BEYOND WORDS

Graphic Design as a Gateway to Scientific Understanding

Dr. Kristin Jonasson

Why listen to me?

No formal training in graphic design (most of us don’t)

Visual thinker

Dyslexic

ADHD

Artist

Value of Visuals

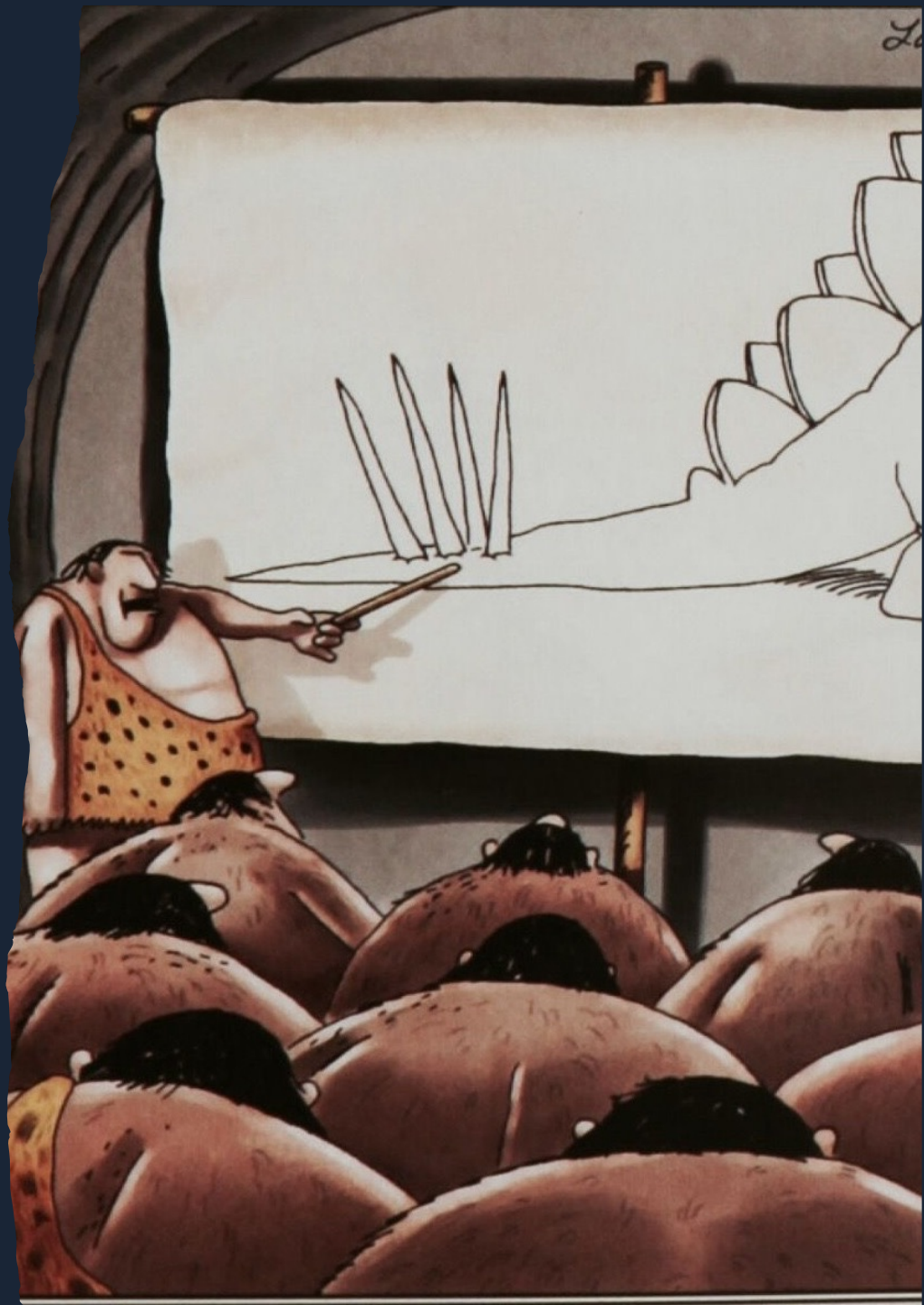
Tools to Improve

Growing Value of Visuals in Science

- Graphical abstracts
- Diagrams in grant proposals
- Social media to promote research

Papers with graphical abstracts & infographics get more likes, shares, and reads on social media [1-4]

Visuals enhance understanding for experts and non-experts[5-7]



Truthiness

Information is perceived as more credible when backed up with visuals related to the claim but does not reveal whether the claim was true[8,9]

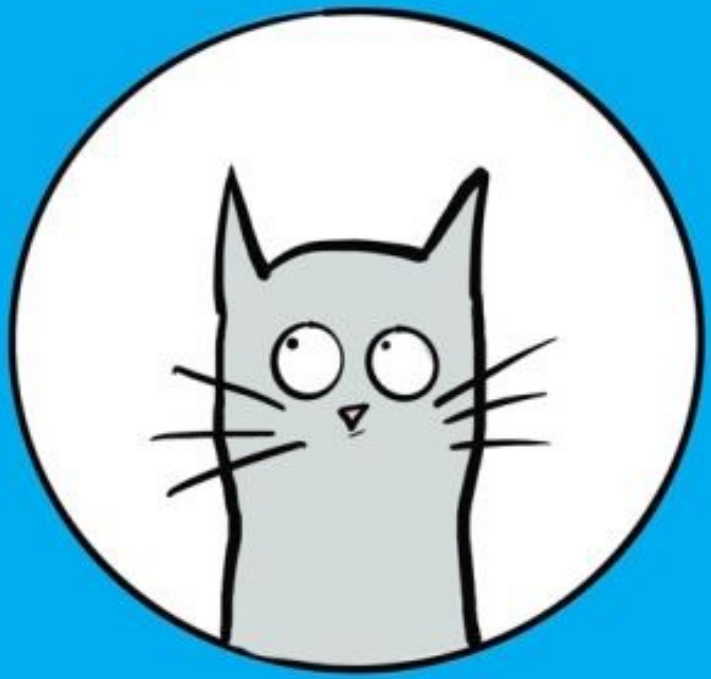
Claim: “Giraffes are the only mammal that cannot jump”

Picture Superiority Effect 10-12

CAT

10%

Remembered 3 days afterwards



65%

Remembered 3 days afterwards

Distinctiveness makes pictures more memorable than text [13]

Bats collide with windows

hotograph of a *Myotis sodalis* crashing into a glas
on is not that of a bat attempting to alight. Pho

Good Visuals = Good 1st Impressions[14]

Understanding

I have a sense of what this paper will be about

The title and the figure make sense together

Paper

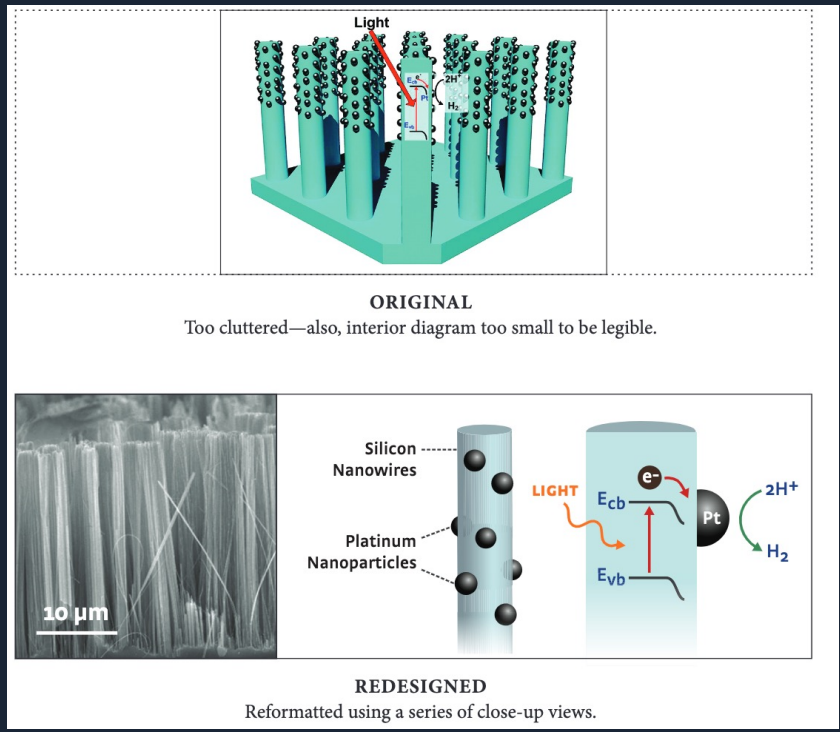
The paper will be written clearly

The paper seems interesting

Authors

The authors seem intelligent

The science in the paper seems rigorous



Visuals Improve

Attention

Understanding

Truthiness

Recall

1st Impressions

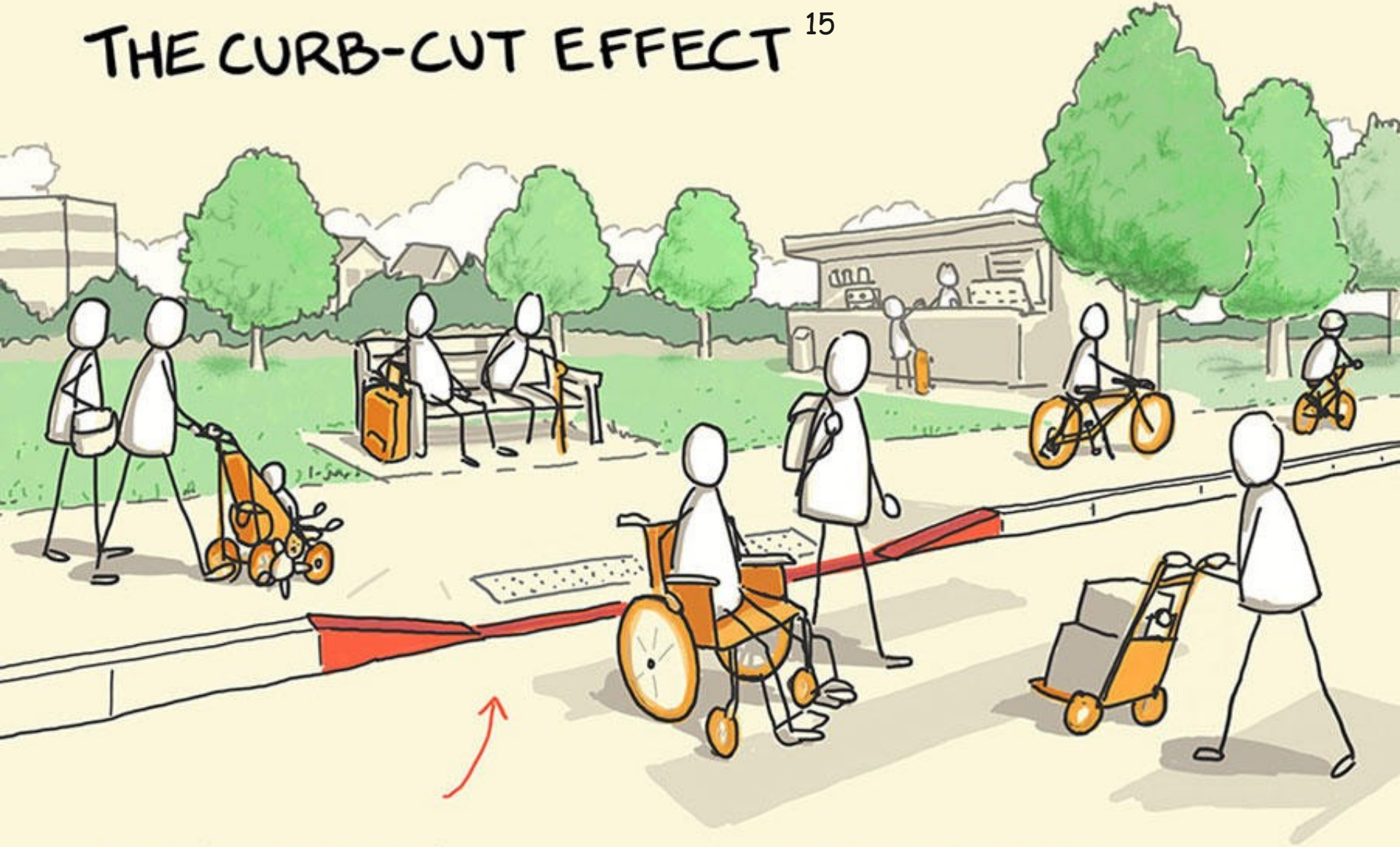
Impact

Tools to Improve

Accessibility

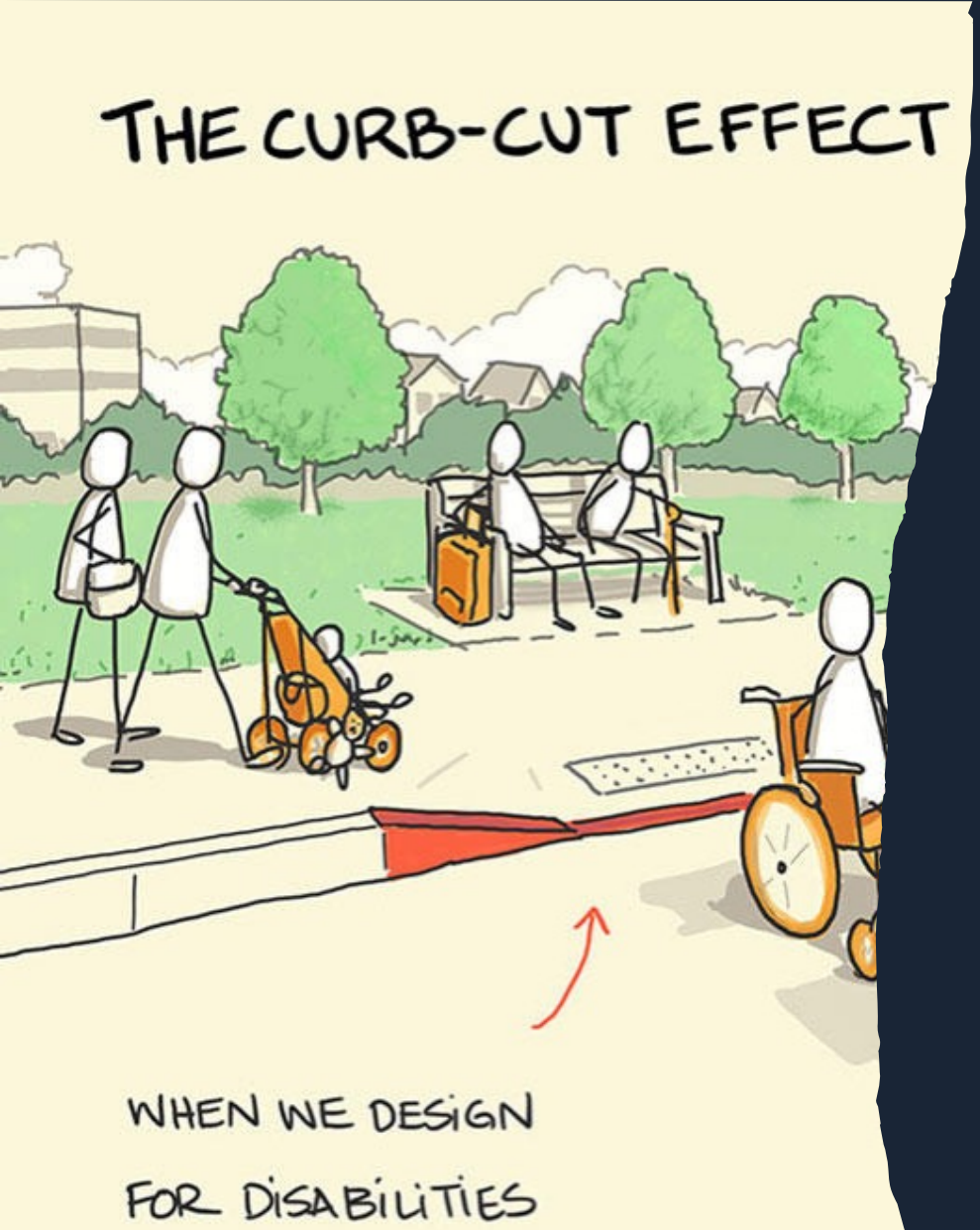
Should not be an Afterthought

THE CURB-CUT EFFECT



WHEN WE DESIGN FOR DISABILITIES

... WE MAKE THINGS BETTER FOR EVERYONE



IN SCIENCE GRAPHICS

Inclusive and equitable communication is the right thing to do.

Improves retention and understanding

Engages distracted or fatigued audience

Assists speakers with different first language

More approachable and relatable to non-scientists

Disability is in your Audience

	Touch	See	Hear	Speak	Cognitive
Permanent	One arm	Blind	Deaf	Non-verbal	ADHD/ concentration difficulties

Disability is in your Audience

Vision

- Require Glasses (2/3)
- Colorblind (1/12 men, 1/200 women)

Cognition

- ADHD (6%)
- Dyslexia (10%)
- Depression, Brain Fog (Long Covid)
- Concussion
- Fatigue, Distraction

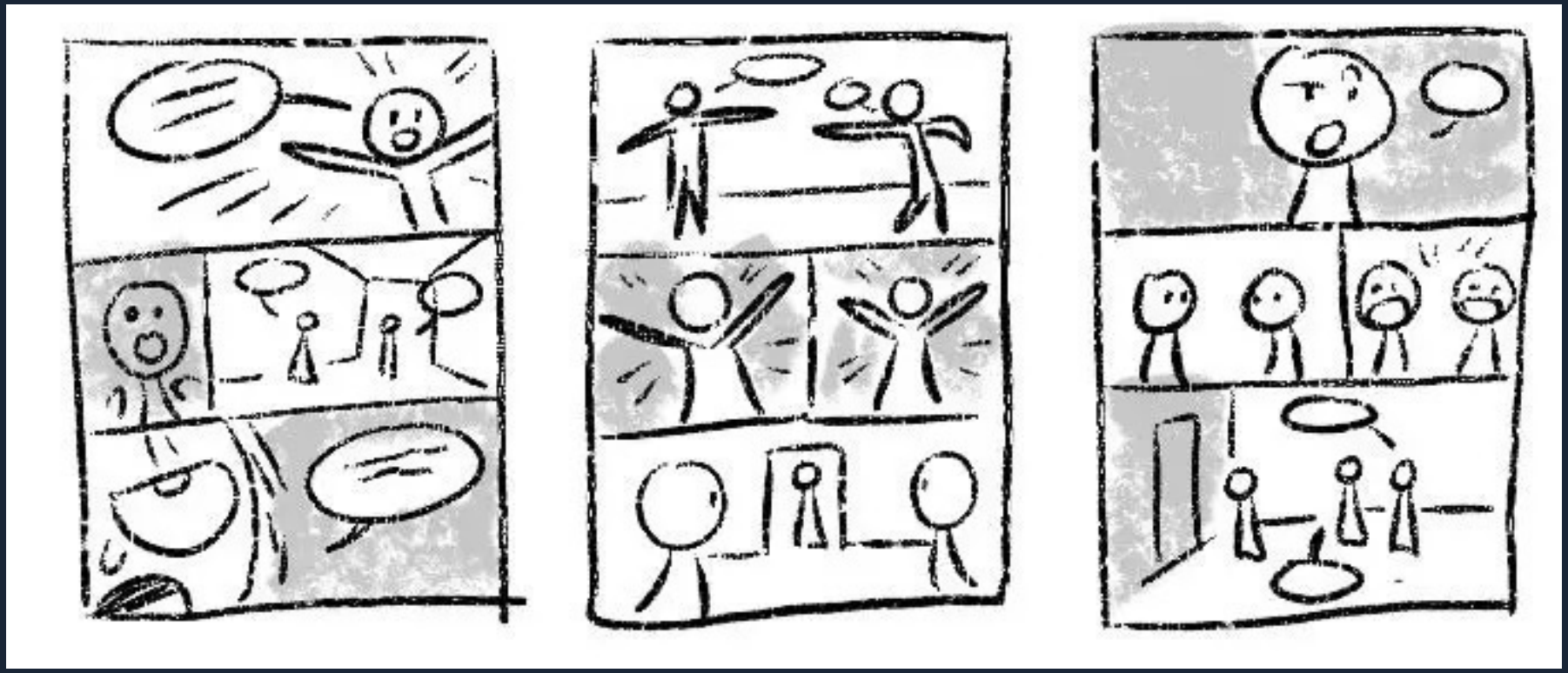
BIGGER than you think

Should feel uncomfortably large

- Aid visual disability
- 1st seen at a reduced scale
  (e.g. Thumbnail, from afar)

Thumbnailing

- A planning technique from animation
- Limits detail, forces focus on key elements



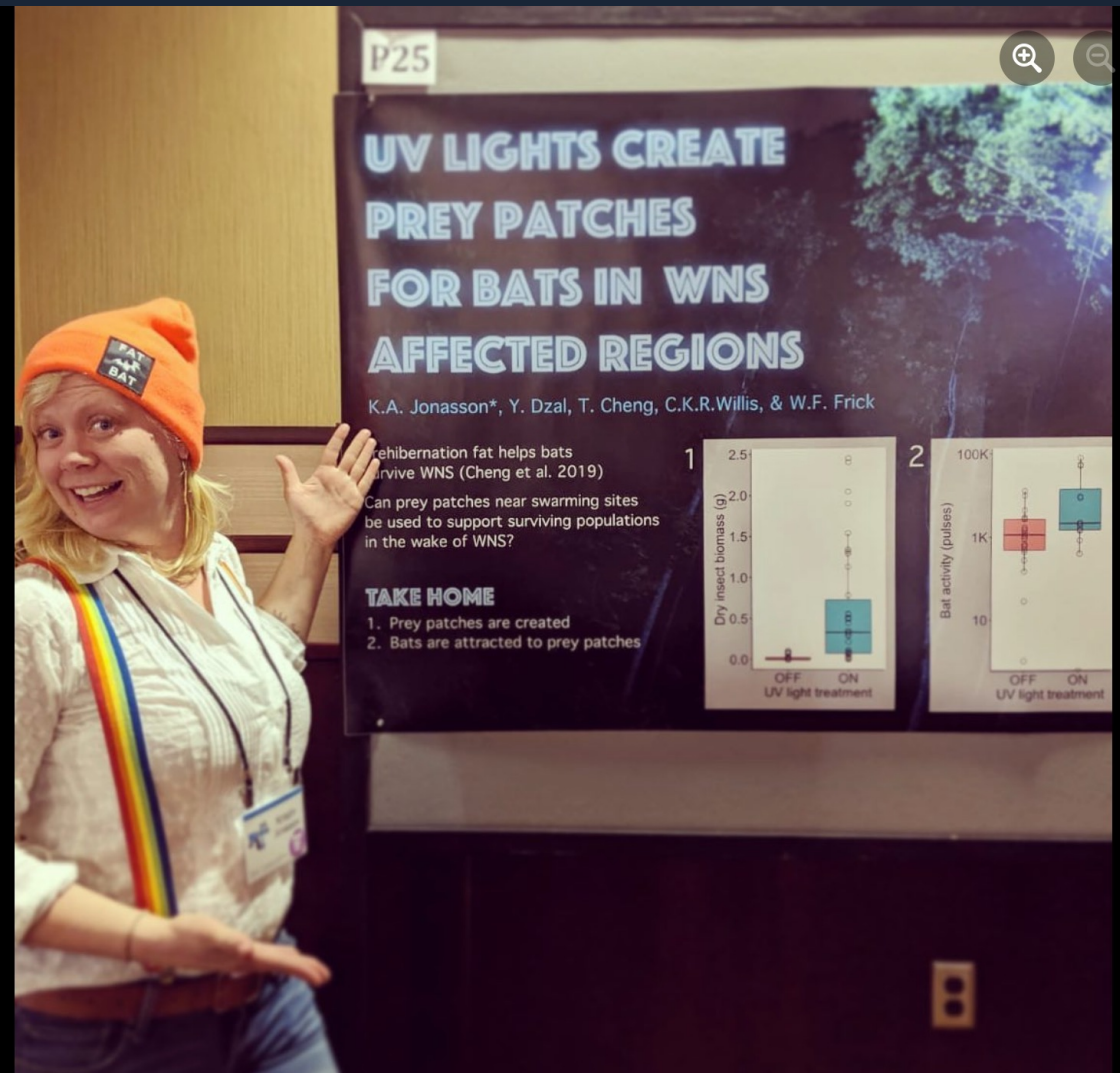
Design Visuals as Thumbnails First

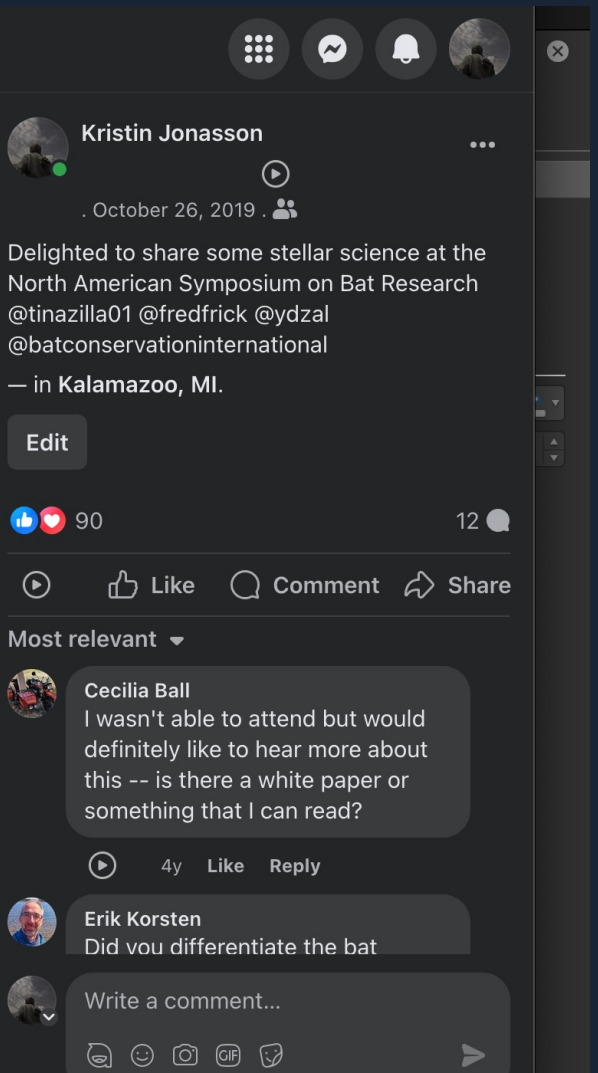
Figures 2″ x 2″ post-it note

Power points & poster slides on screen

3″ x 4″

Plan for your posters and choice slides to be readable as a social media thumbnail





Accessible Font & Color

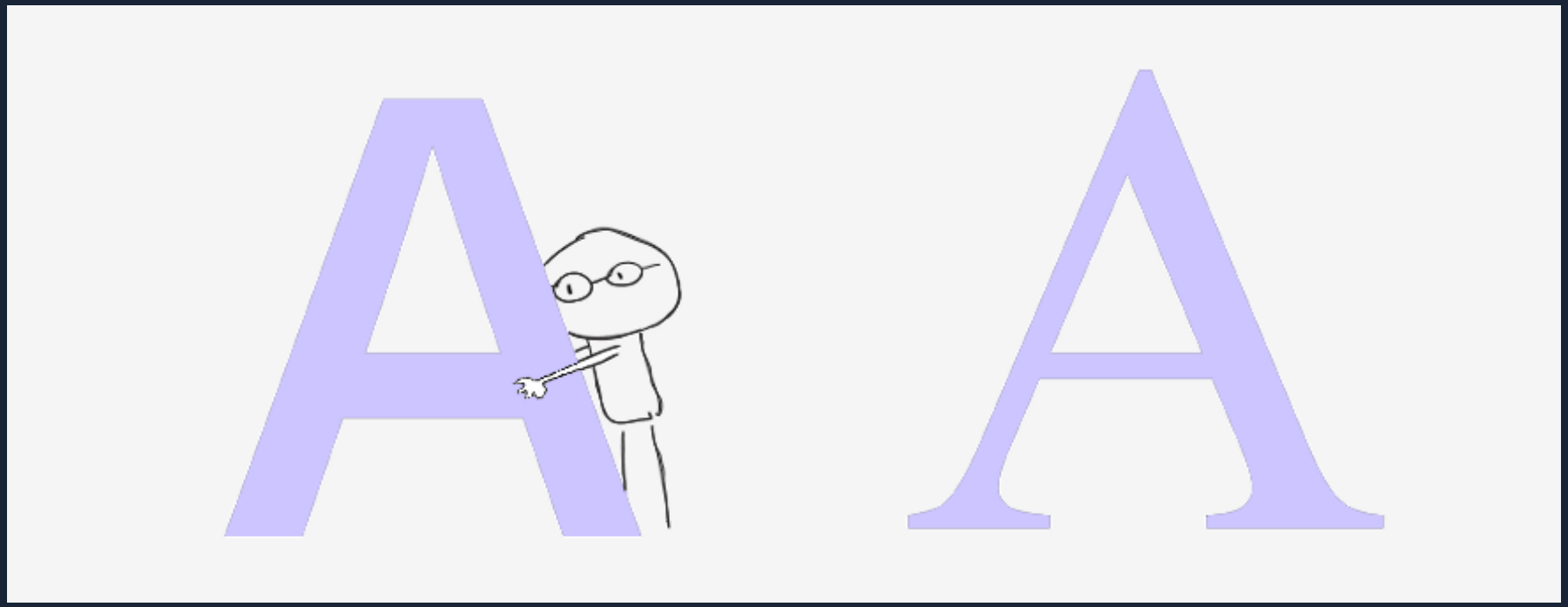
You may remember slides like this

But they made sense when projectors made them look like this

Arial is a **sans serif** font

Times New Roman is a **serif** font

Sans serif fonts help readers with low-vision and dyslexia[16]

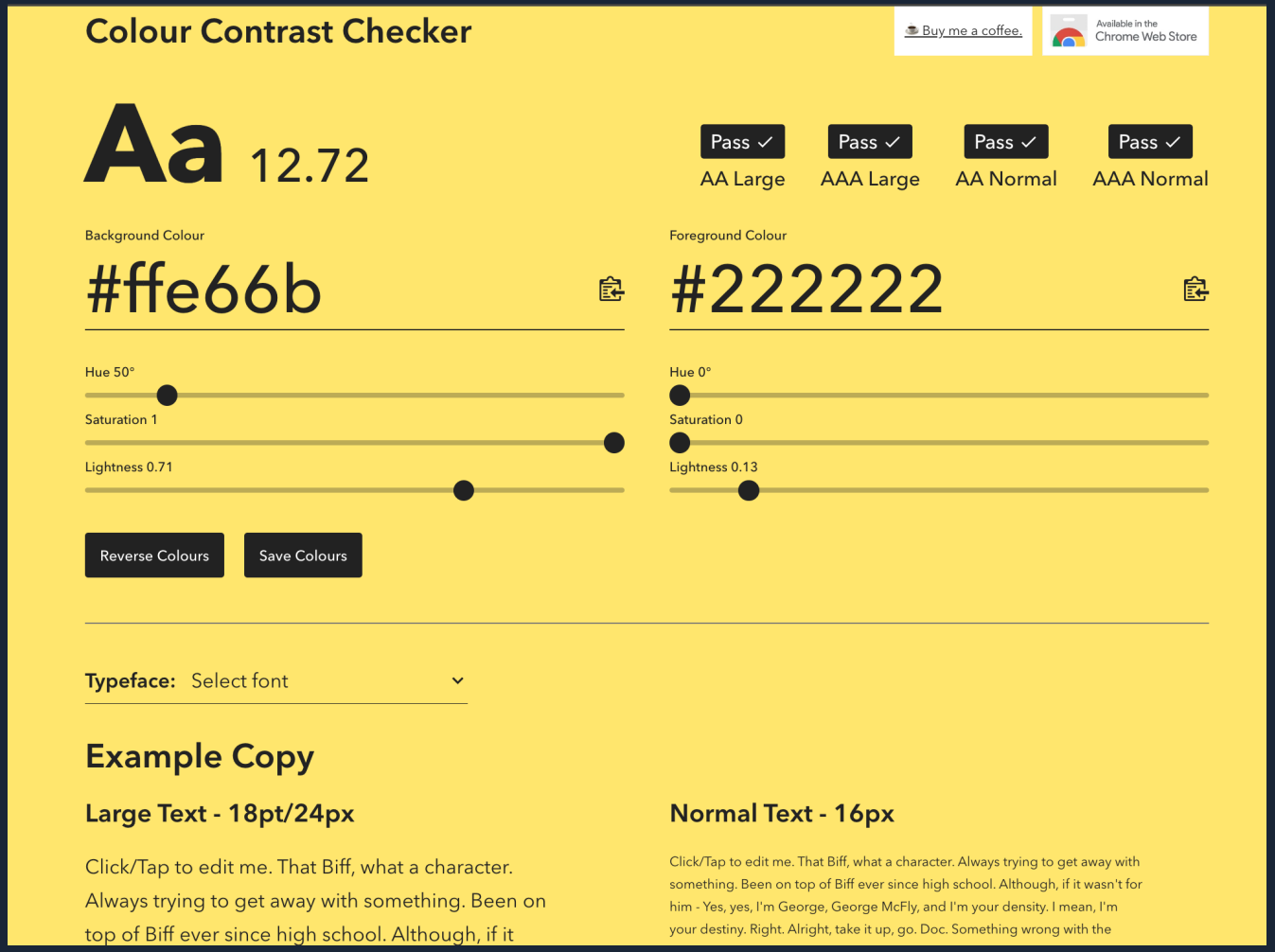


Best fonts for dyslexic and non-dyslexic readers[17]:

Arial
Helvetica
Verdana

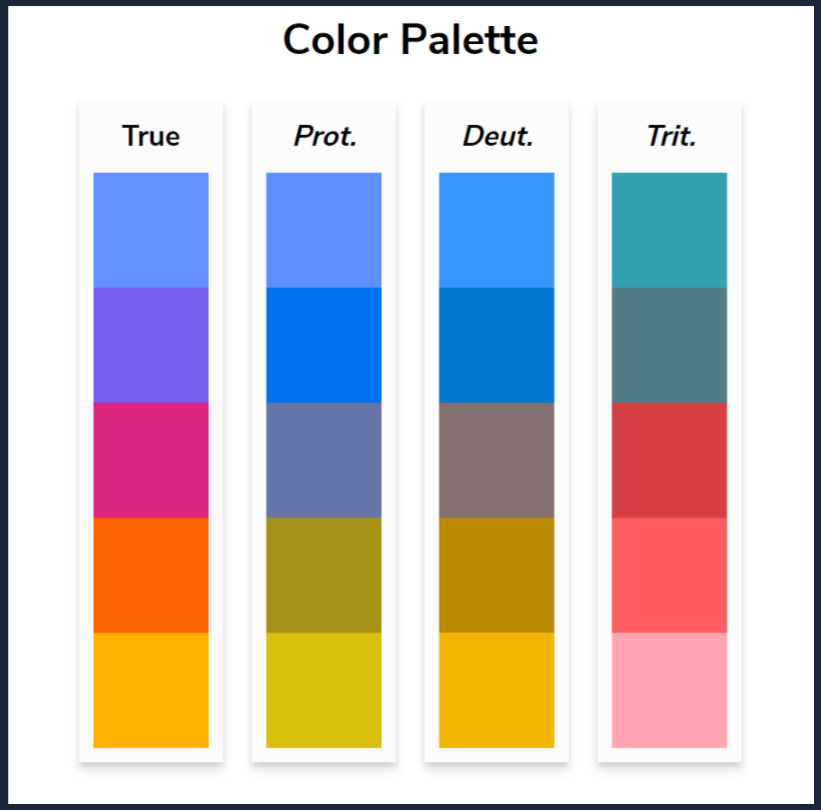
Color Contrast

Color Contrast Checker



Color-blind Accessibility

1. Do not rely on ONLY color
2. Use color blind-safe palettes
3. Use a color blindness simulator



Colblindor

Cognitive Load theory

When you overload working memory learning suffers[18]

Working Memory:

- Holds 5-9 bits of info
- Processes 2-4 elements at most
- Deals with info for a few seconds
- All info lost after ~20s

- No known limitations when handling info stored in long-term memory

Your Audience

Non-experts

YOU

Experts

Integrate text into images [18,19]

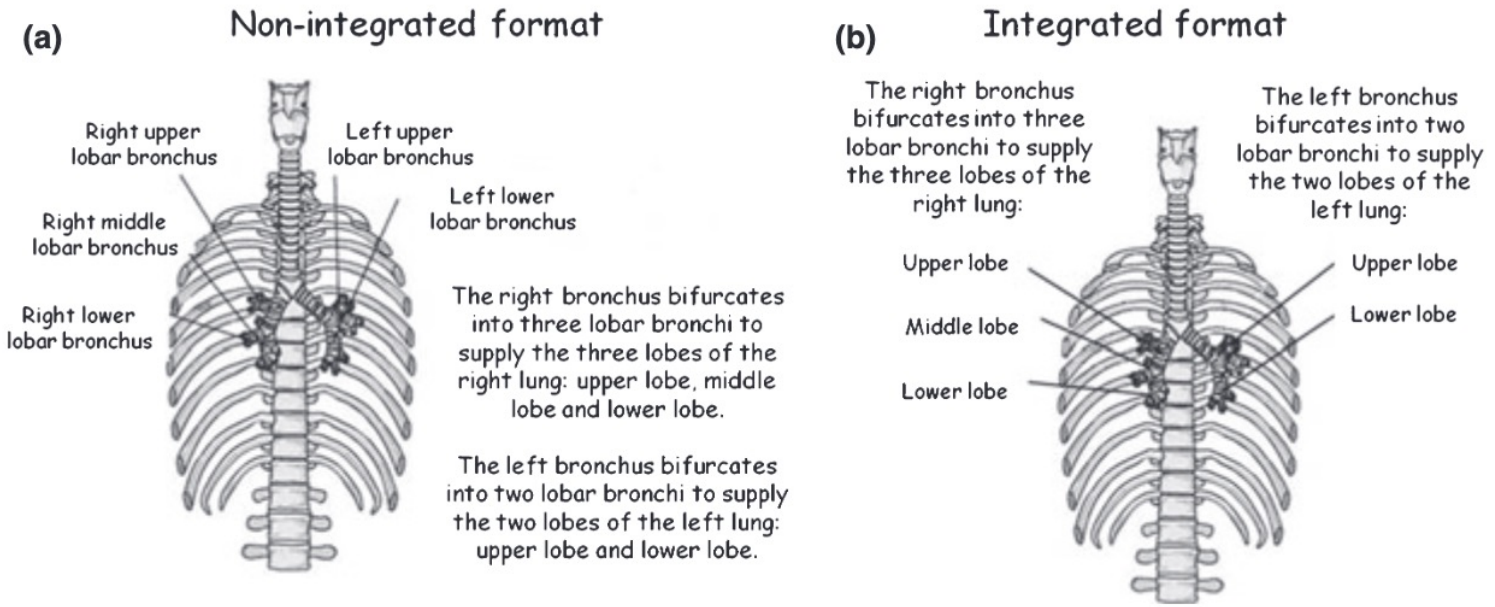
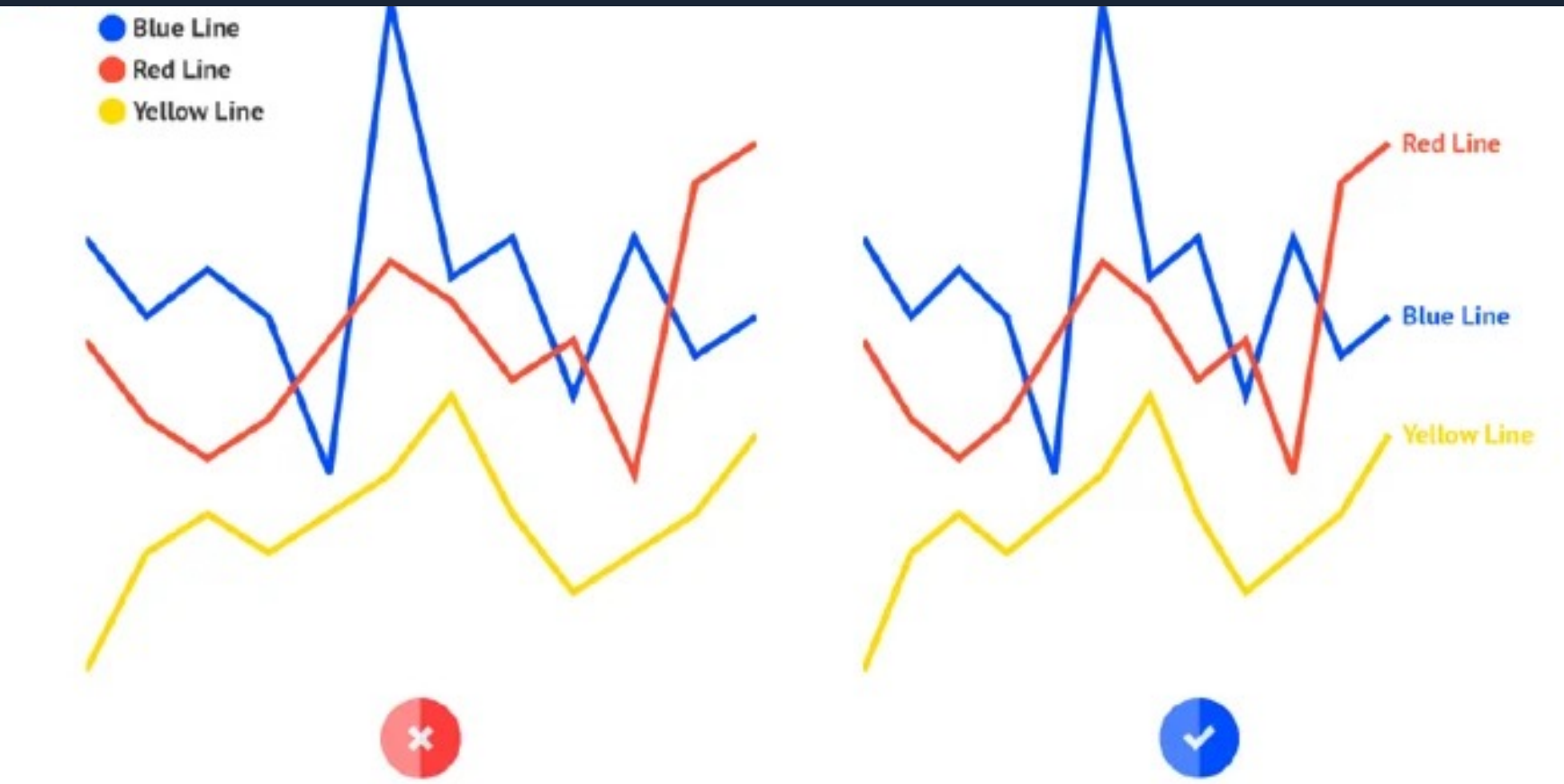


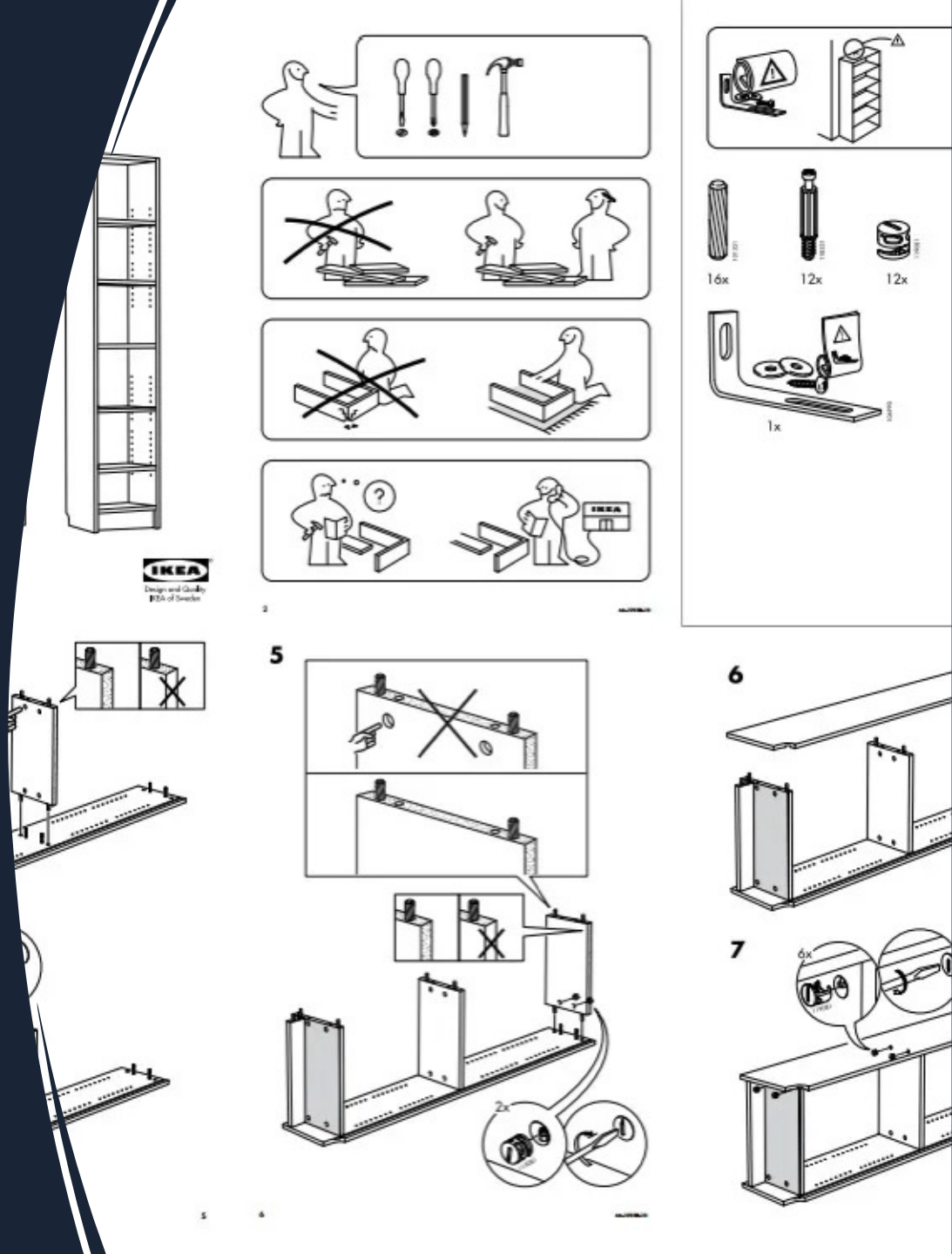
Figure 2 Text and picture in (a) a non-integrated format and (b) an integrated format

Direct labels >> figure legend [18,19]



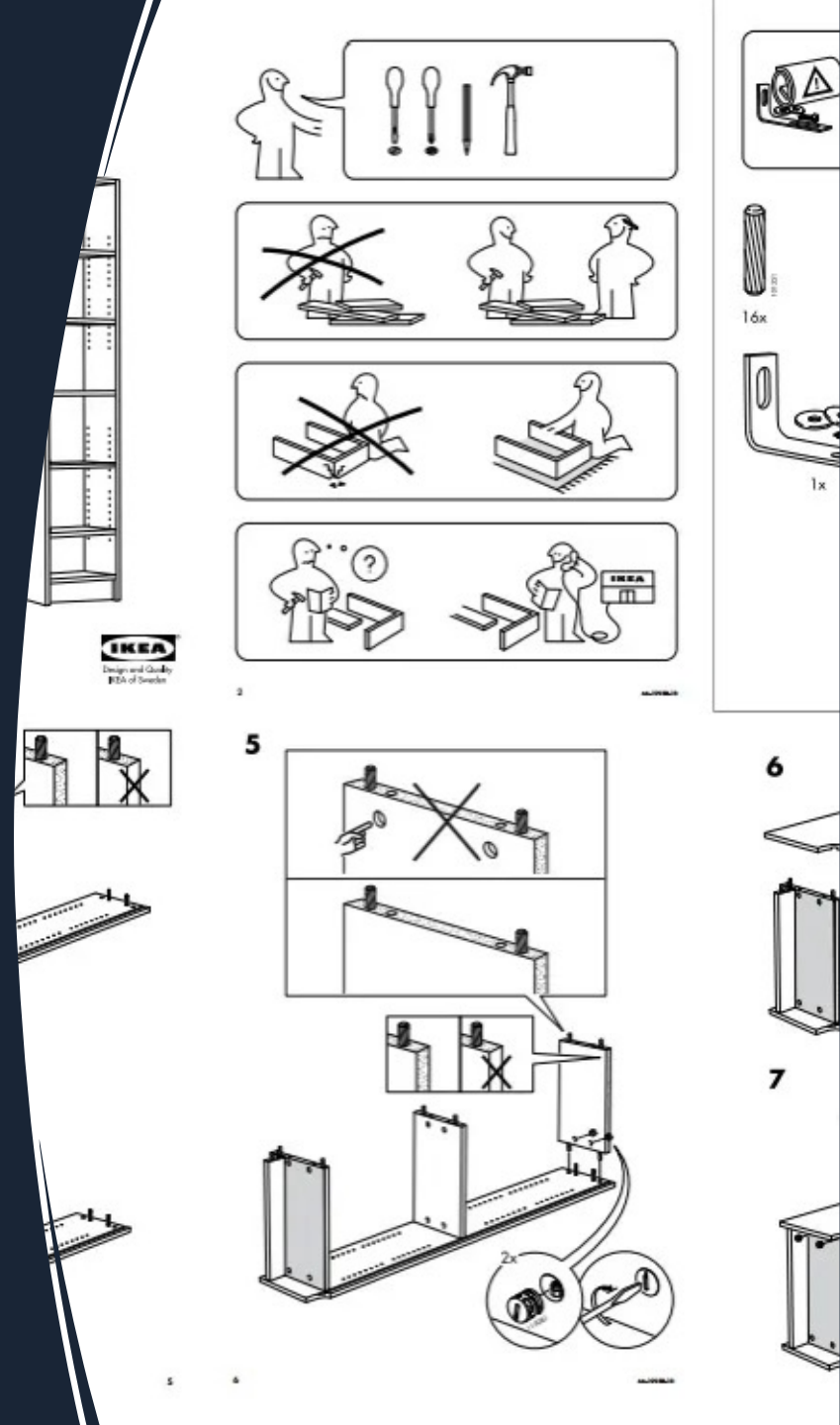
Use Fewer Words

Better recall and understanding when visuals have shorter descriptions[20]



Challenge yourself to:

1. Make no text figures
2. Add text last
3. Edit to reduce text
4. Make slide text appear on “click”

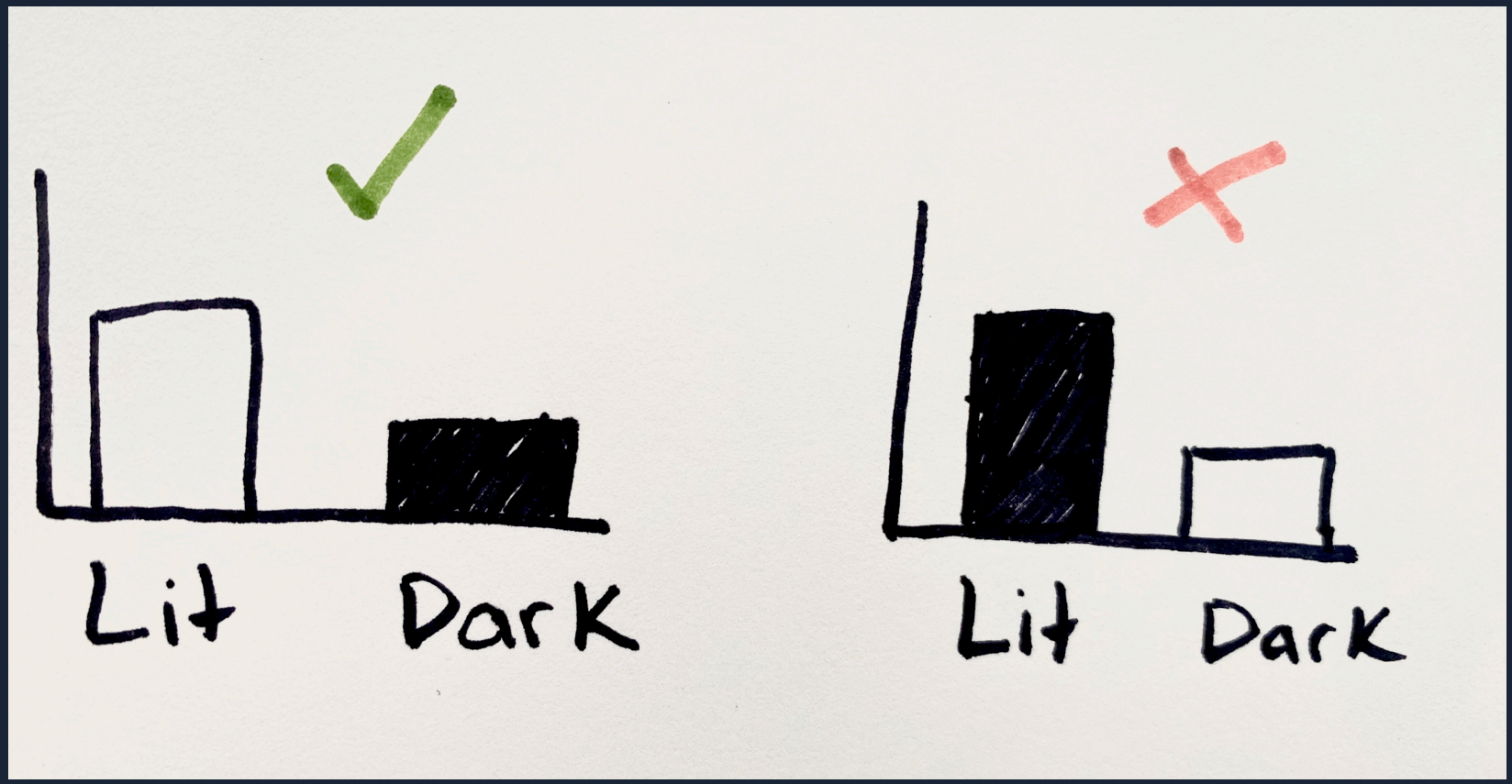


It takes readers longer to understand words if the attribute is miss-matched[21]

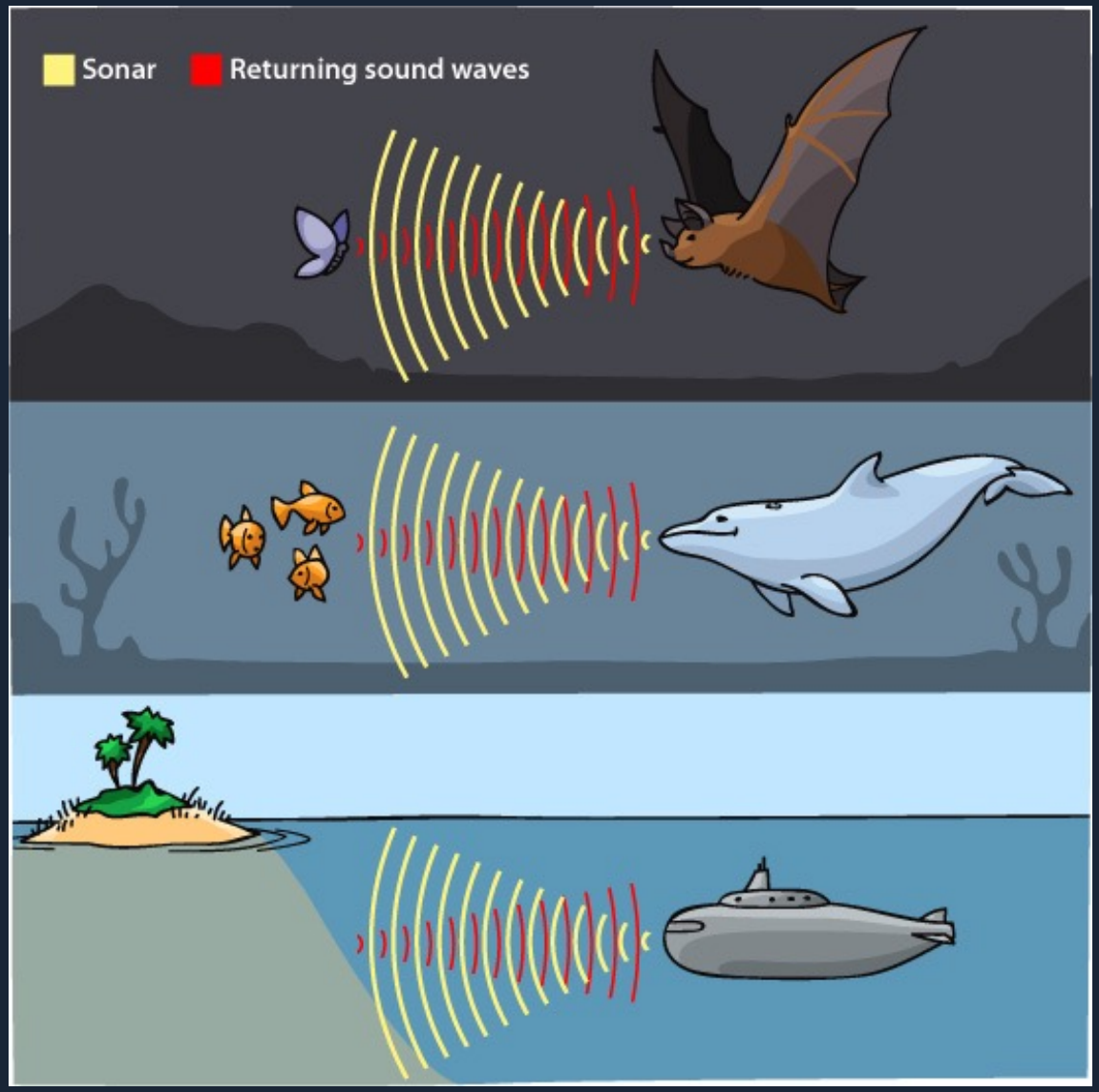
Red **Blue** **Green** **Purple**

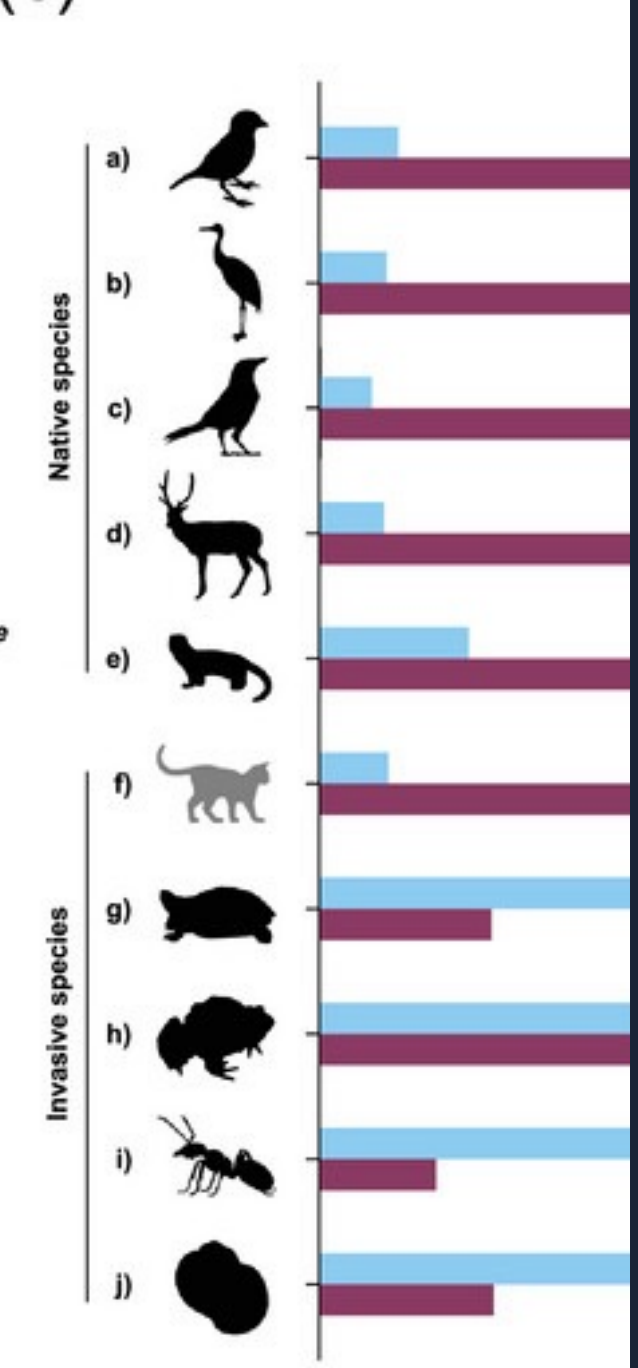
huge **MINISCULE**

Match color & shape with meaning



Use position to emphasize similarities





Good Design[22]

- Photos or outlines
- Invasive/non-invasive are grouped together
- integrated labels
- Focal species highlighted by different shade

Visual Hierarchy

If every element appears important, nothing will seem important

YOU

At some point you may come back to read this line or maybe not.

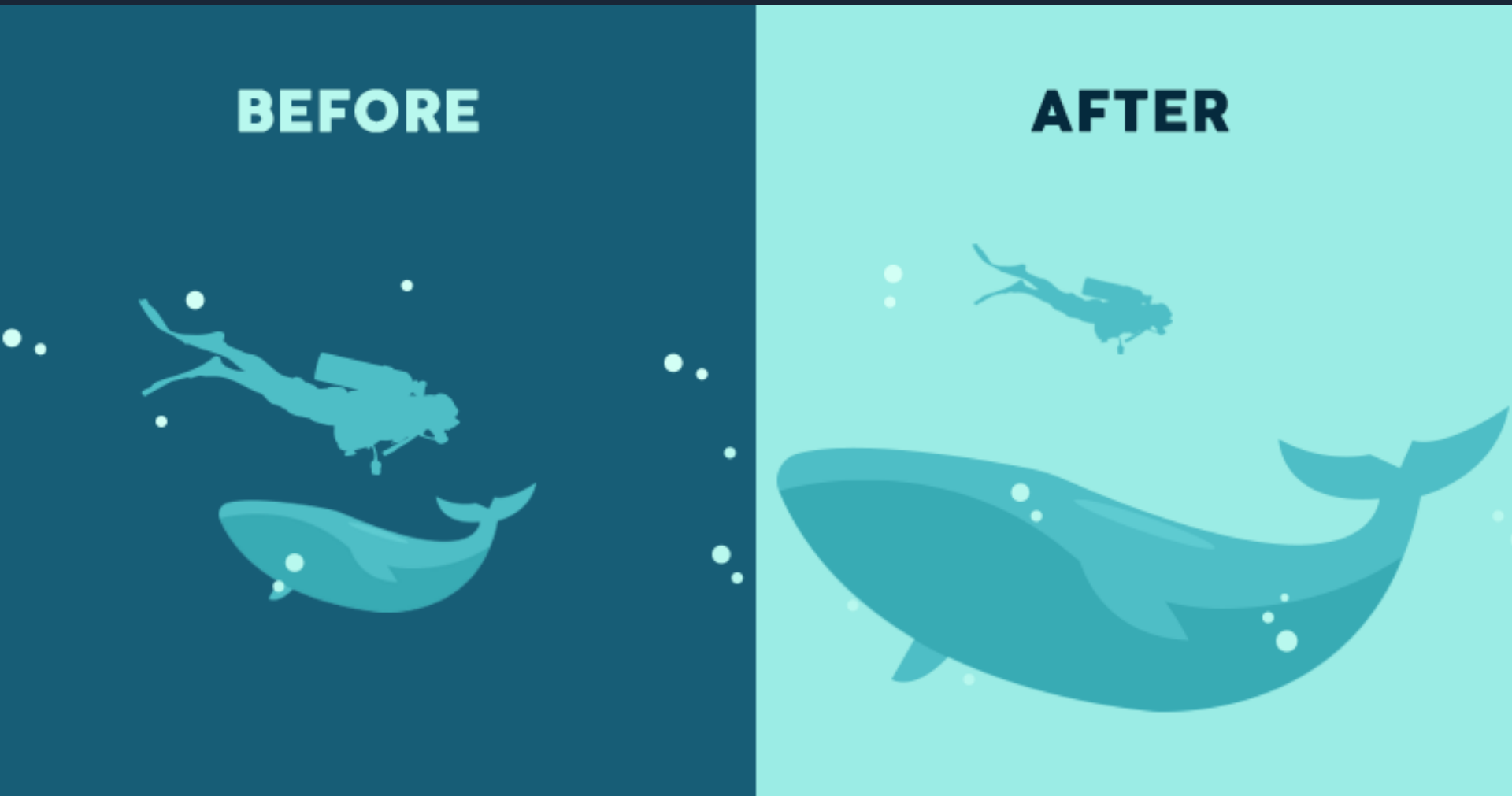
WILL READ THIS FIRST.

And then you will read this line next.

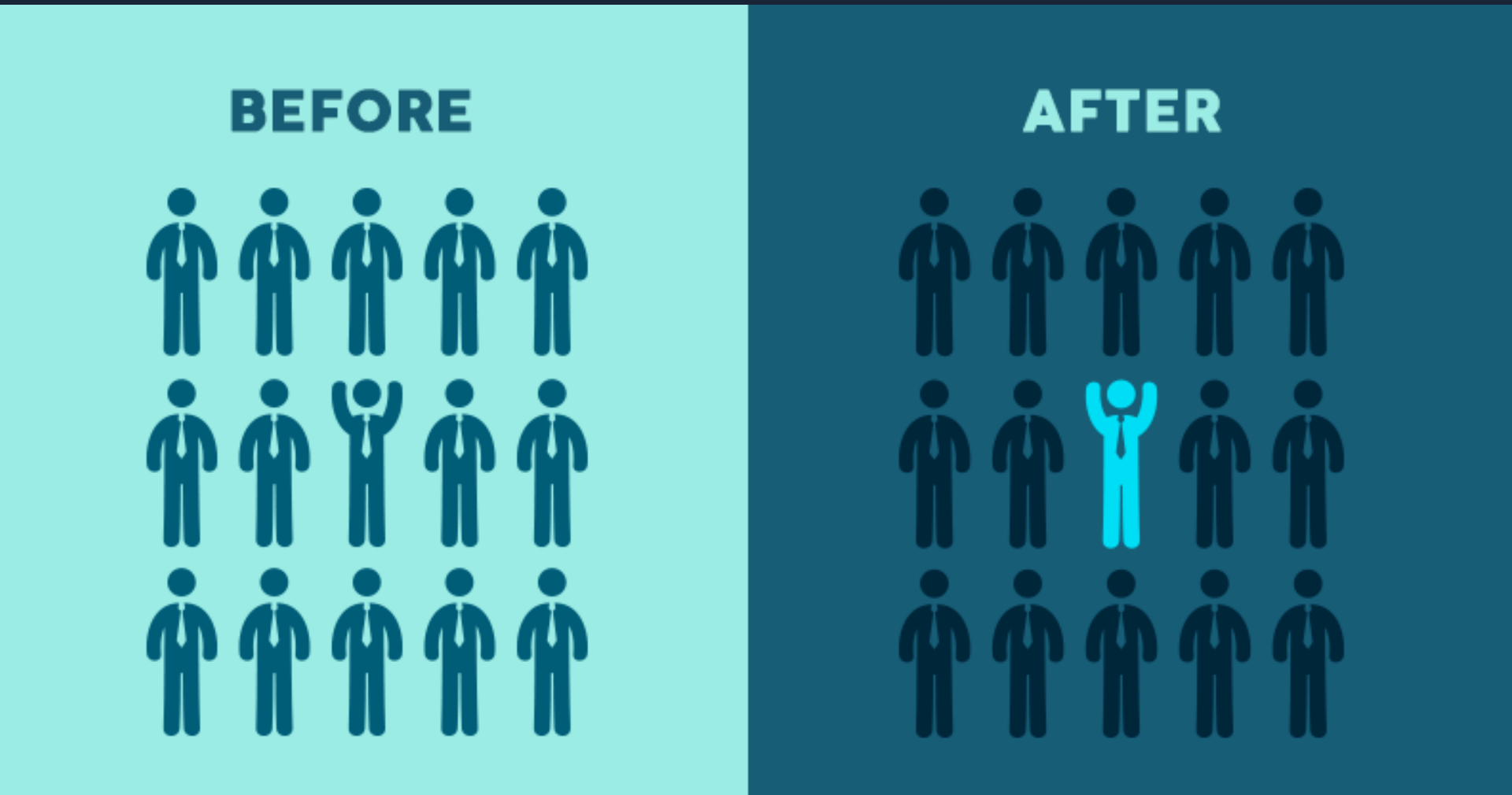
You will go back to read this body copy if you want to know more. It takes the most effort to read because it has a lot of text in a small font in a light weight with tight line spacing. Many people will skip paragraphs like this unless if they aren't engaged right away. This is why it's important to draw attention to your message using visual hierarchy.

You'll probably read this before the paragraph.

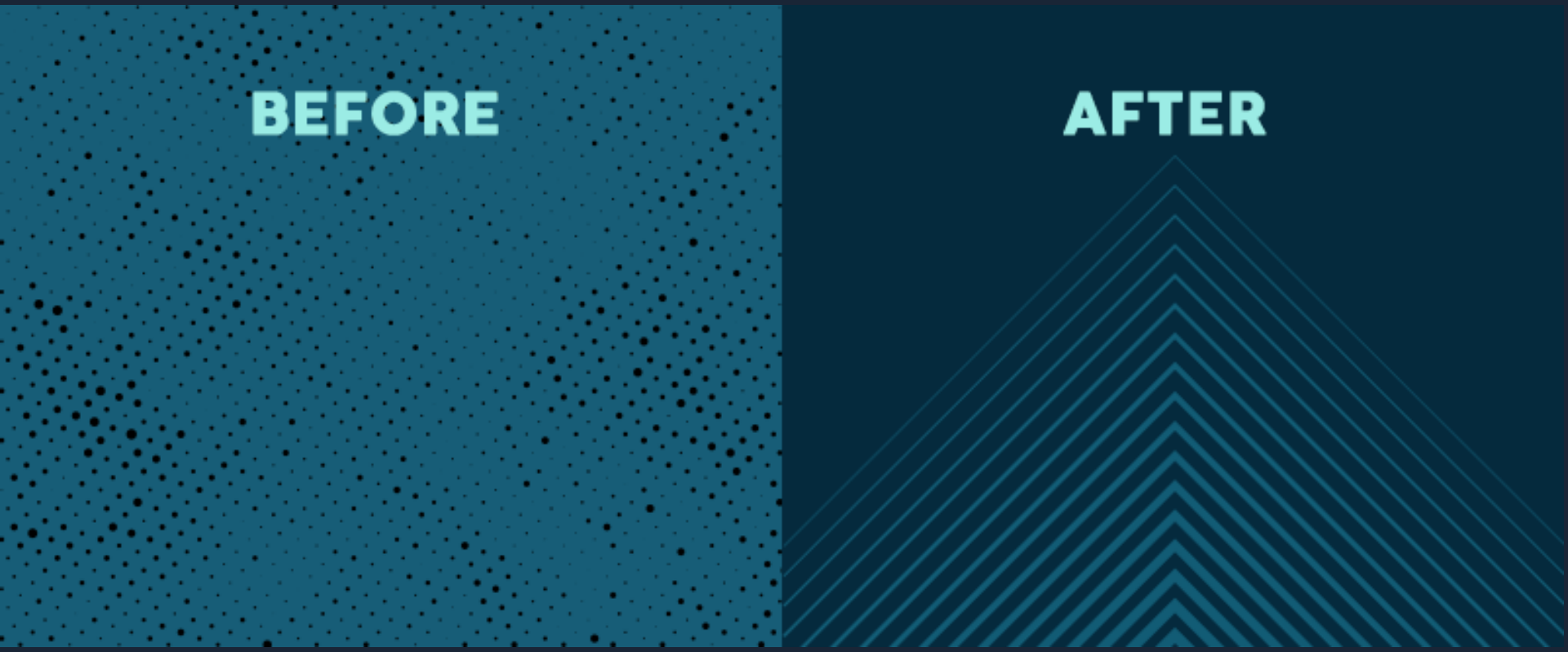
Bigger elements seen first



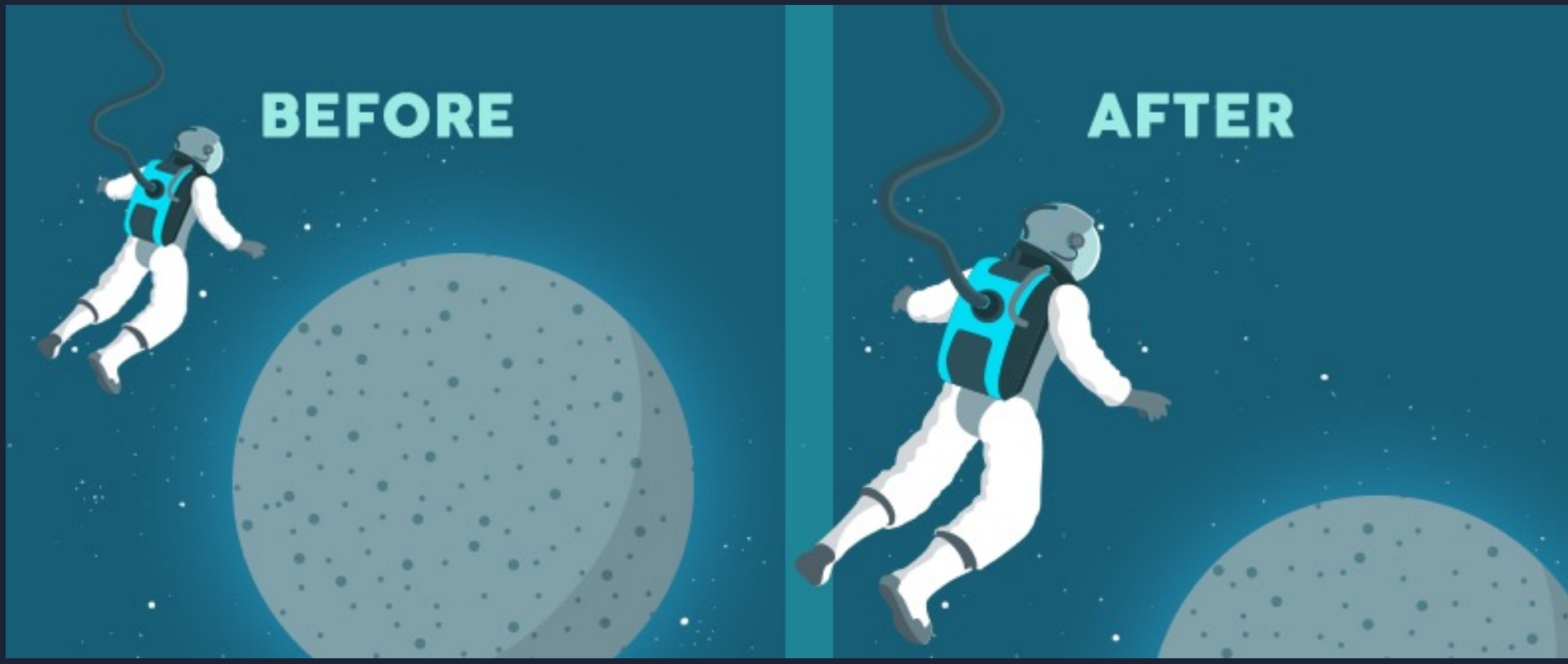
Color and contrast draw attention



Lines direct eyes



Space creates emphasis



Blank space lets the eyes rest

Inefficient utilization of space.

Items feel croweded

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Preferrable use of space.

Provides rest for the eyes.

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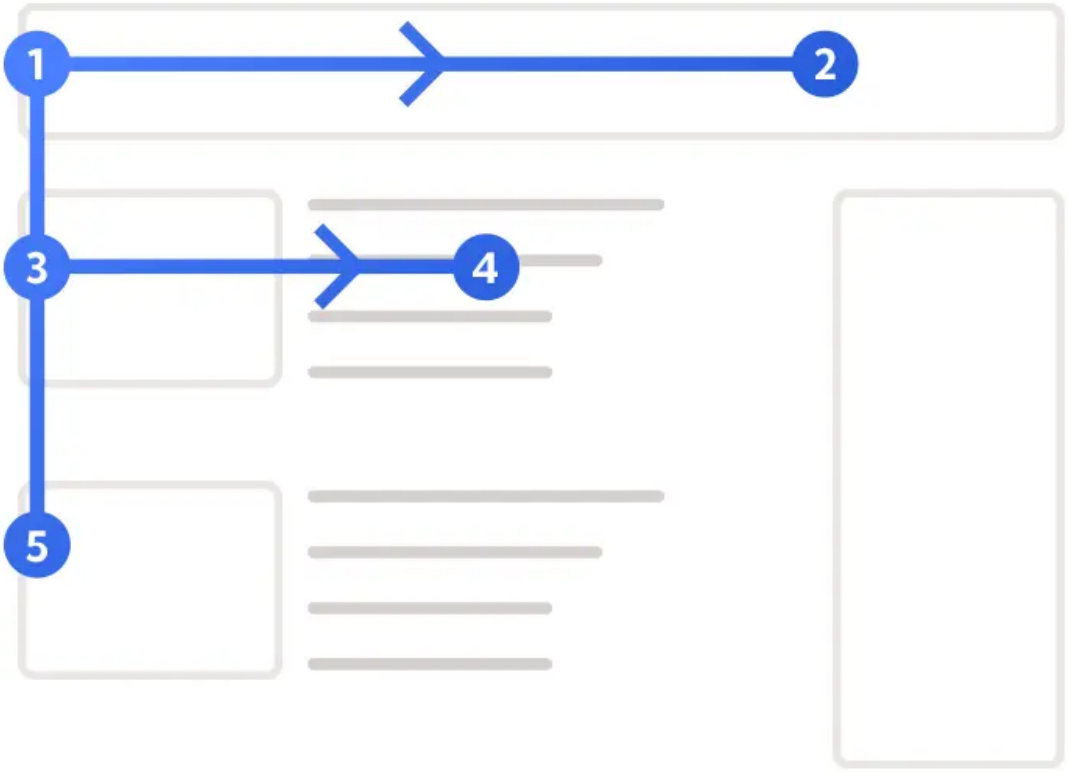
F reading pattern



Mammal Review

Review

A multisensory approach to understanding bat responses to wind energy developments

Kristin A. Jonasson, Amanda M. Adams, Alyson F. Brokaw, Michael D. Whitby, M. Teague O'Mara, Winifred F. Frick

First published: 11 January 2024 | https://doi.org/10.1111/mam.12340

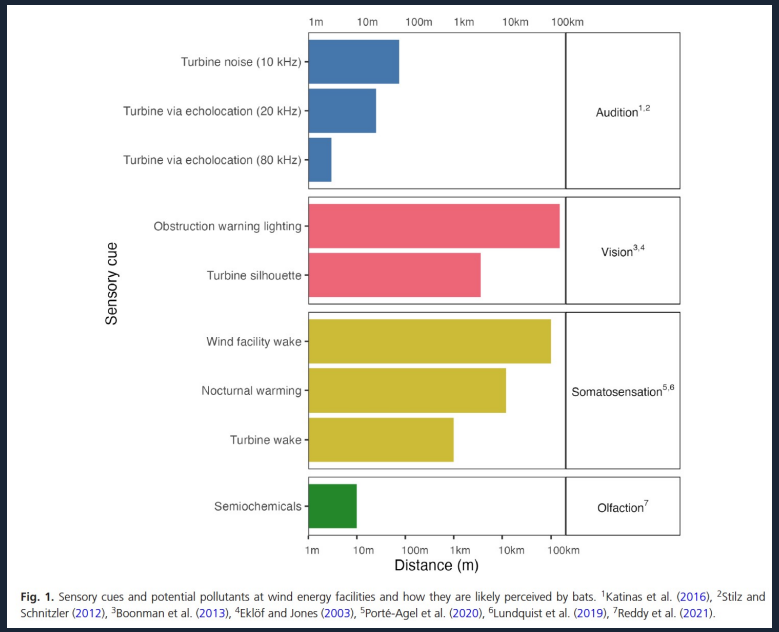
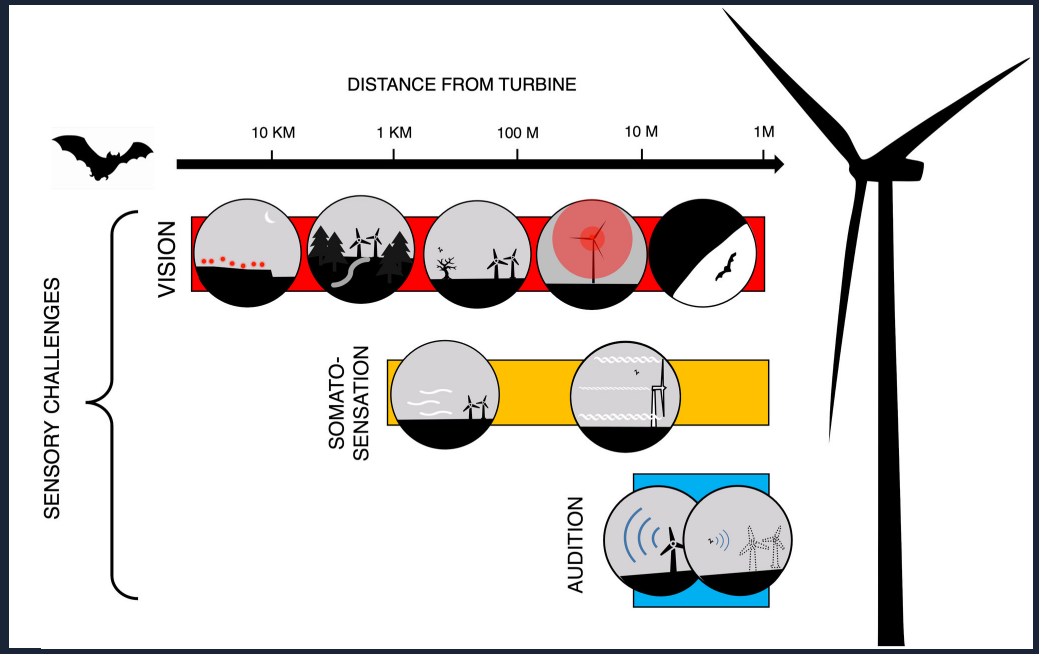


Fig. 1. Sensory cues and potential pollutants at wind energy facilities and how they are likely perceived by bats. [1]Katinas et al. (2016), [2]Stilz and Schnitzler (2012), [3]Boonman et al. (2013), [4]Eklöf and Jones (2003), [5]Porté-Agel et al. (2020), [6]Lundquist et al. (2019), [7]Reddy et al. (2021).

Figure



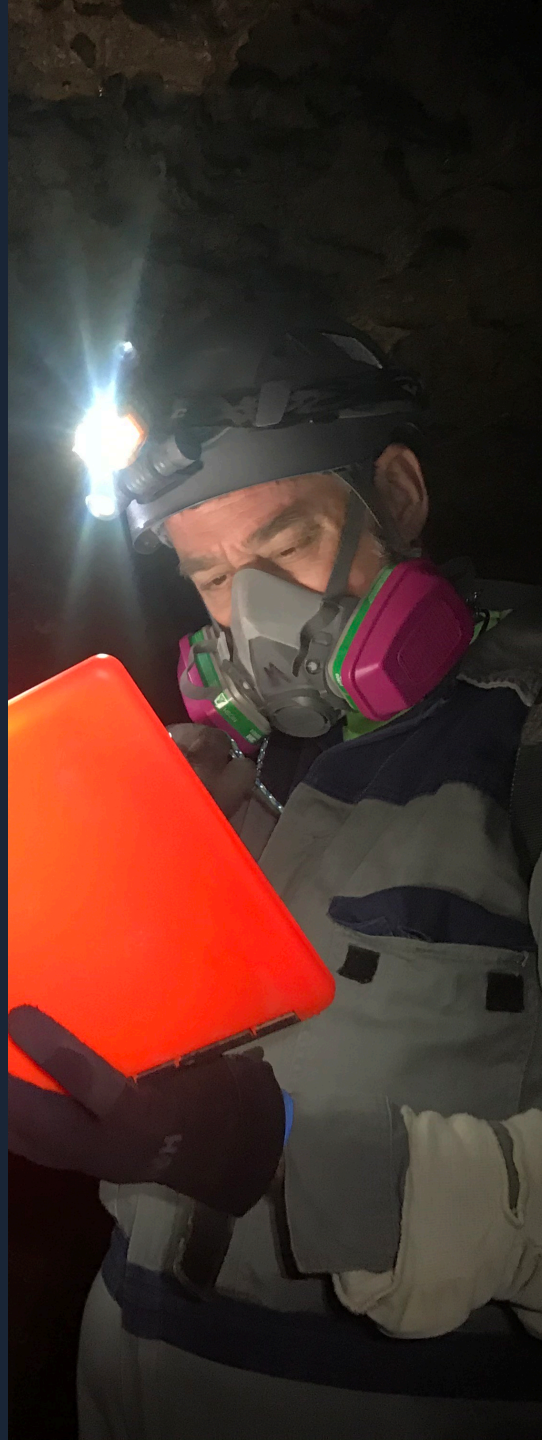
Graphical Abstract

Science in *Action*

Plan out the photos you need *before* you go to the field

"Science in Action" Checklist

- Researchers
- Highlights Field Site Features
- Techniques & Equipment
- Study Species
- Sense of Scale
- **Multiple elements together**
- **Link yourself to your research**



Background

- Need high resolution
- Use handheld camera
- Plan out open space areas for text > 2/3 of image
- Presentation cover side
- Poster background

Object

Cell phone pics = OK

Keep distractions low

Think about composition

Study species

Technique

Animal is CALM

Guides the eye to text

Image for data analysis slide

Researchers

Field site underground, respirators needed

Clipboard shows data collection

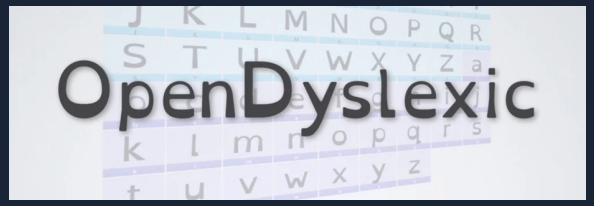
Tools to improve your visual stories

1. Integrate accessible design from the start
2. Big enough to be understood as a thumbnail
3. Use accessible fonts and color combinations
4. Reduce demands on working memory
5. Guide the user's eye with visual hierarchy
6. Preplan your fieldwork photos

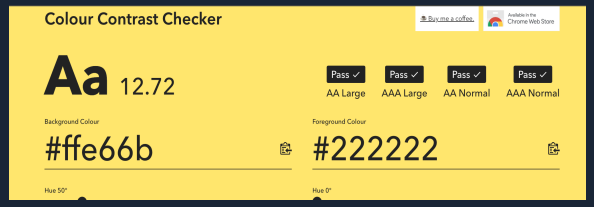

THANK
YOU!

Resources

Web Accessibility Initiative
https://www.w3.org/WAI/



Free font for dyslexia
https://opendyslexic.org/



Color contrast checker
https://colourcontrast.cc/

Color blindness simulator
https://www.color-blindness.com/coblis-color-blindness-simulator/

Citations

1. K.N. Kunze et al., "Infographics are more effective at increasing social media attention in comparison with original research articles: an altmetrics-based analysis," *Arthroscopy*, 37(8):2591-7, 2021.
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