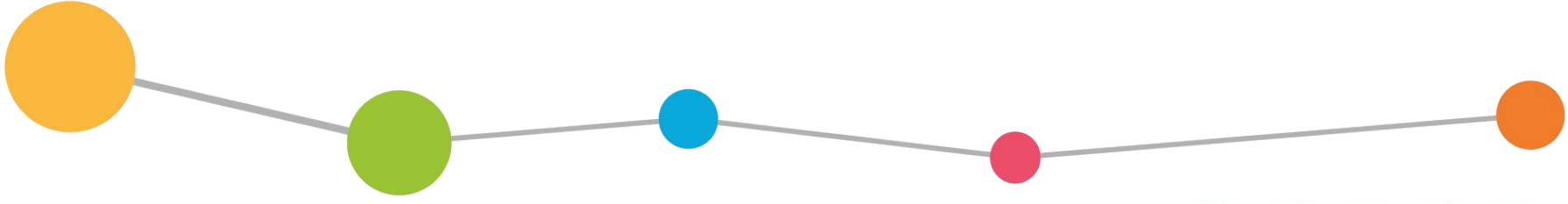
Creating Interpretive Instructional Graphics*

#instructional graphics #communication functions
#interpretive communication function #VisDNA
#visual grammar #visual components #visual encodings

http://vistolearn.online/

*This learning material was developed for the activity plan which was created within the scope of Project VistoLearn supported by IVLA research Grant 2020.



HACETTEPE UNIVERSITY

www.hacettepe.edu.tr

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IVLA
INTERNATIONAL VISUAL LITERACY ASSOCIATION

www.ivla.org

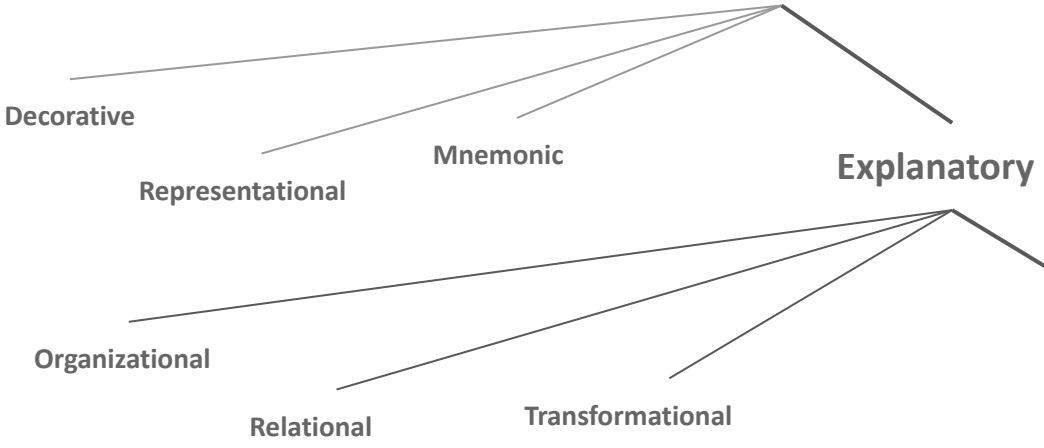
Instructional Graphics

> "Iconic expressions of content designed to promote learning and improve performance."

Clark and Lyons, 2011

Communication functions

Instructional graphics have communication functions focuses on how they convey information based on visual grammar used.



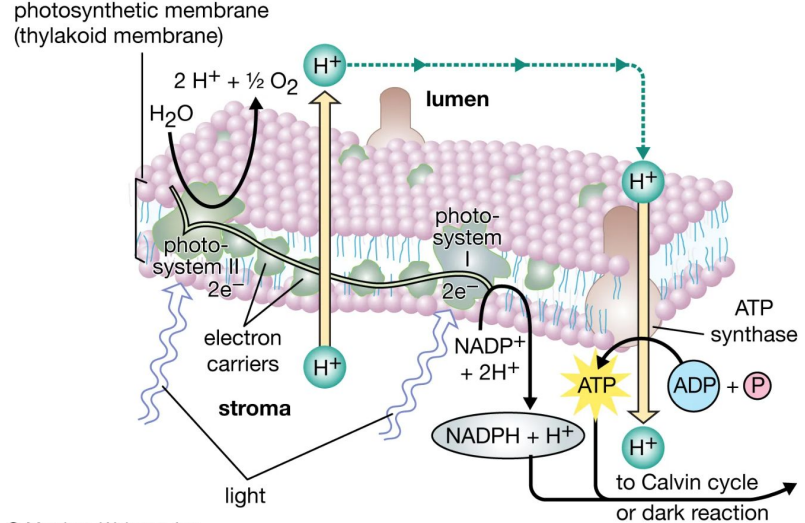
Interpretive

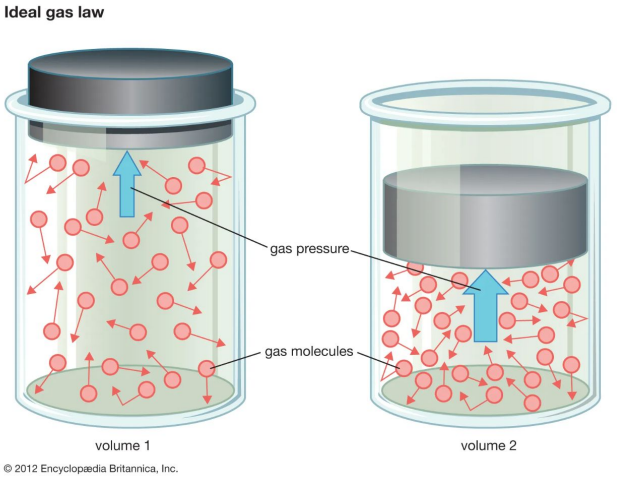
Interpretive graphics enable to build knowledge of events/processes.

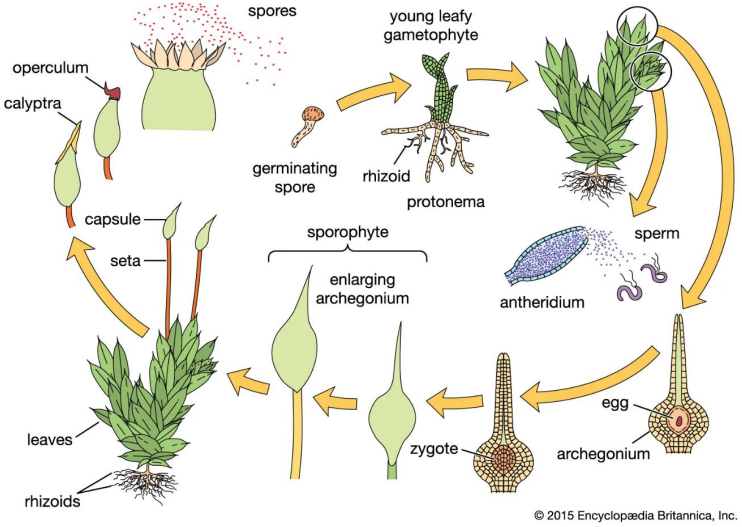
Clark, R. C., & Lyons, C. (2011). *Graphics for learning: Proven guidelines for planning, designing, and evaluating visuals in training materials*. John Wiley & Sons.

Interpretive Communication Function

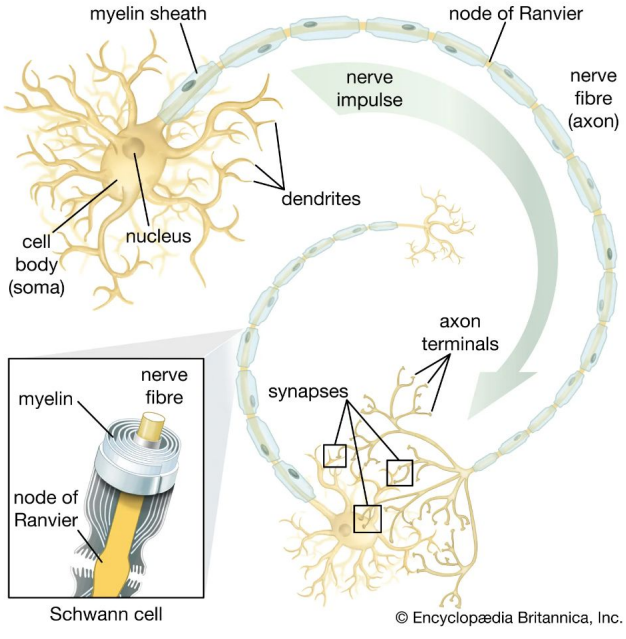
Graphics that describe the water cycle, photosynthesis or the working principle of the bicycle pump etc. can be examples for interpretive graphics. Such graphics enable to make **concrete the abstract processes and events**.



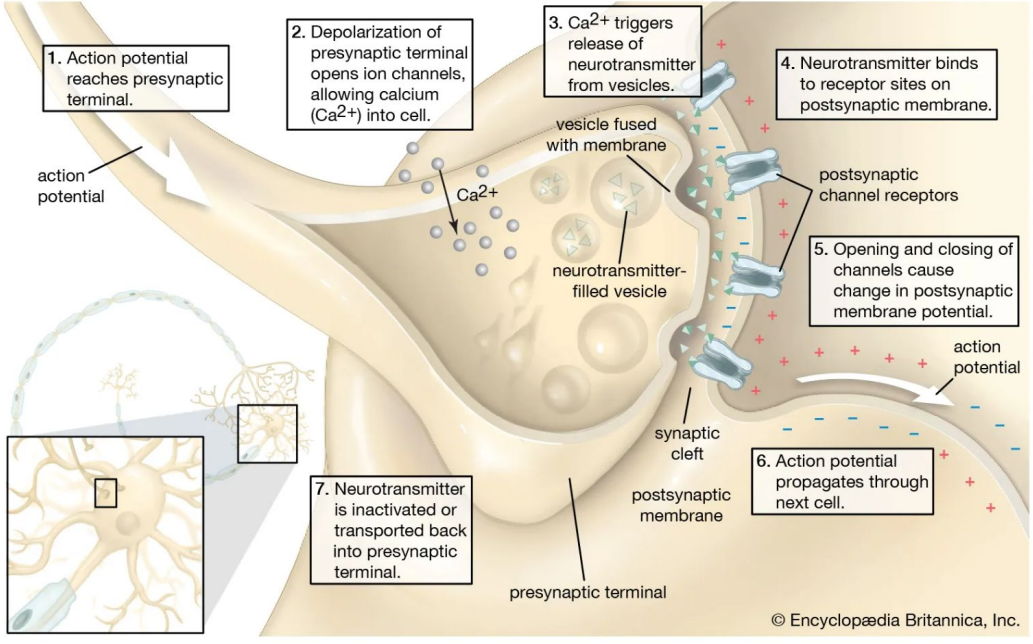




Representative vs. Interpretive Communication Function



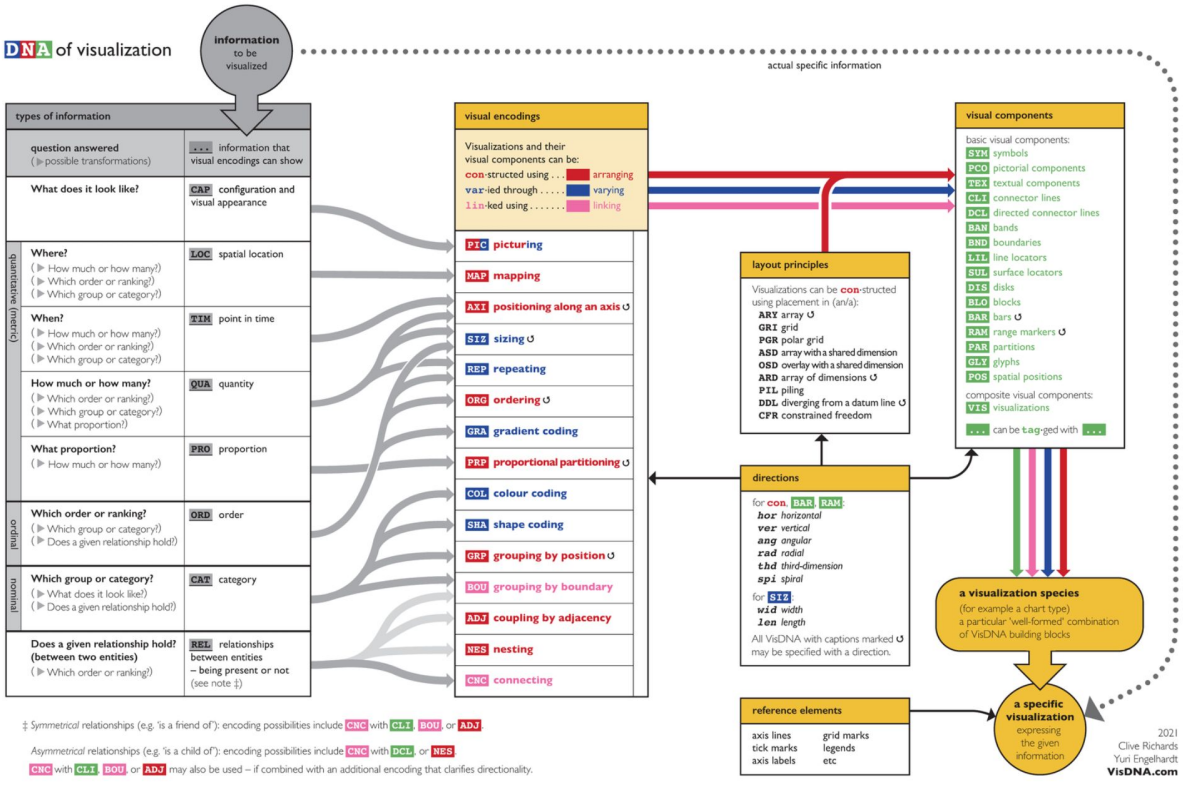
…represents the structure of the nerve cell.



…interprets the synaptic transmission between nerve cells.

instructional graphics, https://www.britannica.com/science/nervous-system/Evolution-and-development-of-the-nervous-system

VisDNA | The DNA of Visualization: A universal grammar for specifying visualization types



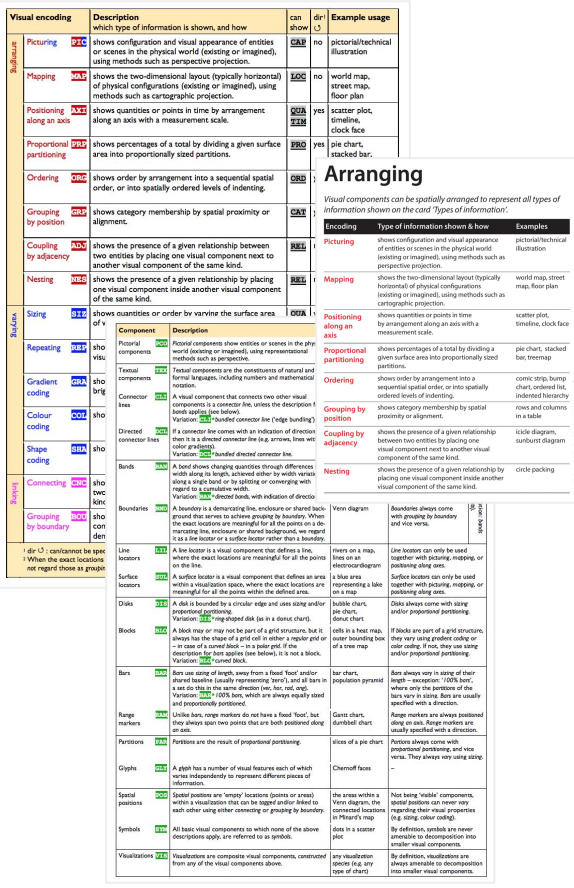
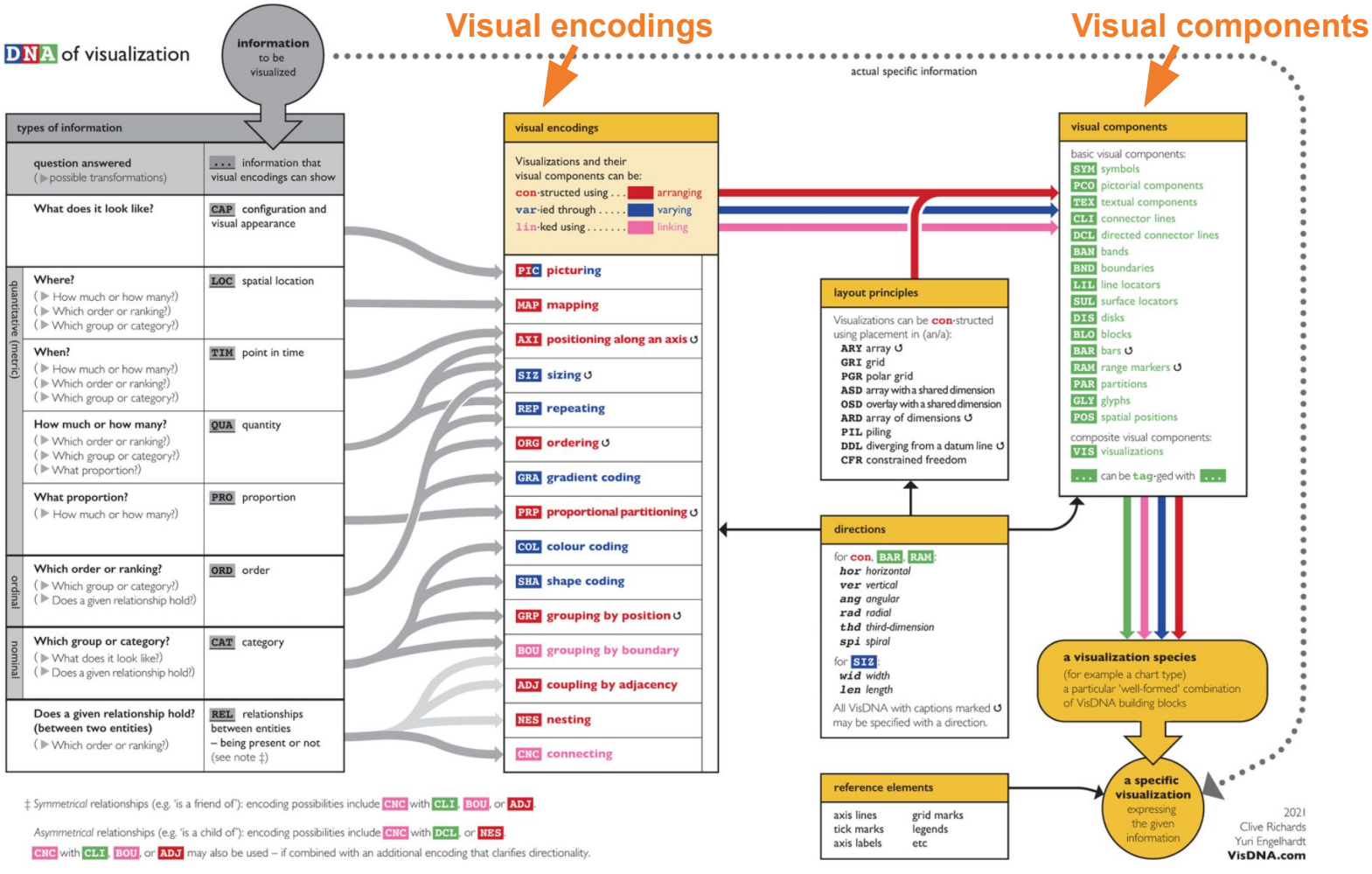


Figure 1. The 'DNA' building blocks and their possible relationships for visualizing information

Richards, C. and Engelhardt, Y. (2021). The DNA of Visualization: A universal grammar for specifying visualization types. https://visdna.com/



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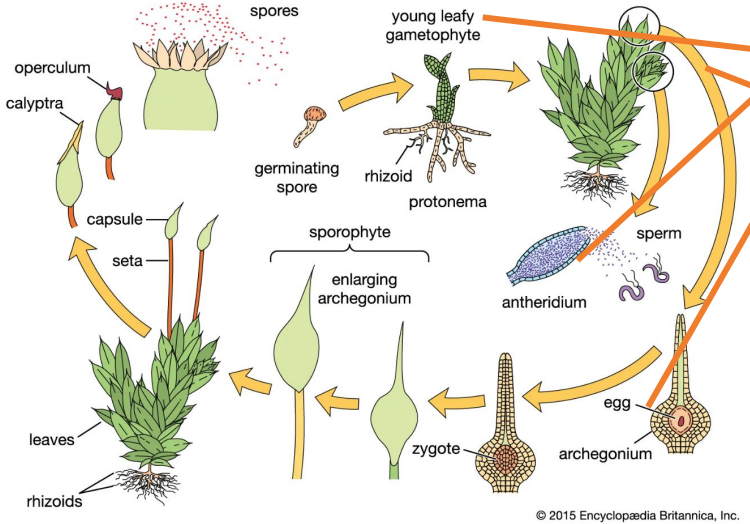
Visual components

Visual components (symbols, pictorial/textual components, connecting lines, borders, blocks, etc.) are the elements that make up graphics.



visual components

basic visual components:

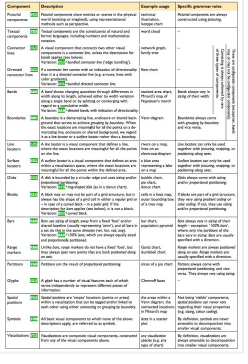
- SYM symbols
- PCO pictorial components
- TEX textual components
- CLI connector lines
- DCL directed connector lines
- BAN bands
- BND boundaries
- LIL line locators
- SUL surface locators
- DIS disks
- BLO blocks
- BAR bars
- RAM range markers
- PAR partitions
- GLY glyphs
- POS spatial positions

composite visual components:

- VIS visualizations

... can be tag·ged with ...

Component	Description
Pictorial components PCO	*Pictorial components* show entities or scenes in the physical world (existing or imagined), using representational methods such as perspective.
Textual components TEX	*Textual components* are the constituents of natural and formal languages, including numbers and mathematical notation.
Connector lines CLI	A visual component that connects two other visual components is a *connector line*, unless the description for *bands* applies (see below). Variation: CLI**bundled connector line* ('edge bundling').
Directed connector lines DCL	If a *connector line* comes with an indication of directionality then it is a *directed connector line* (e.g. arrows, lines with color gradients). Variation: DCI**bundled directed connector line*.



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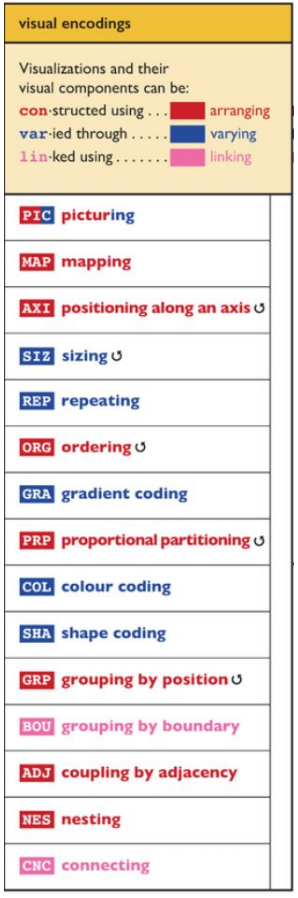
Visual encodings

Visual components are formatted using visual encodings to create the desired pattern and meaning.

Arranging aims to create a meaningful structure by combining components with positional encodings such as ordering, grouping by position, and coupling by adjacency.

Varying aims to reflect the meaning in the content by formatting the components with encodings related to visual qualities such as sizing, color coding, and shape coding.

Linking aims to associate components with visual encodings such as connecting or grouping by boundary using additional visual components (such as connecting lines or borders).



Visual encoding			Description which type of information is shown, and how	can show	dir[1] ↺	Example usage
arranging	Picturing	PIC	shows configuration and visual appearance of entities or scenes in the physical world (existing or imagined), using methods such as perspective projection.	CAP	no	pictorial/technical illustration
	Mapping	MAP	shows the two-dimensional layout (typically horizontal) of physical configurations (existing or imagined), using methods such as cartographic projection.	LOC	no	world map, street map, floor plan
	Positioning along an axis	AXI	shows quantities or points in time by arrangement along an axis with a measurement scale.	QUA TIM	yes	scatter plot, timeline, clock face
	Proportional partitioning	PRP	shows percentages of a total by dividing a given surface area into proportionally sized partitions.	PRO	yes	pie chart, stacked bar, treemap
	Ordering	ORG	shows order by arrangement into a sequential spatial order, or into spatially ordered levels of indenting.	ORD	yes	comic strip, bump chart, ordered list, indented hierarchy
	Grouping by position	GRP	shows category membership by spatial proximity or alignment.	CAT	yes	rows and columns in a table
	Coupling by adjacency	ADJ	shows the presence of a given relationship between two entities by placing one visual component next to another visual component of the same kind.	REL	no	icicle diagram, sunburst diagram
	Nesting	NES	shows the presence of a given relationship by placing one visual component inside another visual component of the same kind.	REL	no	circle packing
varying	Sizing	SIZ	shows quantities or order by varying the surface area of visual components.	QUA ORD	yes	bar chart, word cloud, size-ranked symbols on a map
	Repeating	REP	shows quantities or order by the use of multiples of visual components.	QUA ORD	no	Isotype chart, dot plot, dot matrix chart
	Gradient coding	GRA	shows order by the use of gradated differences in brightness or saturation, transparency, fuzziness, etc.	ORD	no	heatmap table, brightness gradient on a map
	Colour coding	COL	shows category membership by the use of colour.	CAT	no	coloured lines on a subway map
	Shape coding	SHA	shows category membership by the use of shape.	CAT	no	the outline shapes of signs in a traffic sign system
linking	Connecting	CNC	shows the presence of a given relationship between two entities by linking two visual components of the same kind with a 'configurator component', e.g. a line or arrow.	REL	no	flow chart, family tree, network graph
	Grouping by boundary	BOU	shows category membership by corraling visual components with a 'configurator component' such as a demarcating line, enclosure or shared background.[2]	CAT	no	Venn diagram

[1] dir ↺ : can/cannot be specified with a direction
[2] When the exact locations are meaningful for all the points on a demarcating line, enclosure or shared background, we do *not* regard those as *grouping by boundary* but as *line locators* or *surface locators* (e.g. country borders or areas on a map).

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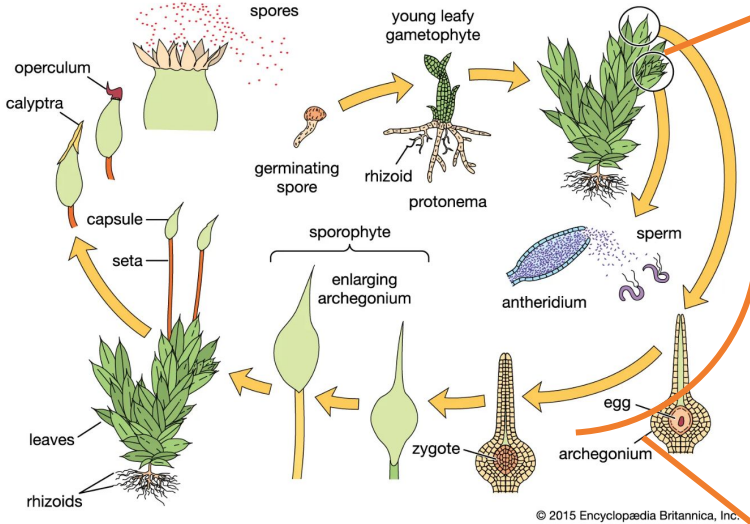

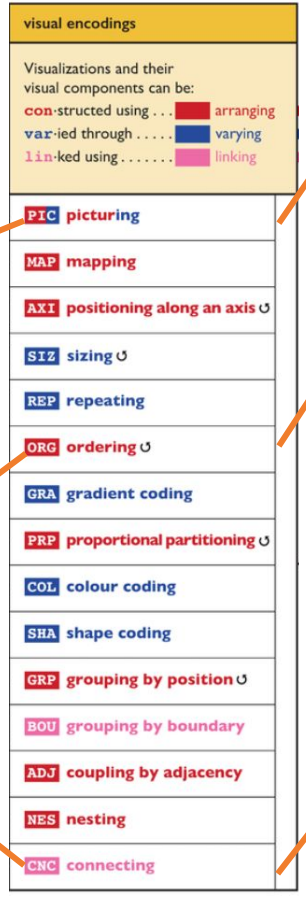

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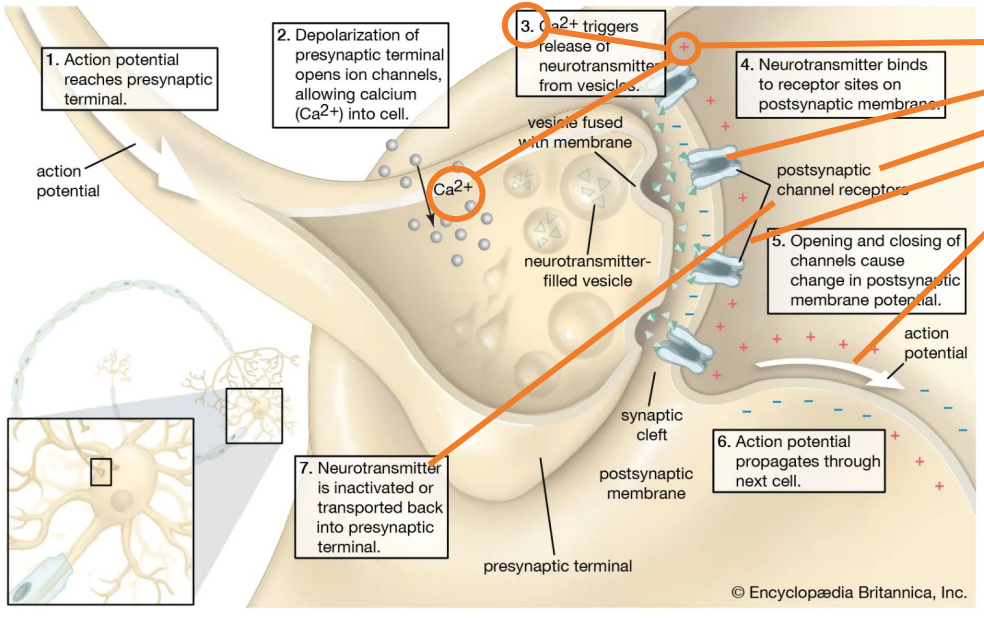

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... can be tag·ged with ...

visual encodings

Visualizations and their visual components can be:

con·structed using . . . arranging
var·ied through . . . . . varying
lin·ked using . . . . . linking

- PIC picturing
- MAP mapping
- AXI positioning along an axis ↺
- SIZ sizing ↺
- REP repeating
- ORG ordering ↺
- GRA gradient coding
- PRP proportional partitioning ↺
- COL colour coding
- SHA shape coding
- GRP grouping by position ↺
- BOU grouping by boundary
- ADJ coupling by adjacency
- NES nesting
- CNC connecting

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