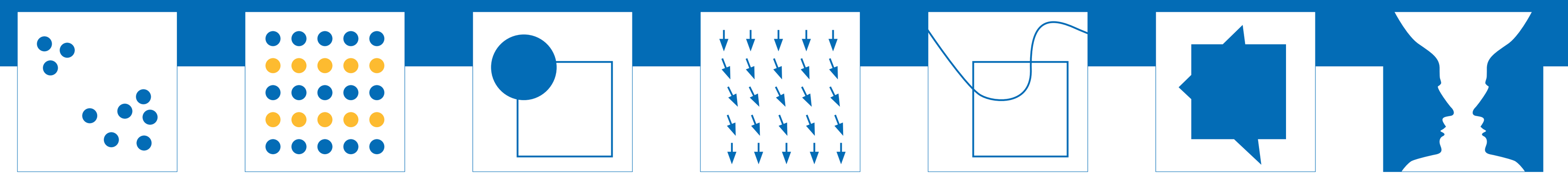
Department of Visual Arts

m. isabel meirelles

m.meirelles@neu.edu

educational tool for the discipline of information design

The Gestalt School of Psychology proposes that the perception of elements (e.g., visual, musical, etc.) depends on contextual and structural relations. The theory explains that we don't experience stimuli as individual, piecemeal things. Rather, we experience larger wholes separated from and related to one another. They developed a series of principles —known as the "Gestalt laws"— describing the way we detect patterns, how individual units are integrated into a coherent percept.



proximity | similarity | closure | common fate | good continuation | simplicity | figure / ground segregation

This panel presents the project *Historical Resource for Information Design* conceived and developed in 2004 – 2005 with the Instructional Development Fund, Provost Grant Program, Northeastern University. The result is a prototype of a learning tool for the discipline of Information Design targeted at undergraduate students from different disciplines who are involved in the visualization of information. The project's educational objectives are both to serve as a repository of exemplary historical visualizations and to encourage creative and critical thinking.

Visualization of information has a long history. It has been extensively used for solving problems and for communicating solutions by a large number of disciplines: from the sciences to engineering, from music to design. In most cases, the visualization of information is domain specific with specific methods and conventions for data encoding. Visual representations could roughly be organized by data type (e.g. physical data, abstract data, statistical data); medium (e.g., dynamic information visualizations, information design, data exploratory devices); and function (e.g., communication, reasoning). Independent of data type, medium and function, all visualizations involve the translation of a system into a spatial representation. The graphic elements (and properties) and the graphic structure in a representation stand for elements and relations in another domain.

Information Design depends upon cognitive processes and visual perception for both its creation (encoding) and its use (decoding). Understanding the constraints and capabilities of cognition and visual perception can enhance the way we organize and encode information.

prototype

The prototype presents information in two modes: visual and verbal. It encourages three different levels of knowledge acquisition: theoretical (Gestalt Principles), historical (exemplary visualizations) and practical (guidelines for the construction of effective visualizations).

The current interface presents a preliminary model with limited content. Because pattern detection and perceptual inferences are essential to any information visualization, the Gestalt Laws were chosen as the theoretical framework of the prototype. Selected historical examples were organized by principles. The main criteria used for selecting the historical examples was that of visualizations presenting novel methods and strategies for representing data effectively.

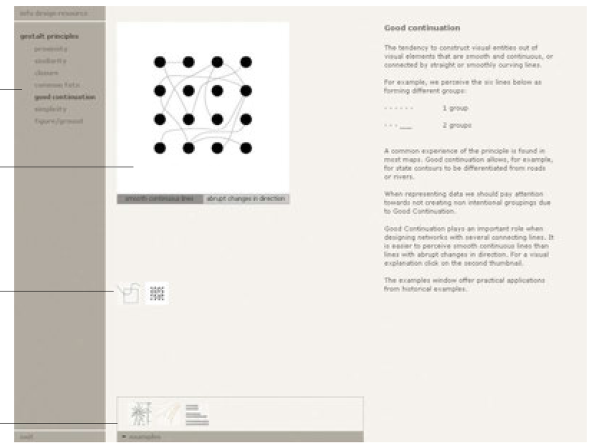
Sample page for the Gestalt principles

Main menu navigation

Image for the visual explanation of Gestalt principles

Thumbnails / buttons: access to visual explanations of principles

Examples collapsible window / button: opens window and gives access to examples ' thumbnails



Sample pages for the historical examples

Image area for historical visualizations

Button: on click returns to this specific Gestalt principle's page

Enlarge-reduce / button: on click enlarges image to 200%

Description collapsible window / button: on click opens description

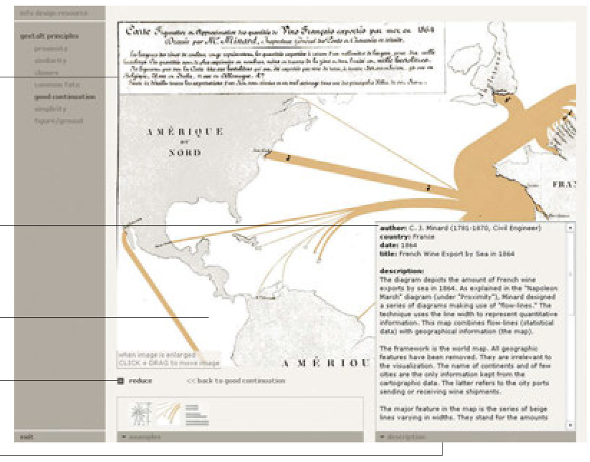
Enlarged image scale = 200%

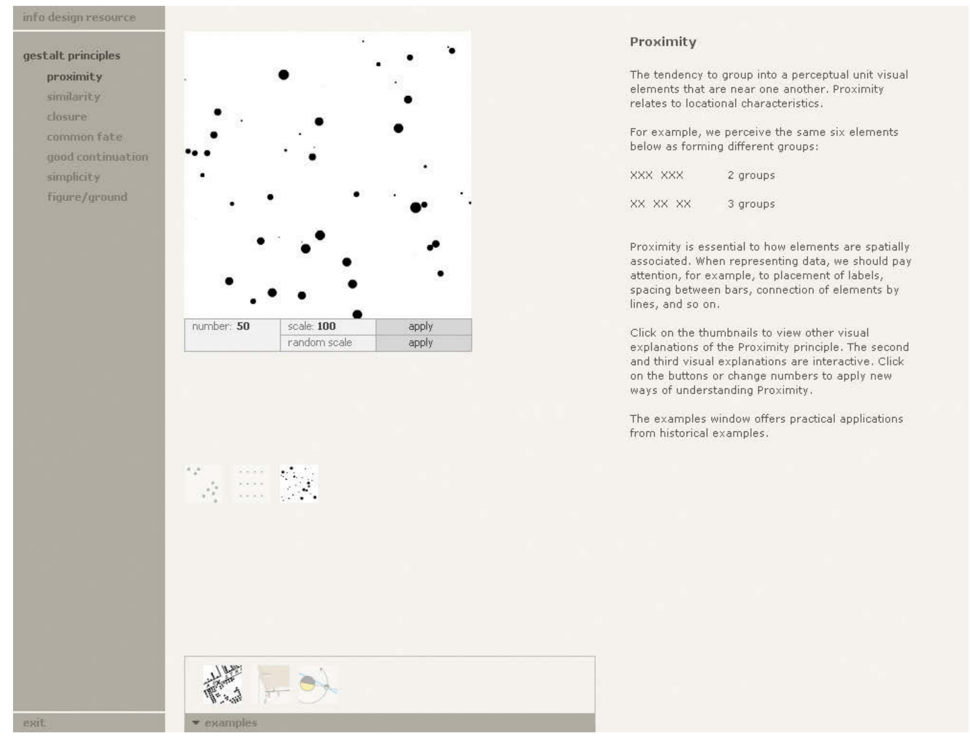
Description window: historical and analytical text about visualization

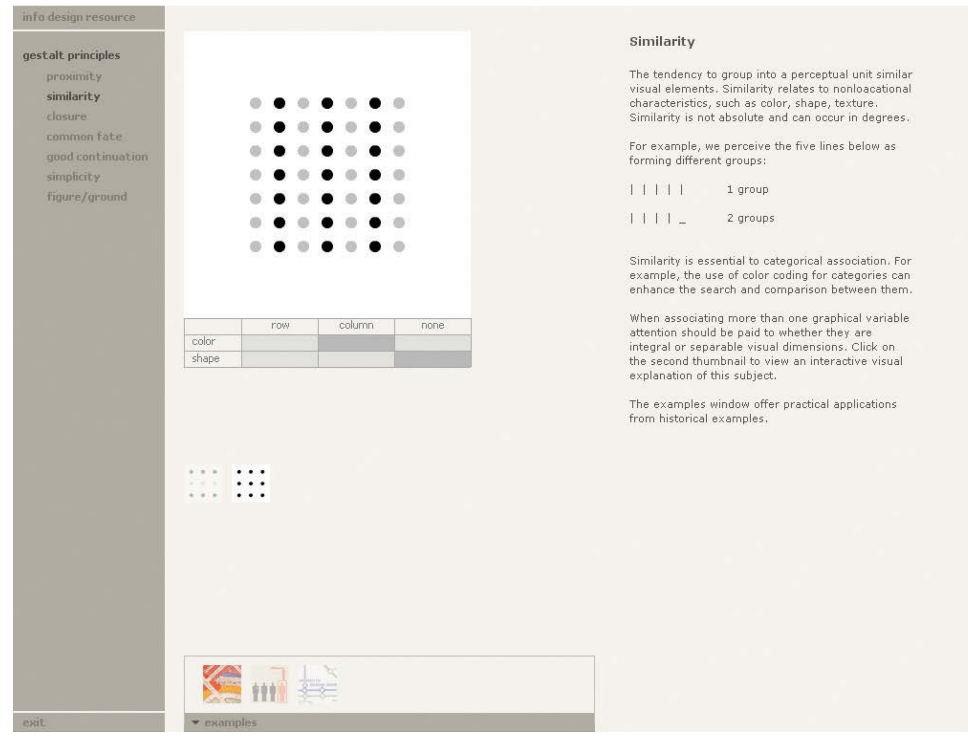
Tip on how to move the image when it is enlarged (on mouse over event)

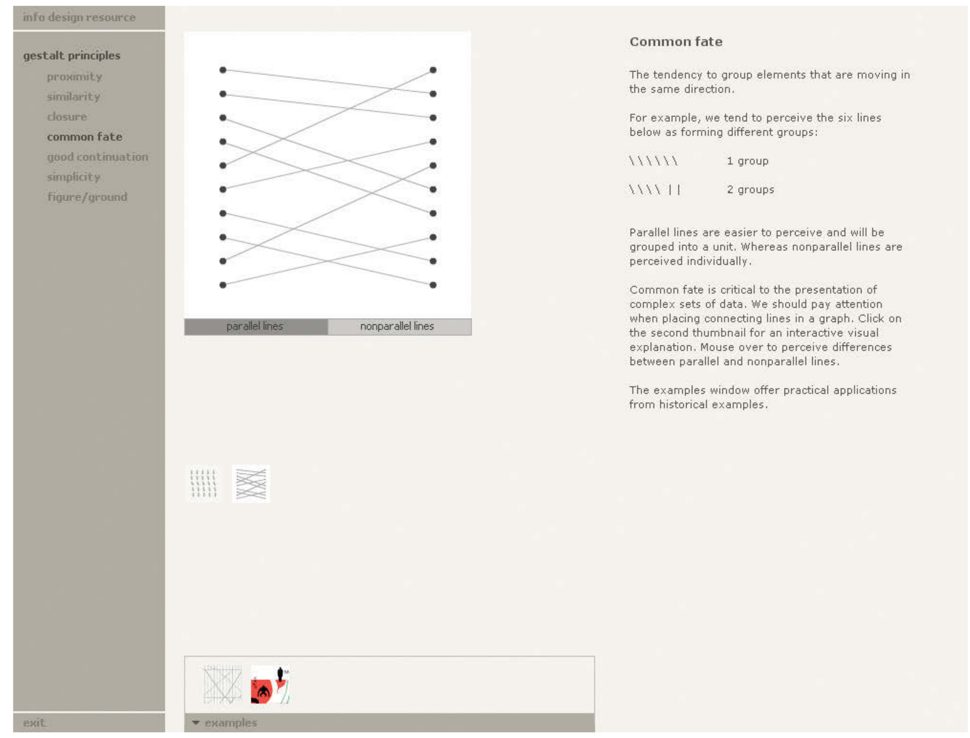
Enlarge-reduce / button: on click reduces image to 100%

Description collapsible window / button: on click closes description









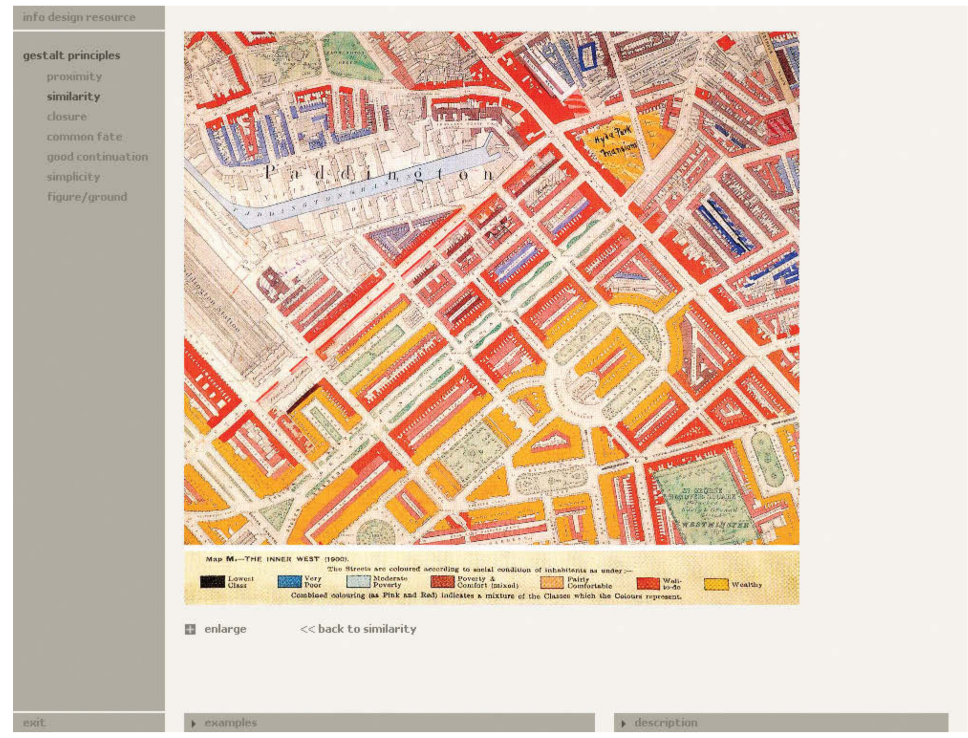
author: Dr. Snow (1813-1858 | Epidemiologist)
country: England
date: 1854
title: Cholera Epidemic Map

The map depicts the spatial location of individual deaths from cholera and of water pumps in a London neighborhood, in September 1854. It is considered one of the first uses of the "plot" technique. The technique was devised by another doctor, Dr.. Thomas Shapter, in 1849. It is also often referred to as a landmark in epidemiology. It is one of the first attempts to connect the cause of cholera to improper water supply. Dr. Snow decided to plot the deaths into a map in order to check for this hypothesis. The map provided him with the graphical evidence. The result was the removal of the pump, which stopped the spread of cholera, and consequently the deaths.

The framework is geographical space. The scale is provided at the top. Main roads have their names written down. Two symbols are used. A key below the scale provides what they stand for: the crosses "X" for water pumps and dots "O" for deaths.

The answer to the problem lies in the pattern of dots. Perception of the pattern is afforded by the proximity principle. The concentration of dots (representing deaths) around the pump on Road Street (the cross at the center of the map) shows that the number of deaths were larger in that area. A new level of information became available: the relationship between deaths and pumps.

The number of dots represents the total amount of deaths (statistical data). To learn the absolute number one would have to count them all. However, the absolute number is irrelevant to the visualization. The relevant information is provided visually by the dot clusters (proximity principle) in relationship with the crosses in space. The map enabled perceptual inference due to the easy detection of pattern.



author: Charles Booth
country: England
date: 1889
title: London Poverty Map

The nineteenth century saw the proliferation of statistical thematic maps. Charles Booth was among those developing graphical displays of measured data related to a wide range of subjects (e.g., social, cultural, economic, etc.). He developed a series of maps representing social conditions in the late nineteenth century London. The Poverty Map is the only colored map in his seventeen volume publication of 1889.

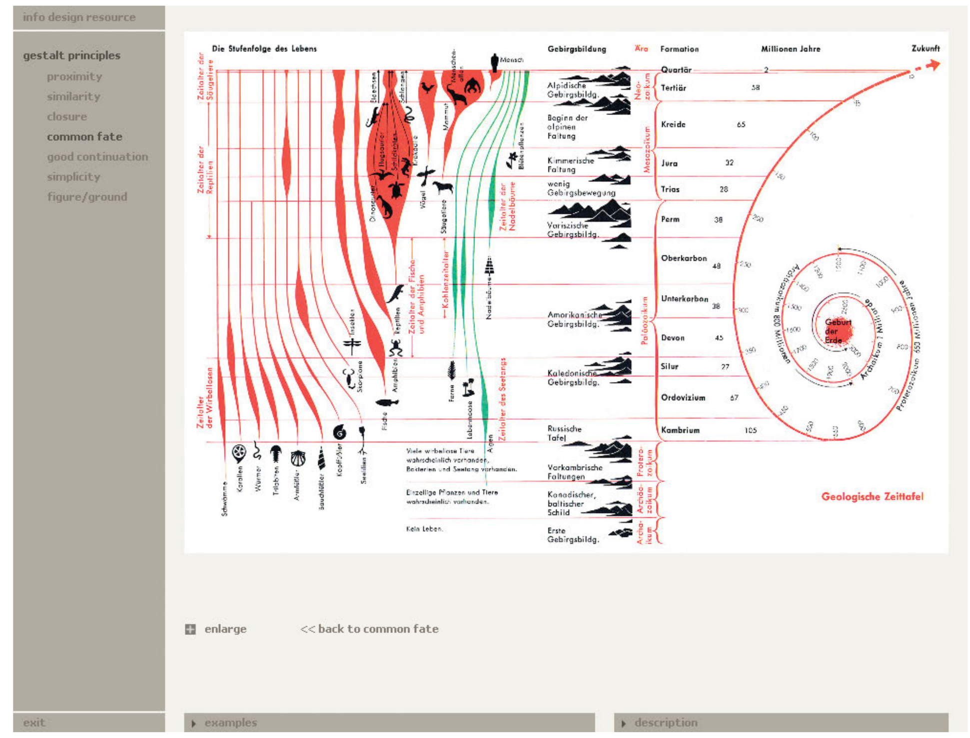
Booth's Poverty Map is a good example of an early use of color as categorical encoding. The framework is the urban area of London in late nineteenth century. This section of the map shows the Paddington area of west London. Seven colors are used to stand for social use of land: the degrees of poverty and wealthiness.

The colors range from dark blue (representing "lowest class") through light blue ("moderate poverty") to yellow (the "wealthy").

Color is not perceived as a continuum, rather as a discrete dimension. The color spectrum is not perceptually ordered. Color discrimination is increased by choosing noticeably distinct hues. In the London Poverty Map, color is used as an ordered data value: increasing from poor to wealth residents. It is easy to discriminate among the colors in the map. However, it is hard to perceive any sense of an ordered sequence. Literature in Perception suggests that colors monotonically increasing or decreasing are easier to perceive as ordered sequences.

The number of colors used —seven— is within the threshold of memorability. Literature in Perception and Cognition explains that we can generally keep in mind the distinctions up to nine colors.

The principle of similarity enhances the recognition and grouping of information. Other levels of information can be inferred from the map. It is possible to detect certain categorical clusters, for example, where concentration of wealth occurs, and so on.



author: Herbert Bayer (1900-1985, Graphic Designer)
country: Germany
date: 1953
title: Diagram of the Chronology of Life and Geology

This diagram appeared in the *World Geo-Graphic Atlas* designed by Herbert Bayer and published by the Container Corporation of America in 1953. It explains visually the succession of life and geology throughout time. To use Tufte's expression it is a "space-time story graphic". It tells the story of geology and life on Earth as a function of time.

The spiral represents time. The choice of the spiral is not arbitrary. Time is portrayed backwards. The starting point (or the end of data in the diagram) is at the top-right, when human life starts (the label says "future"). It regresses to the beginning of our planet, millions of years back. The spiral enables both the representation of such huge span of time and the focus on the period when life occurs.

The scale of time is in million years. Numbers are positioned along the time line. Horizontal lines connect specific times in the spiral with the diagram. The lines mark the different phases on the earth's history. Each phase is labelled and presents numerical information about its duration (also in million years). Phases are grouped into Eras, labelled in red.

From right to left the diagram displays the chronology of geological formations (mountains in black), plant life (green vertical lines) and animal life (red vertical lines). Each categorical group is represented graphically and verbally. Pictograms and labels are grouped according to the proximity principle. Line variations represent quantitative information. Verbal information along the vertical axis of time describes the main occurrences of life in these periods.

Similarity (by means of color code) and proximity (spatial position) play an important role in perceiving the different categories. Animal, flora and geological data are easily recognizable and differentiated. The diagram affords easy perceptual inferences in the macro scale. For example, it is possible to quickly understand relationships between categories and the temporal dimension.

Common fate (parallel lines) and good continuation (smooth lines) enhance the perception of the micro scale. Comparisons between species are easily inferred. The iconic representations offer an extra level of readability and recognition of the plotted data.