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interactive historical resource for information design

This panel presents ongoing research that is being developed with the Instructional Development Fund, Provost Grant Program, Northeastern University. The project aims at developing an interactive historical resource for the discipline of Information Design. The proposed final product will be a prototype of a learning tool targeted at undergraduate students of different fields of knowledge involved in the visualization of information.

The project has two major goals:

- to help students solidify the historical background of the discipline of Information Design by means of an interface which organizes and systematizes the existent body of knowledge, nowadays spread among various books.
- to design an interface that encourages students to think creatively and critically by allowing them to create new relationships and connections among the collected data.

Information Design is by nature cross-disciplinary. Visual systems, informational structures and visualization of information are part of the curriculum of different disciplines outside the design area, where they are used not only as a research method and practice but also as a means to communicate results. Biology, geology, astronomy, computer sciences, physics and mathematics are examples.

Graphic design is the profession that plans and executes the design of visual communication according to the needs of audiences and contexts for which communication is intended. Graphic designers apply what they have learned about physical, cognitive, social, and cultural human factors to communication planning and the creation of appropriate form that interprets, informs, instructs, or persuades. Graphic designers use various technologies as means for creating visual form and as an environment through which communication takes place.

NASAD guidelines

information From Latin *informare* to give form or shape to, from *in* into + *formare* to form, from *forma* a form or shape + *-ation* indicating a process or condition

see verb **1.** I can see the house make out, catch sight of, glimpse, spot, notice, observe, view, perceive, discern, espy, descry, distinguish, identify, recognize. **2.** see that man over there look at, regard, note, observe, heed, mark, behold, watch; inf. get a load of. **3.** saw a movie last night watch, look at, view. **4.** see what they mean understand, grasp, get, comprehend, follow, take in, know, realize, get the drift of, make out, fathom; inf. latch on to. **5.** go and see what he wants find out, discover, learn, ascertain, determine, ask, inquire, make inquiries into/about, investigate. **6.** we will have to see think, consider, reflect, deliberate, give thought, have a think.

understand verb **1.** understand his meaning | understand what he says comprehend, apprehend, grasp, see, take in, perceive, discern, make out, glean, recognize, appreciate, get to know, follow, fathom, get to the bottom of, penetrate, interpret; inf. get the hang/drift of, catch on, latch on to, figure out. **2** . I understand your feelings/position appreciate, accept, commiserate with, feel compassionate toward, sympathize with, empathize with. **3.** I understand that he has left gather, hear, be informed, learn, believe, think, conclude.

The Oxford American Thesaurus of Current English

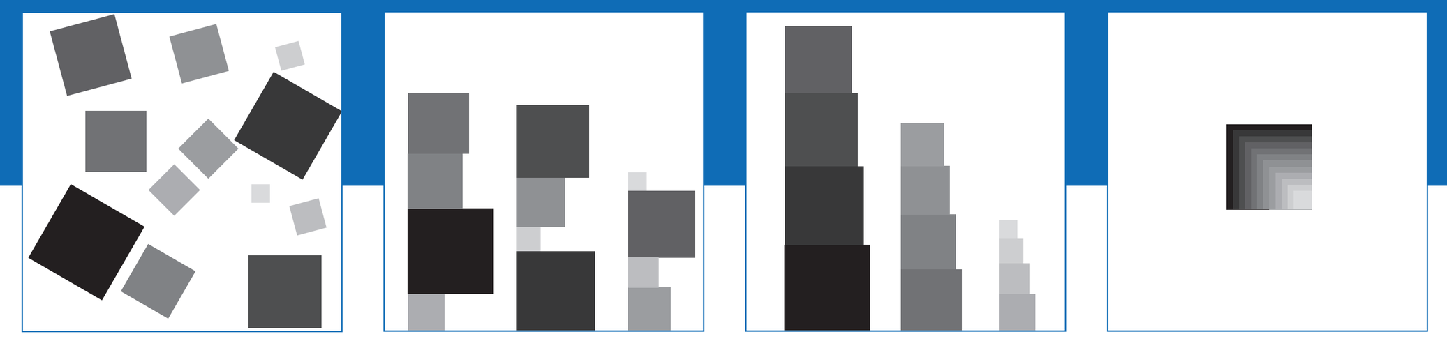
There are several definitions of the term "information design." The one quoted here is by the Design Council in England (in http://www.designcouncil.org.uk):

Information design is concerned with making complex information easier to understand and to use. It is a rapidly growing discipline that draws on typography, graphic design, applied linguistics, applied psychology, applied ergonomics, computing, and other fields. It emerged as a response to people's need to understand and use such things as forms, legal documents, computer interfaces and technical information.

Information design is user-centred. Usually, it is iterative – design solutions are tested and modified repeatedly. Information designers serve the needs of both information providers and information users. They consider the selection, structuring and presentation of the information provider's message in relation to the purposes, skills, experience, preferences and circumstances of the intended users.

Fundamental to the discipline of Information Design is Information Visualization. In the book *Information Visualization: Perception for Design* Colin Ware, psychologist of perception, explains the meaning of the term:

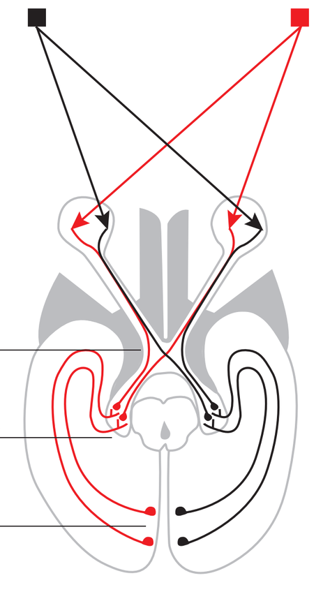
> Until recently, the term *visualization* meant *constructing a visual image in the mind* (Shorter Oxford English Dictionary). But now it has come to mean something more like *a graphical representation of data or concepts*. Thus, from being an internal construct of the mind, a visualization has become an external artifact supporting decision making.



This serial picture in four phases shows a development from random dispersion to strict order. It demonstrates the process of organization in a generally valid form.

Stankowski, A.
Visual Presentation of Invisible Processes
images redrawn after Stankowski

learning from visual perception and cognition



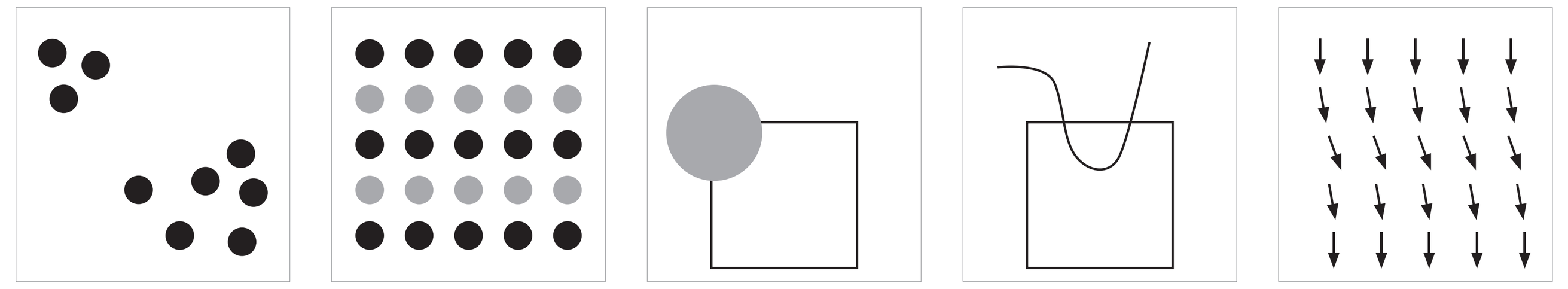
the eye's pathways and processors
diagram redrawn after Gregory R.L. *Eye and Brain*

How to achieve analytically derived solutions that are visually effective? The study of visual perception and cognition are essential to conveying meaningful information in a graphical form.

Visual perception informs how decisions on graphical representations can and should be made. It can be used both as a set of principles for the construction of graphical systems and as criteria for judging the efficiency of displaying data.

Informational structures should be precise and meaningful. Illusions, ambiguities and distortions should be avoided. The presentation of data obeying perceptual rules can help visual patterns to be readily perceived.

The Gestalt "laws" of pattern perception provide understanding of basic perceptual phenomena and are important cues for perceptual organization. They can be considered as design principles:



proximity
the tendency of objects near one another to be grouped together into a perceptual unit

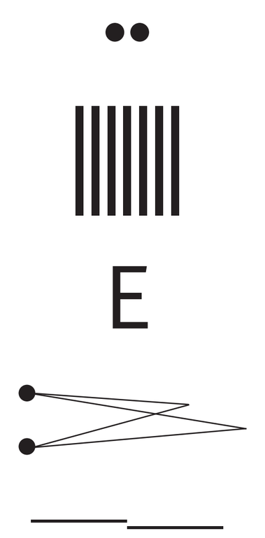
similarity
if several stimuli are presented together, there is a tendency to see the form in such a way that the similar items are grouped together

closure
the tendency to unite contours that are very close to each other

good continuation
the tendency to construct visual entities out of visual elements that are smooth and continuous

common fate
elements that are moving in the same direction seem to be grouped together

Visual acuities measure the ability to see detail. They help defining the limits of information that can be perceived. Some of the basic visual acuities as presented by Colin Ware in *Information Visualization*:



point acuity
(1 minute of arc):
the ability to resolve two distinct point targets

grating acuity
(1-2 minutes of arc):
the ability to distinguish a pattern of bright and dark bars from uniform gray patch

letter acuity
(5 minutes of arc):
the ability to resolve letters

stereo acuity
(10 seconds of arc):
the ability to resolve objects in depth

vernier acuity
(10 seconds of arc):
the ability to see if two line segments are collinear

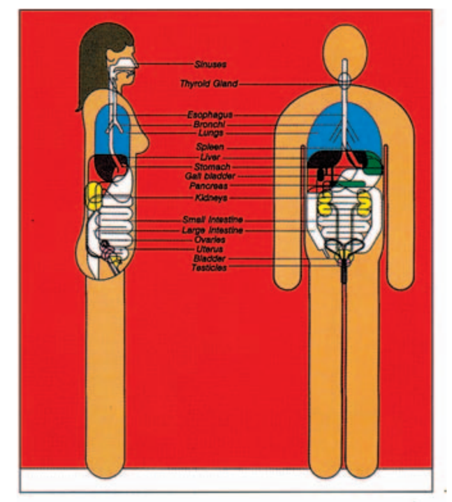
historical examples of graphical representations of information from different disciplines

The power of unaided mind is highly overrated. Without external aids, memory, thought, and reasoning are all constrained. But human intelligence is highly flexible and adaptive, superb at inventing procedures and objects that overcome its own limits. The real powers come from devising external aids that enhance cognitive abilities. How we increase memory, thought, and reasoning? By the invention of external aids: It is things that make us smart.

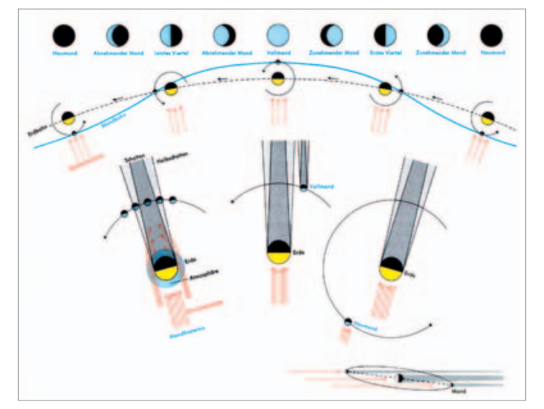
Norman, D.A.
Things that makes us smart

15000 BC, painting of a galloping horse from the Lascaux cave, France.

physical data

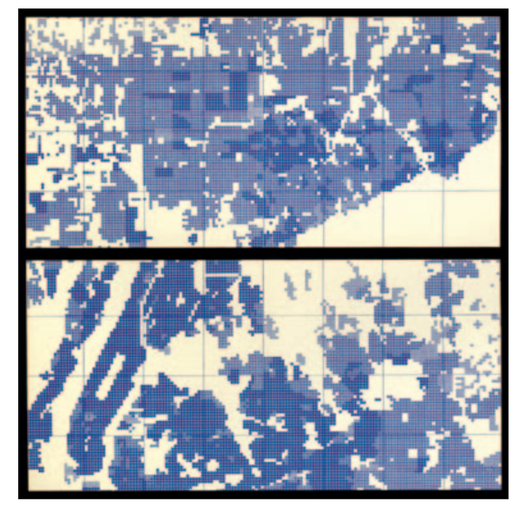


1985, Richard S. Wurman: diagram explaining male and female organs in *Medical Access*. (Wurman, R. *Medical Access*)



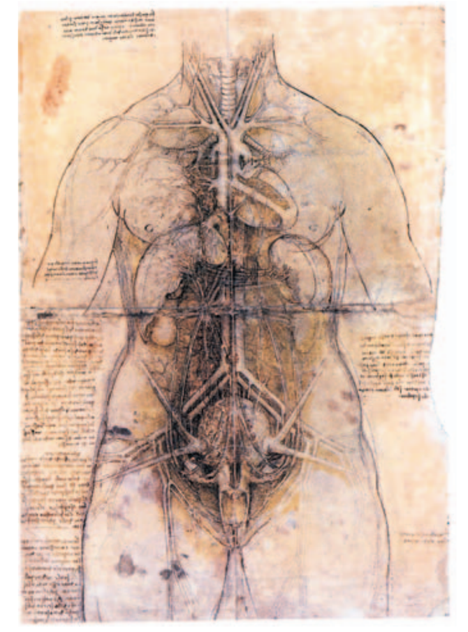
1953, Herbert Bayer: diagram of the moon, explaining its phases, orbit, and occurrences such as lunar eclipses in the *World Geo-Graphic Atlas*. (Herdeg, W. ed. *Graphis Diagrams*)

1933, Harry Beck: London underground map. (Meggs, P.B. *A History of Graphic Design*)



1967, Richard S. Wurman: statistical maps from Urban Atlas: 20 American Cities. (Wurman, R.S. *Information Architects*)

c.1510, Leonardo da Vinci: anatomical drawing of the female body. (Pedersen, M. ed. *Graphis Diagram 1*)

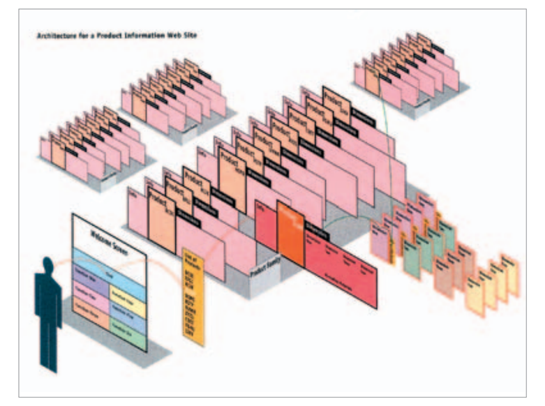


1616, Galileo Galilei: six phases of the moon. (Robin, H. *The Scientific Image: from Cave to Computer*)

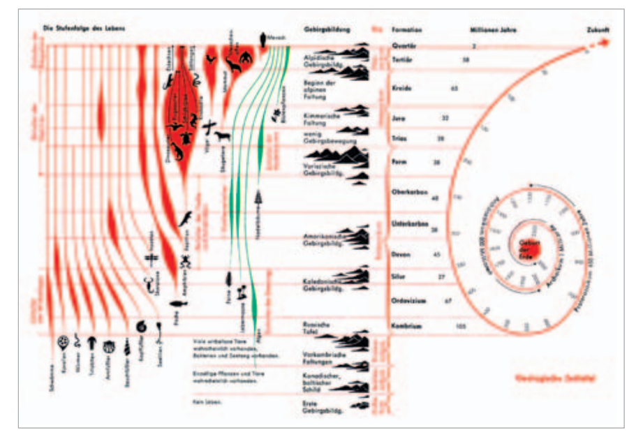
mid-13th century, Matthew Paris: Pilgrim map, first of its five pages. (Harvey, P.D.A. *Medieval Maps*)

1889, Charles Booth: map of London Poverty. (Burke, M., Wildbur, P. *Information Graphics*)

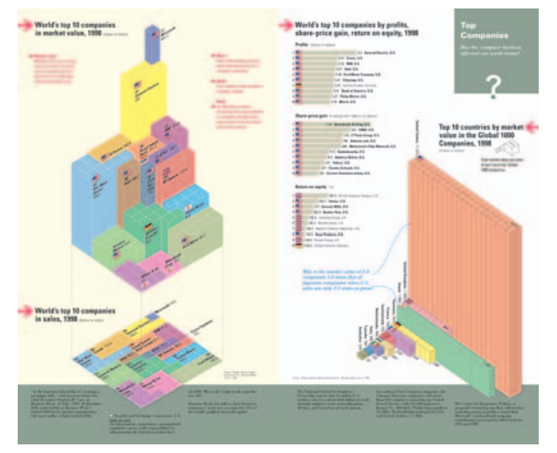
abstract data (nonphysical)



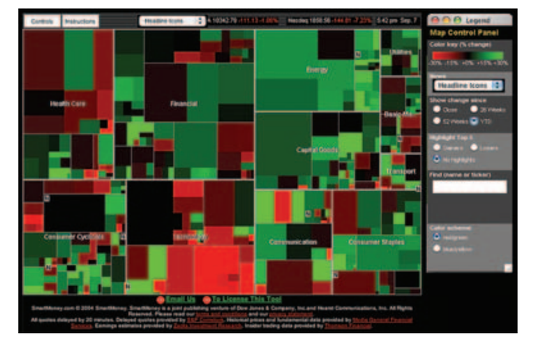
1990s, Dynamic Diagrams: Merrill Lynch Product Information web site. (Kahn, P., Lenk, K. *Mapping Web Sites*)



1953, Herbert Bayer: diagram of the succession of life and geological time-table in the *World Geo-Graphic Atlas*. (Herdeg, W. ed. *Graphis Diagrams*)

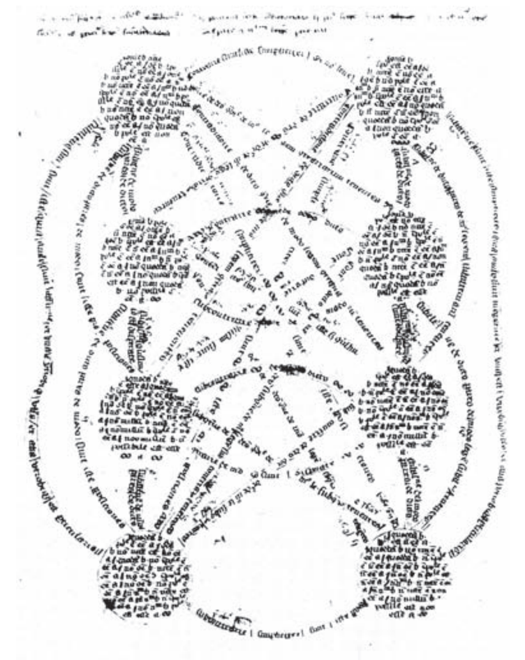


1999, Krzysztof Lenk and Paul Kahn: diagram of top 10 countries by market value in the global 1000 companies, 1998. (Wurman, s. ed. *Understanding USA*)

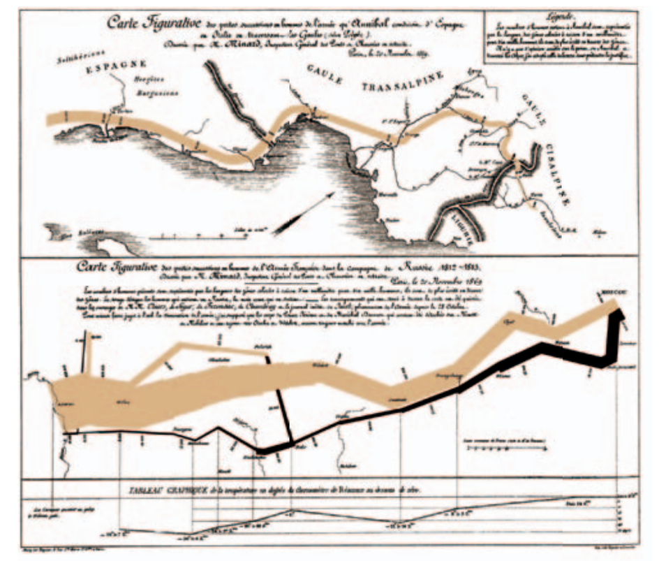


launched 1998, SmartMoney.com: Map of the Market. (http://SmartMoney.com/marketmap)

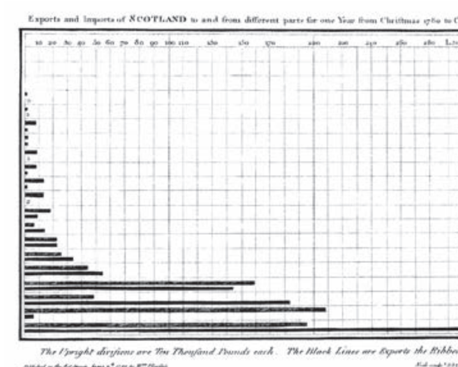
15th century, Jean Buridan: the relation of propositions in the manuscript *Expositio Summularum* (Murdoch, J.E. *Album of Science: antiquity and the middle ages*)



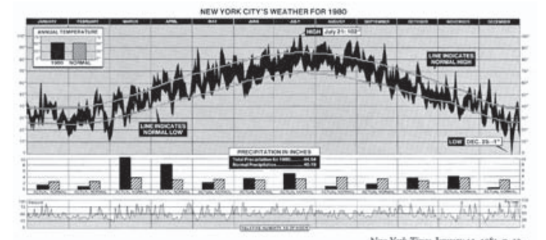
1869, Charles J. Minard: two graphical representations (Tufte, E. *The Visual Display of Quantitative Information*)



1786, William Playfair: Exports and Imports of Scotland to and from different parts from one year from Christmas 1780 to Christmas 1781. (Tufte, E. *The Visual Display of Quantitative Information*)



1981, *New York Times*: New York City's Weather for 1980 (Tufte, E. *The Visual Display of Quantitative Information*)



The study of graphical constructions and methods used throughout time in visualizations of information can inform how to design data displays for both purposes: as a means to communicate information or as hypothesis formation.

The current challenge of this project is how to make connections among the historical examples. It is clear that they can be organized in time, space and categories. However, there are several other layers of information that need to be analyzed, such as for example, innovations in graphical methods. Another important issue to be considered is how the different disciplines involved with the graphical display of data can benefit from the final prototype. These issues, among others, are under consideration towards a product that will encourage cross-disciplinary, critical and creative thinking for those involved in information visualizations.

Images were digitized by Lisa Perry, a senior undergraduate student in Graphic Design who is working on the project.