



**ISKO**UK

# Visual Representations *of* Knowledge Structures *for* Information Discovery

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Images are used for  
educational purposes.

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Visual Representations of  
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- Knowledge Structures  
- Hierarchical Structures



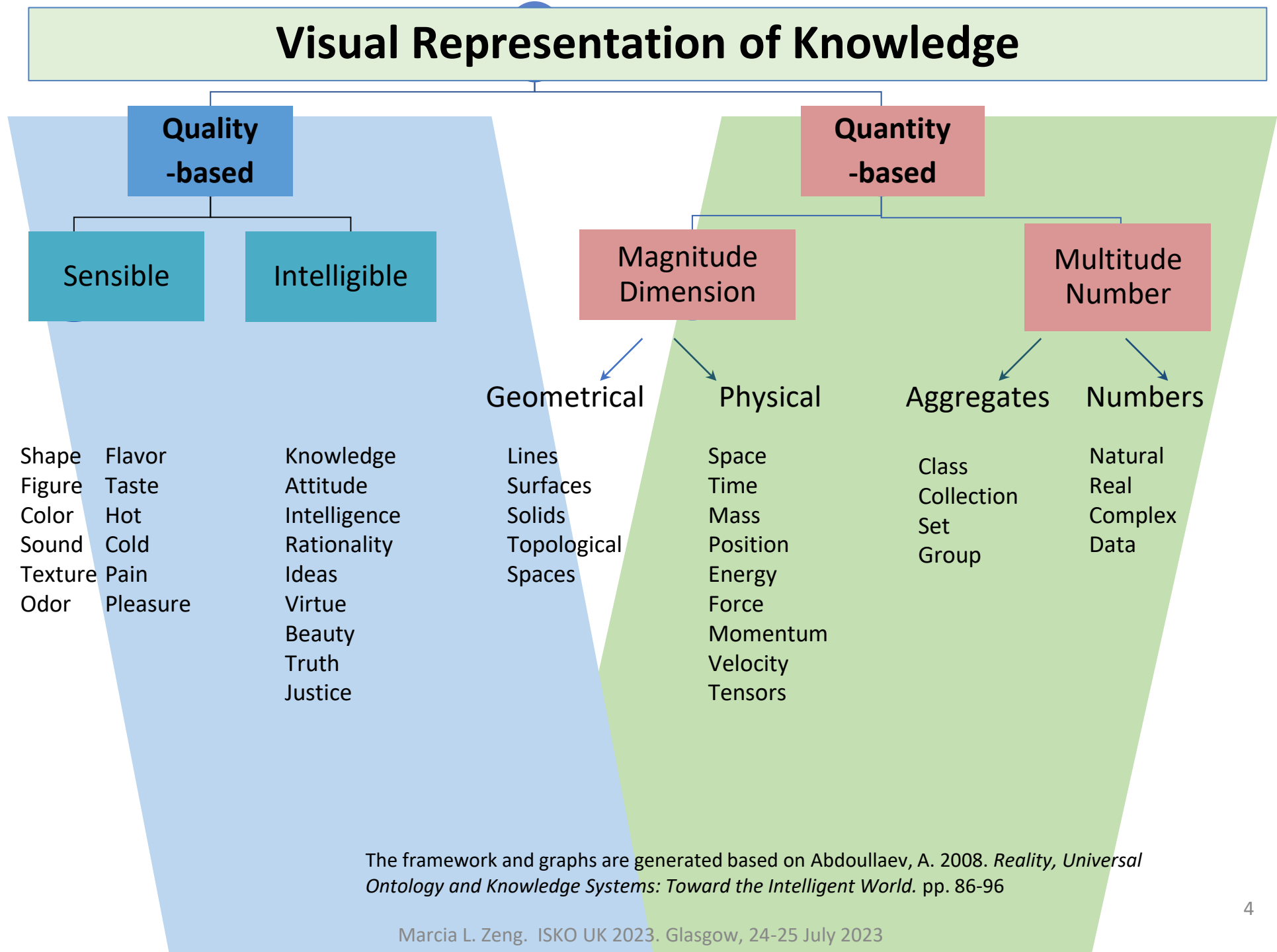
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# I. Introduction

- The focus of this report  
and  
contextual information

- a) Visual Representation of Knowledge
  - A Framework
- b) Focus of this report

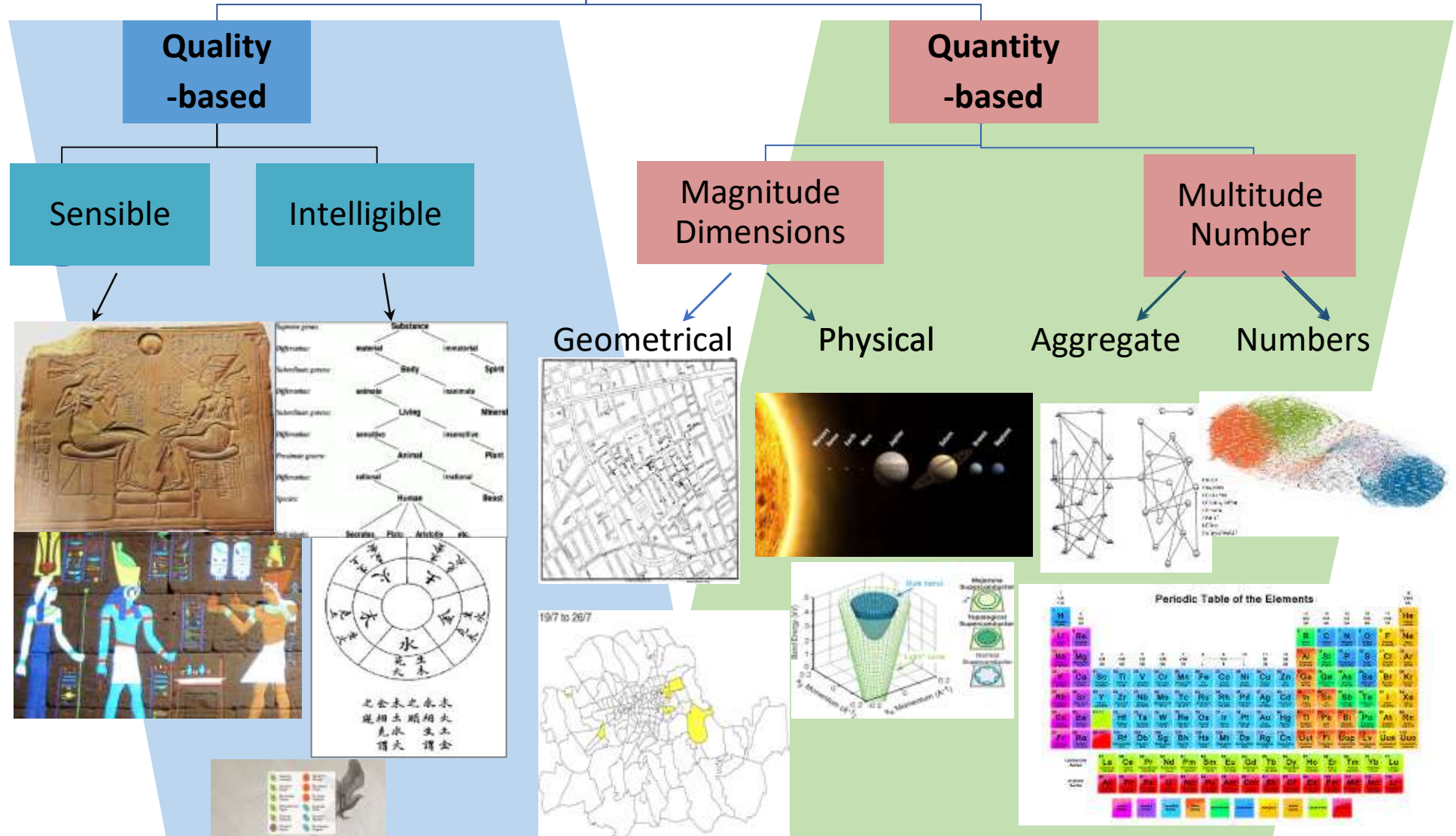
a) Visual Representation of Knowledge – a framework



The framework and graphs are generated based on Abdoullaev, A. 2008. *Reality, Universal Ontology and Knowledge Systems: Toward the Intelligent World*. pp. 86-96

a) Visual Representation of Knowledge – a framework

# Visual Representation of Knowledge



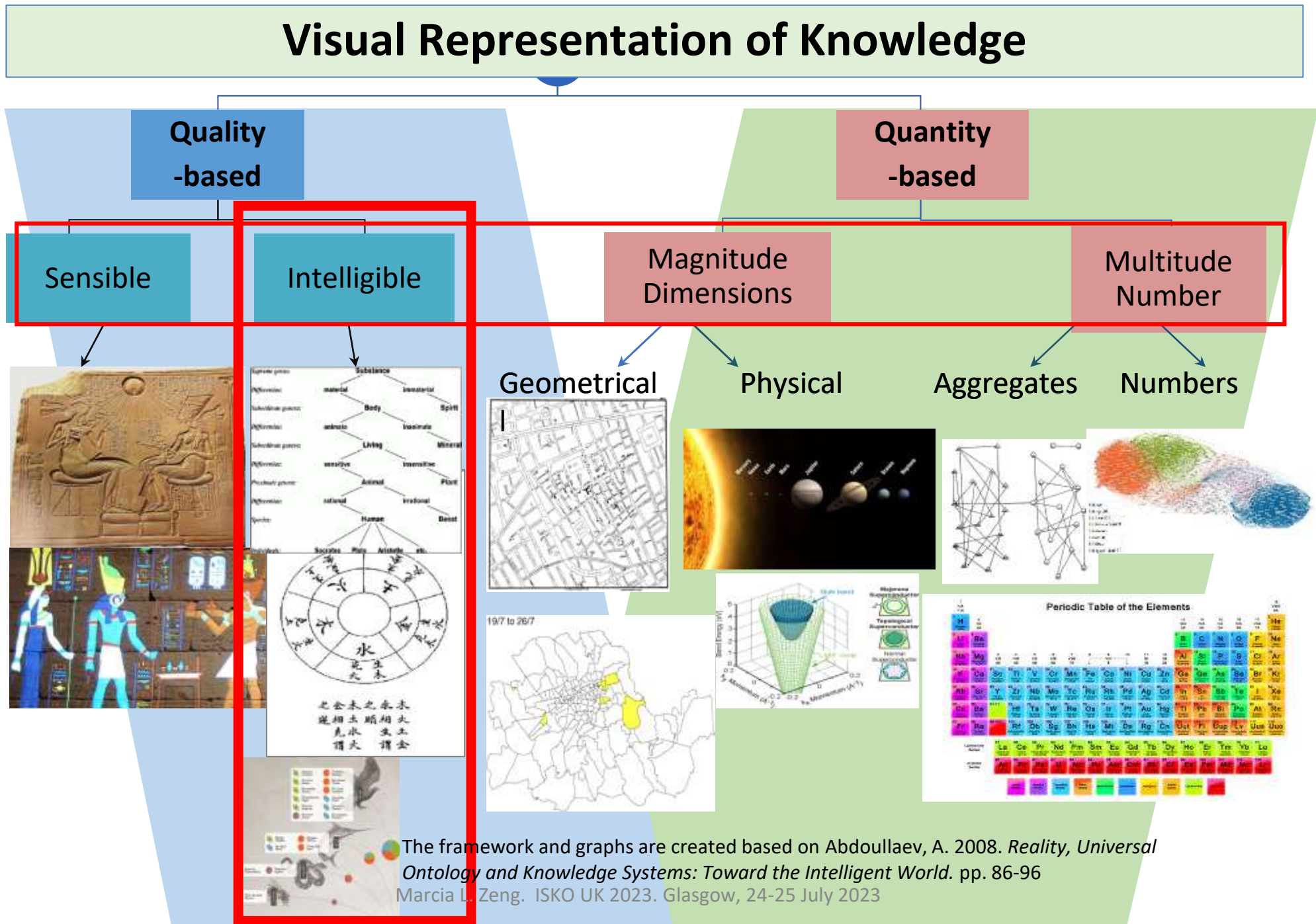
\*Intelligible: “able to be understood” or, “comprehensible”

Image sources are listed at the end of this report.

The framework and graphs are created based on Abdoullaev, A. 2008. *Reality, Universal Ontology and Knowledge Systems: Toward the Intelligent World*. pp. 86-96



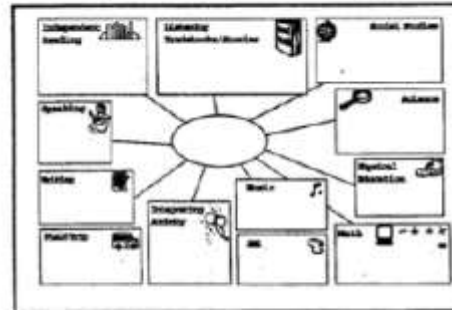
**b) The focus of this report (1/4)**



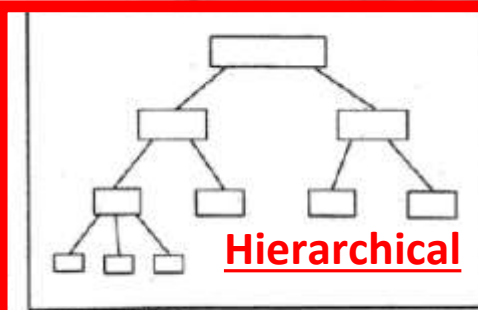
b) The focus of this report (2/4)

# Visual Representation of Knowledge Structures

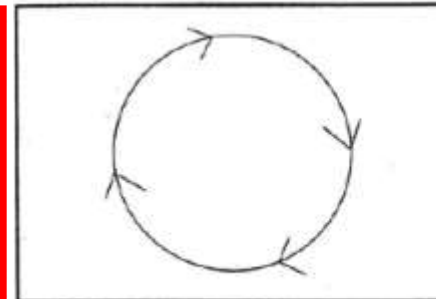
## Sample Graphic Organizer Patterns



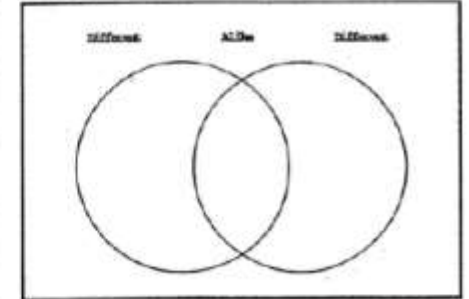
1. Planning Organizer



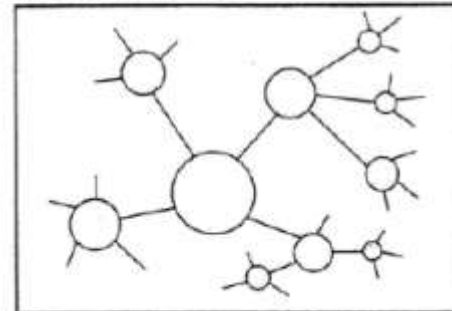
2. Hierarchical



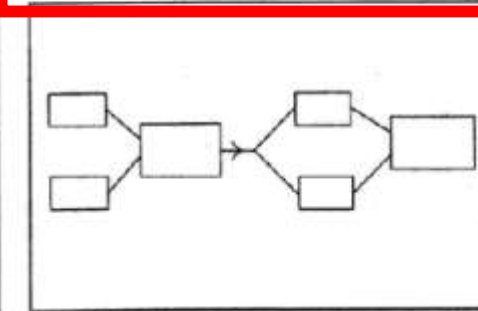
5. Cyclical



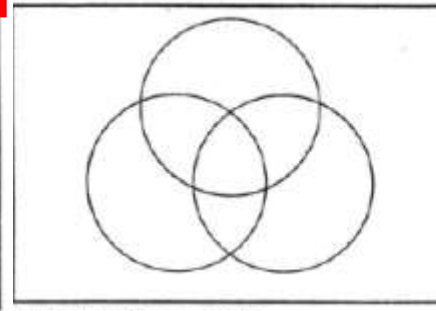
6. Venn Diagram



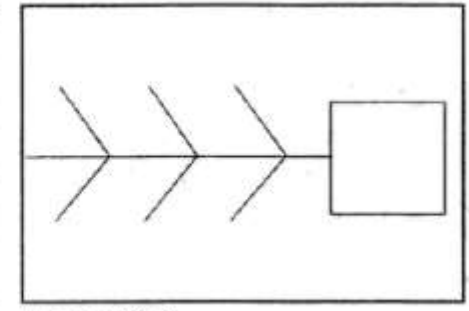
3. Conceptual



4. Sequential

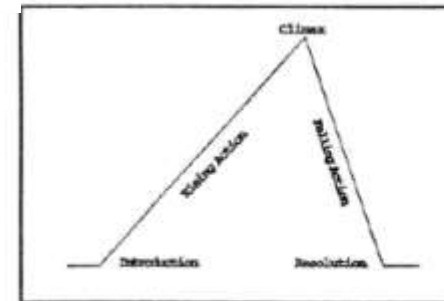


7. Overlapping Concepts



8. Cause-Effect

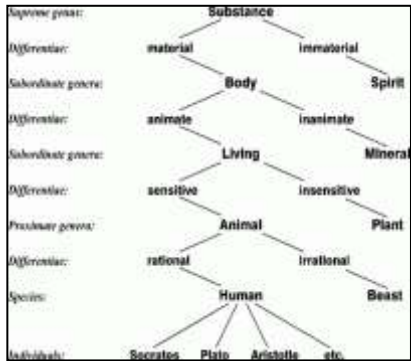
Image source: Bromley, K., Irwin-De Vitis, L., and Modlo, M. (1995). *Graphic Organizers: Visual Strategies for Active Learning*. New York, Scholastic Professional Books



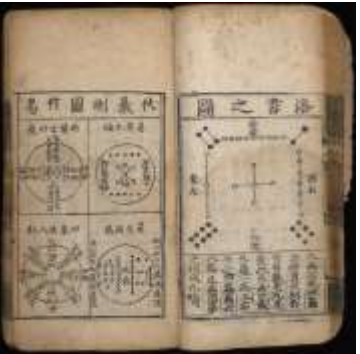
9. Plot Diagram



b) focus of this report (cont.) (3/4) -- computerized



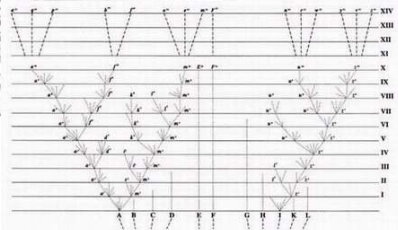
A Porphyrian tree, originally drawn by the 13th century logician Peter of Spain. Image source: John Sowa 2017. [https://www.researchgate.net/publication/220017746\\_Semantic\\_Networks](https://www.researchgate.net/publication/220017746_Semantic_Networks)



The Astronomical Phenomena. (Tien Yuan Fa Wei). 13th century.

Tree of Life -- The Linnaean Taxonomy. Table of the Animal Kingdom (Regnum Animale) from the 1st edition of Systema Naturae (1735)

Divisio scientiae, c1430 Peter of Poitiers



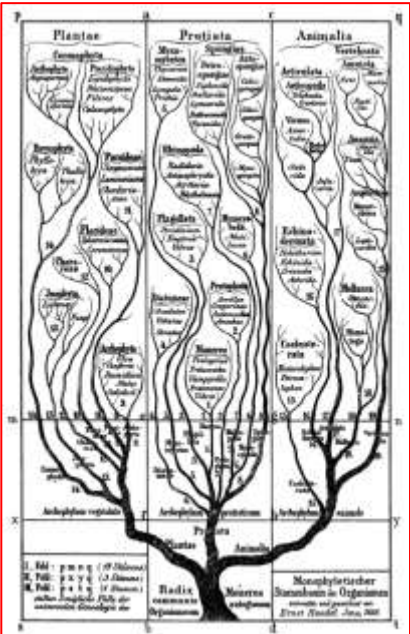
The tree of life - in Darwin's On the Origin of Species by Natural Selection, 1859.



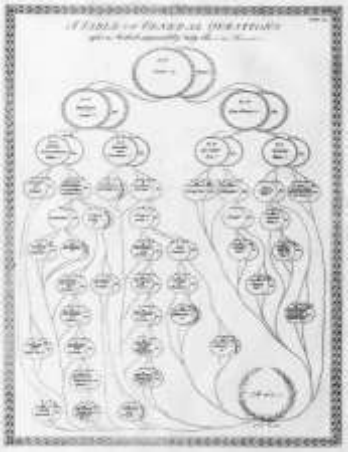
Complete tables of all liberal arts, Christophe de Savigny 1587



Fu Xi the Sixty-Four Hexagrams of I Ching (Classic of Changes) By Zhu Xi 朱熹(1130-1200),



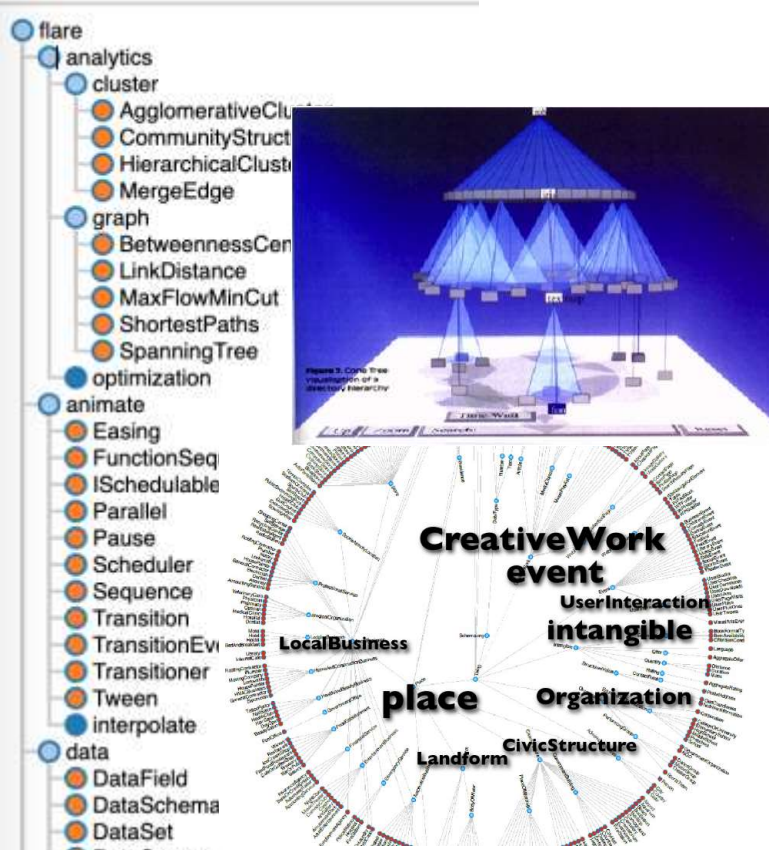
Generelle Morphologie der Organismen by Ernst Haeckel (1866)



Aloisius Edouard Camille Gaultier, "Table of General Questions on Geography," 1821



Tree of science --Llull's Arbor scientiae 1296



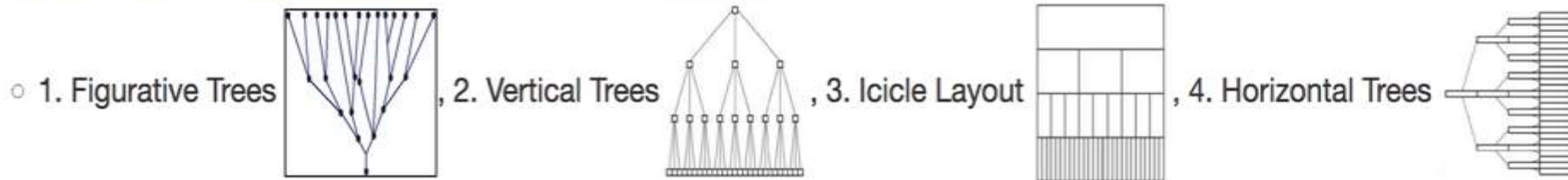


b) The focus of this report (4/4)

# Visual Representation of Knowledge

- Knowledge Structures
- Hierarchical structures

## A. Hierarchical Structures in Tree Shapes



## B. Hierarchical Structures in Circular Shapes



## C. Hierarchical Structures in Enclosure Diagrams



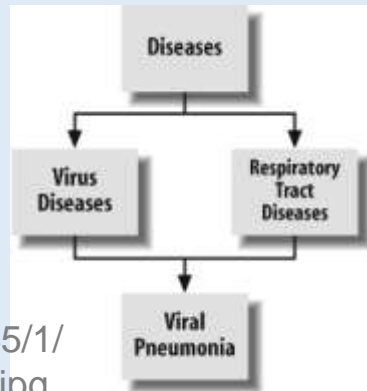
### Think in terms of:

- Position of Root
- Shape
- Features
  - Extensibility
  - Hospitality
  - Readability
  - Comfortability
  - ... ..

# Types of Hierarchical Relationships

1. Generic (Genus-species) relationship - *“kind-of”*
2. Hierarchical whole-part relationship - *“part-of”*
3. Instance relationship - *“instance-of”*

- + Polyhierarchical relationships



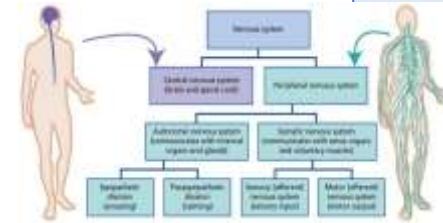
Source: [https://flylib.com/books/4/45/1/html/2/images/info3\\_0925.jpg](https://flylib.com/books/4/45/1/html/2/images/info3_0925.jpg)

	Extension	
Living beings	life	plants, animals
Animals	life, senses	molluscs, arthropods, vertebrates, etc.
Vertebrates	life, senses, backbones	reptiles, birds, mammals, etc.
Mammals	life, senses, backbones, suckle their young	primates, carnivores, etc.
Primates	life, senses, backbones, suckle their young, ability to grasp	apes, human beings
Humankind	life, senses, backbones, suckle their young, ability to grasp, reason	individual persons
	Intension	

Source: Essentials Of Unification Thought <http://www.unification.org/ucbooks/euth/Euth10-01.htm>

Example 105: Whole-part relationships – systems and organs of the body

nervous system  
 central nervous system  
 brain  
 spinal cord



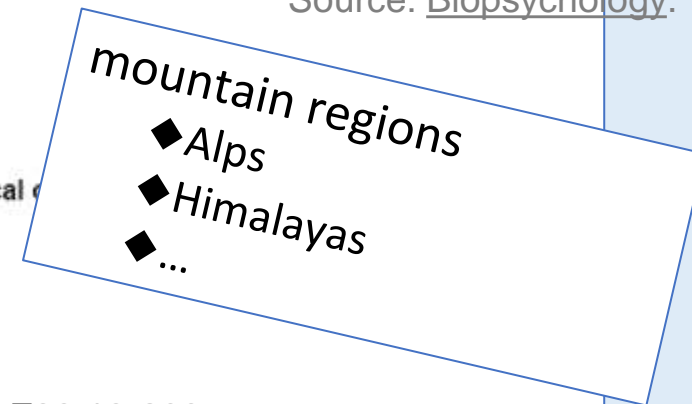
Example 106: Whole-part relationships – geographic locations

Canada  
 Ontario  
 Ottawa  
 Toronto

Source: Biopsychology.

Example 107: Whole-part relationships – hierarchical structures

armies  
 military divisions  
 battalions  
 regiments



Source: NISO Z39.19-2005

# User Experience Design (UxD)

## - Some Normal Methods

- Usability Testing (e.g., eye-tracking, mouse-tracking)
- Card sorting (open or/and closed)
- Personas (traditional and proto)
- Content Audits (full or partial)
- Surveys
- Website Analytics (normal and mobile)

### References:

Schmidt, Aaron and Amanda Etches. 2012. *User experience (UX) design for libraries*. American Library Association, 2012.

Salaba, Athena, and Tanja Merčun. 2020. "Visualizations of bibliographic information: A user experience study." *Journal of Librarianship and Information Science* 52(1): 271-287.

Merčun, Tanja, Athena Salaba, and Maja Žumer. 2016. "User testing of prototype systems in two different environments: preliminary results." 18th International Conference on Asia-Pacific Digital Libraries, ICADL 2016, Tsukuba, Japan, December 7–9, 2016.

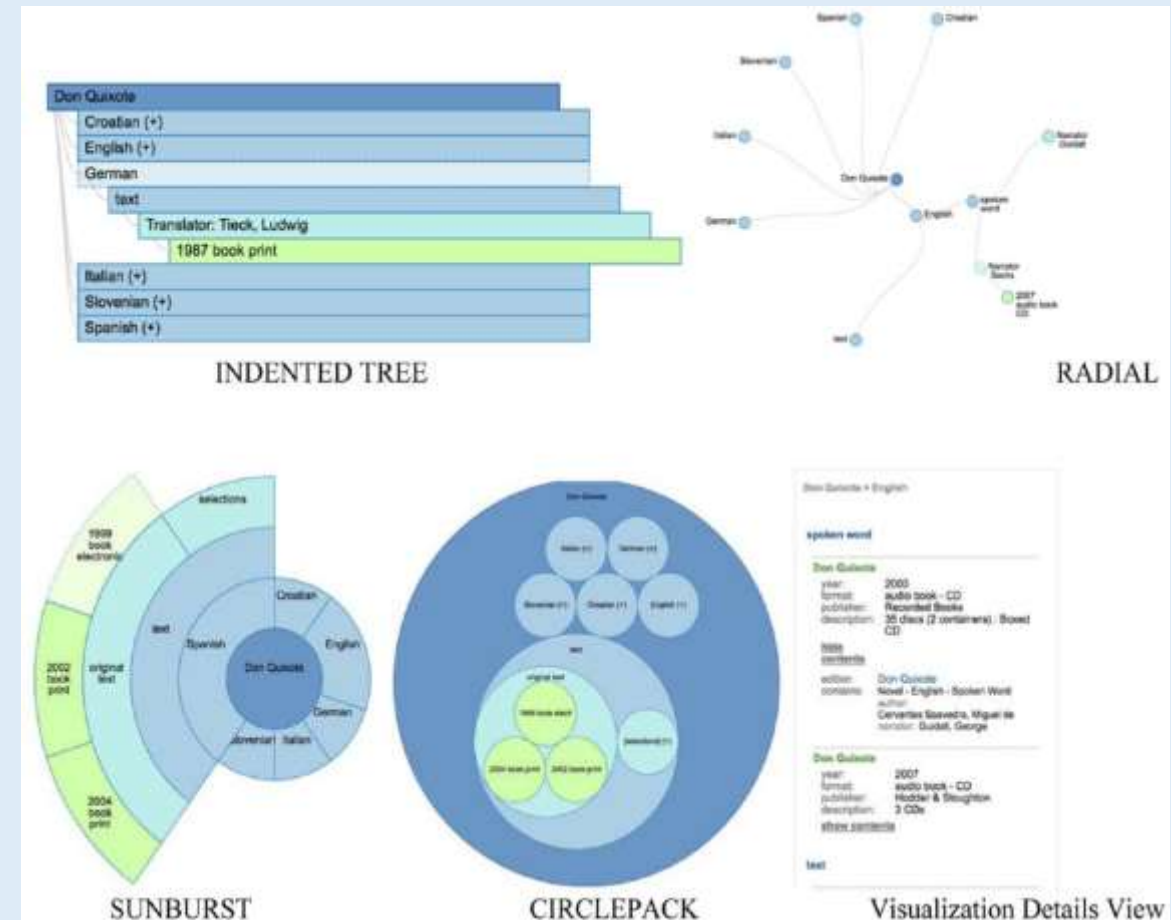


Image source: Salaba and Merčun, 2020. Figure1. Visualization interfaces. [It is based on a continuation of a study testing the same prototype interfaces in Slovenia.]



# I. Introduction - The focus of this report and contextual information

## Summary: The focus of this report

Visual representations reflecting the order and structure of knowledge have been used for thousands of years.

Most modern computerized visual deliveries of information and knowledge can trace their roots in the graphic works found in early prints, manuscripts, and other artifacts.

This report focuses on the hierarchical structures of KO, aiming to:

- connect theories and practices
- explore the differences among applications
- discuss the functions of visual representations of knowledge and layouts (computerized) that
  - enable consequential information discovery &
  - ultimate user experience in the data-driven age

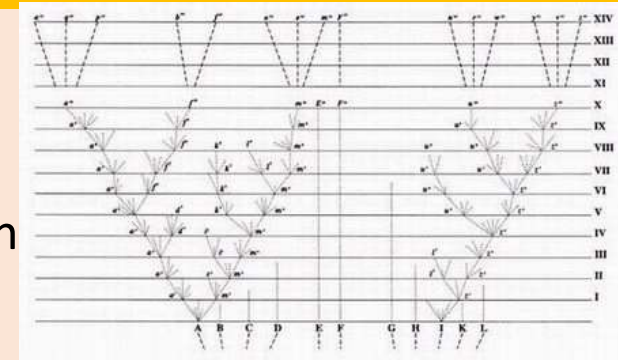


Diagram in Darwin's [\*On the Origin of Species\*](#), 1859.

It was the book's only illustration.

Source:[https://en.wikipedia.org/wiki/Tree\\_of\\_life\\_%28biology%29](https://en.wikipedia.org/wiki/Tree_of_life_%28biology%29)

### Think in terms of:

- **Position of Root**
- **Shape**
- **Features**
  - **Extensibility**
  - **Hospitality**
  - **Readability**
  - **Comfortability**
  - ... ..

# II. Visual Representation of Knowledge Structures – Hierarchical Structures

- A. Tree shapes
- B. Circular shapes
- C. Enclosure diagrams

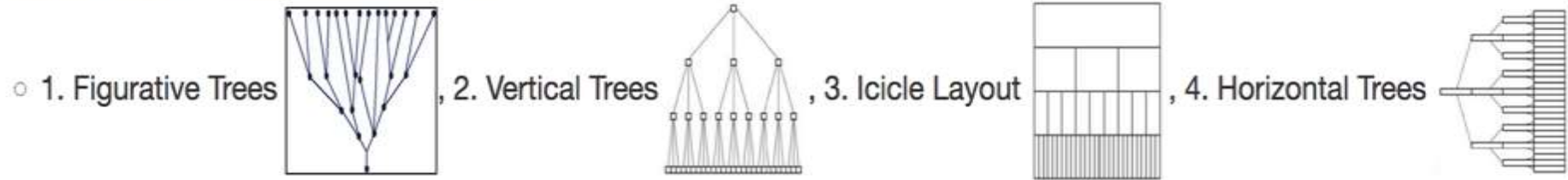
Mainly inspired by:

- Heer, Jeffrey, Bostock, Michael & Vadim Ogievetsky.[2010] *A Tour Through the Visualization Zoo*. Stanford University. Available at <http://homes.cs.washington.edu/~jheer//files/zoo/>
- Lima, Manuel. 2014. *The Book of Trees: Visualizing Branches of Knowledge*. Princeton Architectural Press.
- *Visualization Taxonomies and Techniques Trees and Graphs*. University of Texas – Pan American. CSCI 6361, Spring 2014, Published by Bryce Norton. Available at <http://slideplayer.com/slide/7028078/>

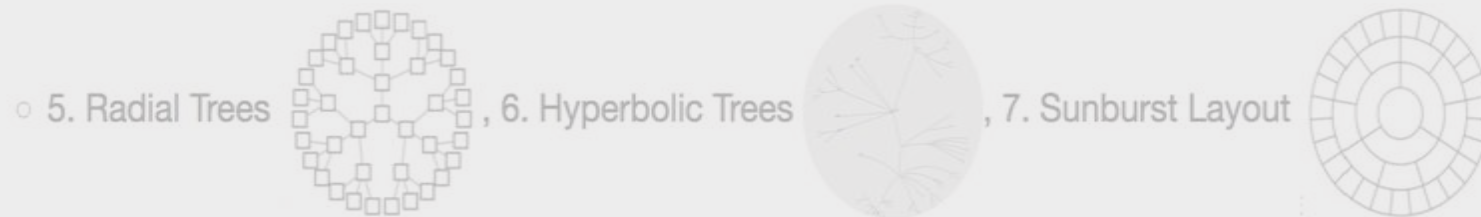
# From graphic representation to computerized visualization

## A. Hierarchical Structures in **Tree** Shapes

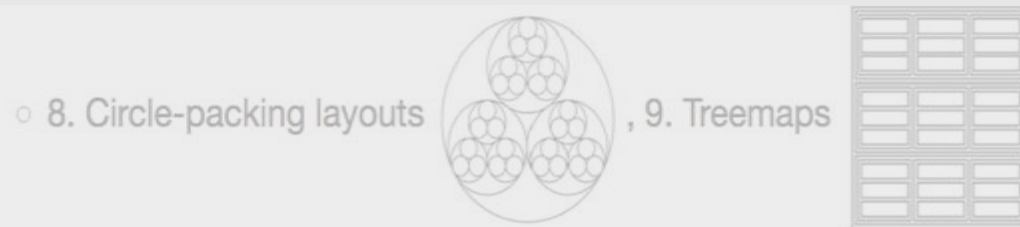
### A. Hierarchical Structures in **Tree Shapes**



### B. Hierarchical Structures in **Circular Shapes**



### C. Hierarchical Structures in **Enclosure Diagrams**





# 1. Figurative tree

The metaphorical structure of a tree finds relevance in many fields:

- generics,
- linguistics,
- archeology,
- epistemology,
- philosophy,
- genealogy,
- computer science,
- library and information science, and
- ... many other



Widely used as the basic structure of modern ontologies.

Source:  
<http://www.inpt.ac.ma/en/cloud-and-iot-engineer-objectives-en>

Tree as an epistemological model, is used in two major domains:

## 1. Genealogy

- in its broad philosophical sense, tracing the development of ideas, subject, people, and society through history;
- incorporate trees to illustrate growth and subdivision over time.

## 2. Classification

- a systematic taxonomy of values and sub-values;
- applies the hierarchical model to show our desire for order, symmetry, and regularity.

& ... the combination of the two

## Questions:

Is the tree structure only based on the logic and the sense felt and received ?

Could the order, structure, and size be both quality and quantity based?

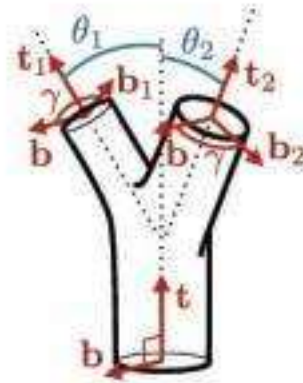
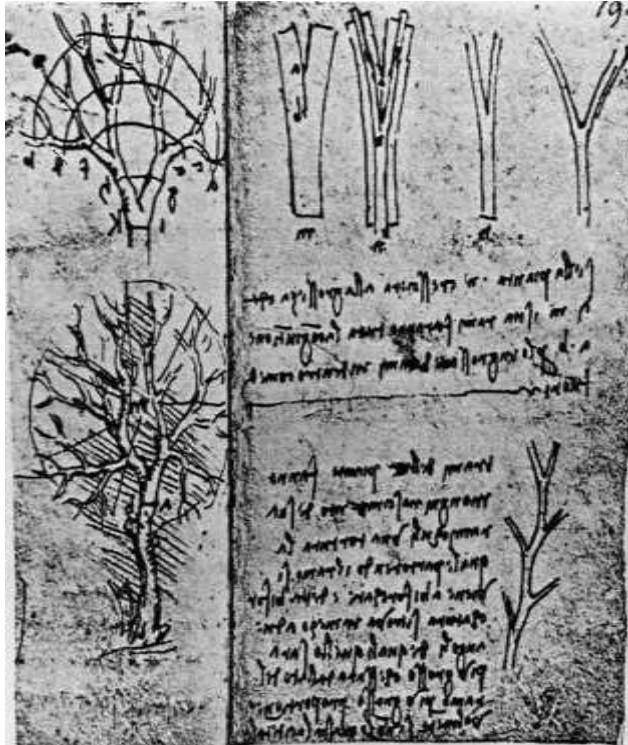
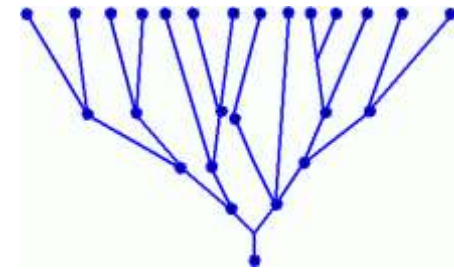
Have the quantity–based methods for visually representing tree structures only occurred in the machine or computer age?



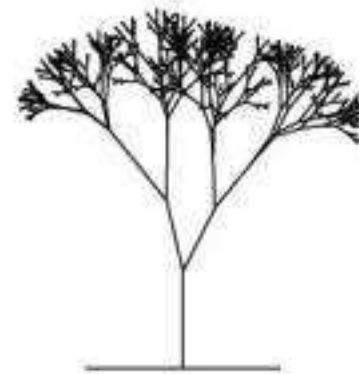
Leonardo Da Vinci  
(1452 – 1519)

- the first to accurately describe trees' branching rules. ca. 1515

Keep thinking:  
What have the modern tree visualizations ignored?



(Left) A model of tree branching.

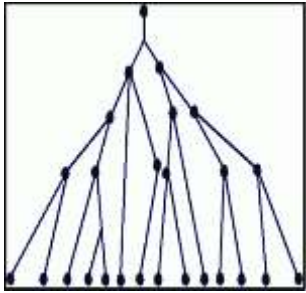
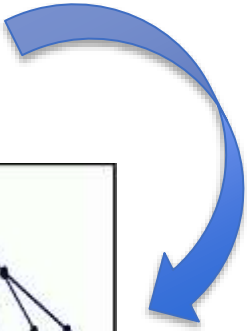
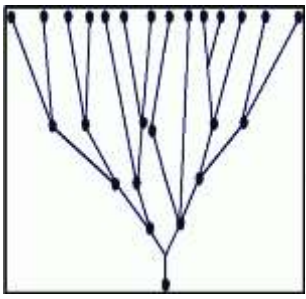


(Middle) A tree skeleton with all branches having the **same thickness**.



(Right) The same tree with **branch diameters calculated** from a model accounting for wind-induced stress, which **closely follows Leonardo's rule**.

## 2. Vertical Trees (a.k.a. Flare package tree)

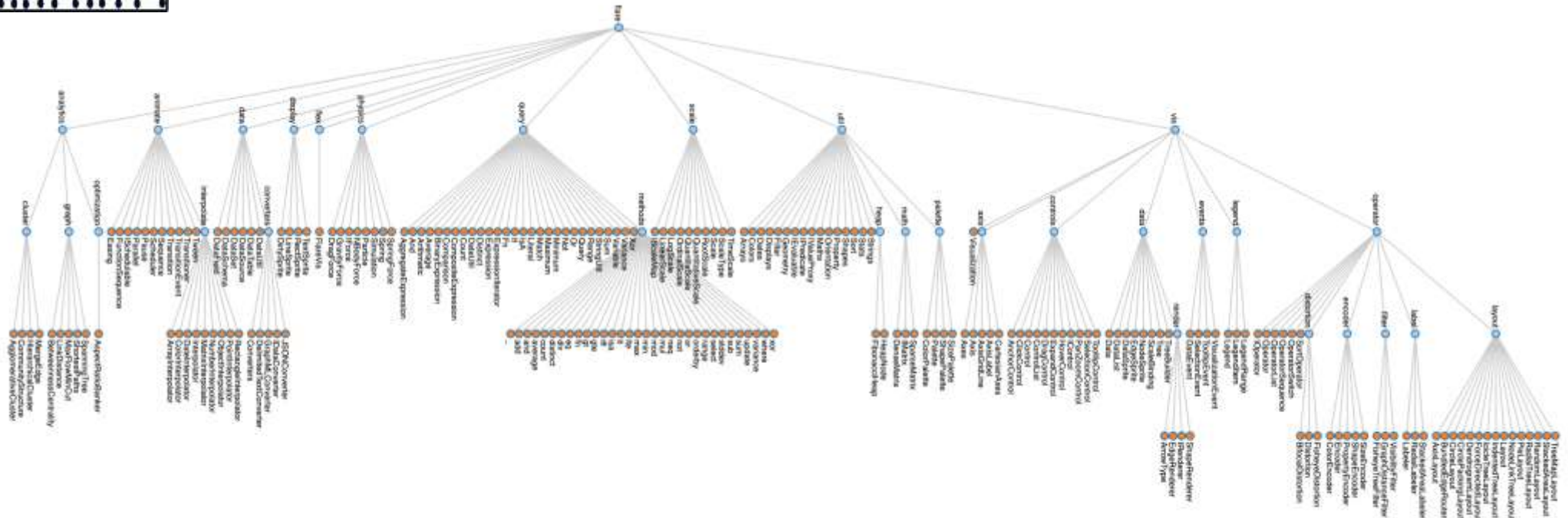


Features:

- Inverted trees, root at the top.
- The tree laid out in horizontal layers.
- All the nodes in a given layer are at the same package depth.

Pro:

- Produces a tidy result with minimal wasted space.



The Flare package tree laid out in horizontal layers. All the nodes in a given layer are at the same package depth.

Source: Flare Visualization Toolkit

Source: Jeffrey Heer, Michael Bostock, and Vadim Ogievetsky, Stanford University. A Tour Through the Visualization Zoo. <https://homes.cs.washington.edu/~jheer//files/zoo/>



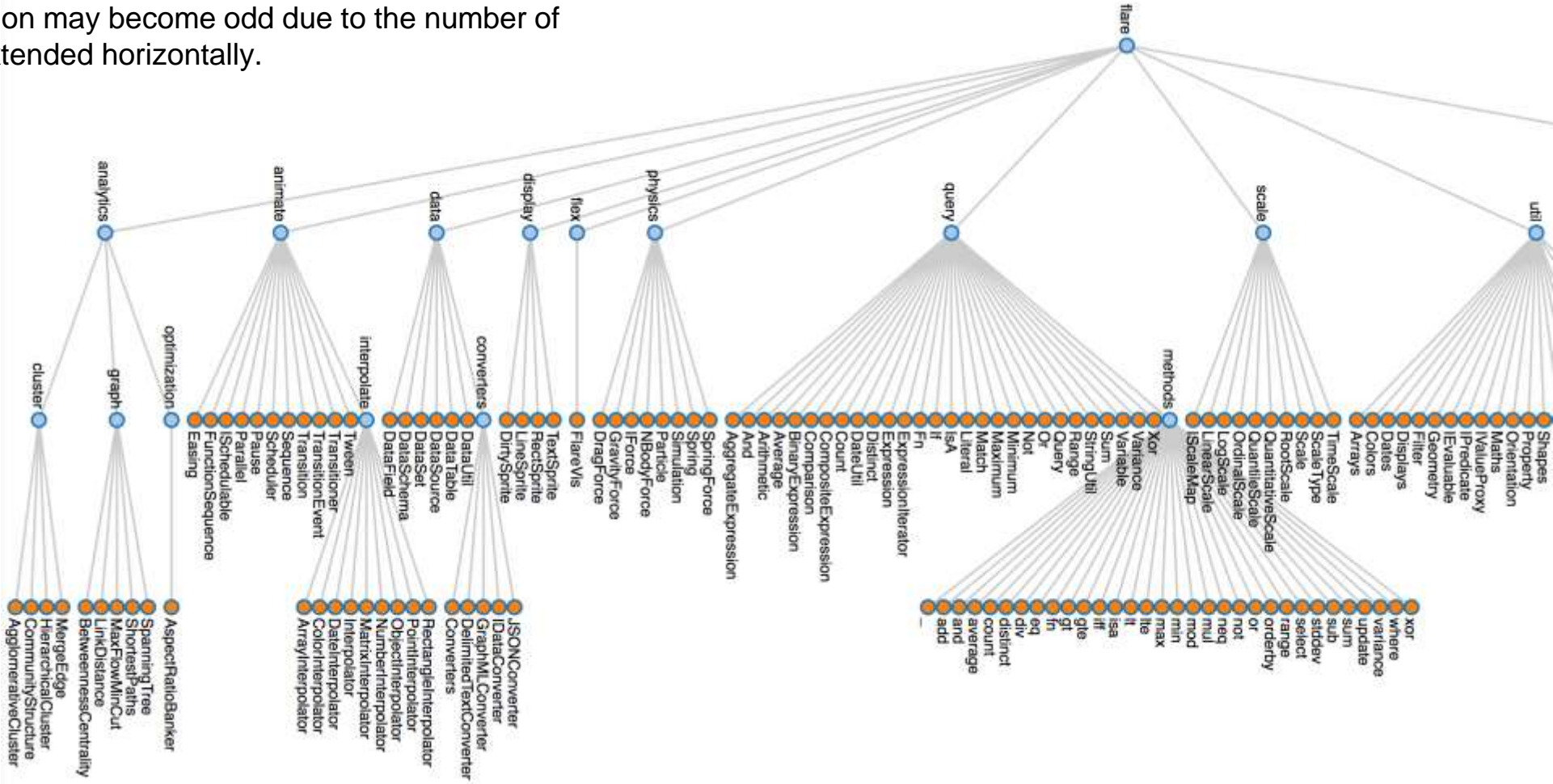
## Vertical trees (cont.)

Pro:

- Produces a tidy result with minimal wasted space.

Cons:

- The readability is questionable.
- Does not follow a natural reading pattern.
- The navigation may become odd due to the number of branches extended horizontally.



View full image at: <https://homes.cs.washington.edu/~jheer/files/zoo/ex/hierarchies/tree.html>

## Vertical trees (cont.)

Pro:

- Produces a tidy result with minimal wasted space.

Cons:

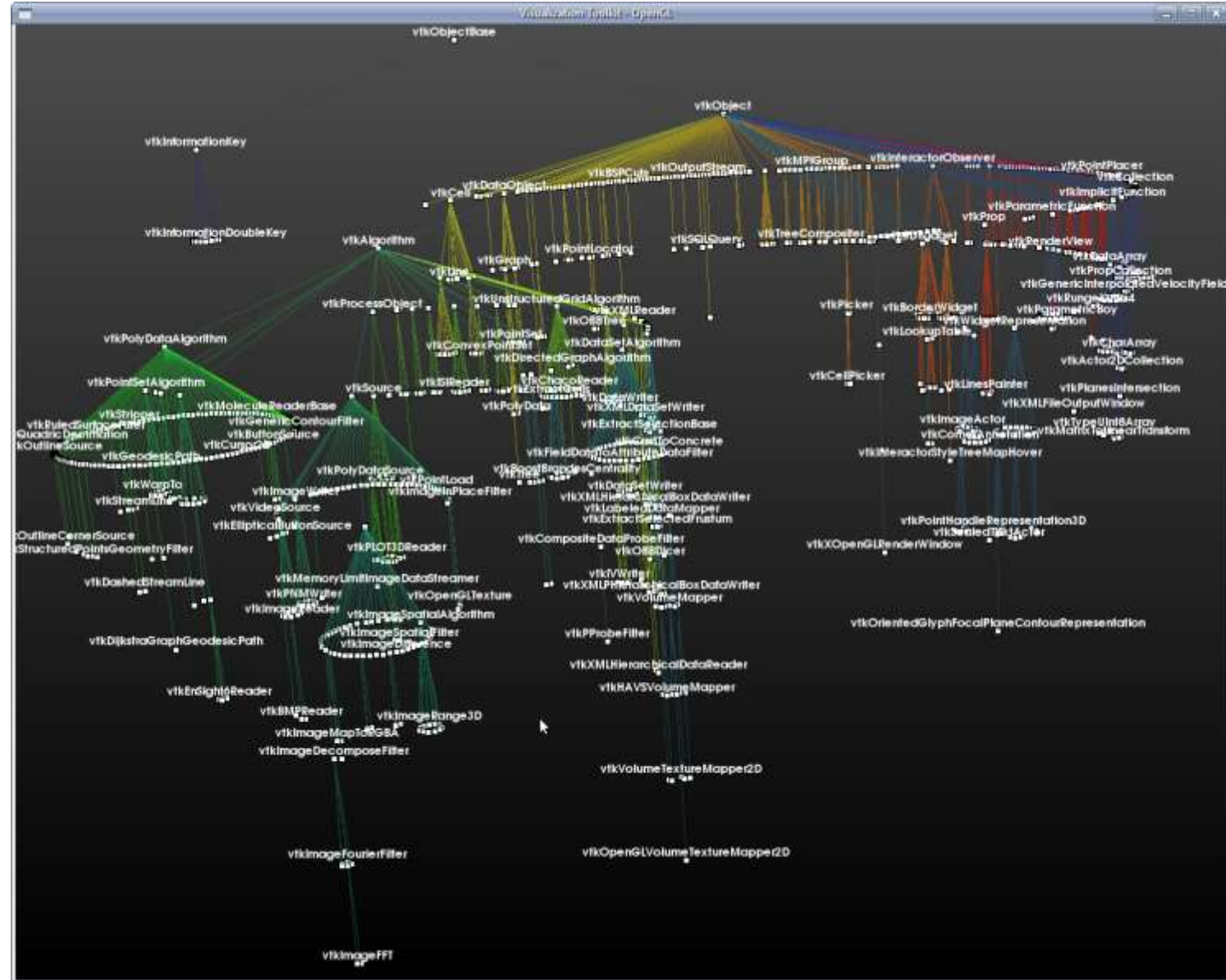
- The readability is questionable.
- Does not follow a natural reading pattern.
- The navigation may become odd due to the number of branches extended horizontally.

## Advancement

To increase the readability:

- Use interactive and 3D technology to display the vertical trees .

## Visualization ToolKit (VTK) 3D cone layout



Source: <https://vtk.org/Wiki/File:ConeLayout.png> View from: [https://vtk.org/Wiki/VTK/Graph\\_Layout](https://vtk.org/Wiki/VTK/Graph_Layout)

# 3. Icicle Layout

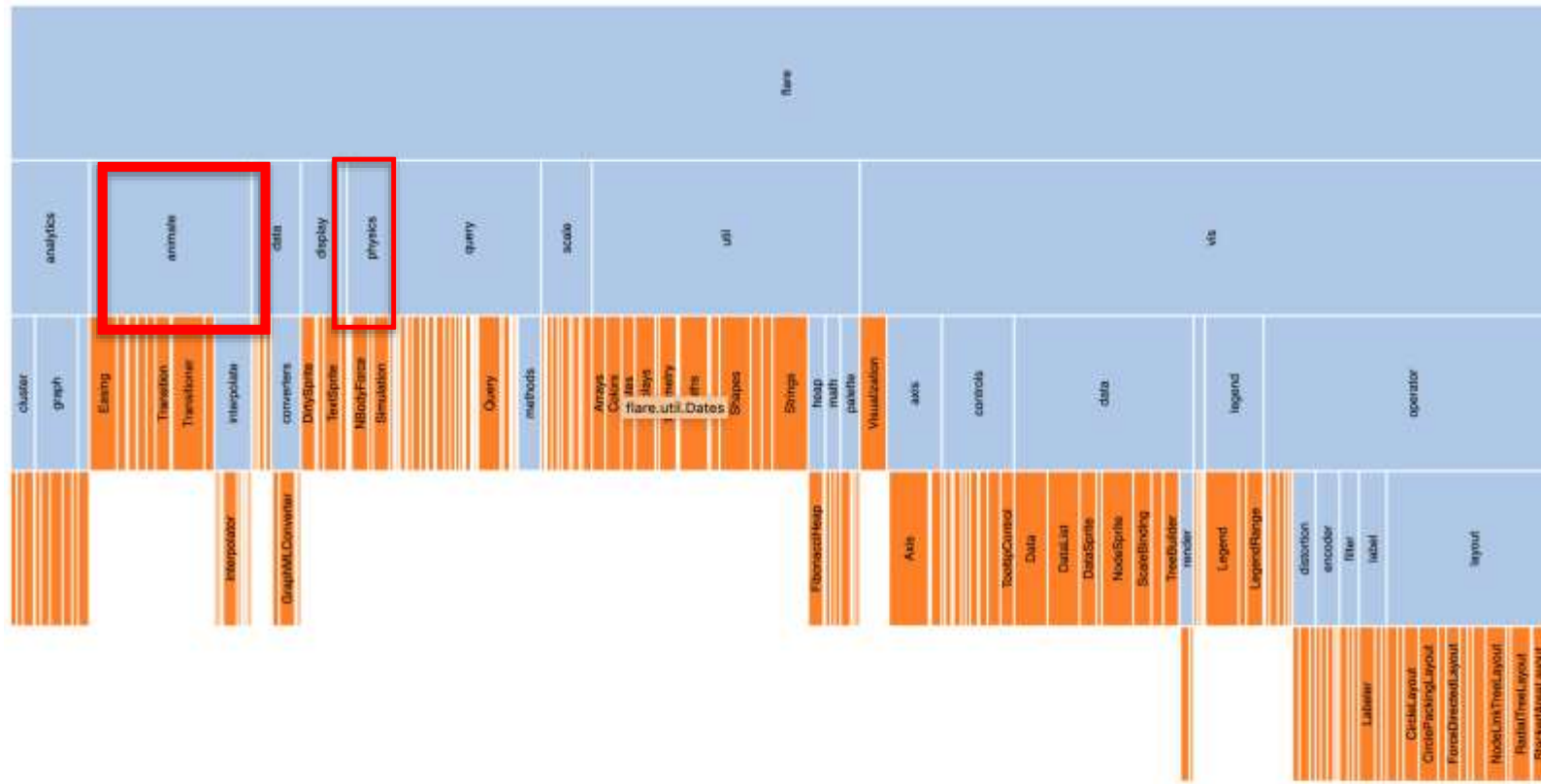
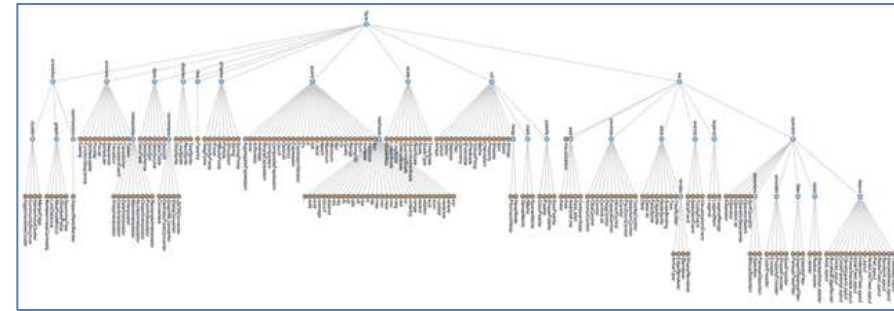
**Features:** adjacency-area method

- space-filling variants of node-link diagrams

**Pro:** Shows the size of classes and packages.

**Cons:** Similar to the vertical trees:

- Labels – not easy to read.
- The width & height could become disproportionate.



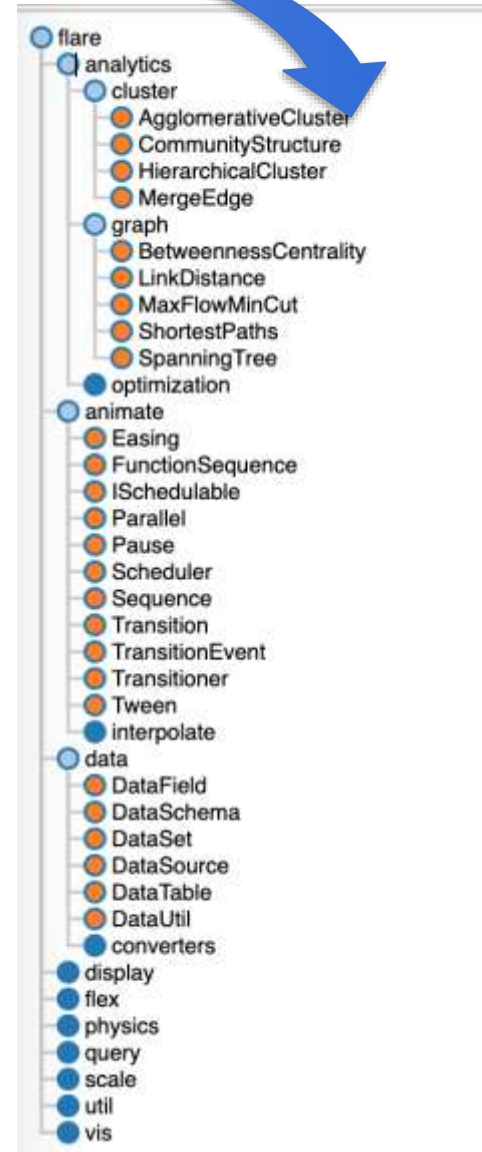
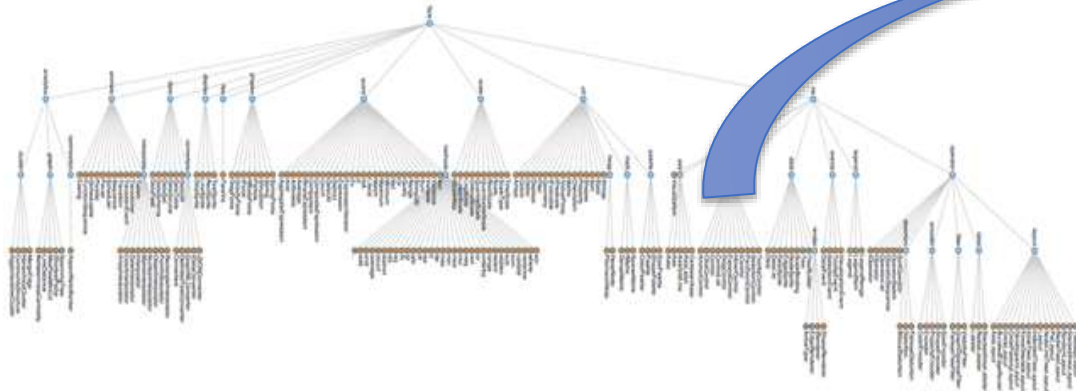
The Flare package tree laid out in horizontal layers. The blocks are sized to correctly partition their containing package block by their size.

Source: [Flare.Visualization.Toolkit](http://Flare.Visualization.Toolkit)

View full image at:

<https://homes.cs.washington.edu/~jheer/files/zoo/ex/hierarchies/icicle.html>

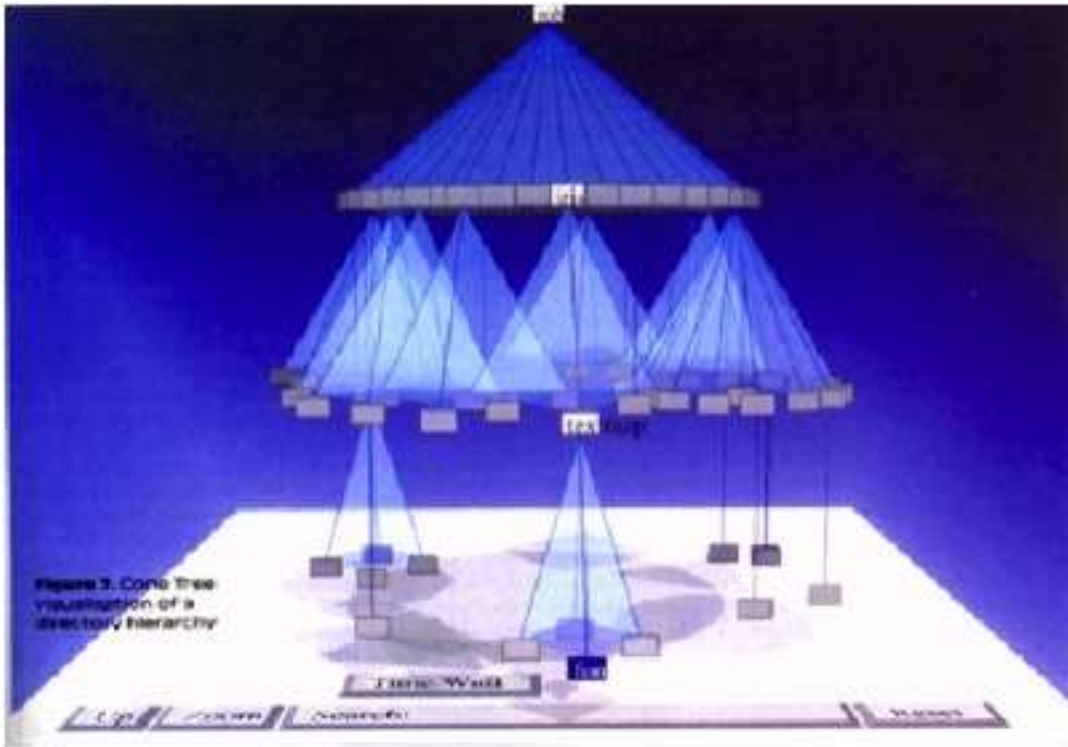
# 4. Horizontal Trees (a.k.a. indented trees)



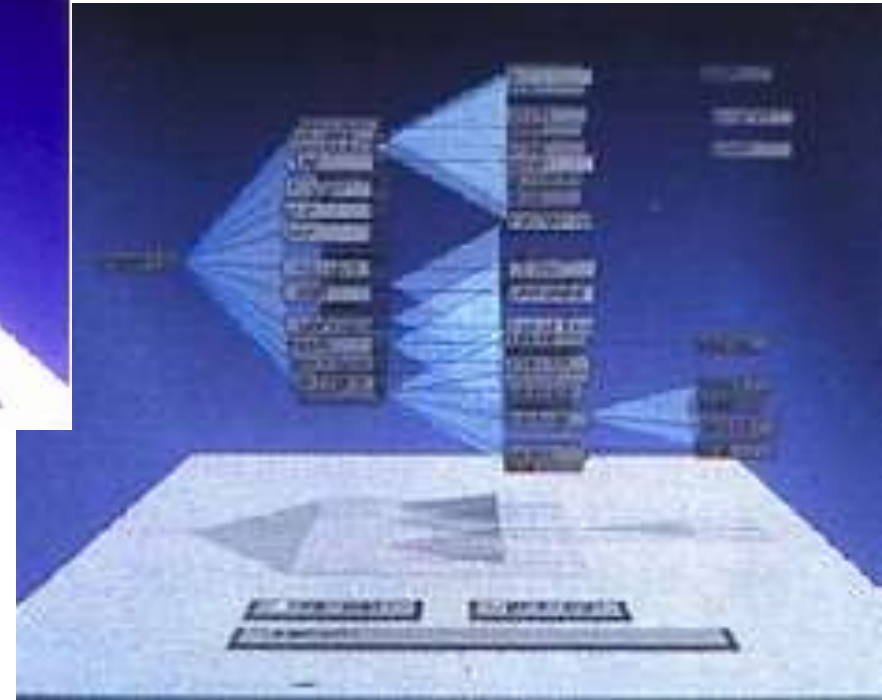
- Pros:
- Resembles the grammatical construct of a sentence, echoes a natural reading pattern;
  - Allows scanning of node labels;
  - Multivariate data (e.g., notes, tips, examples, images) can be displayed adjacent to the hierarchy.

View interactive tree at:  
<https://homes.cs.washington.edu/~jheer/files/zoo/ex/hierarchies/indent.html>



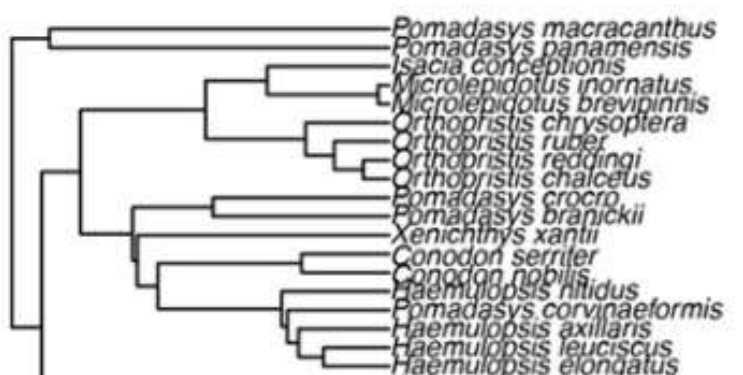
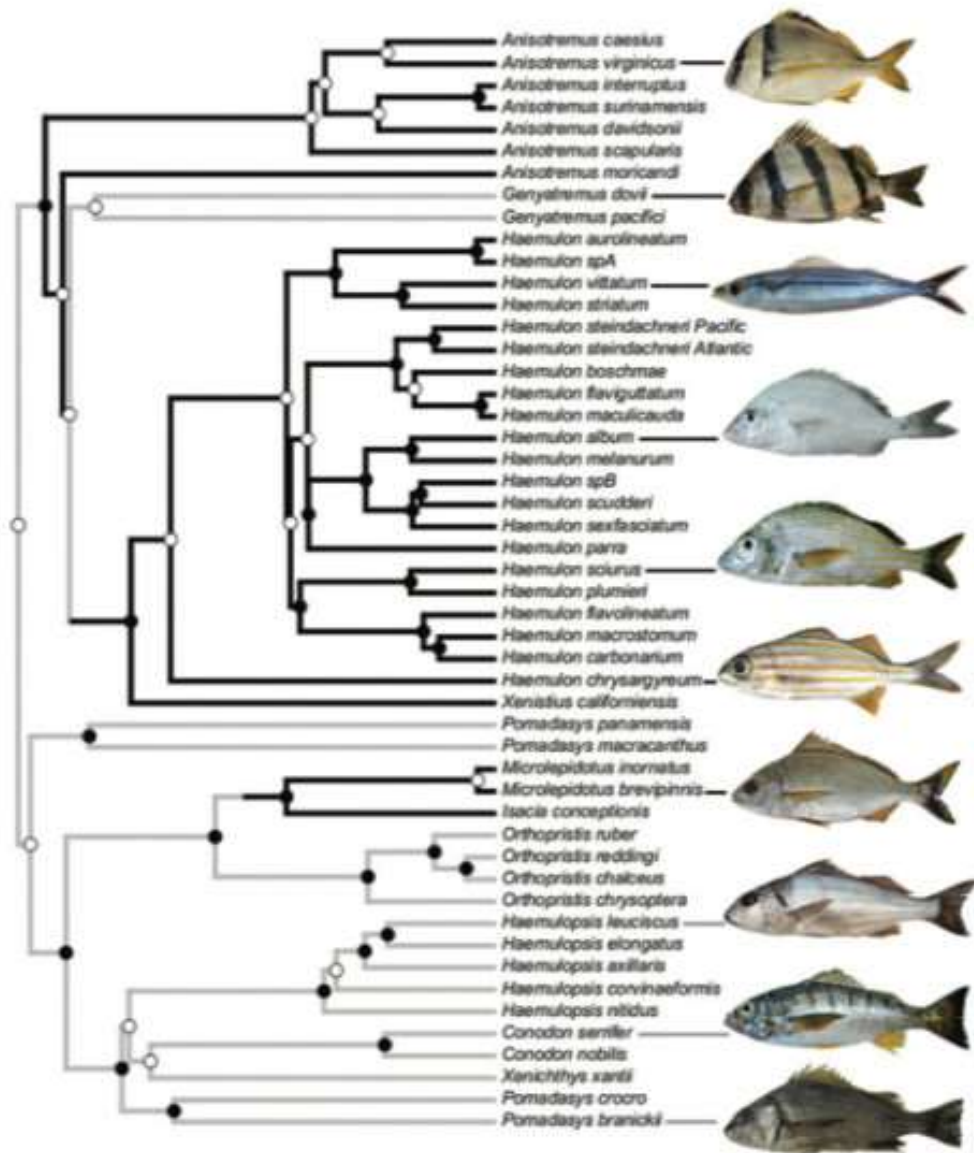


Original **Cone Tree** hierarchy browser developed by Xerox PARC in 1991



The **Cam Tree** is identical to the cone tree, except it is easier to place labels without them overlapping.

Image source: level of detail – scale matters. <https://alandix.com/blog/2015/09/08/level-of-detail-scale-matters/>



Pros:

- Resembles the grammatical construct of a sentence, echoes a natural reading pattern;
- Allows scanning of node labels;
- **Multivariate data (e.g., notes, tips, examples, images) can be displayed adjacent to the hierarchy.**

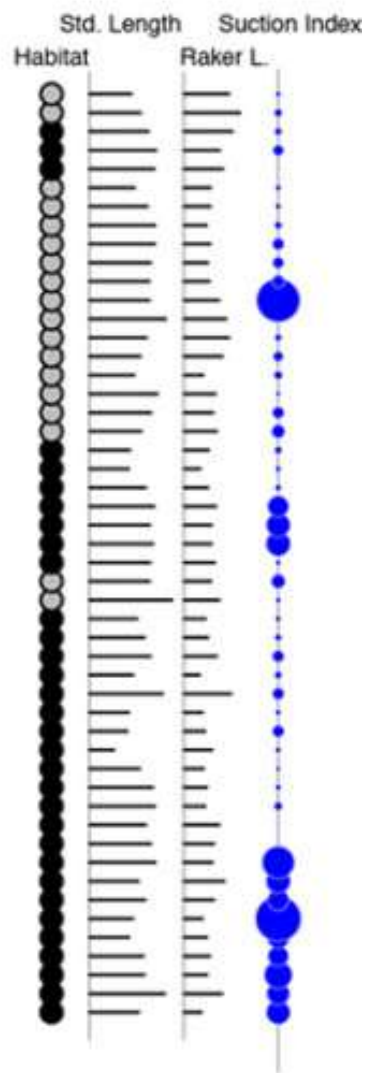
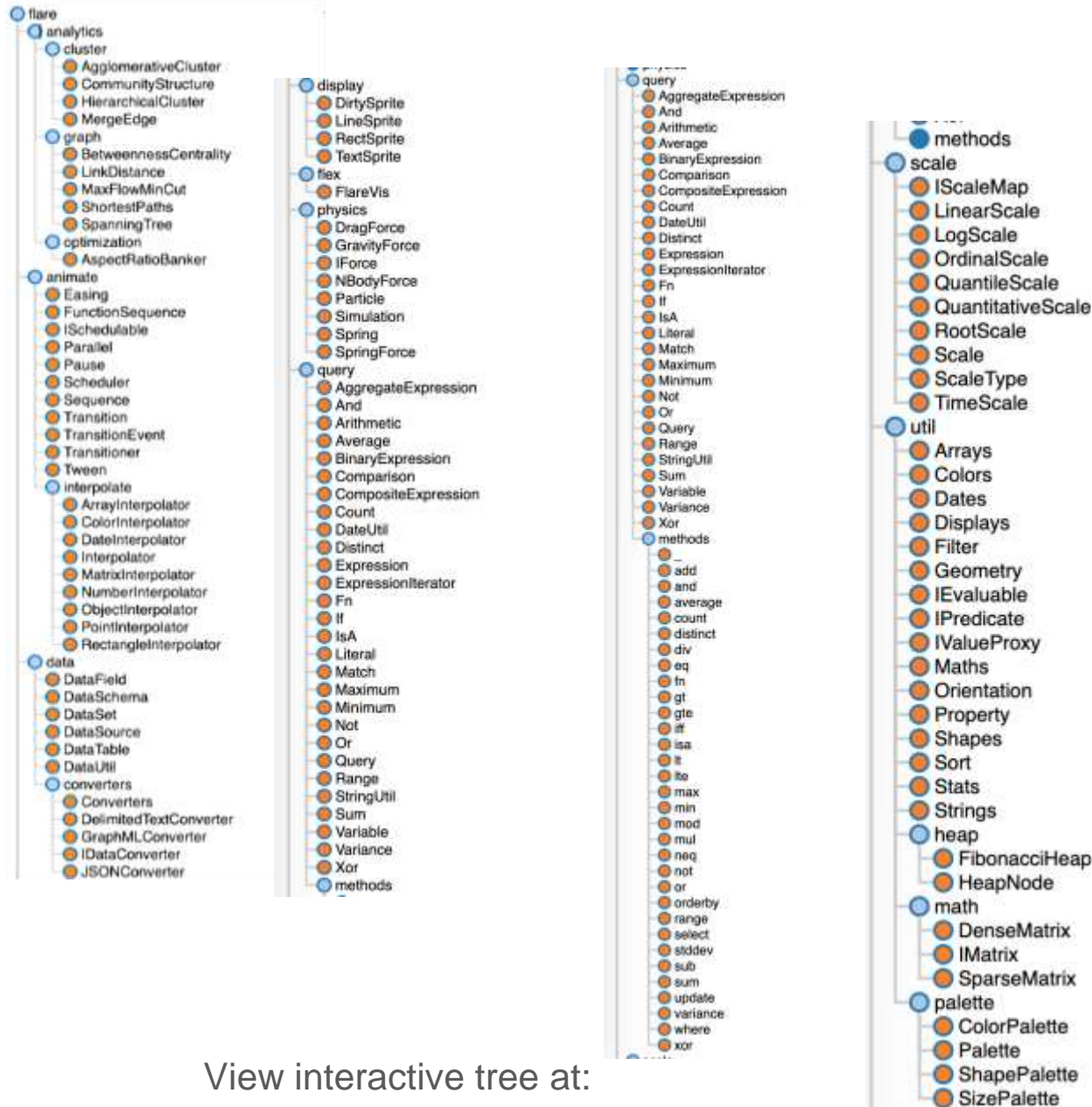


Image source: Data Visualization in R, at Workshop in Applied Phylogenetics, [2014].  
<http://treethinkers.org/tutorials/dataset-visualization/>

## (cont.) Horizontal Trees (a.k.a. indented trees)



### Cons:

- Requires excessive vertical space;
- Wasted horizontal space;
- Does not facilitate multi-scale inferences;
- Lack of efficient interactive exploration of the tree to find a specific node.

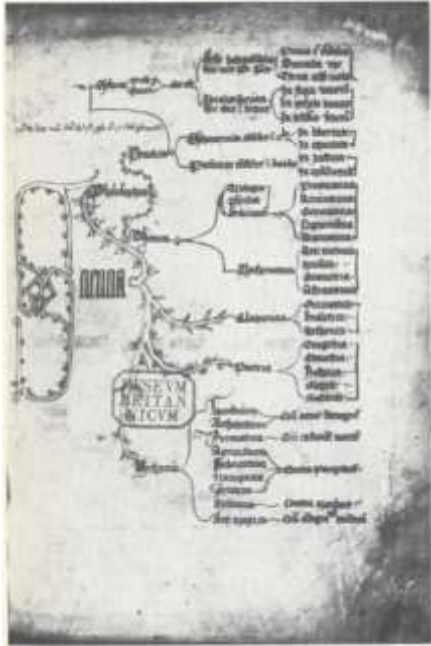
View interactive tree at:

<https://homes.cs.washington.edu/~jheer/files/zoo/ex/hierarchies/indent.html>



## Advancement

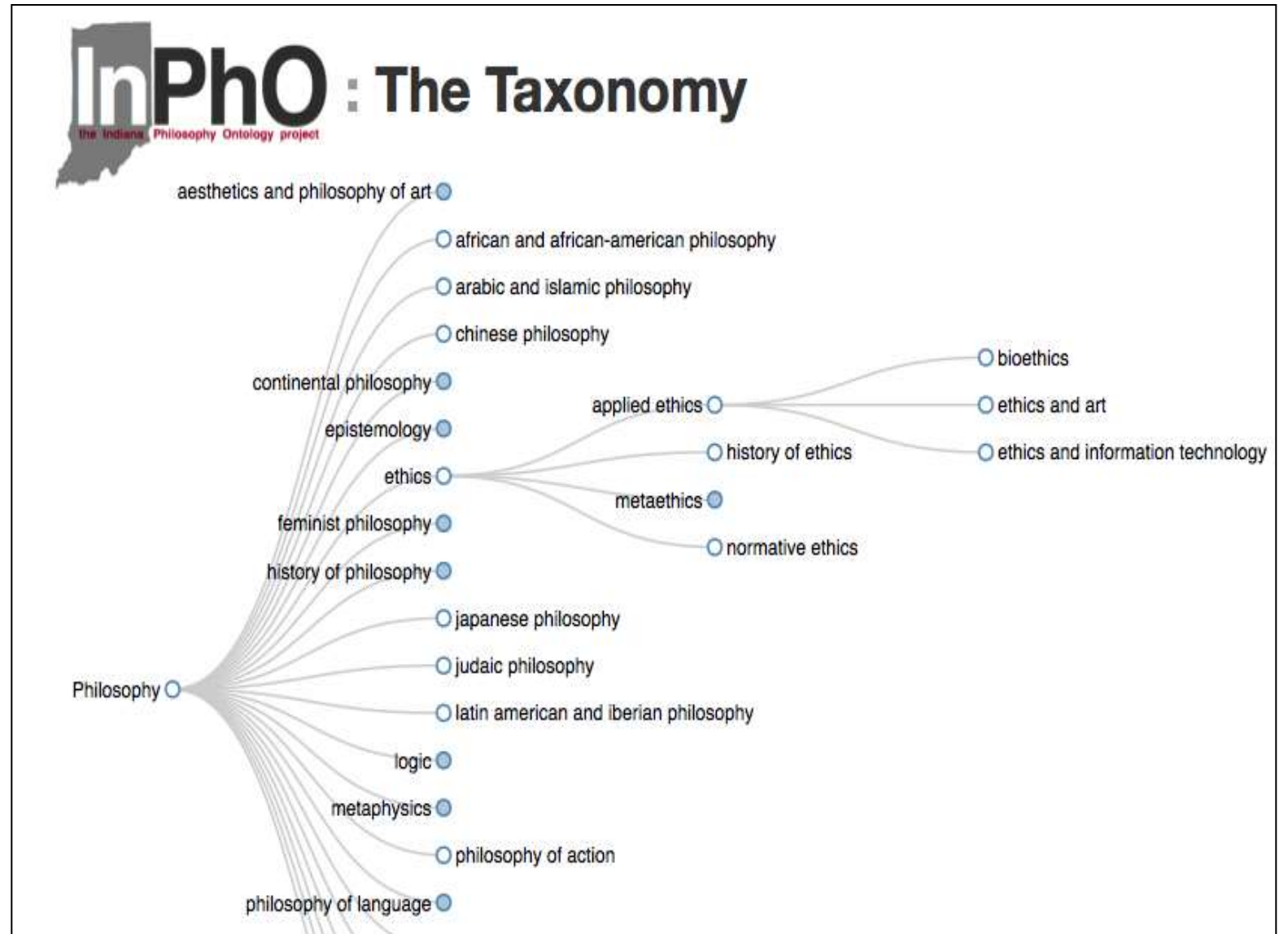
- Interactive, dynamic exploration →



**Divisio scientiae, c1430**

Peter of Poitiers (~1130-1215), a French scholastic theologian

[https://www.she-philosopher.com/gallery/info\\_trees\\_medieval.html](https://www.she-philosopher.com/gallery/info_trees_medieval.html)



The Indiana Philosophy Ontology (InPhO) → now: **Internet Philosophy Ontology (InPhO)**

<https://inpho.cogs.indiana.edu/>

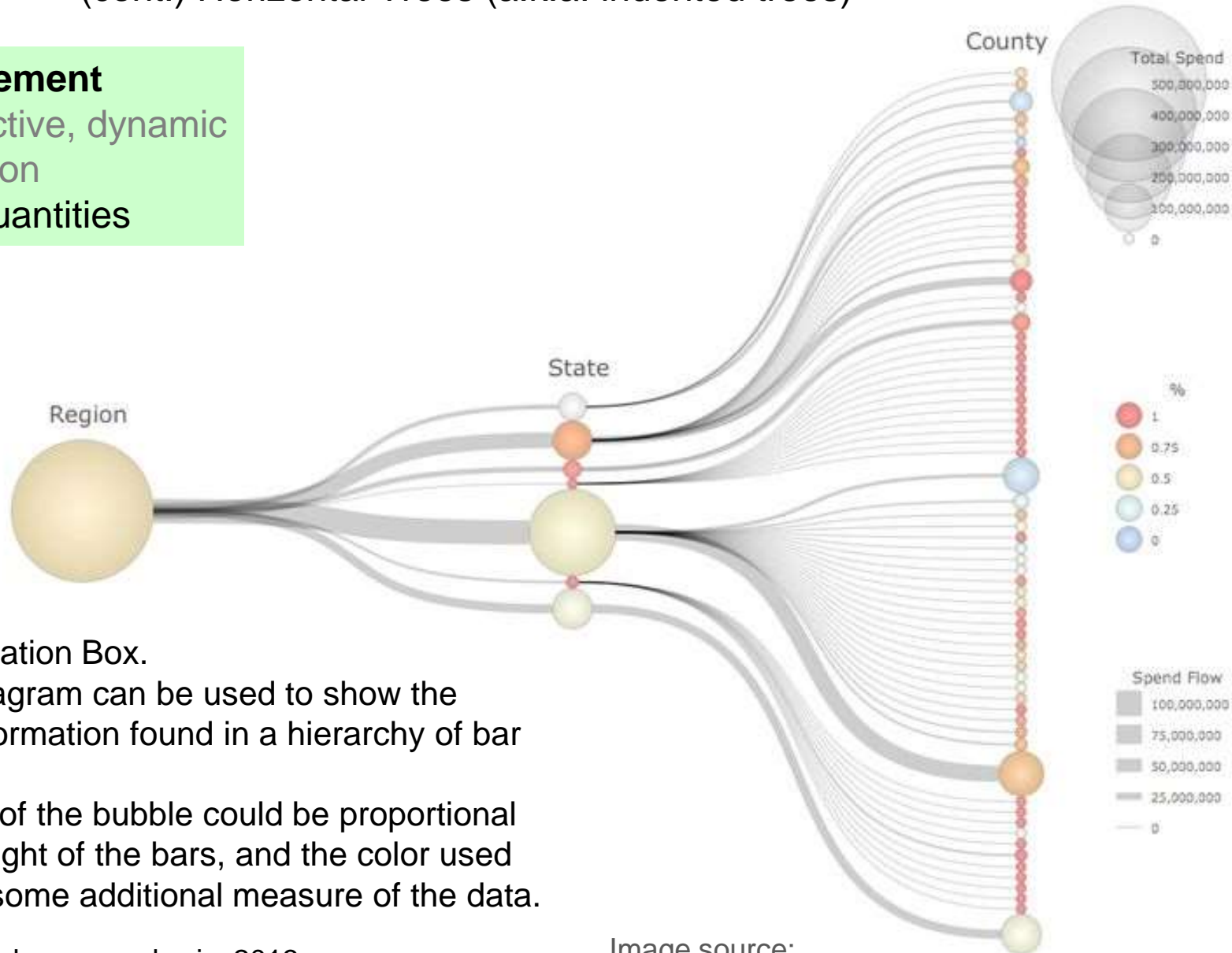
<https://www.inphoproject.org/taxonomy>



## (cont.) Horizontal Trees (a.k.a. indented trees)

### Advancement

- Interactive, dynamic exploration
- with quantities



IBM Visualization Box.

- A tree diagram can be used to show the same information found in a hierarchy of bar charts.
- The size of the bubble could be proportional to the height of the bars, and the color used to show some additional measure of the data.

IBM Blog by norene.lewis, 2013

Image source:

<https://i.pinimg.com/736x/3c/db/86/3cdb869825a77dc2e1ddc0445bb1f276.jpg>



## Structure

Root

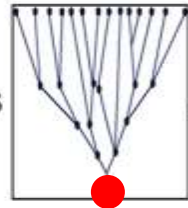
. Branches

. . Leaves

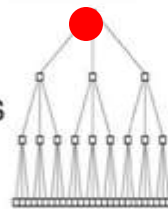
## Summary: Hierarchical structures in **tree** shapes

### A. Hierarchical Structures in **Tree Shapes**

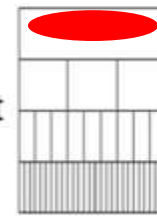
○ 1. Figurative Trees



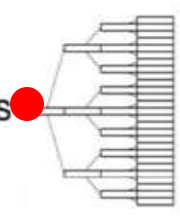
, 2. Vertical Trees



, 3. Icicle Layout



, 4. Horizontal Trees



### B. Hierarchical Structures in **Circular Shapes**

○ 5. Radial Trees



, 6. Hyperbolic Trees



, 7. Sunburst Layout

### C. Hierarchical Structures in **Enclosure Diagrams**

○ 8. Circle-packing layouts



, 9. Treemaps



### Think in terms of:

- **Position** of **Root**
- **Shape**
- **Features**
  - **Extensibility**
  - **Hospitality**
  - **Readability**
  - **Comfortability**
  - ... ???

# From graphic representation to computerized visualization

## B. Hierarchical Structures in **Circular** Shapes

### A. Hierarchical Structures in **Tree Shapes**

○ 1. Figurative Trees



, 2. Vertical Trees



, 3. Icicle Layout

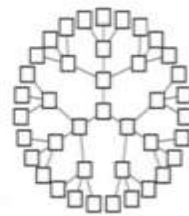


, 4. Horizontal Trees



### B. Hierarchical Structures in **Circular Shapes**

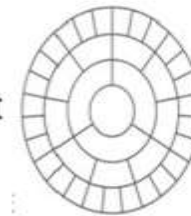
○ 5. Radial Trees



, 6. Hyperbolic Trees



, 7. Sunburst Layout

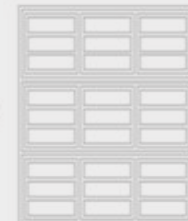


### C. Hierarchical Structures in **Enclosure Diagrams**

○ 8. Circle-packing layouts



, 9. Treemaps



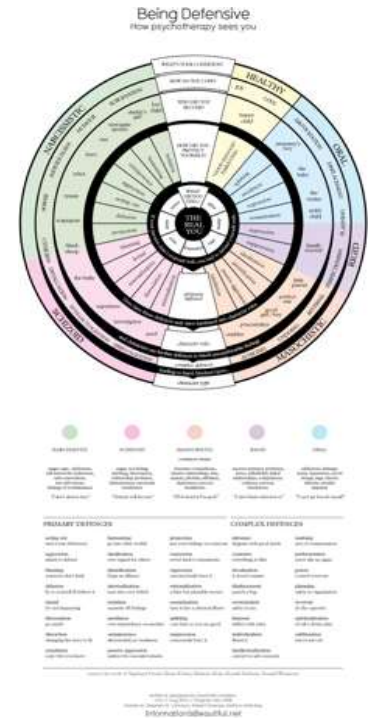
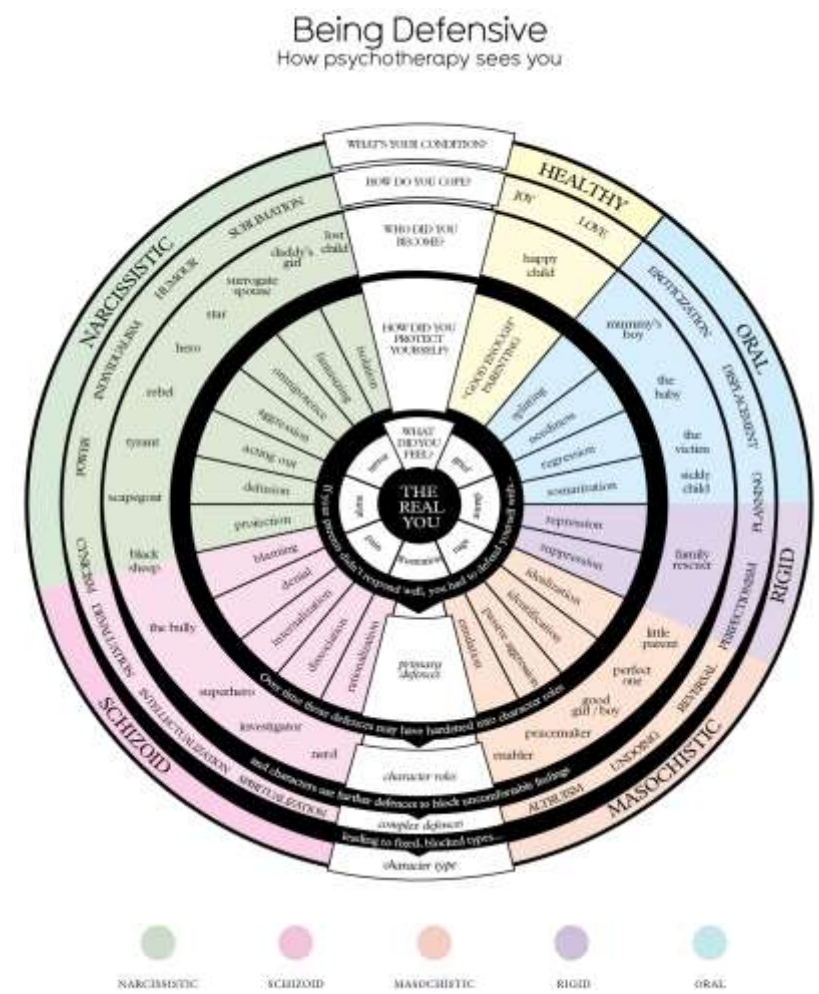
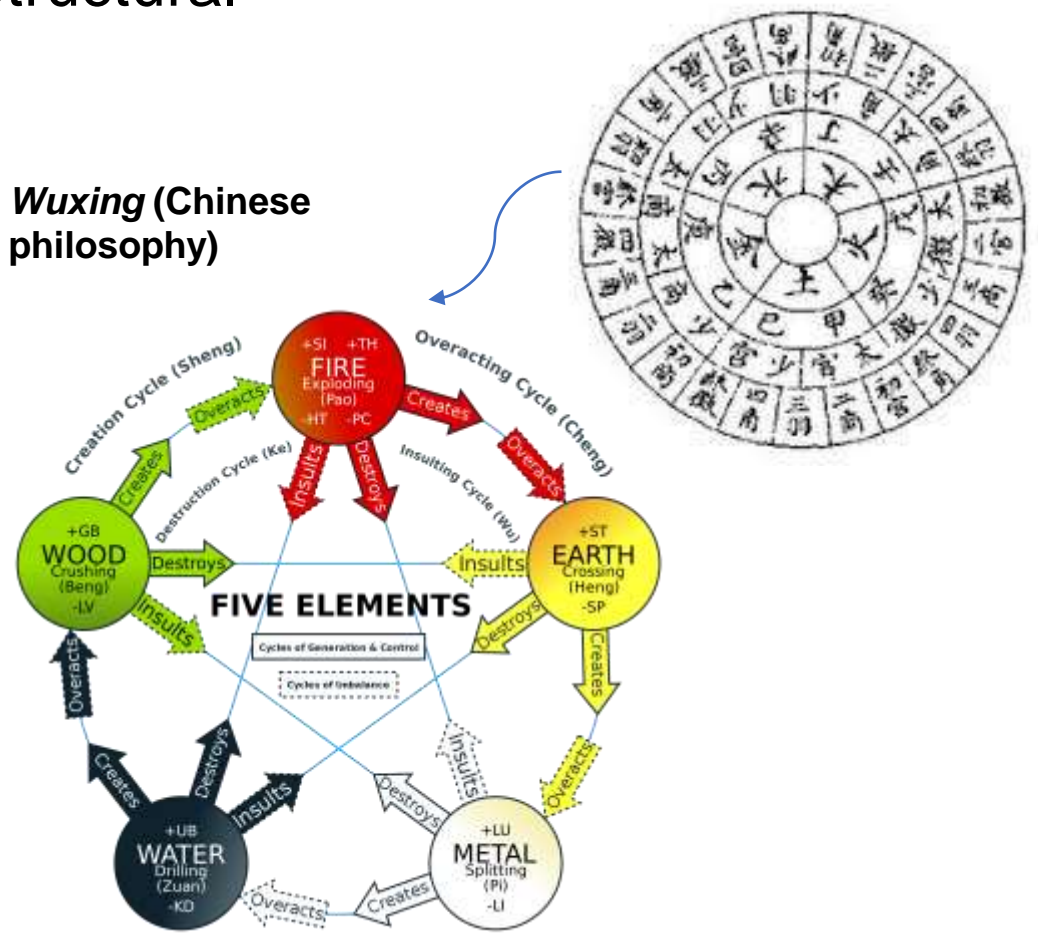




# (cont.) 5. Radial Trees (a.k.a. Radial layers layout)

Conceptual  
Structural

Wuxing (Chinese philosophy)



See details in:

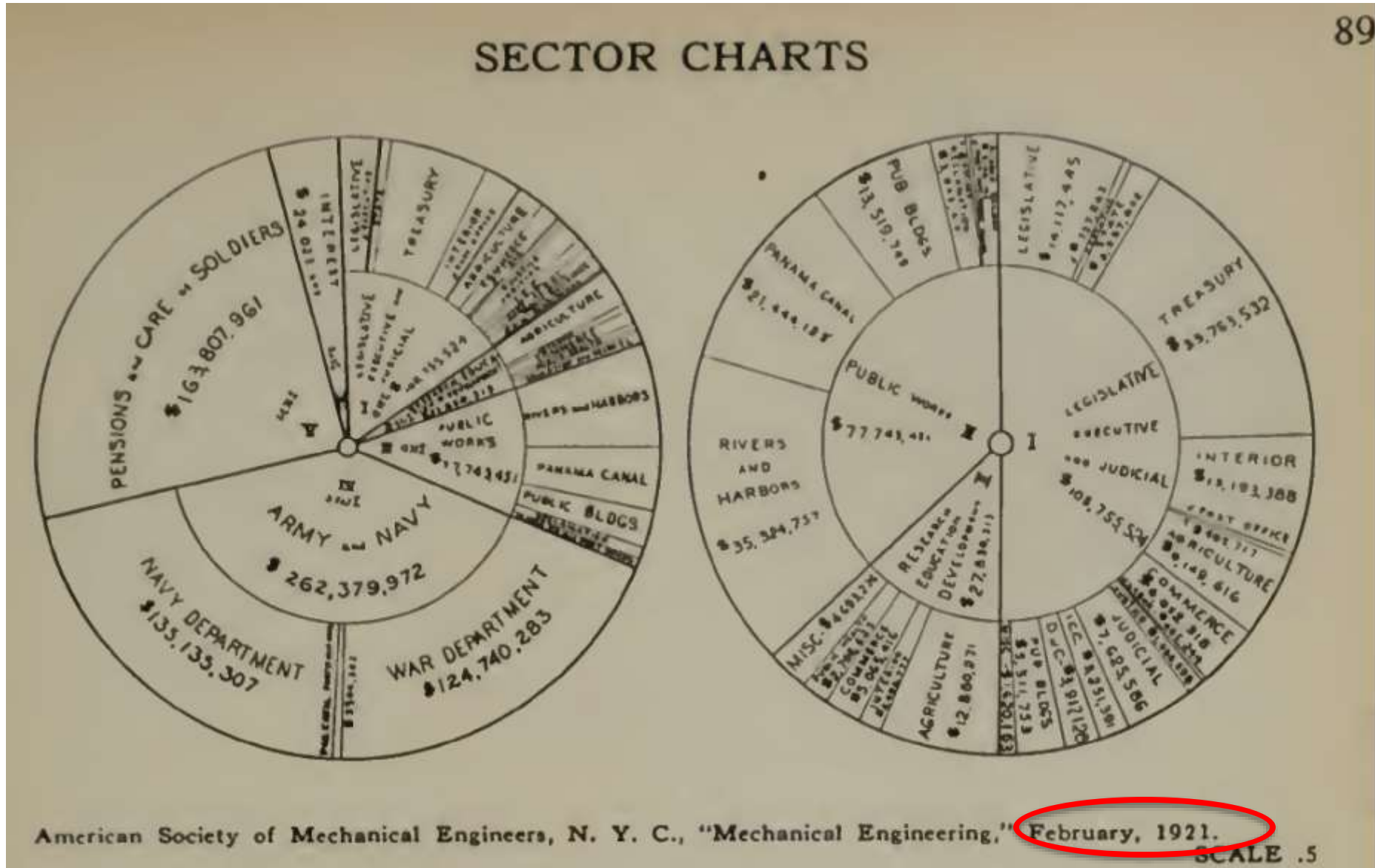
<http://www.informationisbeautiful.net/visualizations/being-defensive/> 2008

Sources: <https://en.wikipedia.org/wiki/Wuxing> (Chinese philosophy)

<http://ctext.org/library.pl?if=gb&res=5641>

(cont.) 5. Radial Trees (a.k.a. Radial layers layout)

Quantity involved

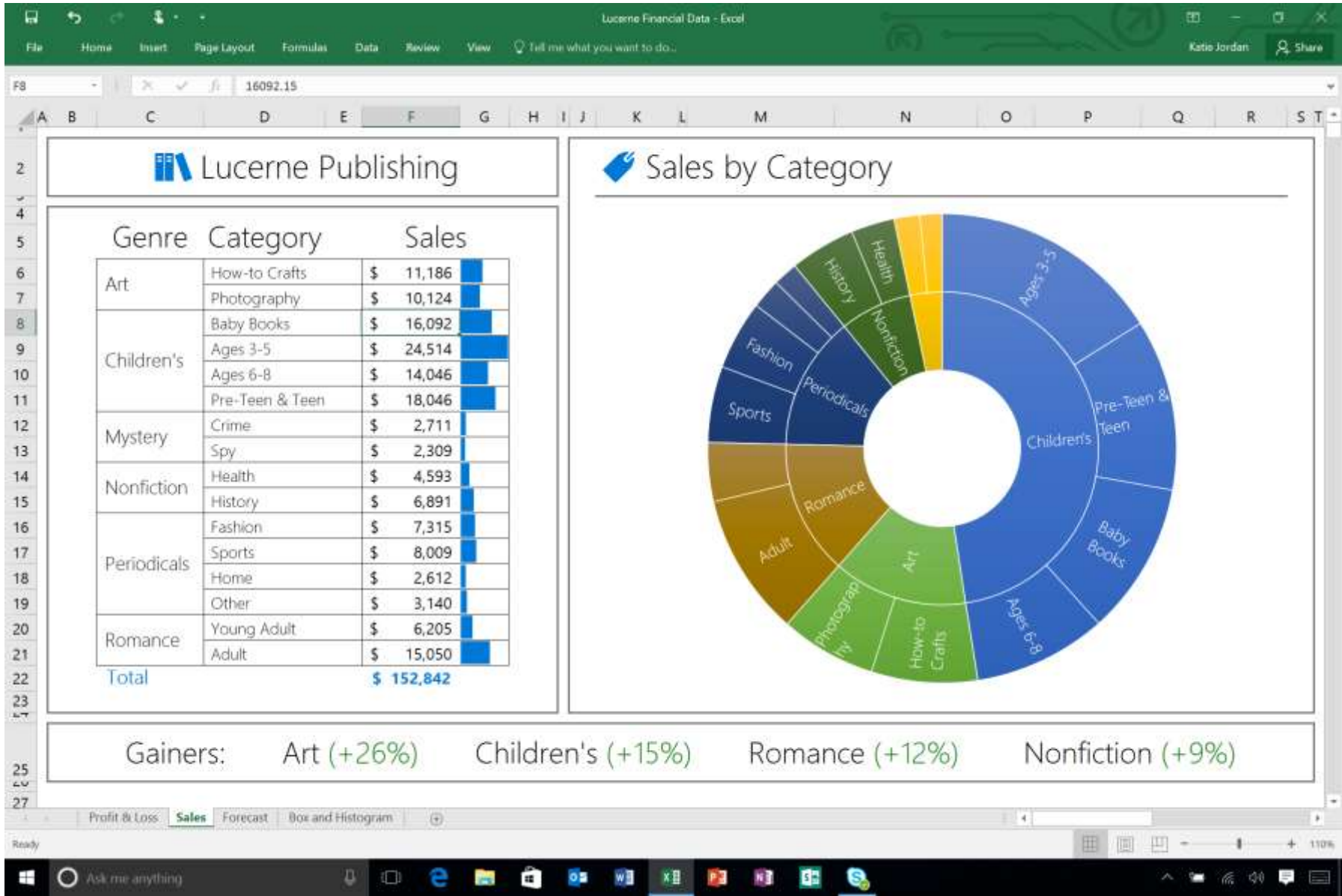


Source: Brinton, W. C. 1939. *Graphic presentation*, p. 89



# (cont.) 5. Radial Trees (a.k.a. Radial layers layout)

Quantity-based





# (cont.) 5. Radial Trees (a.k.a. Radial layers layout)

## With additional marks

Schema.org's hierarchies.

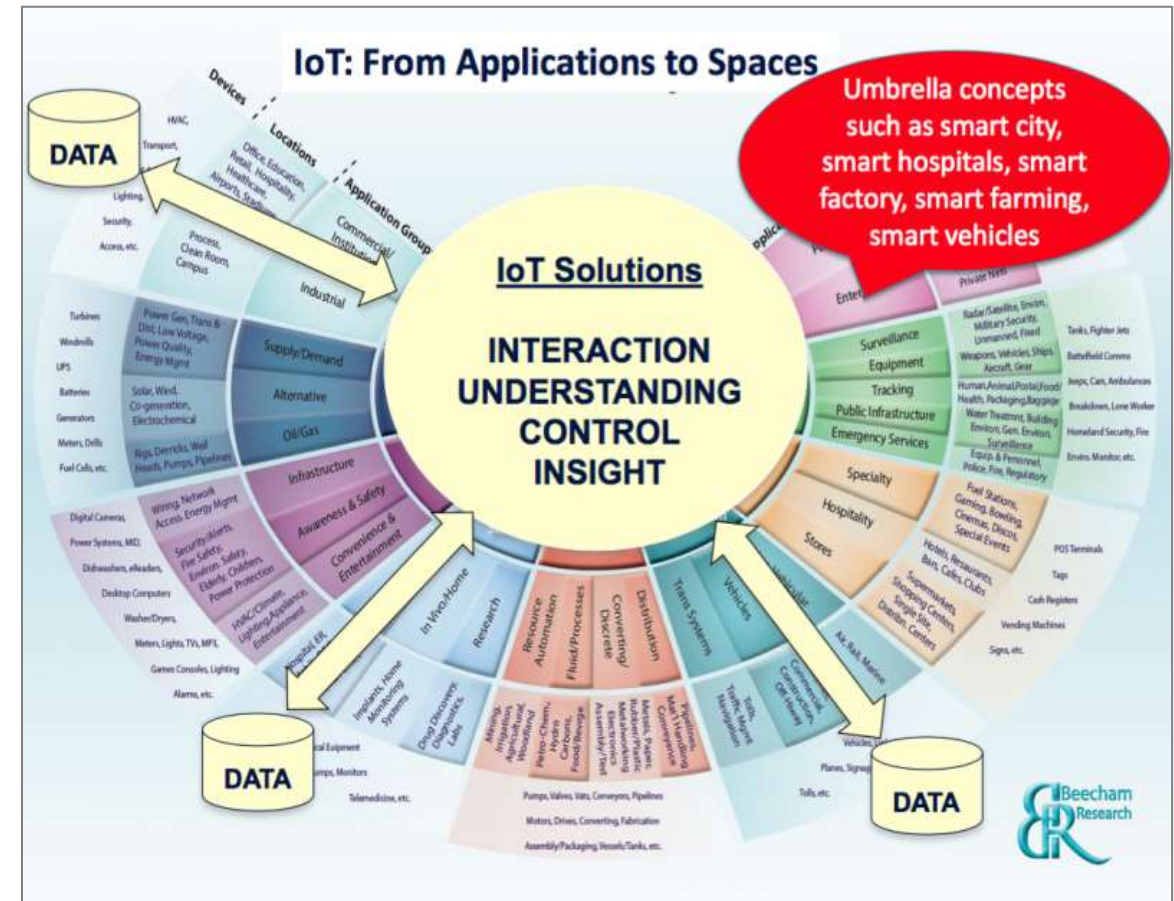
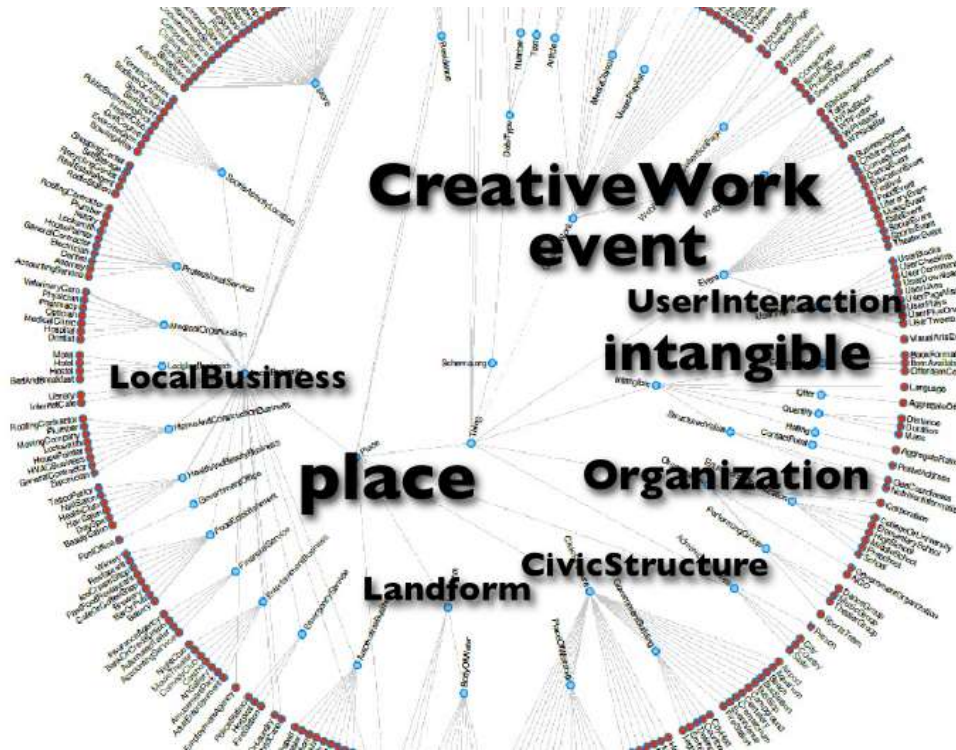


Image source: Erle Alberton. 2015. "Focus schema.org et sémantique SEO Camp Nice Sophia-Antipolis." Slide 15. <https://www.slideshare.net/erlalberton/focus-schemaorg-et-smantique-seo-camp-day-nice-sophiaantipolis>

Image source: TechWorks. 2016. "The Opportunity for Security in the IoT Market." <https://www.youtube.com/watch?v=wXKy5pw-Pls>





# Radial Trees vs. Hyperbolic Trees

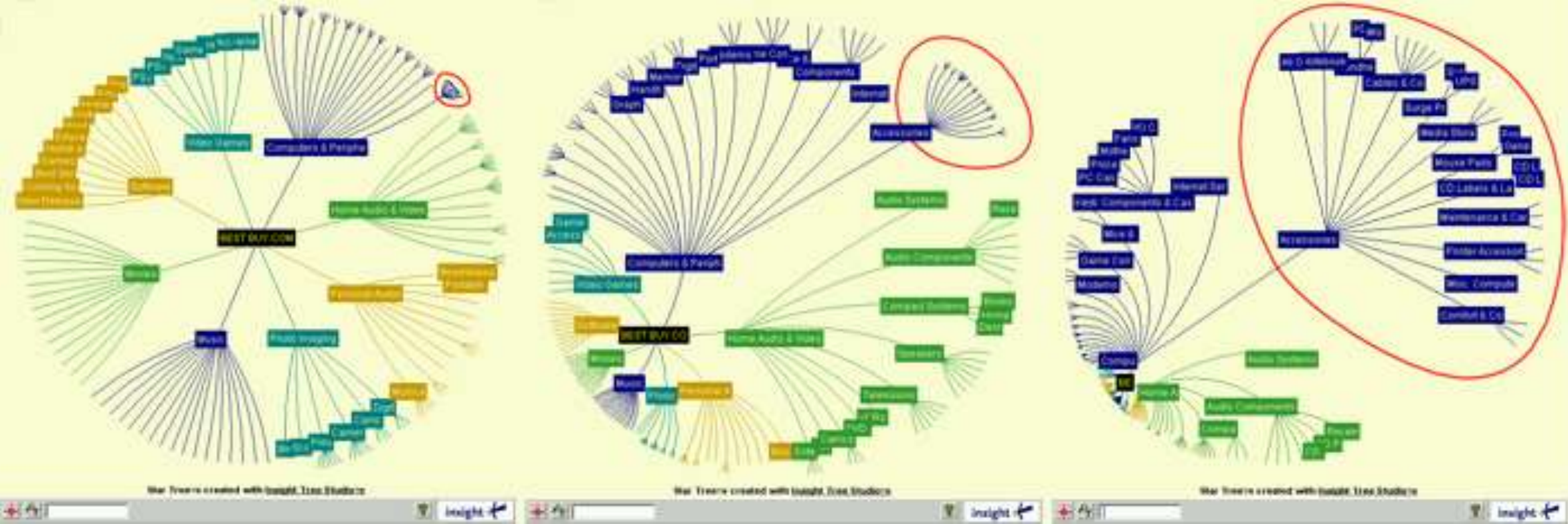


Image source: Introduction to Visualizing Hierarchies  
<http://demo.elearninglab.org/mod/page/view.php?id=30>





## Structure

Root

. Branches

. . Leaves

# Summary: Hierarchical Structures in **Circular** Shapes

## A. Hierarchical Structures in Tree Shapes

○ 1. Figurative Trees



, 2. Vertical Trees



, 3. Icicle Layout

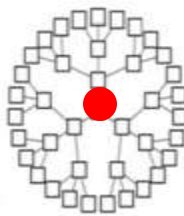


, 4. Horizontal Trees

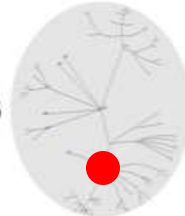


## B. Hierarchical Structures in Circular Shapes

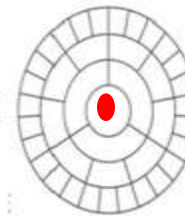
○ 5. Radial Trees



, 6. Hyperbolic Trees

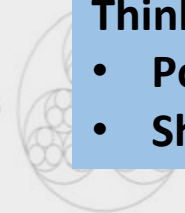


, 7. Sunburst Layout



## C. Hierarchical Structures in Enclosure Diagrams

○ 8. Circle-packing layouts



Think in terms of:

- Position of **Root**
- Shape

### • Features

- Extensibility
- Hospitality
- Readability
- Comfortability
- ...???

# From graphic representation to computerized visualization

## C. Hierarchical Structures in **Enclosure Diagrams**

### A. Hierarchical Structures in **Tree Shapes**

○ 1. Figurative Trees



, 2. Vertical Trees



, 3. Icicle Layout

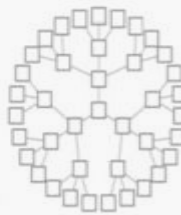


, 4. Horizontal Trees



### B. Hierarchical Structures in **Circular Shapes**

○ 5. Radial Trees



, 6. Hyperbolic Trees

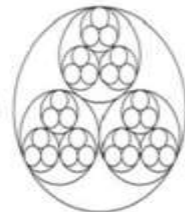


, 7. Sunburst Layout

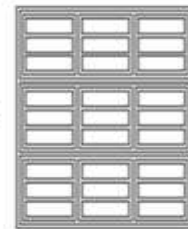


### C. Hierarchical Structures in **Enclosure Diagrams**

○ 8. Circle-packing layouts

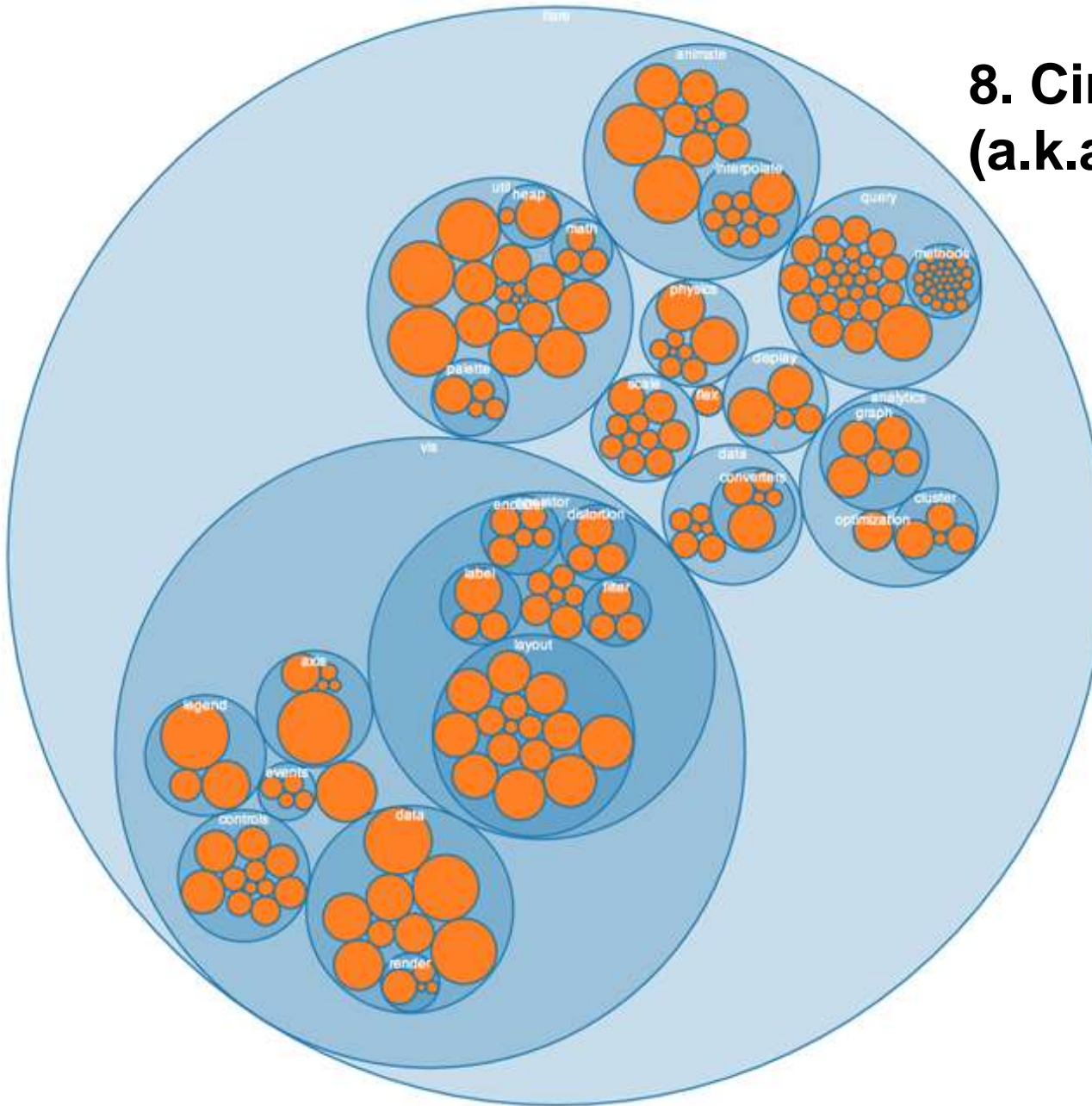


, 9. Treemaps



## 8. Circle-packing layouts (a.k.a. Circular Treemaps)

(Enclosure Diagram)



**Feature:** Packing circles instead of subdividing rectangles.

**Pros:**

- While it seems to have the "wasted space", the layouts effectively reveals the hierarchy.
- Node sizes can be rapidly compared using area judgments.

**Con:**

Branches and leaves change dynamically, no stable structure.

Jeffrey Heer, Michael Bostock, and Vadim Ogievetsky, Stanford University. A Tour Through the Visualization Zoo.

<https://homes.cs.washington.edu/~jheer/files/zoo/>

Image source:

<https://homes.cs.washington.edu/~jheer/files/zoo/ex/hierarchies/pack.html>



## 9. Treemaps (a.s.a. mosaic graphs)

(Enclosure Diagram)

### Features:

- A space-constrained visualization of hierarchical structures;
- Showing attributes of leaf nodes using size and color coding;
- The root is implied by the title of the map.

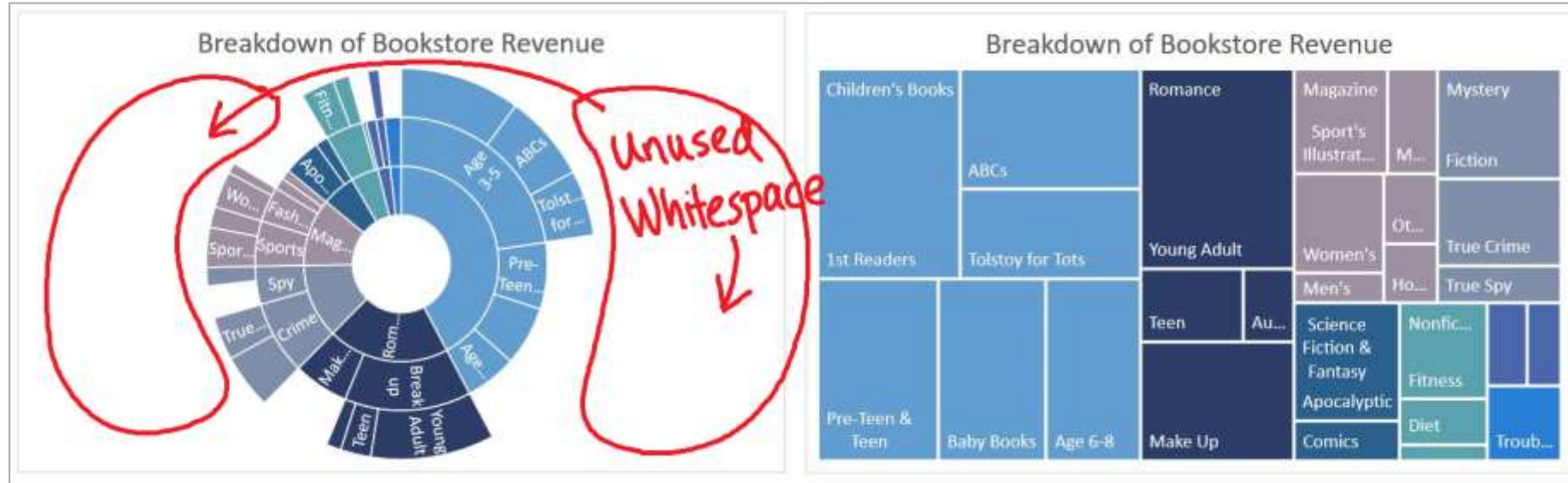


Image source: Breaking down hierarchical data with Treemap and Sunburst charts  
Excel team, August 11, 2015

<https://blogs.office.com/en-us/2015/08/11/breaking-down-hierarchical-data-with-treemap-and-sunburst-charts/>

### Pros:

- Enables users to compare nodes and sub-trees even at varying depth in the tree, and help them spot patterns and exceptions.
- Efficient and adaptable use of space.
- Easy to understand and use.
- Maintain good legibility while showing huge amount of data.

# Treemaps Quantity-based, interactive



Image captured for educational purposes.  
July 15, 2023, from <https://finviz.com/map.ashx>

## Structure

Root

. Branches

. . Leaves

# Summary: Hierarchical Structures in **Enclosure Diagrams**

## A. Hierarchical Structures in Tree Shapes

○ 1. Figurative Trees



, 2. Vertical Trees



, 3. Icicle Layout



Think in terms of:

- Position of **Root**
- Shape

## B. Hierarchical Structures in Circular Shapes

○ 5. Radial Trees



, 6. Hyperbolic Trees

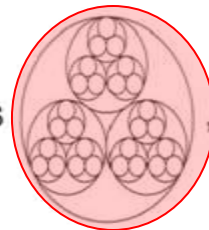


, 7. Sunburst Layout

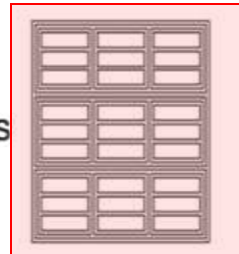


## C. Hierarchical Structures in Enclosure Diagrams

○ 8. Circle-packing layouts



, 9. Treemaps



• Features

- Extensibility
- Hospitality
- Readability
- Comfortability
- ... ???

# III. Conclusion



# Conclusion (1/2)

## Structure

Root

. Branches

. . Leaves

From *graphic representation*  
to *computerized visualization*

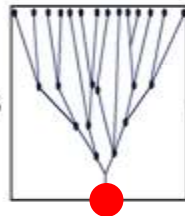
## Hierarchical Structures

## Features

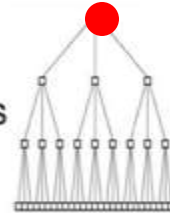
- Extensibility
- Hospitality
- Readability
- Comfortability
- ... ???

### A. Hierarchical Structures in Tree Shapes

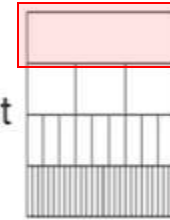
○ 1. Figurative Trees



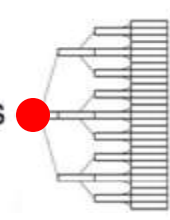
, 2. Vertical Trees



, 3. Icicle Layout

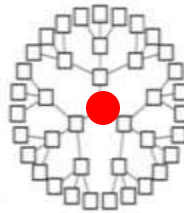


, 4. Horizontal Trees



### B. Hierarchical Structures in Circular Shapes

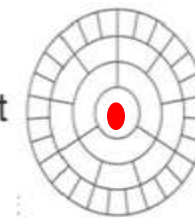
○ 5. Radial Trees



, 6. Hyperbolic Trees

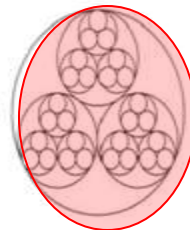


, 7. Sunburst Layout

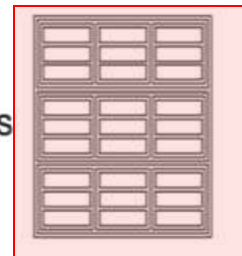


### C. Hierarchical Structures in Enclosure Diagrams

○ 8. Circle-packing layouts



, 9. Treemaps



## Conclusions (2/2)

- a) Visual representations reflecting the order and structure of knowledge that have been used for thousands of years.
- b) Modern computerized visualization and computer-assistant graphic creations offer great potential, while the usability issues still need to be addressed.
- c) It is important to pay attention to the functions of visual representation methods and layouts that enable consequential information discovery and ultimate user experience in the data-driven age.

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- Brinton, Willard Cope. 1939. *Graphic presentation*. Brinton associates. Available at <https://archive.org/details/graphicpresentat00brinrich>
- Heer, Jeffrey, Bostock, Michael & Vadim Ogievetsky. [2010]. *A Tour Through the Visualization Zoo*. Stanford University. Available at <http://homes.cs.washington.edu/~jheer//files/zoo/>
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- Lima, Manuel. 2014. *The Book of Trees: Visualizing Branches of Knowledge*. Princeton Architectural Press.
- McCandless, Davi . 2014. *Knowledge Is Beautiful*. Harper Design (October 21, 2014)
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- Steele, Julie & Noah Iliinsky. 2010. *Beautiful Visualization: Looking at Data through the Eyes of Experts (Theory in Practice)*. O'Reilly Media.
- Usability.gov — Personas. [updated July 7, 2023.] U.S. General Services Administration Technology Transformation Services <http://www.usability.gov/how-to-and-tools/methods/personas.html>

## Image sources

- Monoskop. *Classification of Knowledge*. 2015- (last edited on December 3, 2022) [https://monoskop.org/Classification\\_of\\_knowledge](https://monoskop.org/Classification_of_knowledge)
- She-philosopher.com Library. 2004- (last updated Jan. 12, 2023) <http://she-philosopher.com/library.html>

# Image sources used for the **Visual Representation of Knowledge** framework

## **Sensible:**

1. Amarna Period stela of Akhenaten, Nefertiti, and their daughters. <https://ancientneareast.org/2014/01/03/the-enigma-of-akhenaten/> [Akhenaten (1359-1342 BCE)].
2. Temple of Dendur, around 15 BC. Scene on the south wall, in which Augustus presents offerings to the goddess Hathor and the god Horus. Ref: Met: Color The Temple: Using Projected Light to Restore Color <http://www.metmuseum.org/blogs/digital-underground/2015/color-the-temple>

## **Intelligible:**

1. A Porphyrian tree, originally drawn by the 13th century logician Peter of Spain. [https://www.researchgate.net/publication/220017746\\_Semantic\\_Networks](https://www.researchgate.net/publication/220017746_Semantic_Networks)
2. 五形圖 The Five Elements. About : <http://www.iep.utm.edu/wuxing/>
3. Taxonomy of team names in the major professional sports leagues in the United States, by [Infojocks](#), 2009 <http://weloveinfographics.info/post/5580133590/taxonomy-of-team-names>

## **Map:**

Original map by John Snow showing the clusters of cholera cases in the London epidemic of 1854, and drawn and lithographed by Charles Cheffins. [https://en.wikipedia.org/wiki/John\\_Snow](https://en.wikipedia.org/wiki/John_Snow)

## **Physical:**

1. NASA Astronomy Picture of the Day <http://antwrp.gsfc.nasa.gov/apod/ap060828.html>
2. Different laws of motion [https://sites.google.com/a/lbl.gov/bl10\\_hers/news](https://sites.google.com/a/lbl.gov/bl10_hers/news)

## **Aggregates:**

The psychosociologist Jacob L. Moreno (1889 –1974) used node-link diagrams to analyze and illustrate various social structures. He published a node-link diagram in a 1933 New York Times article, depicting the web of friendships in an elementary school.

[https://en.wikipedia.org/wiki/Jacob\\_L.\\_Moreno](https://en.wikipedia.org/wiki/Jacob_L._Moreno)

## **Numbers:**

1. Using LinkedIn <http://www.stevenchanmd.com/weblog/2013/08/visualize-your-connections-through-linkedin/>
2. How to use a Periodical Table <http://chemistry.about.com/od/periodictable/ss/How-To-Use-A-Periodic-Table.htm>



Thank  
you!



**ISKO**UK

Contact me during the conference, if you would like to access the educational-use website:  
<https://metadataetc.org/KOSVisual/index.html>

# Visual Representations *of* Knowledge Structures *for* Information Discovery

Marcia Lei Zeng  
School of Information  
Kent State University, USA



Images are used for  
educational purposes.