

Design for **Information**

rockport

An introduction to the histories,
theories, and best practices behind
effective information visualizations

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Estructuras jerárquicas

Conjuntos ordenados en los que los elementos forman subconjuntos y se organizan según una relación determinada, tanto entre si mismos como con el conjunto

2 tipos básicos de representación: (esquemas apilados y anidados)

Niveles

Conexiones

CARTESIAN SYSTEMS



node-link layout



dendrogram



indented layout



cone-tree



icicle tree



treemap



POLAR SYSTEMS



node-link radial layout



radial icicle or sunburst

OTHER GEOMETRIES

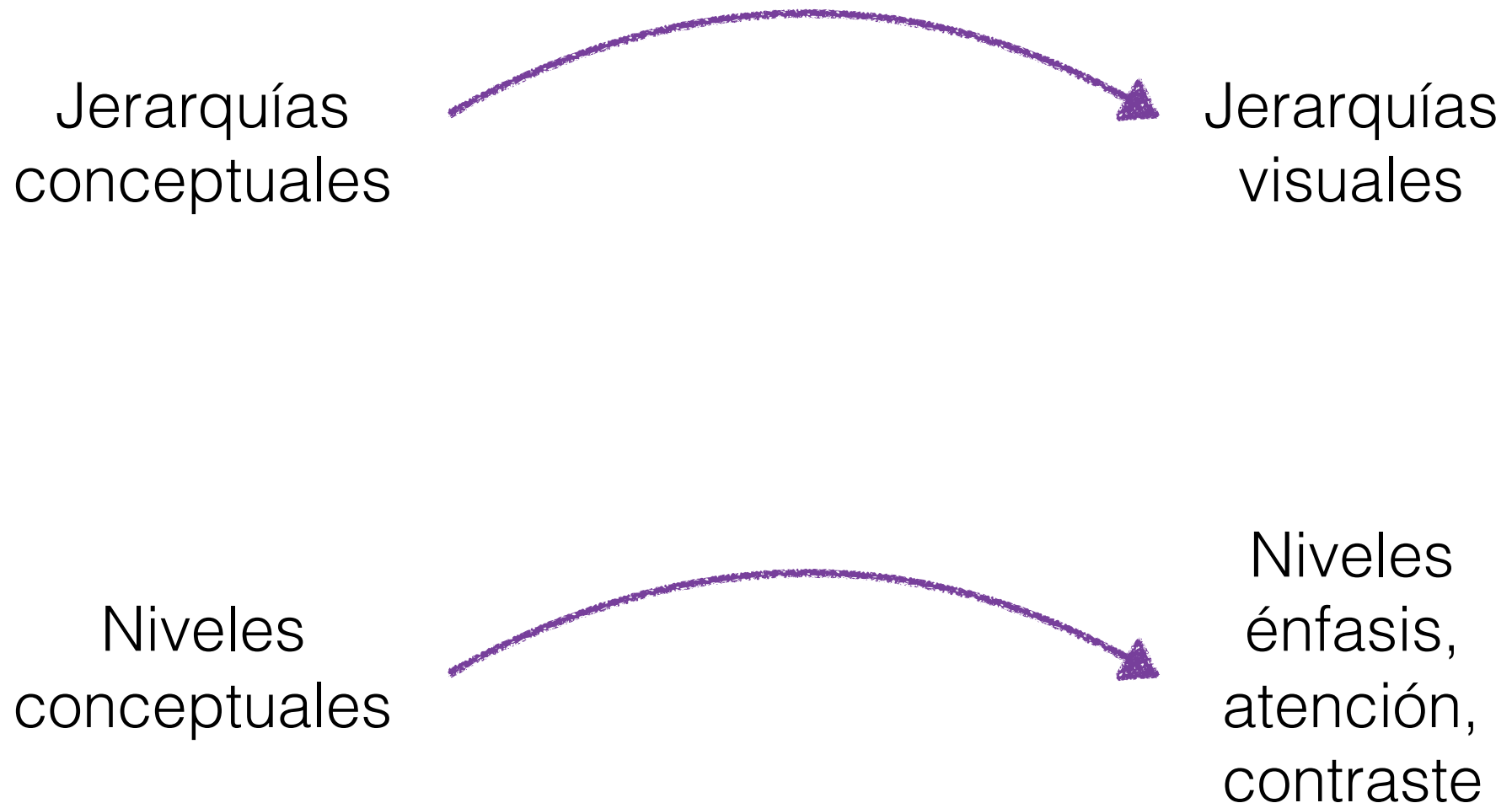


3D hyperbolic tree



venousi treemap

Para visualizar un sistema jerárquico necesitamos
un sistema jerárquico de codificación visual



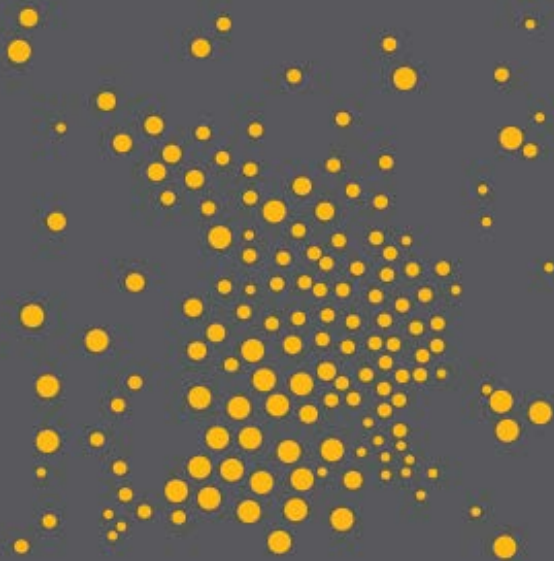
Proporciones
espaciales

Posición
Tamaño

Propiedades
de los objetos

Color
Textura
Forma

Proporciones espaciales

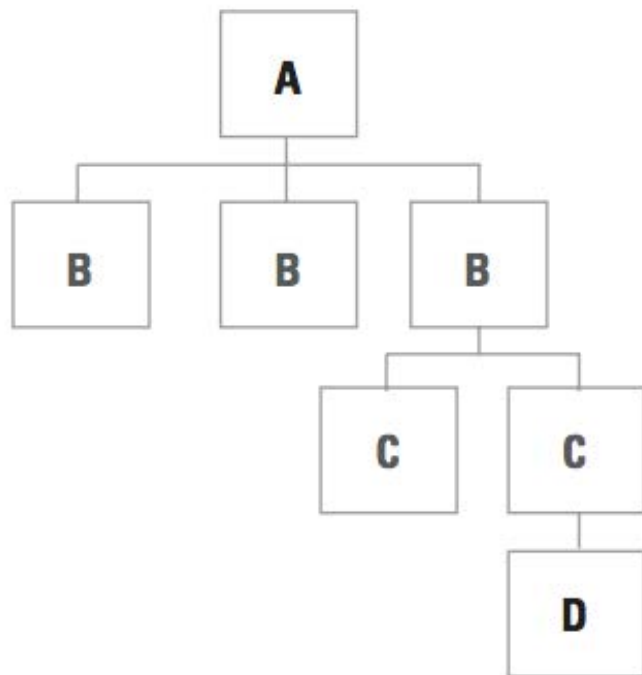


Proximity relates to locational characteristics and is essential to how elements are spatially associated, whether intentionally or not. Note how easily we detect groups and how we tend to make sense of the perceived patterns in the image above with randomly generated sets of dots.

	= 1 group	= <i>word</i>
	= 2 groups	= <i>two words</i>



The difference between the images above is that one is rotated 90 degrees in relation to the other. Otherwise, they are identical. Note how we perceive rows in the first one and columns in the second. The space between dots makes us perceive the dots grouped as linear units in the horizontal or vertical direction.



En el espacio codificamos relaciones conceptuales

Las propiedades geométricas y las relaciones espaciales de la representación deben de equivaler a propiedades y relaciones existentes en la fuente de origen.

Relaciones físicas o conceptuales

Propiedades de los objetos

Modelo de procesamiento perceptivo en 3 etapas (Collin Ware)

Etapa 1: Se extraen características que se procesan con rapidez y de forma simultánea; color, textura, orientación.

Etapa 2: De forma mucho más lenta se extraen patrones; regiones del mismo color, regiones con la misma textura.

Etapa 3: La información se reduce a unos cuantos pocos objetos, se mantienen en la memoria visual a corto plazo.

Etapa 1:
Se extraen
características que
se procesan con
rapidez y de forma
simultánea; color,
textura, orientación.

18596746321475030608030504090
70502769843010215346748950213
06057204020503090845064201040
70204070835061305080239245798

18596746321475030608030504090
70502769843010215346748950213
06057204020503090845064201040
70204070835061305080239245798

Procesamiento de
características
preatentivas.

18596746321475030608030504090
70502769843010215346748950213
06057204020503090845064201040
70204070835061305080239245798

“De un vistazo”

18596746321475030608030504090
70502769843010215346748950213
06057204020503090845064201040
70204070835061305080239245798

Las características pre-atentivas facilitan procesos cognitivos como:

- Detección de objetos
- Detección de bordes
- Detección de regiones
 - Contar elementos
 - Estimaciones

El objetivo al usarlas debe ser el aumento de la detección y el reconocimiento de patrones

LINE ORIENTATION



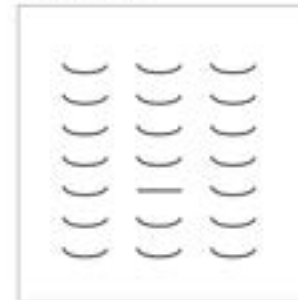
LINE LENGTH



LINE WEIGHT



CURVATURE



ADDED MARKS



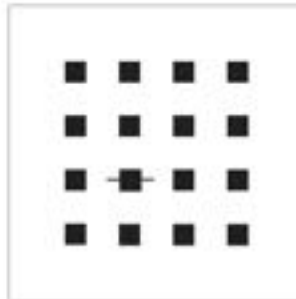
ENCLOSURE



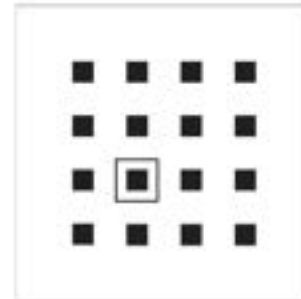
COLOR/HUE



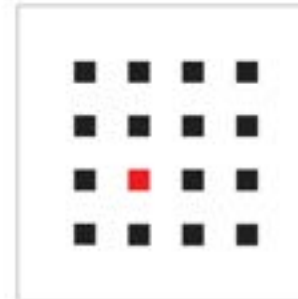
INTENSITY/VALUE



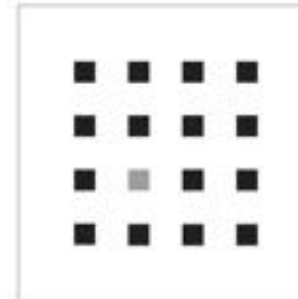
SHAPE



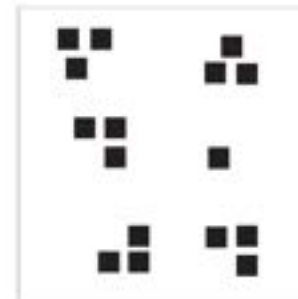
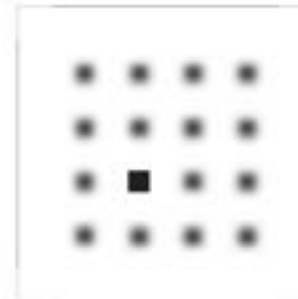
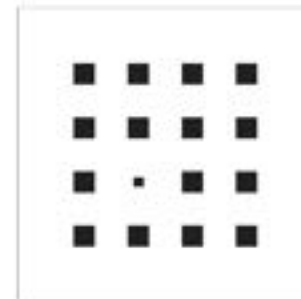
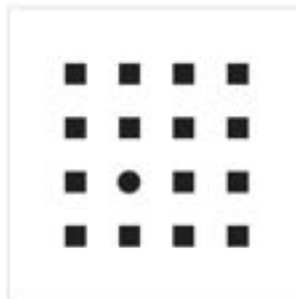
SIZE



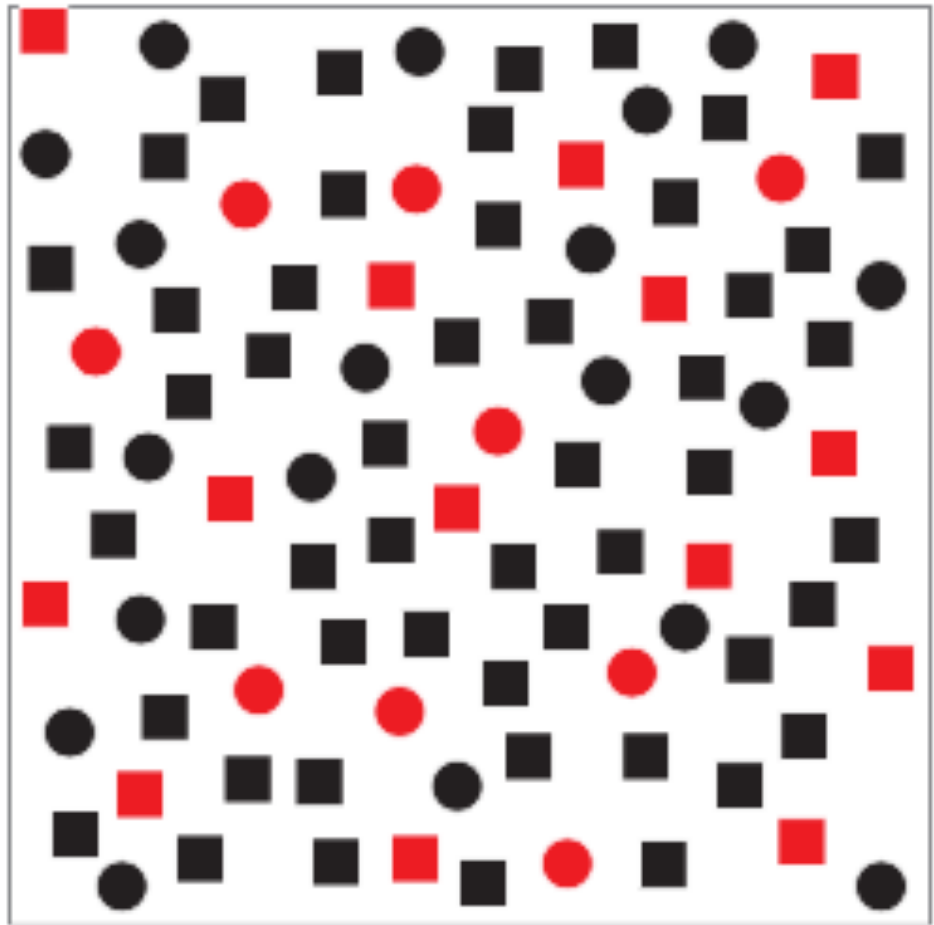
SHARPNESS



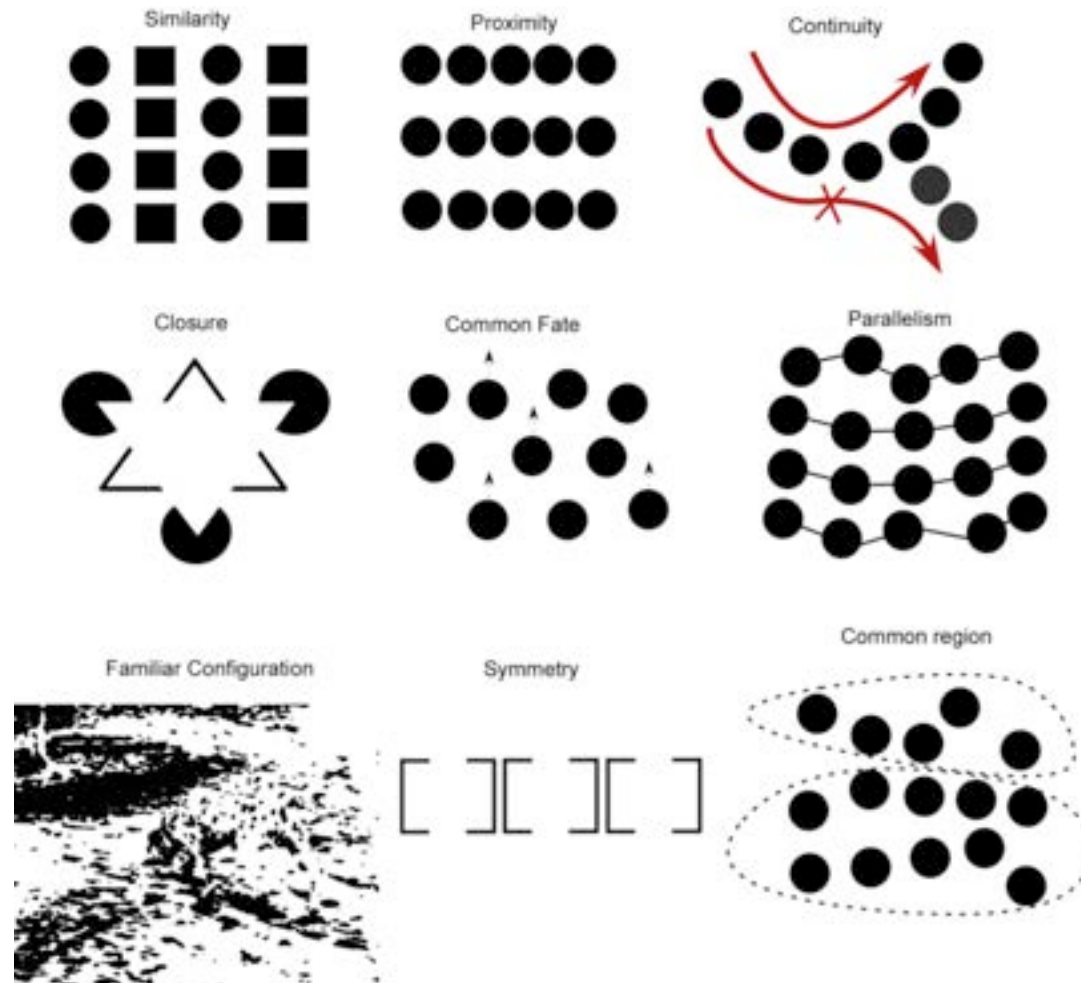
NUMEROSITY



Cuidado con el
número y la variedad
de las características
preatentivas.



En el paso 2 del proceso se une y se discrimina características para determinar patrones



Facilitan la solución de problemas y los procesos de pensamiento

STEMMA I



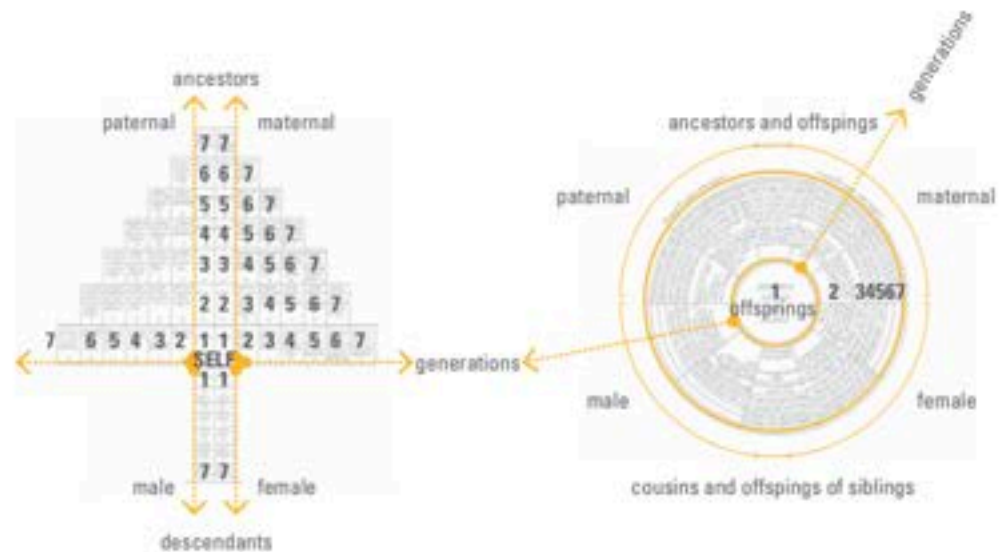
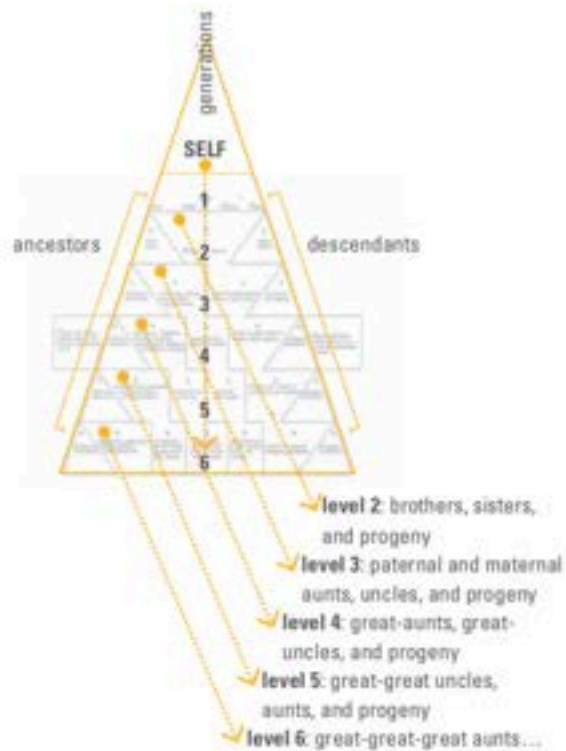
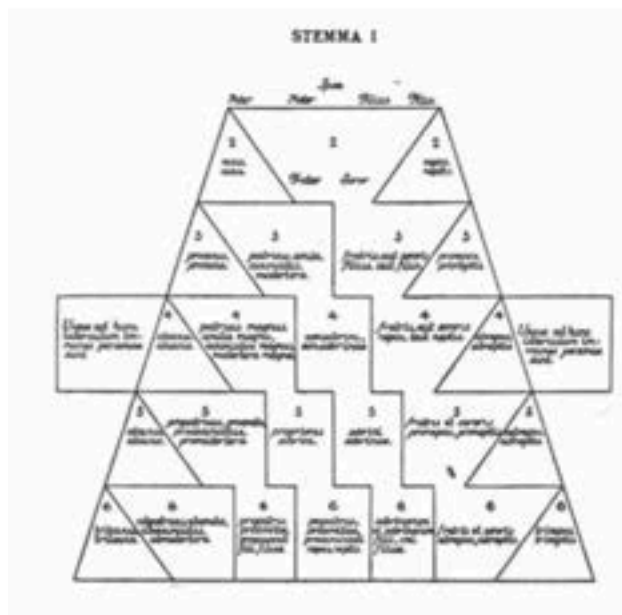
STEMMA II



STEMMA III



Arzobispo Isidoro de Sevilla, enciclopedia medieval siglo VII Etimologías, Libro XX



Bishop Isidore of Seville: "Consanguinity Trees," I, II, III, Seventh century.

ARBOR SCIENTIÆ.

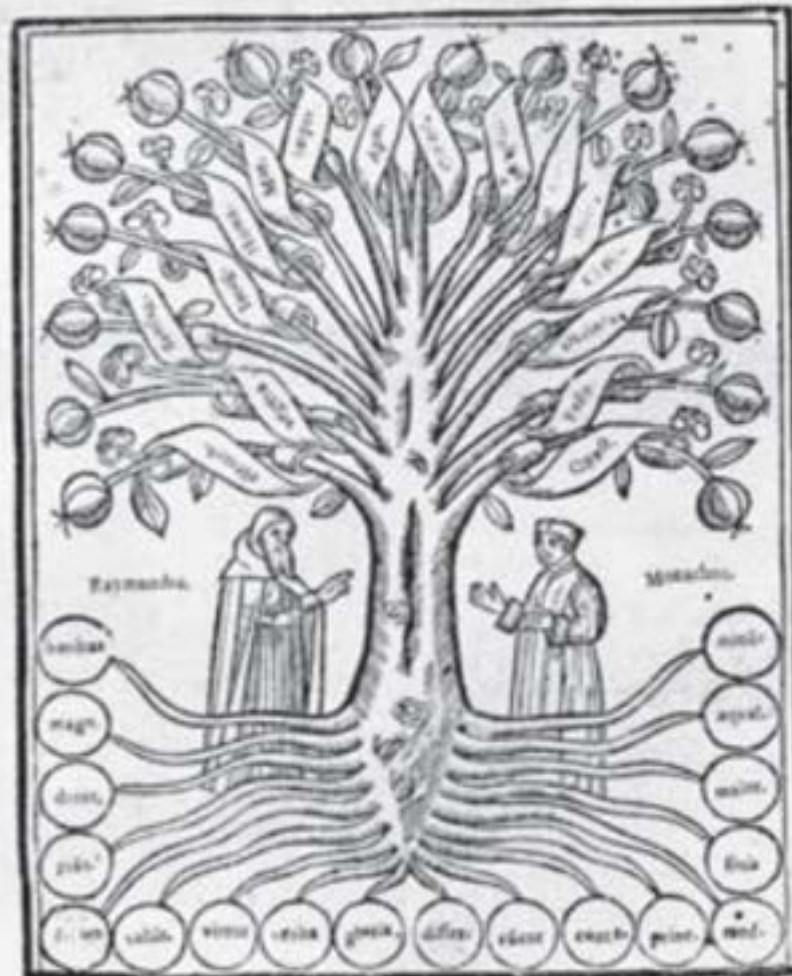
VENERABILIS ET CÆLITVS

illuminati Patris RAYMONDI LULLII

Maioricensis,

LIBER AD OMNES SCIENTIAS

utilissimus.



Anno Domini M. D. XV.

Ramon Llull: "Tree of Knowledge," 1515.

The diagram was published in the title page of *Arbor Scientiæ Venerabilis et Cælitvs*.

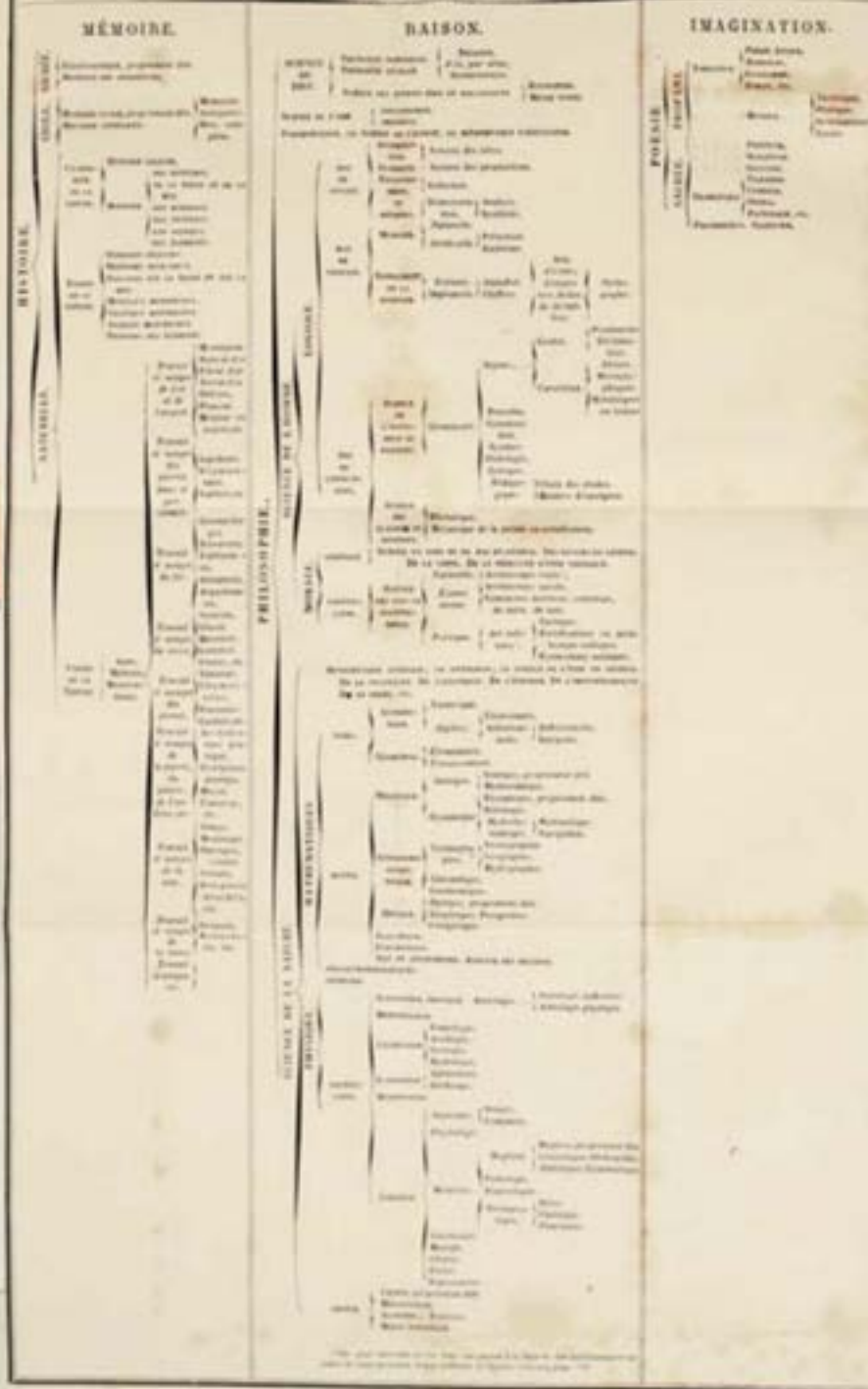


Athanasius Kircher: "Universal Horoscope of the Society of Jesus," 1646.

The diagram uses a composite sundial in the form of an olive tree with the base representing Rome. It appeared in *Ars Magna Lucis et Umbrae*, page 553.

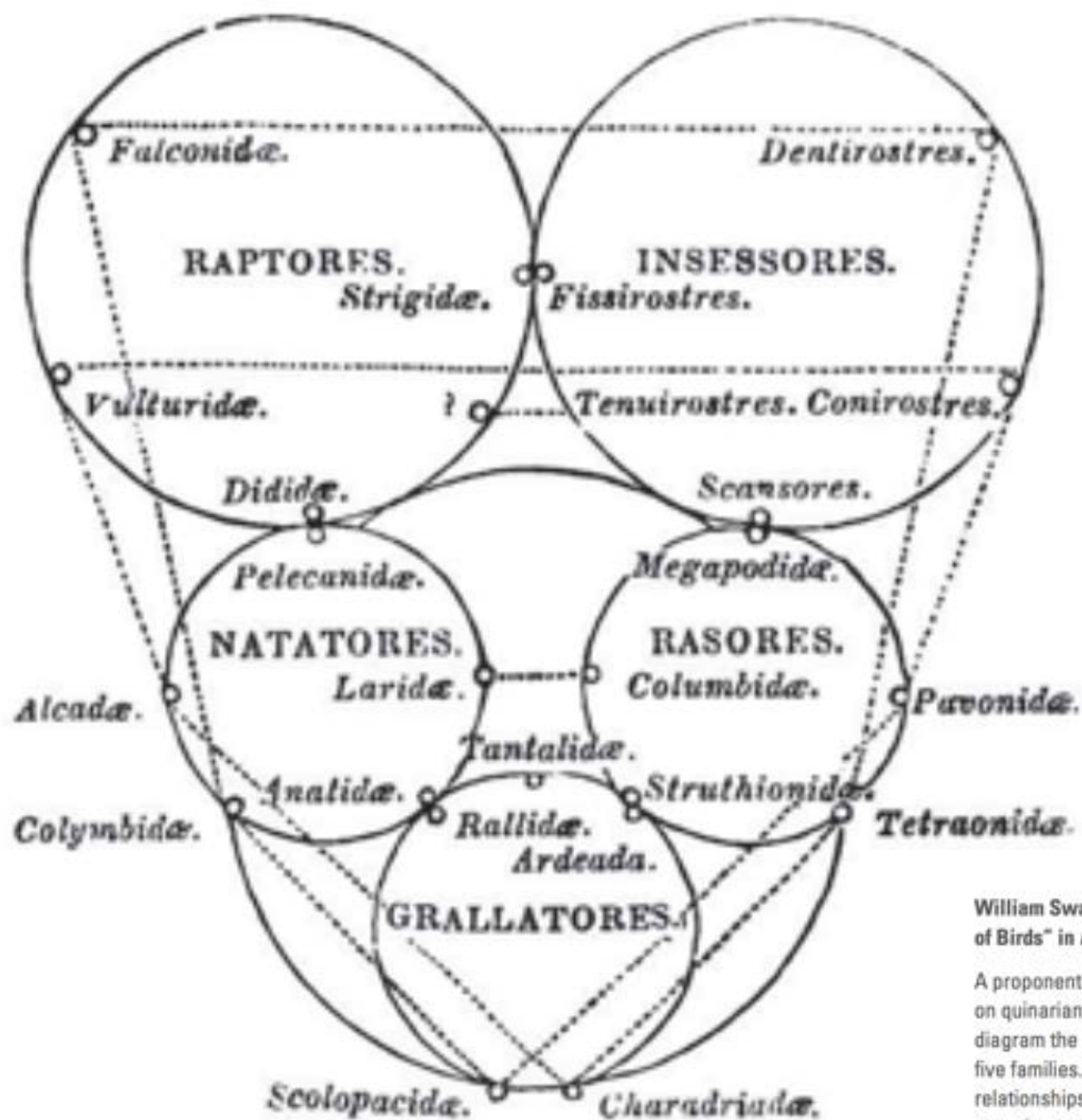
SYSTÈME FIGURÉ DES CONNAISSANCES HUMAINES.

ENTENDEMENT.



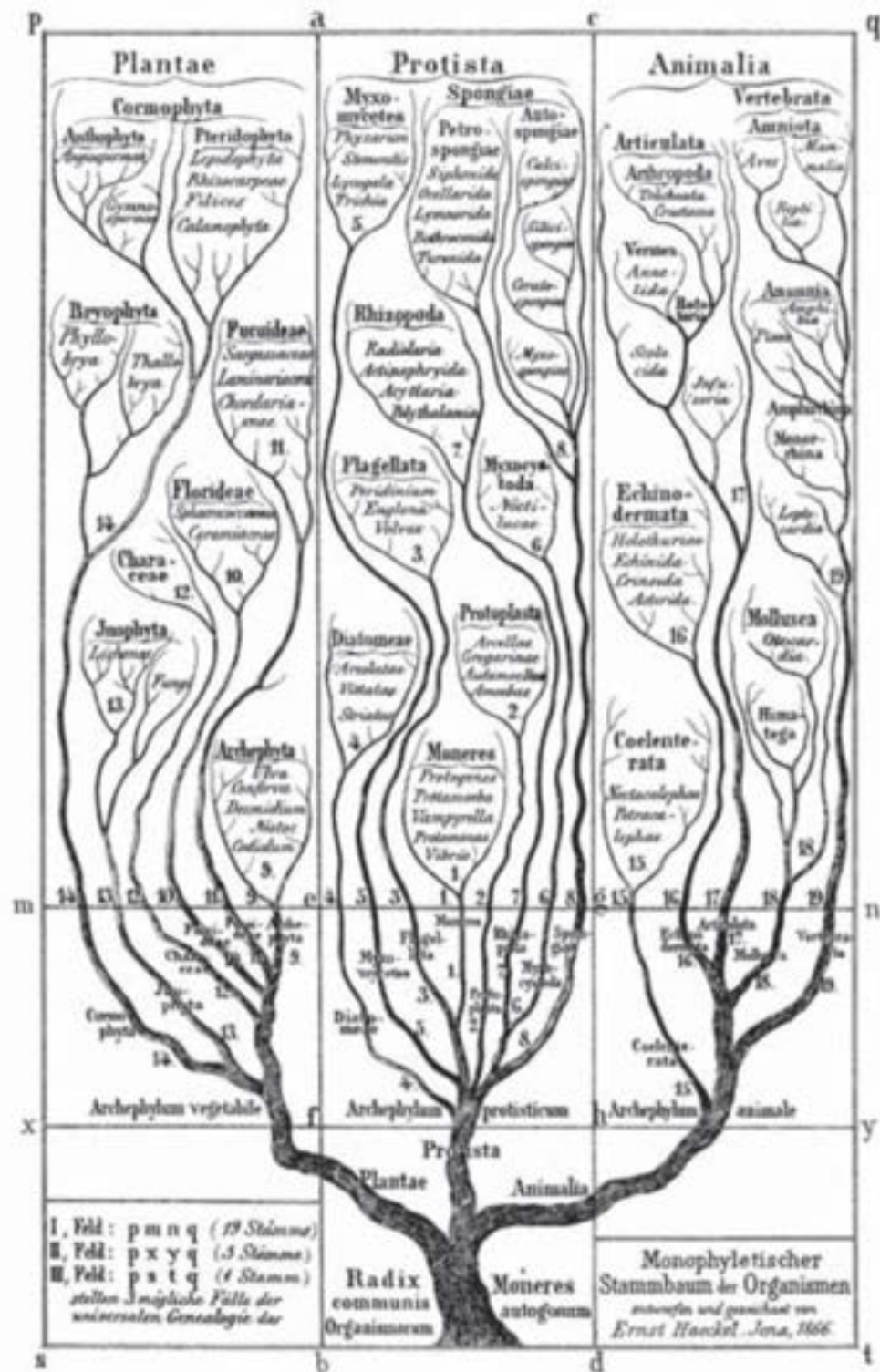
Denis Diderot: Table of "Figurative System of Human Knowledge," 1751.

The system was published in *Oeuvres Complètes* (1876), tome XIII, between pages 164–165, edited by J. Assézat, Garnier, Paris.



William Swainson: "Five Natural Orders of Birds" in *Natural History of Birds*, 1837.

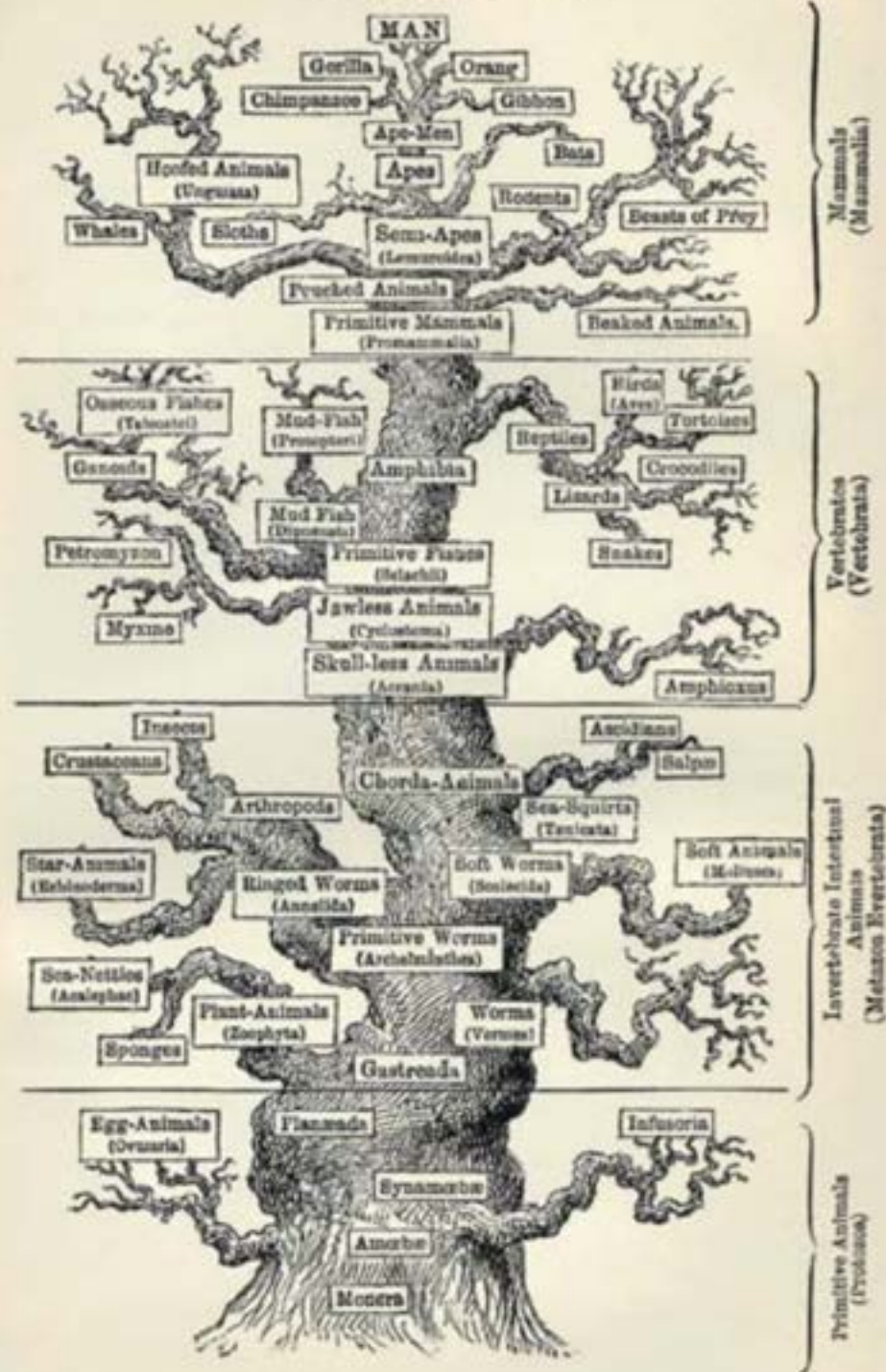
A proponent of general classification based on quinaryism, Swainson represented in the diagram the orders as circles, each containing five families. The dotted lines indicate relationships of analogy. Pietsch draws attention to the bottom part of the diagram in which the three lower orders are enclosed in a larger circle, standing for closer affinities.²⁰



Ernst Haeckel: "Monophyletic Family Tree of Organisms" in the first edition of *Generelle Morphologie der Organismen* (*General Morphology of Organisms*), 1866.

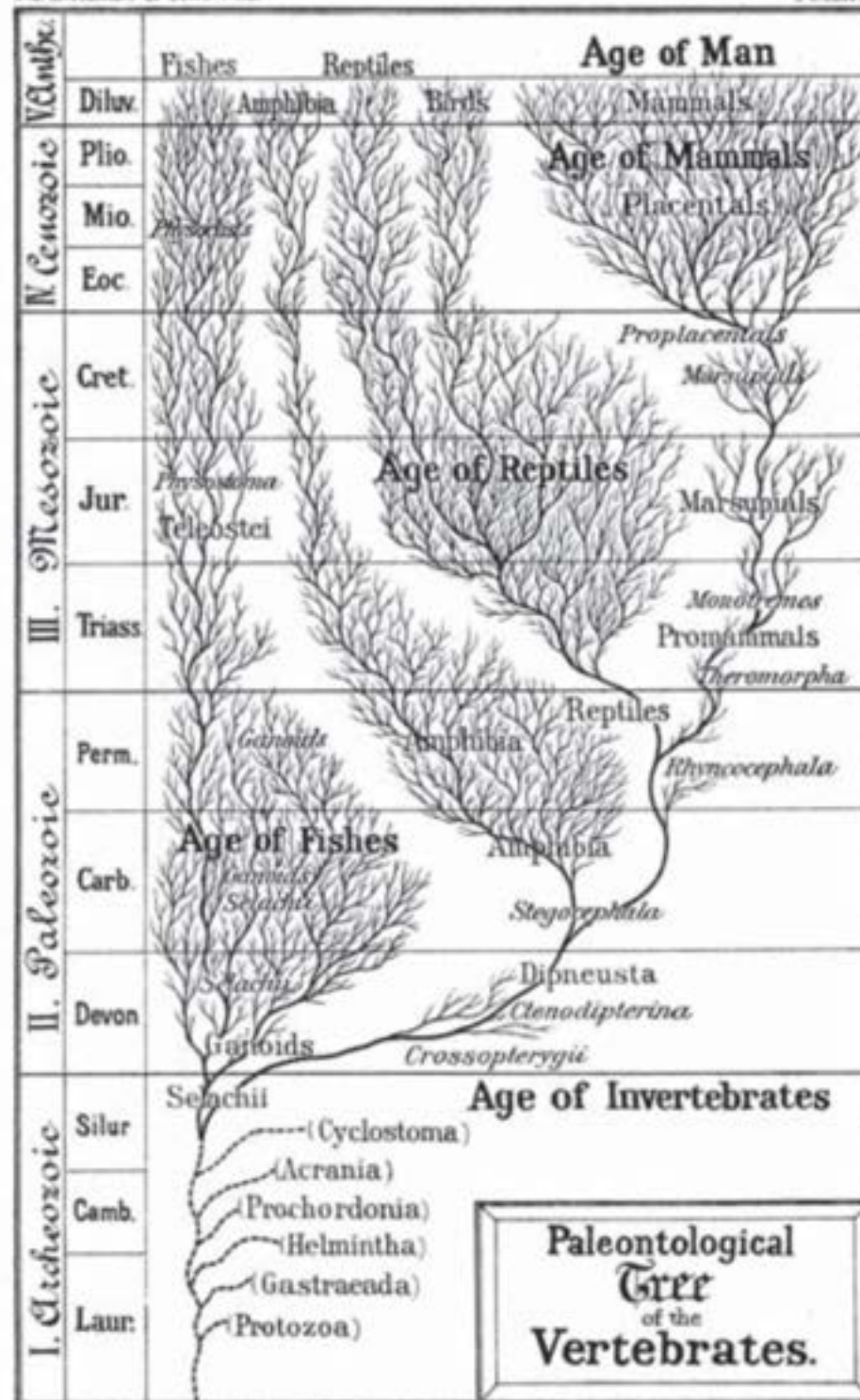
This branching diagram is considered the earliest one published by Haeckel.²⁵ It shows the three kingdoms of life: unicellular organisms (*Protista*) and multicellular organisms—animals (*Animalia*) and plants (*Plantae*).

PEDIGREE OF MAN.



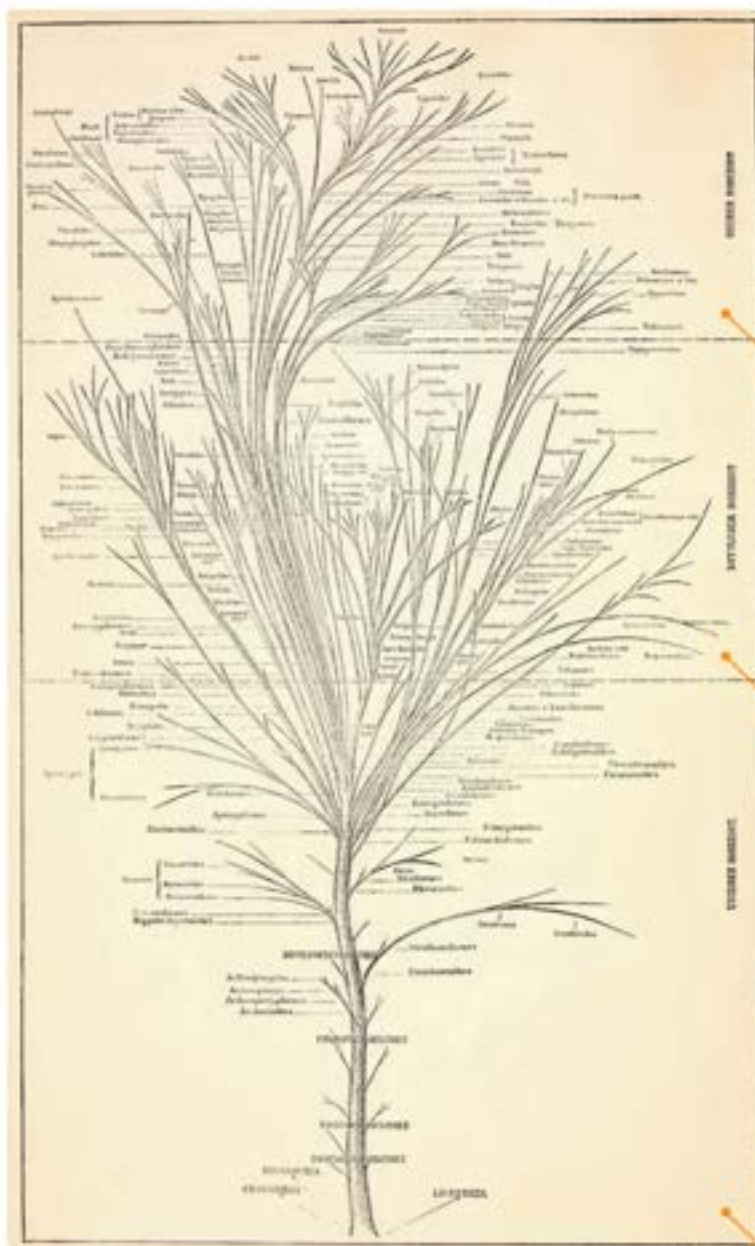
Ernst Haeckel: "Family Tree of Man," 1879.

The well-known oak "Family Tree of Man" was published in the first edition of *Anthropogenie oder Entwicklungsgeschichte des Menschen* (*The Evolution of Man*).



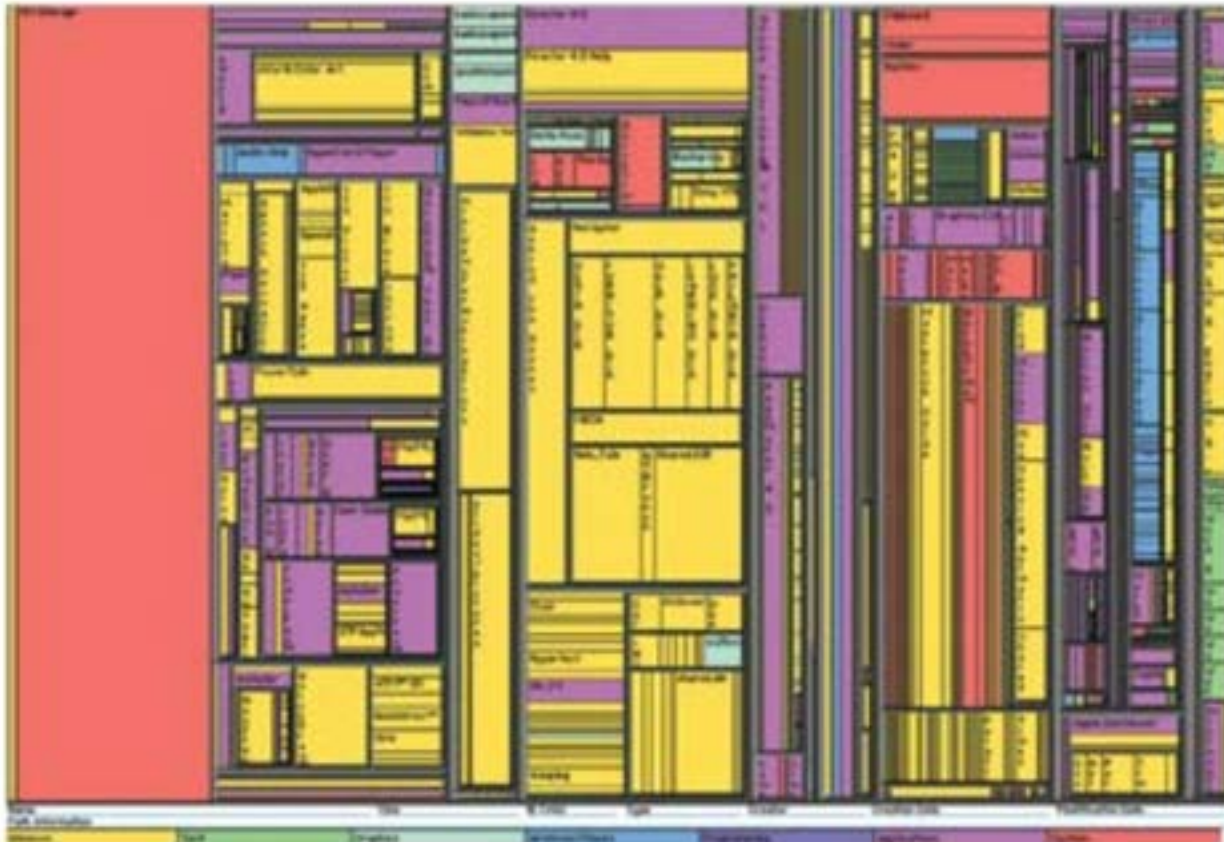
Ernst Haeckel: "Paleontological Tree of Vertebrates," c1879.

This diagram shows the evolutionary history of species.



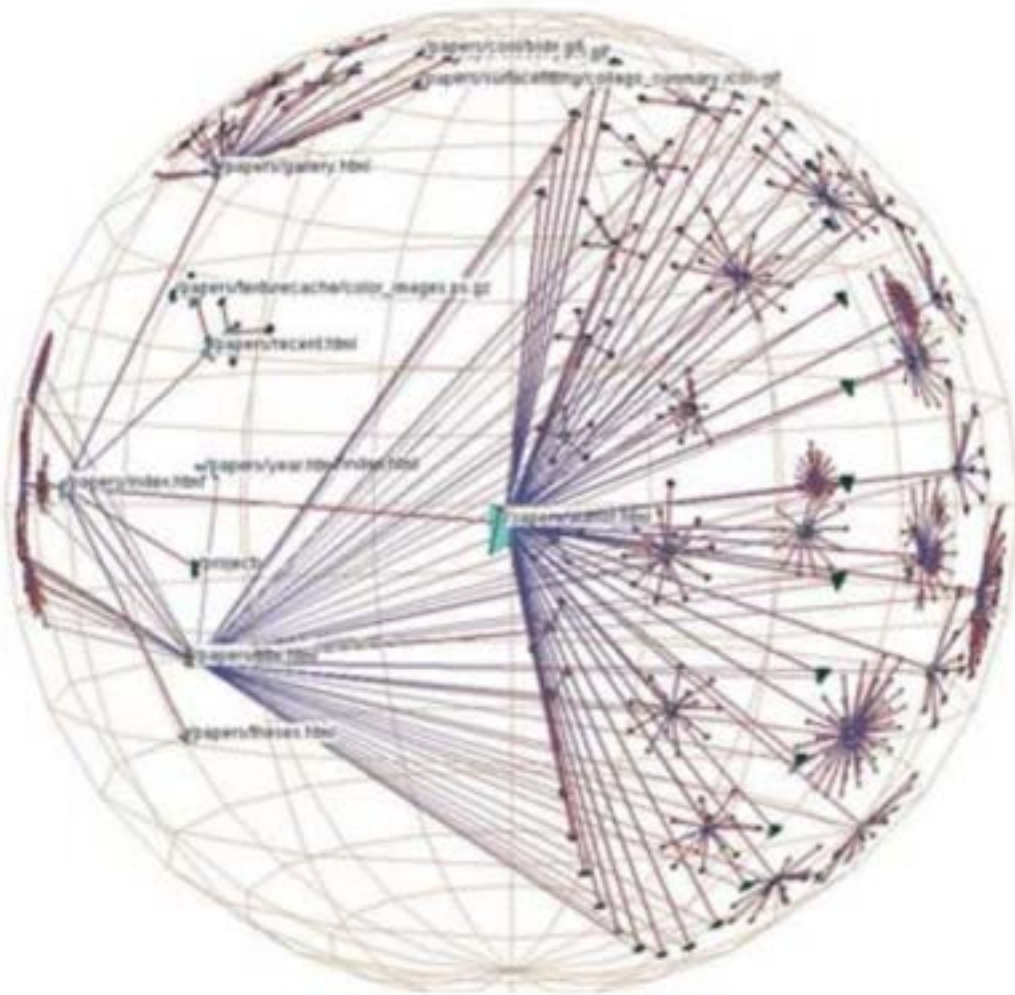
Max Fürbringer: Four diagrams representing the "Phylogenetic Tree of Birds" in *Bijdragen tot de Dierkunde*, tome XIII, vol. XV, edited by J. Asselst, Amsterdam, 1888.

The diagram on the top shows the vertical aspect of the tree, whereas Plates V-VII (to the right) show the horizontal projections for the upper, middle, and lower sections, respectively.



Brian Johnson and Ben Shneiderman at the Human-Computer Interaction Laboratory²⁴ University of Maryland, U.S.: Snapshot of the "TreeViz" interface that uses a treemap to represent files in a computer, 1993.

Shneiderman originally devised the treemap technique in 1991 and he contends that "treemaps are a convenient representation that has unmatched utility for certain tasks. The capacity to see tens of thousands of nodes in a fixed space and find large areas or duplicate directories is very powerful."²⁵ The treemap technique is further examined in the case study that follows.



**Tamara Munzner, U.S. : Snapshot of the
"3-D Hyperbolic Tree," 1998.**

Munzner devised and implemented the 3-D Hyperbolic Tree technique to navigate large datasets with the objective of reducing visual clutter and supporting dynamic exploration. Tamara explains that the layout in three-dimensional hyperbolic space allows for focus on a point of interest while providing enough context.²⁶

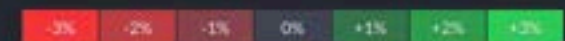
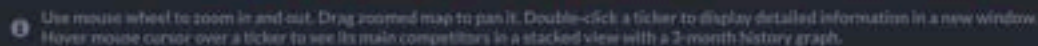
TREEMAPS

SmartMoney Map of the Market

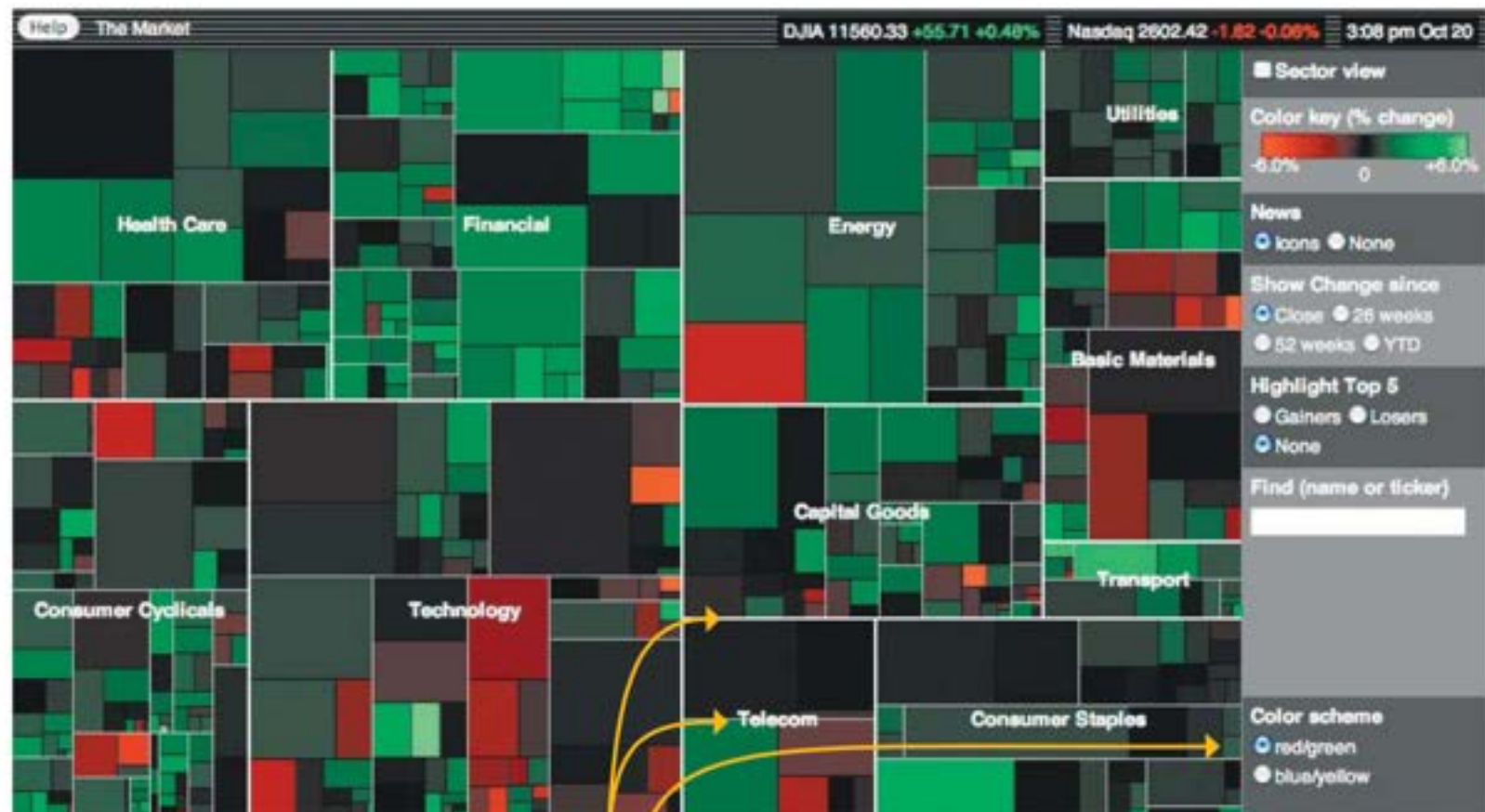
www.smartmoney.com/marketmap

https://finviz.com/map.ashx?t=sec_all

1 Day Performance ▾







AUTHOR Martin Wattenberg
COMPANY SmartMoney.com
COUNTRY United States
DATE 1998
MEDIUM Online, real-time interactive application
DOMAIN Finance
TASK To provide an overview of stock market performance with detection of trends at given periods of time
STRUCTURE The visualization uses the treemap technique. The algorithm devised by Wattenberg renders the internal divisions closer to squared shapes, resulting in a more legible and easier to interact with interface.

DATA TYPE AND VISUAL ENCODING

Categorical: Sectors
Encoding: Spatial positioning (grouping) and line weight

Temporal: Invariant period of time
Encoding: Text (enabled by selection)

Quantitative: Market capitalization
Encoding: Area size

Quantitative: Price performance as percentages
Encoding: Color scheme

Ordered and Quantum Treemaps: Making Effective Use of 2D Space to Display Hierarchies

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Martin Wattenberg
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mwattenberg@smartmoney.com

Squarified Treemaps

Mark Bruls, Kees Huizing, and Jarke J. van Wijk

Eindhoven University of Technology
Dept. of Mathematics and Computer Science,
P.O. Box 513,
5600 MB Eindhoven, The Netherlands
email{keesh, vanwijk}@win.tue.nl

Treemap

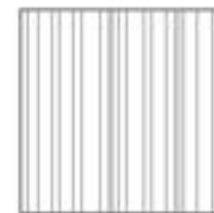
Dividir un rectángulo en subrectángulos de áreas predeterminadas.

Subrectángulos con “aspect ratio” cercano a 1

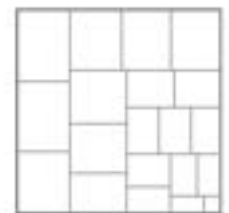
Preserva el orden de los datos

Treemap algorithms^[1]

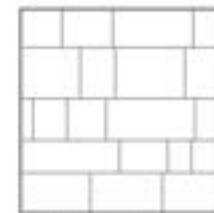
Algorithm	Order	Aspect ratios	Stability
BinaryTree	partially ordered	high	stable
Mixed Treemaps ^[2]	ordered	lowest	stable
Ordered	partially ordered	medium	medium stability
Slice And Dice	ordered	very high	stable
Squarified ^[3]	unordered	lowest	medium stability
Strip	ordered	medium	medium stability



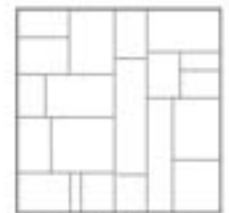
slice-and-dice



squarified



strip treemap

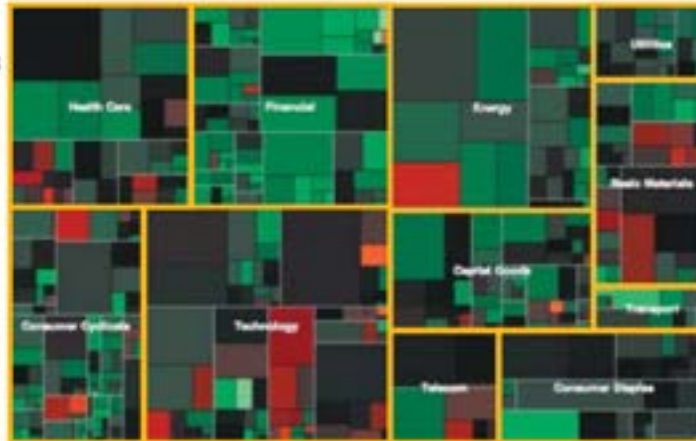


pivot by split size

LEVEL 1:
Sectors



LEVEL 2:
Subdivisions
of sectors



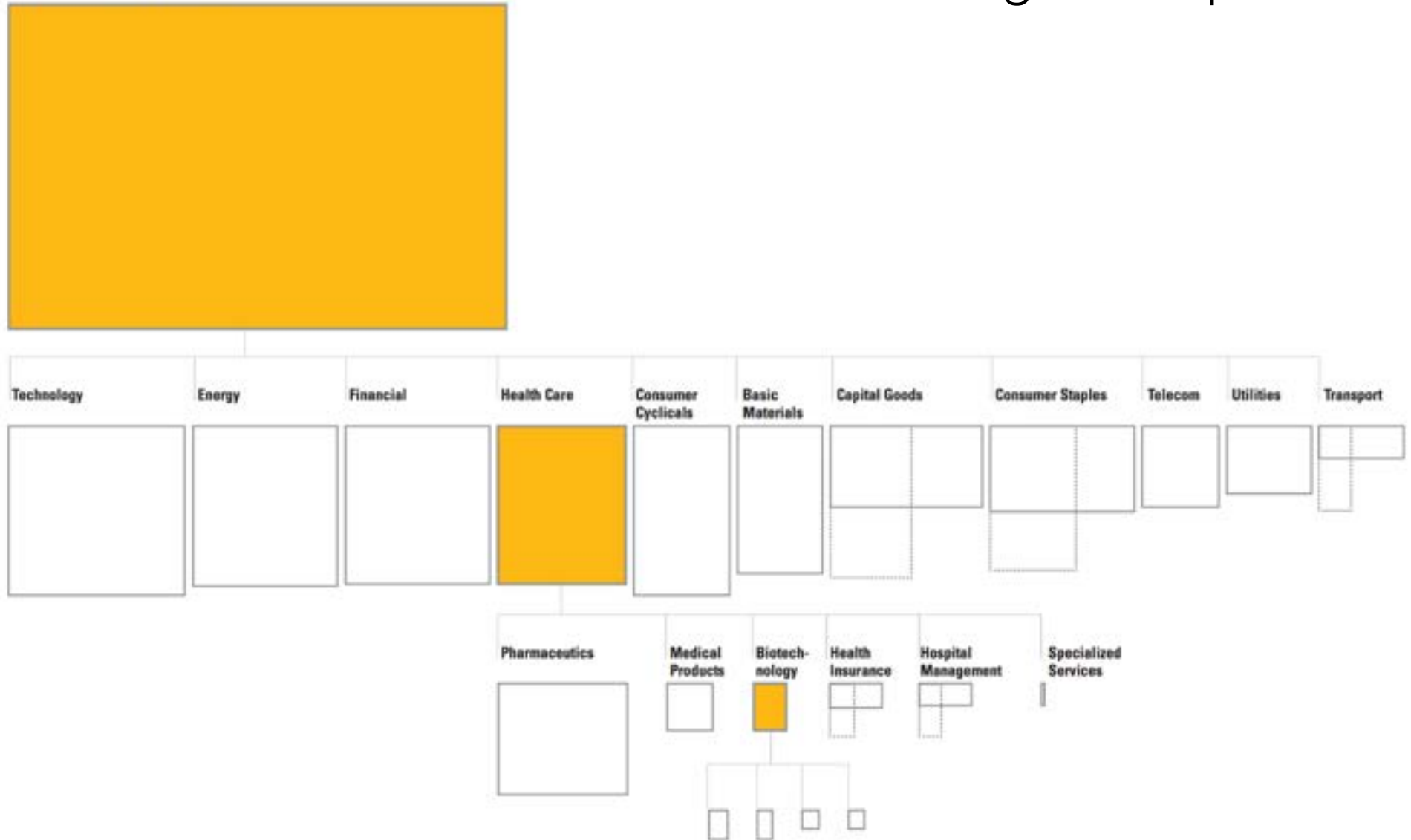
LEVEL 3:
Companies



Diagrama anidado

Diagrama apilado

Total stocks in given period of time

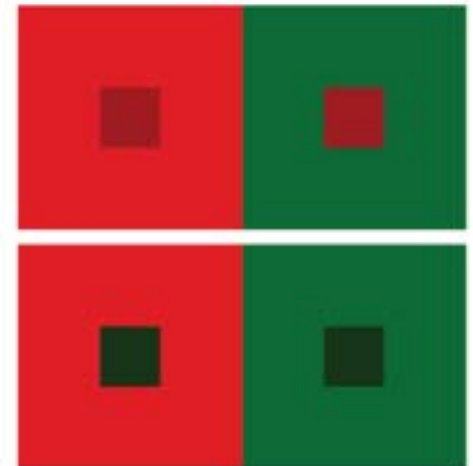


Área → Capitalización (Proporción)



No somos buenos para comparar áreas!!!

El área percibida depende del
“aspect ratio”, la orientación y el
color, incluso los colores que rodean





$$1 < 2, \quad A < B$$



$$1 < 2, \quad A = 3/5 \text{ de } 1, \quad B = 6/10 \text{ de } 2$$



$$2 = 1 \text{ dos veces}, \quad A = 3/5 \text{ de } 1, \quad B = 6/10 \text{ de } 2$$

$$A = 1/2 \text{ de } B$$



$$2 = 1 \text{ dos veces}, \quad \text{hay } 3/5 \text{ de mujeres en } 1,$$

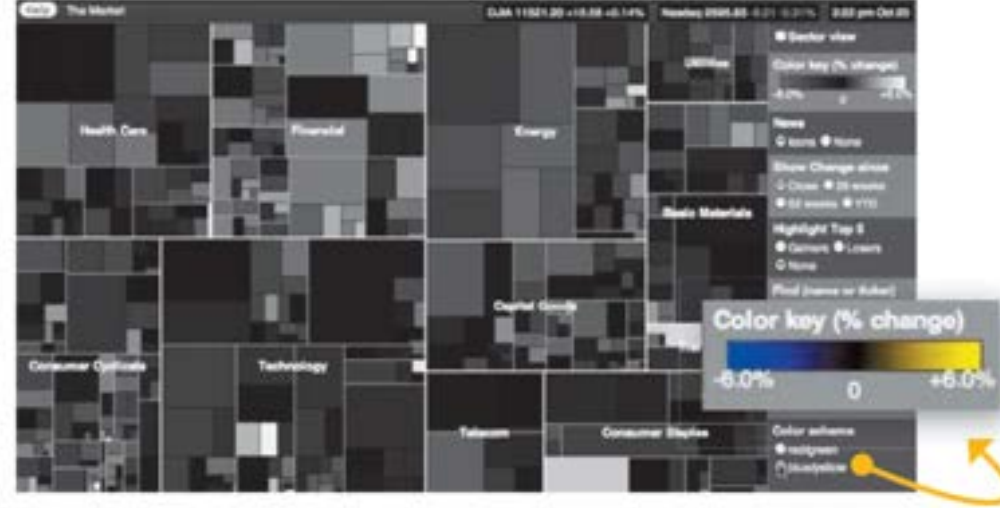
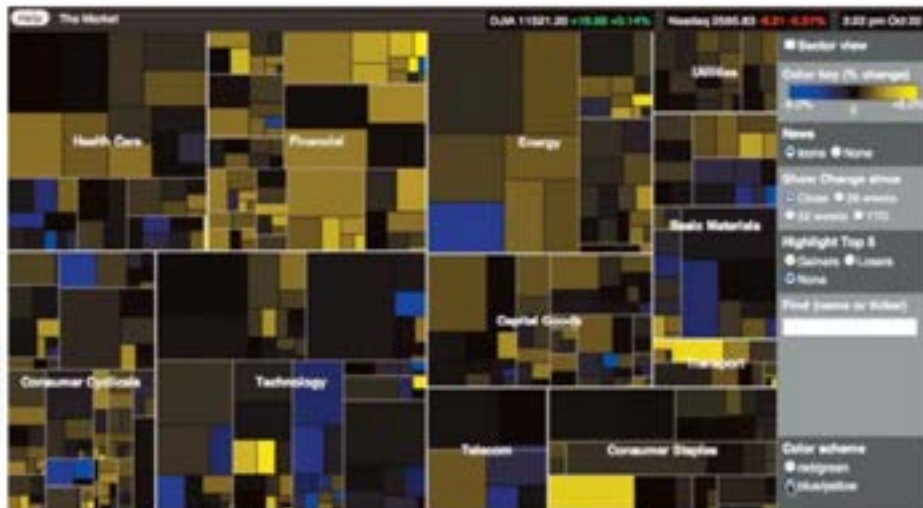
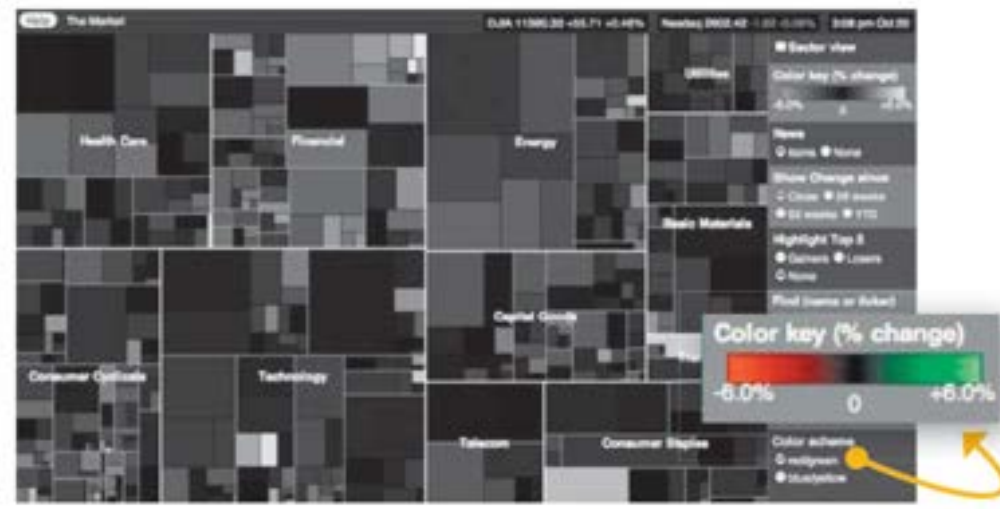
$$\text{hay } 4/10 \text{ de hombres en } 2, \quad \text{el número de}$$

$$\text{mujeres en } 1 \text{ es } 1/2 \text{ del número de mujeres en } 2$$



No lo hagan nunca

Color  Rendimiento de las acciones

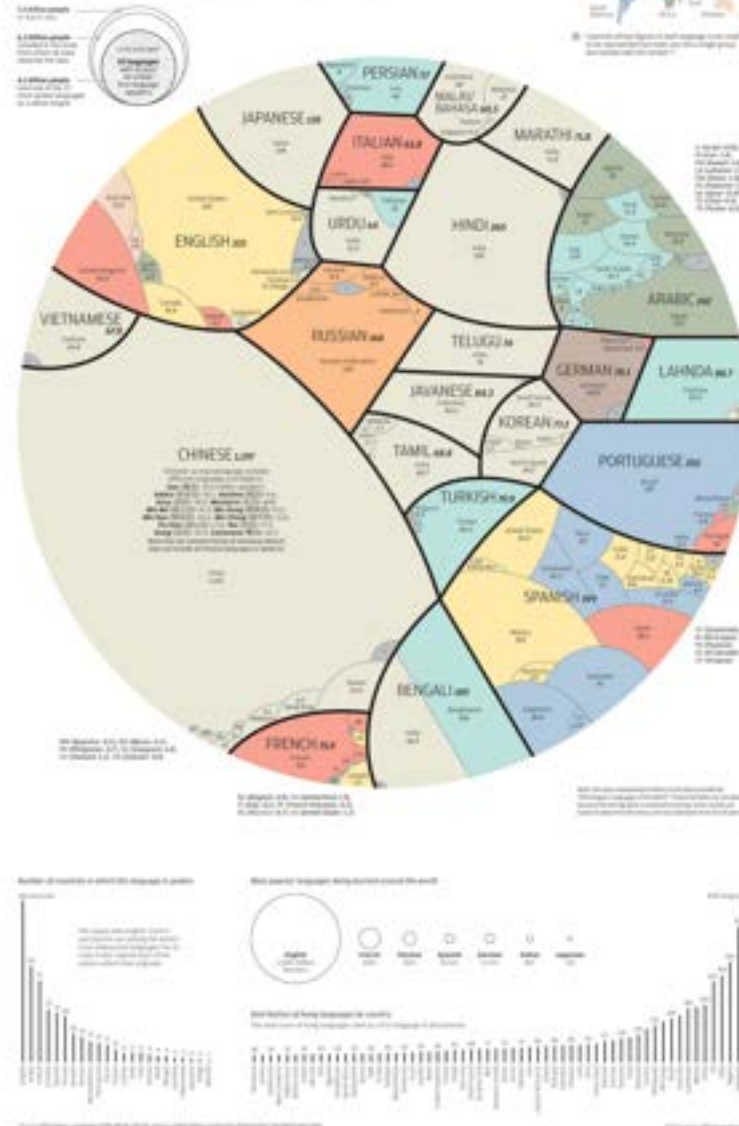




AUTHOR	Marcos Weskamp (concept, design, frontend and backend coding) and Dan Albritton (backend coding)
COUNTRY	United States
DATE	2004
MEDIUM	Online, real-time interactive application
URL	http://newsmap.jp
DOMAIN	News coverage aggregated by Google News API
TASK	To provide an overview of online news stories and reveal underlying patterns in news reporting around the world
STRUCTURE	The visualization uses the treemap technique. The algorithm renders the inner-division shapes closer to rectangles, facilitating readability of text.
DATA TYPE AND VISUAL ENCODING	
Categorical:	News segments
Encoding:	Color hues and spatial grouping
Categorical:	Countries
Encoding:	Label and enabled by selection
Temporal:	News age: how old the news is
Encoding:	Color value
Quantitative:	Number of related stories
Encoding:	Area size
Nominal:	Title of news story
Encoding:	Type size relative to the quantitative data

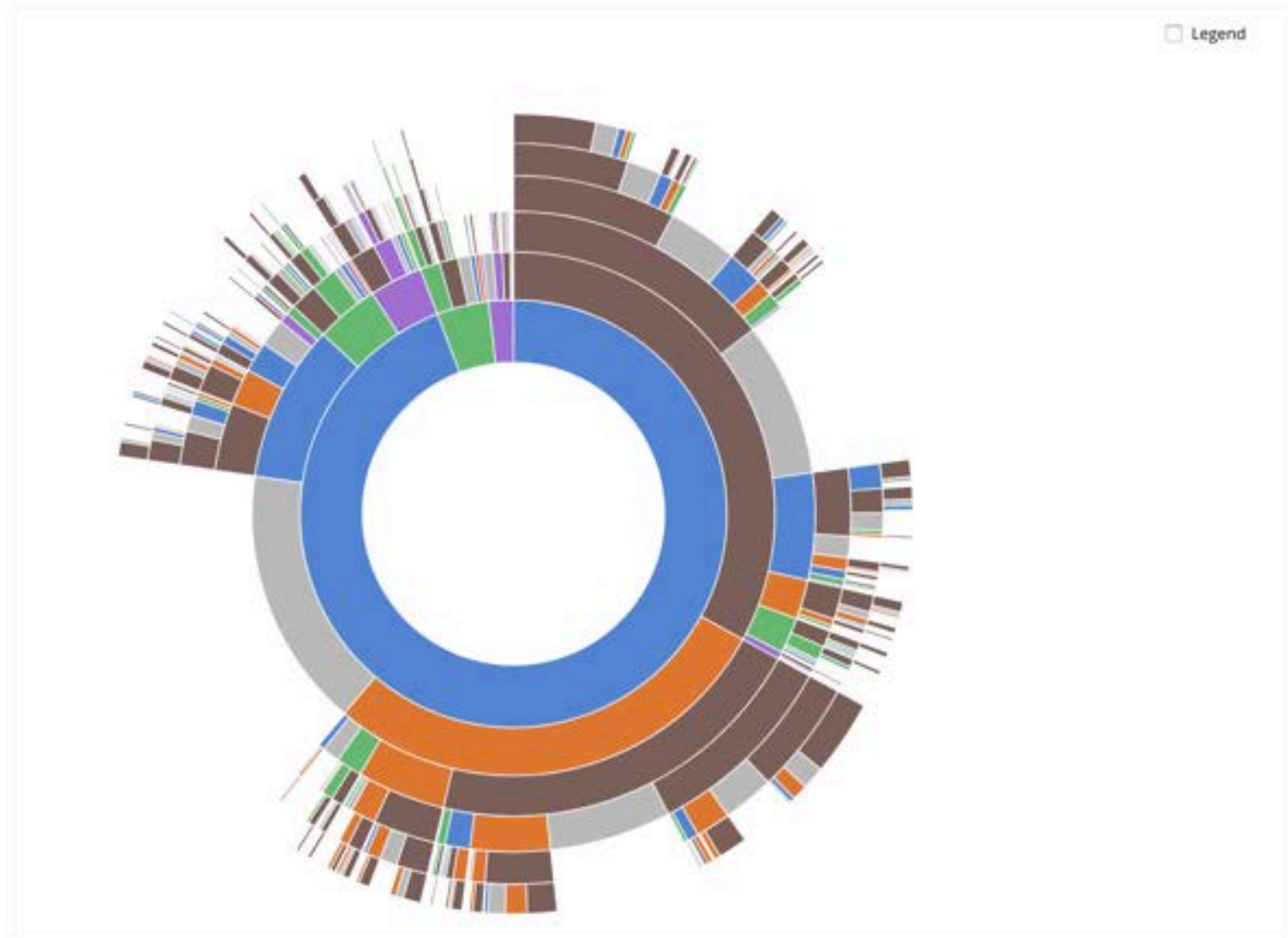
A world of languages

There are at least 5,000 languages spoken in the world today. It is estimated that there are about 10,000 languages spoken in the world today. The languages of the world are divided into several major groups. The languages of the world are divided into several major groups. The languages of the world are divided into several major groups.

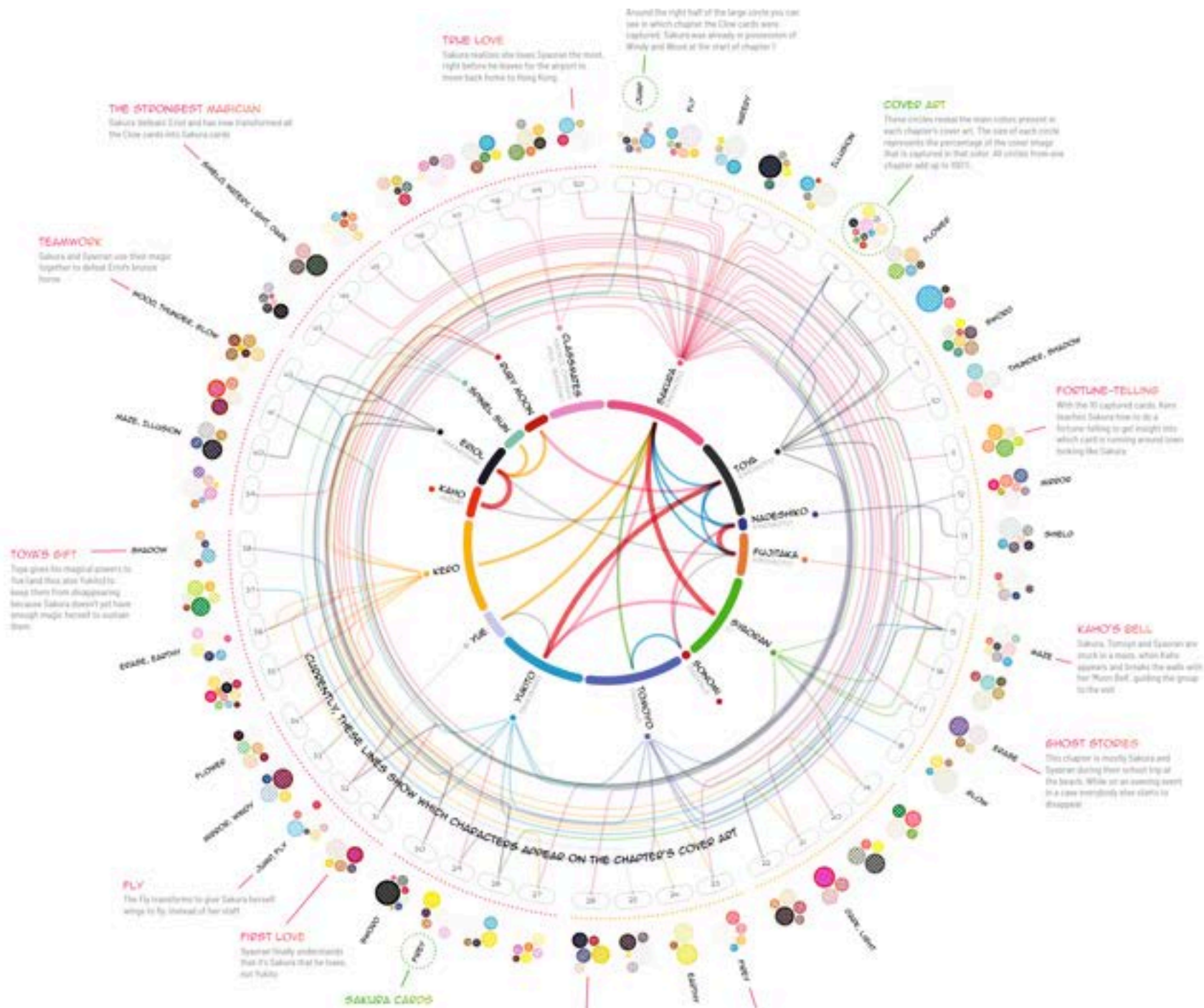


<https://www.scmp.com/sites/default/files/2015/11/25/languageshqscmp.png>

Sequences sunburst



<https://bl.ocks.org/kerryrodden/7090426>



<http://www.datasketch.es/june/code/nadieh/>

A Closer Look at Labor

The number of employed persons by occupation & age | US

In this visualization you can investigate how the 146 million employed persons in 2014 were divided up between ~550 different occupations. The occupations are grouped and even subgrouped. Each grey colored circle encloses all occupations that fall under its umbrella name. Each white circle is finally an actual profession and further shows the age distribution within that occupation. You can click on any of the circles to zoom in or search for an occupation with the search box below

Find an Occupation

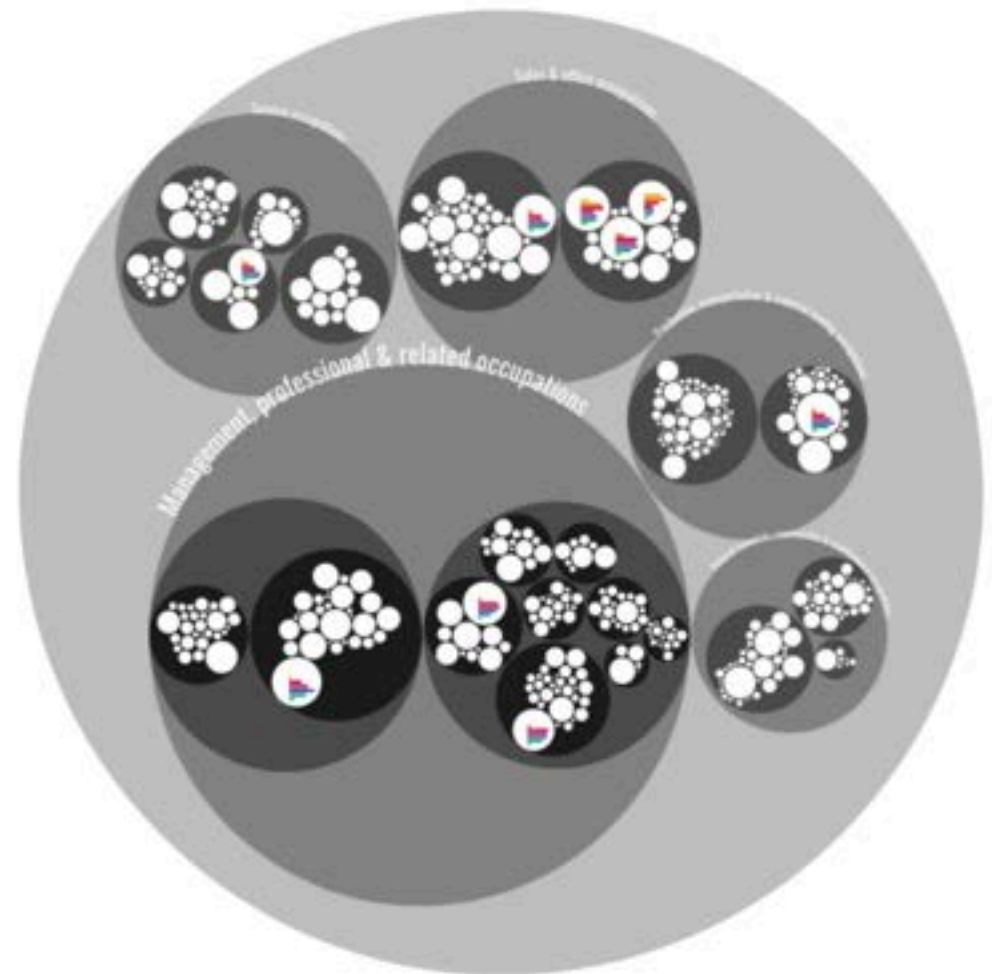


Legend

The size of each white circle is scaled according to the number of persons employed. The bigger the circle, the more people who are working in that occupation

Number of employed persons

in thousands



Created by Nadieh Bremer | VisualCinnamon.com | Data: Bureau of Labor Statistics

<http://nbremer.github.io/occupationscanvas/>