical innovations including: darkening the house, surround-sound reverberance, and the revitalization of the Greek amphitheatrical seating to focus audience attention on stage. This approach to opera foreshadowed the experience of virtual reality, immersing the audience in the imaginary world of the stage.

www.adwmainz.de/ AkademieHomePage/wagnerweb.htm

Les panoramas (dioramas)



http://www.digischool.nl/ckv2/romantiek/romantiek/panorama/

Rue Léon Jouhaux (Xème)

vision en relief

http://www.berezin.com/3d/holmes.htm (en kit 45€)

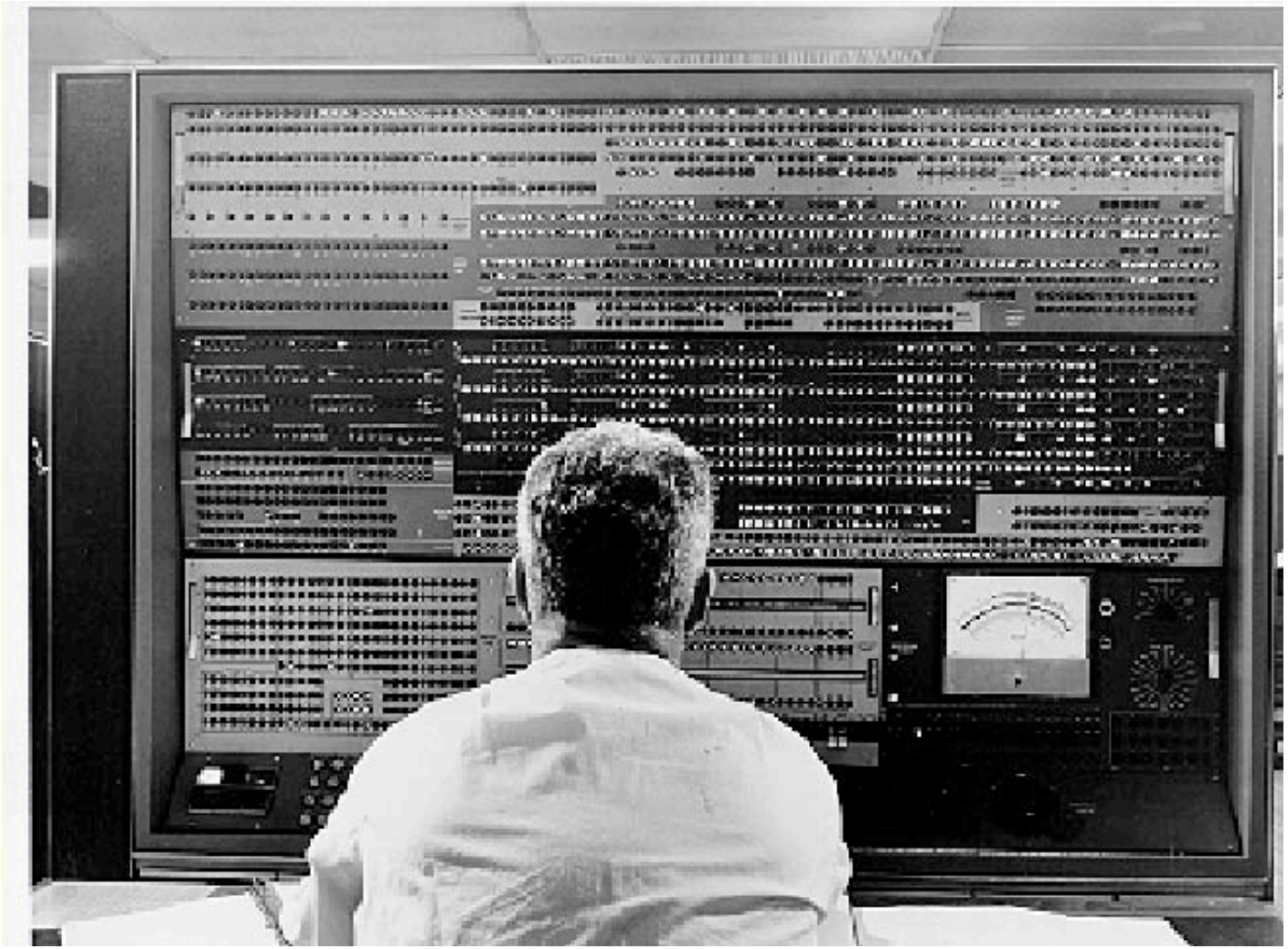
son stéréo

Ivan Sutherland, “The Ultimate Display” (1965)

http://www.5dt.com/products/phmd.html

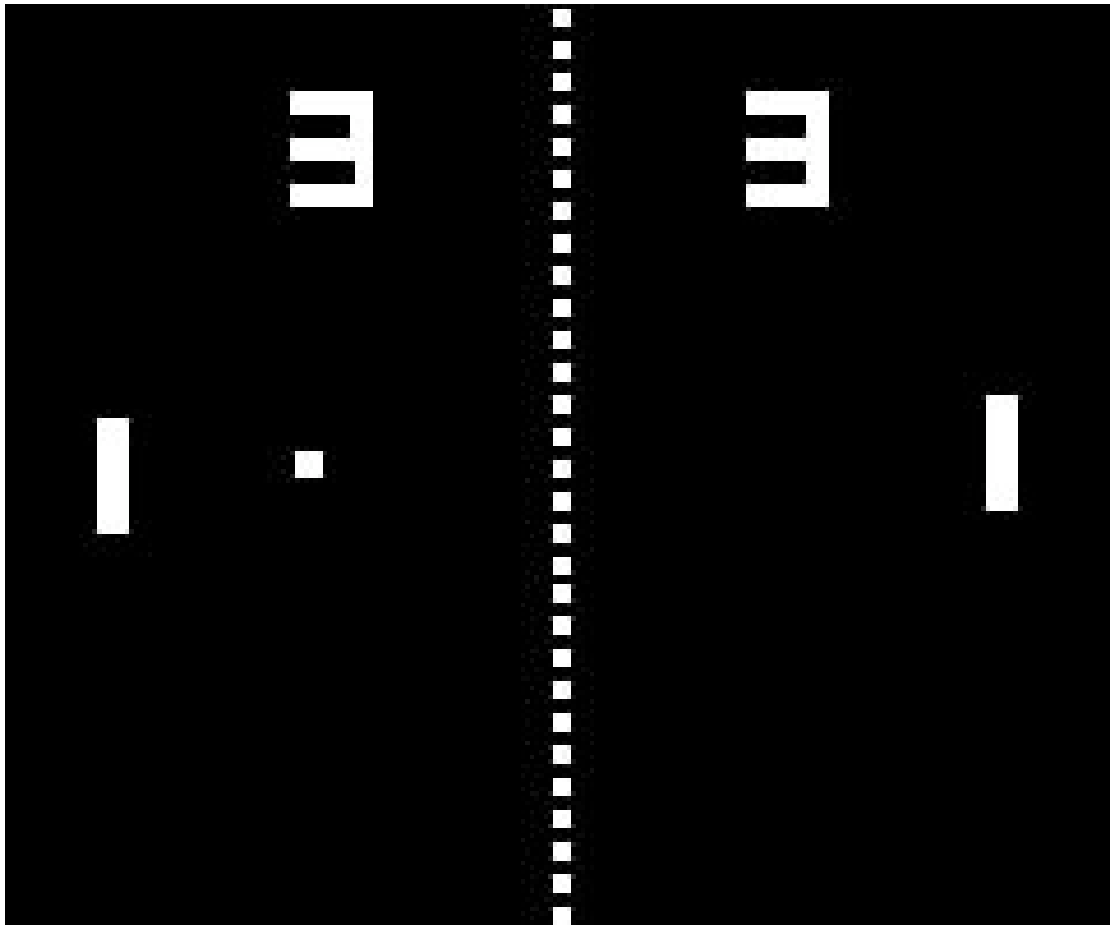
poignée retour d'effort
(Richard feldmann, 197?)

Panneau de contrôle (synoptique)

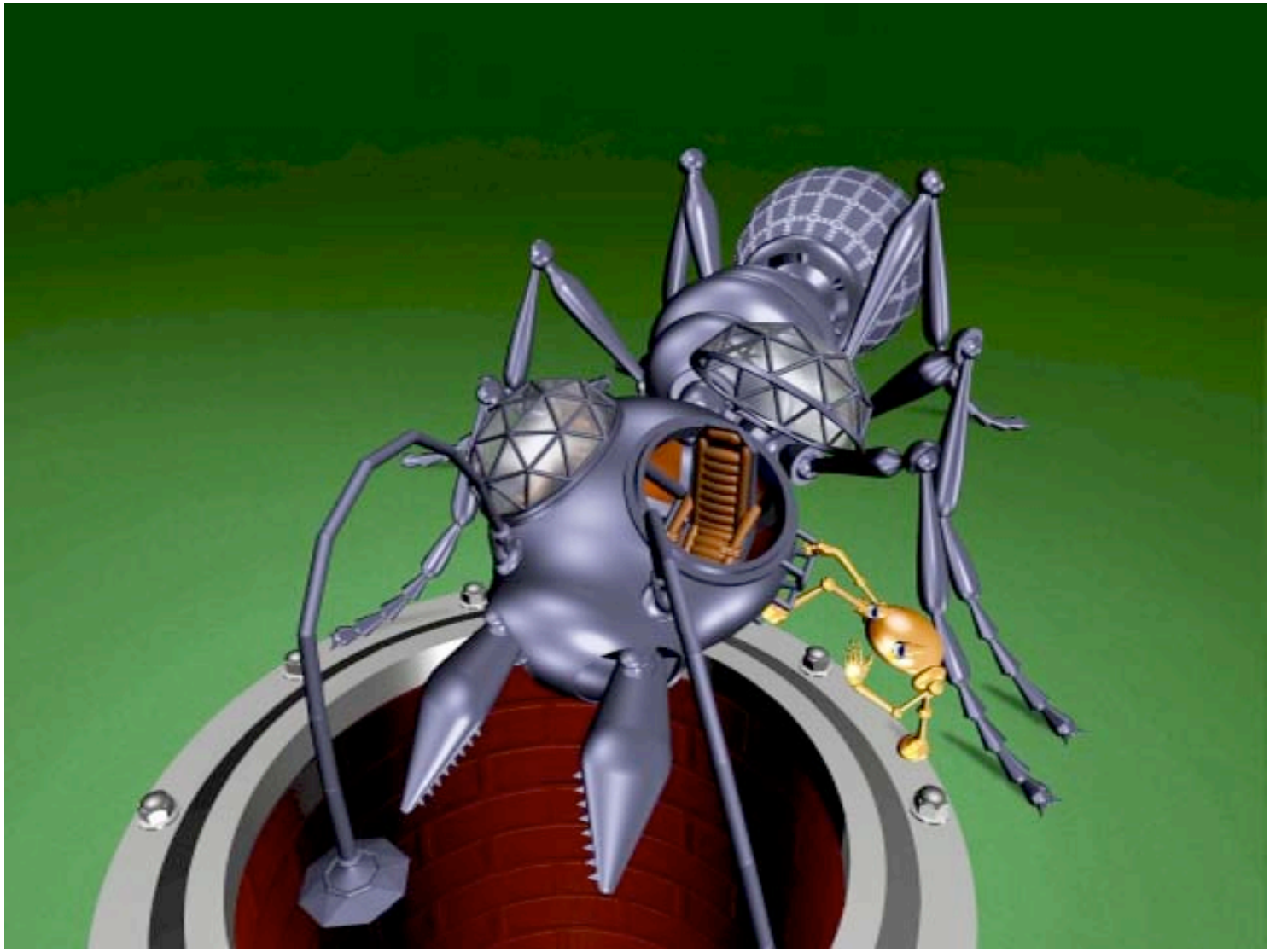


simulateur

jeu vidéo



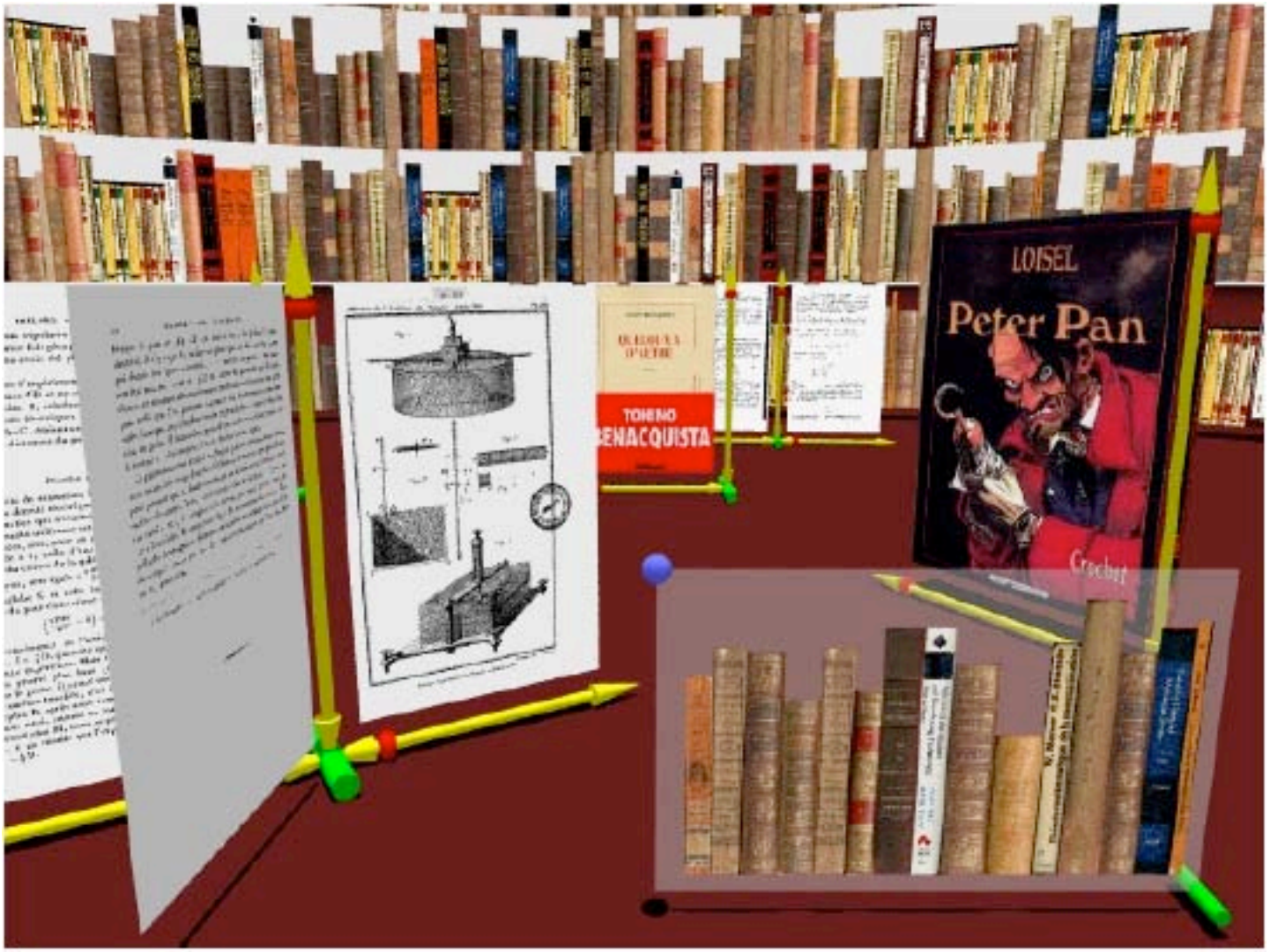
Pong (1972)



1980 - NYIT - The works

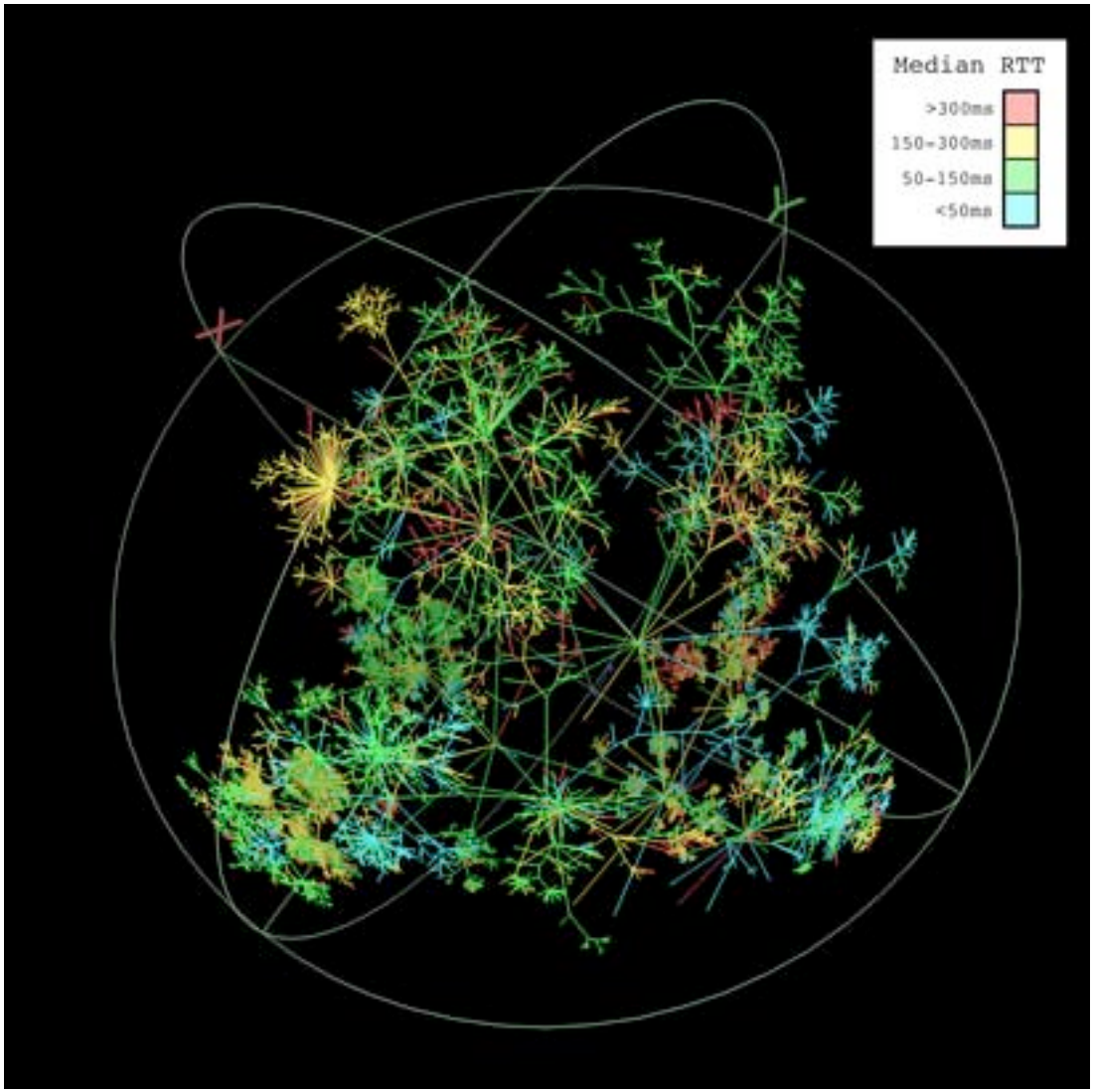
La "réalité virtuelle"

K. Borner et al.
SLIS Univ. Indiana



P. Cubaud, A. Topol

"information visualization"



CAIDA

Breve