ON COMBINING VISUAL AND WRITTEN ELEMENTS IN SCIENCE COMMUNICATION

Gil Costa | Filipa Vala





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2021

Basic principles of design and illustration

Gil Costa @GilCostaDesign

	Covers		Outreach and media	Co	omics		Identity
	Scientific stories with visual Impact		Engaging with the public	Fui of	Fun digestions of science		Supporting institutions and consortia
Diagrams		Articles			Data visualization		
V n	Vhen realism is lecessary		Clarity and for scientis	Salience ts		In the realms of data	

14 Brain - wider than the sky Science illustration in a museum A chance to witness how people relate with scientific illustration 1



flow



Think of aligning on top of an imaginary grid. Use this grid to direct the information flow





Orienting arrows in similar directions creates natural visual flow.

Adapted from Bang Wong, NMethods, 2010

"Je n'ai fait celle-ci plus longue que parce que je n'ai pas eu le loisir de la faire plus courte" wrote the french mathematician and philosopher Blaise Pascal in 1657⁶.





Translate the principles of effective writing to the process of figure design

Martin Krzywinski, NMethods, 2013

- "Omit needless words"
- "Express coordinate ideas in similar form"
- "Use definite, specific, concrete language"
- "Rich, ornate prose is hard to digest, generally unwholesome, and sometimes nauseating"
- "place yourself in the background"



"Omit needless words"



"Express coordinate ideas in similar form"

be intuitive



"Use definite, specific, concrete language"



"Whereas text is a natural place for nuance and alternative interpretations, multiple lines of argument in a figure can easily interfere with our perception of all its parts" $^{\rm 10}$

Color	Size	Orientation	Shape	Added mark Motion	Grouping
			••••		

salience

Bang Wong 2010 Nature Methods

IMPORTANT IMPORTANT

white space



"According to the Gestalt principle of simplicity, the brain groups elements in order to minimize the number of objects in a scene. Pursuing simplicity became an aesthetic imperative for modern designers" / *Ellen Lupton Design is Storytelling*

found on the web, author unknown



Aligning is grouping by common position. That is why it's so powerful

alignment

Bang Wong 2010 Nature Methods

visual completion



Too much color emphasizes nothing

> Color can cause the wrong information to stand out and make meaningful information difficult to see



https://classicalatelierathome.com/munsell-101-for-the-artist

work with a small selection of systematically chosen colours (palette) and stick to them throughout the project



colorbrewer.org

Color

Brewer color palettes



A color space that is perceptually uniform defines colors based on how we perceive them. Distances between colors in the space are proportional to their perceived difference. Brewer palettes were selected for their perceptual properties by Cynthia Brewer for cartography.

Color

figure from M Krzywinski



Basic principles of science writing and narrative

Filipa Vala Centre for Ecology, Evolution and Environmental Changes



Science communication

is "a variety of practices that transmit scientific ideas, methods, knowledge and research to non-expert audiences"

Intro to a SciComm Course at New Castle Univ.

Science writer

Scientific writing is technical writing by a scientist, with an audience of peers -- other scientists. *Science writing* is writing about science for the popular media.

I'm a storyteller.

Science communication

is "a variety of practices that transmit scientific ideas, methods, knowledge and research to non-expert audiences"

Intro to a SciComm Course at New Castle Univ.

News article

A documentary

An exhibition

Narrative

noun

a spoken or written account of connected events; a story. "a gripping narrative"

Oxford online

Scientific paper

A play

An infographic

Storytelling: my single golden rule

Language

Nominalization vs action (verb):

We performed an analysis of the data vs We analysed the data

Scientific paper vs the rest: audience

Language

Technical vs not:

The evolution of tetrapods vs The history of 4-limbed animals

Detail

The park extends over 69,594.48 hectares, from the Mourala to the Castro Laboreiro highlands...

vs The park extends almost seventy thousand hectares ...

About 70% of terrestrial animal species found in Portugal occur within the Park's 74,224.89 hectares...

vs About 70% of terrestrial animal species found in Portugal occur within the Park's more than seventy-four thousand hectares...

Scientific paper vs the rest: audience

Language

Technical vs not:

"The evolution of tetrapods" vs "The history of 4-limbed animals"

Detail

unless *detail* is the point:

LHCb measures tiny mass difference between particles

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News article



The Basic Film Paradigm

Narrative structure

Documentary /Film /Play



An exhibition





An exhibition

Visitors become narrators

. Texts/panels are not read in a given order => one can't rely on what was said "previously" to build an argument

. even if all panels were read/visited, one can't assume info will be remembered



Infographics

Are self-sufficient visual (short) stories



Developing an infographic for an exhibition



EXHIBITION

https://gulbenkian.pt/en/agenda/brain-wider-than-the-sky/#:~:text=Brain%20%2D%20wider%20than%20the%20sky,the%20arts%20and%20the%20humanities.

Exhibition

Brain – wider than the sky The evolution of brains (part 1/3) The evolution of CNS The evolution of nerve nets in invertebrates



Exhibition

Brain – wider than the sky The evolution of brains (part 1) The evolution of CNS The evolution of nerve nets in invertebrates

Book



Brain Architecture, Understanding the Basic Plan

Chapters 3 and 4: Neurons, Nerve Nets, and Behavior; Centralization and Symmetry: Ganglia and Nerves Hydra, flatworms, octopus... Animals Behavior, movement, ecology Evolution of architecture, not building blocks



Exhibition

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Animals

Evolution of **architecture**, not building blocks



Animals

Evolution of architecture, not building blocks



Behavior, movement, ecology

Sea animous any predictors. To hund, they raily on that reares notics a pay touches is stratch, nerrors communicated that holmation to muscles which contract, cardracting mession make terricates more, cardination to the strategy of the Sea animous, planatans, entropering, caryfin hand edopuesa all have nerver on the horizonts, and the strategy and have nerver on the horizonts, and the strategy and the strategy of the strategy and the strategy of the nerver of the horizon the strategy of the strategy of the nerver of the horizon the strategy of the strategy of the nerver of the horizon the strategy of the strategy of the nerver of the horizon the strategy of the strategy of the nerver of the strategy strategy of the strategy of the strategy control the strategy of the strategy of the strategy where the strategy of the strategy appropriate response to its mainteners.



Animals Behavior, movement, ecology

Evolution of architecture, not building blocks



"Before bodies had brains, bodies had neurons.

Sea anemones are predators. To hunt, they rely on their nerve nets: a prey touches a tentacle, neurons communicate that information to muscles which contract, contracting muscles make tentacles move, catching the prey.

Sea anemones, planarians, earthworms, crayfish and octopuses all have neurons: but the architecture differs.

Simpler, scattered forms in sea anemones; neurons packed into two nerve cords in planarians; a single nerve cord in earthworms. And then neurons grouped near sensory organs – mouth, eyes, antennae – in crayfish and octopus. At these centres sensory – touch, vision, smell – information is processed, to transmit an order: "Prey on the left" leads to a left body turn; while "Predator on the left" leads to a right body turn.

Variability of neural organization across animal groups suggests continuity: architecture varies from simpler forms, like nerve nets, to more complex, such as brains.

Each architecture serves an animal's life style, producing appropriate responses to its environment."

"Before bodies had brains, bodies had neurons.

Sea anemones are predators. To hunt, they rely on their nerve ts: a prey touches a tentacle, neurons communicate that information `les which contract, contracting muscles make tentacles mr 227-230 words... ١e prey.

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PS. I read that infographics have on average 22. PS. I read that infographics have on average 22. This one had 166. Simpler, scattered forms in sea ane cords in planarians; a single ne^r grouped near sensory organ octopus. At these centr processed, to trans while "Predato"

Variabili[†] archi SUCI.

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Each ar are serves an animal's life style, producing appropriate responses to its environment."

all have

The evolution of nerve nets in invertebrates



This infographic condensed information by allowing an "intuitive" reading of a very complex process to a lay audience:

1st, we identified the main message ("it's the architecture that evolves")

2nd, we identified the elements to be used – symbols that people relate to or recognize: animals, "net structures" (for architecture), an arrow for increasing complexity; and only two colours – bodies & neural nets

3rd, we complemented the story with text – text adds detail to a message that should be there already (run a clarity test: if text is removed, the infogrphc should lose detail but not meaning)

Graphic and text elements for an infographic **Exercise for the afternoon discussion**

Sketch your own story

Work in groups of 4

Choose between 2 possible infographic projects

Adaptive radiation of cichlid fish in lake Tanganyika

The evolution of SARS-CoV-2 variants

Infographics should focus on the **process** (not its end result)

Sketch your own story

1st Identify your story's main message – we would like the exercise to focus on a process: the evolutionary process, or the way data was collected, or how you draw/read a phylogenetic tree...

2nd Identify the elements in the story – main and secondary components (if any); visual/graphic and text items for each

3rdAdd detail with text – write drafts of the text for each element

(sometimes, it also works backwards: start with text – usually too long and dense – then polish, simplify, and cut text by illustrating it)

4th Arrange graphic and text elements in a schematic (may be hand) drawing