How to create scientific figures?
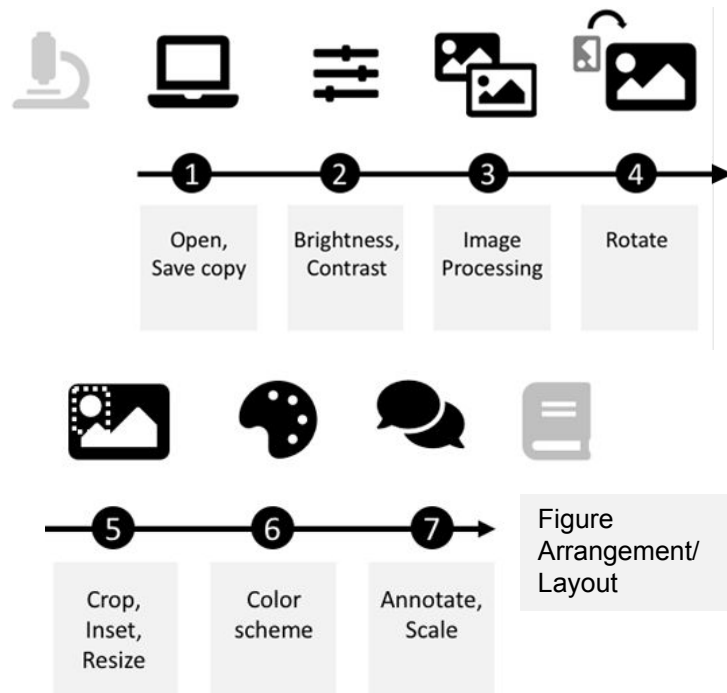*Dominika Wawrzyniak, M.sc.*

Creating scientific figures

What is good scientific practice?

- Data processing: Try to preserve as much original information as possible

- Data portrayal: Make your scientific statement accessible

  - Avoid compression (= loss of information)

  - Mindful image processing

  - Mindful cropping, rotation, resizing

  - Mindful arrangement/layout of data

Good scientific image practice workflows and guides:
- https://f1000research.com/articles/9-1373/v2
- https://www.nature.com/articles/s41592-023-01987-9
- https://www.nature.com/nature-index/news/three-ways-to-make-your-scientific-images-accurate-informative-accessible

Handling raw images

Goal: Preserving as much original information as possible

- Always keep a backup file. Do not edit this file.
- Save the data in the right image format
    - Avoid:
        - .jpeg/ .jpg/ .png
    - ☐ Compress image
        - Instead use:
            - E.g. .tif/ .tiff
            - For plots: vectorized images (e.g. .svg, .eps, .pdf)

- Use scientific image processing software
    - Avoid:
        - Power point, Paint, Google presentations etc.
    - Instead use:
        - ImageJ/Fiji (specializes in scientific image processing)
        - R
        - Python
        - Matlab

☐ You can get this for free!
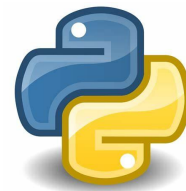
Nature guidelines for figures: minimum 450 dpi (see resources for more guidelines)
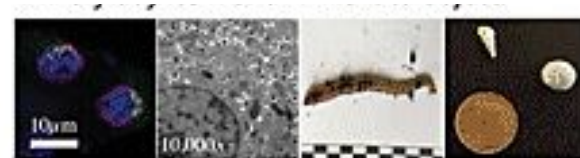
Creating Scientific Figures

Annotations

Correct annotation allows to
- accurately represent the scale of your biological object to relate to reality
- To draw attention to certain findings

Annotation tools:
- The size reference
  - Can be a scale bar, tape measure, ruler, or any object of known size (like bananas)
  - Length/size of reference must be given
  - Annotate dimensions in image
- Indicate magnification
- Use arrows, lines, shapes, letters or numbers to
  - Label pictures
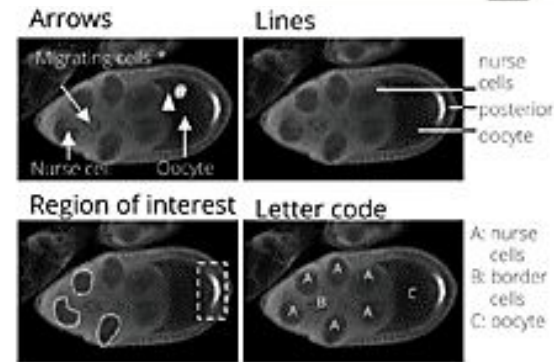 - Draw attention to certain findings

Add a scale/reference point to your biological objects

Be cautious of the background when adding scales

Point out details

Creating Scientific figures

Layout and legend

The layout helps to tell your story
The right layout will support your scientific storyline and emphasize critical data
- Direct the reading direction using
    - row or a column layout
    - White space
    - Index (letter, number, roman numeral etc.)

The figure legend
The figure legend provides context so that the figure can be understood without the context of the main text body
- Legends are generally composed of
    - The index (Figure 1., Fig. 1 etc)
    - The Figure title
    - Short descriptions of each panel
- Legends should include
    - Species/Tissue/Cell type
    - Treatment/Condition/Age
    - Scale/Magnification/Statistics
    - Color/Letter annotation
    - Etc.
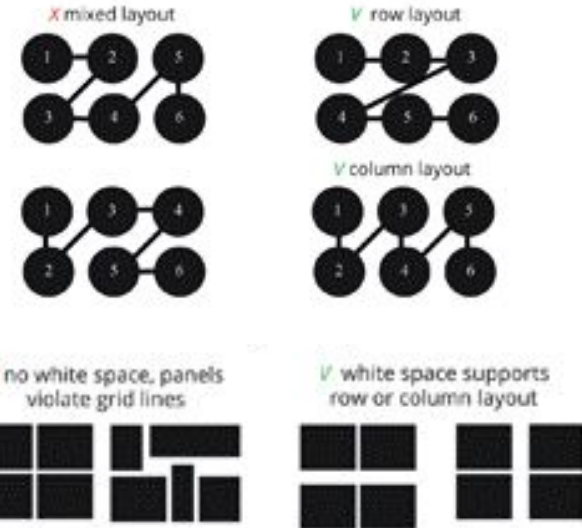
Figure 4. Histological analysis of pectin (**A**–**J**) and de-methyl-esterified pectin (**K**–**O**) in banana (*Musa* spp. AAA) peel during fruit development and ripening. (**A**–**J**) Sections stained with ruthenium red after NaOH treatment; (**K**–**O**) Sections stained with ruthenium red; (**A,B,K**) Peel of fruits just emerging from the bunch; (**C,D,L**) Peel of 35 day-old fruits; (**E,F,M**) Peel of 60 day-old fruits; (**G,H,N**) Fruit peel at harvest; (**I,J,O**) Fruit peel 6 d after ethylene treatment. Ep, epidermis; LC, latex cells; PM, plasma membrane; VB, vascular bundle. Bar = 50 µm.

Scientific figures – a cautionary tale

Elisabeth Bik @MicrobiomDigest · Jan 5

Green chemistry!
After 6 rounds of recycling, this wonderful catalyst still looks as fresh as the day it was synthesized.
/s
Published in 2023 in @SciReports 😭
pubpeer.com/publications/E...

Nature Journal
https://www.nature.com › news feature

Meet this super-spotter of duplicated images in science ...

by G ABRIEL · 2020 — **Elisabeth Bik** quit her job to spot errors in research papers — and has become the public face of image sleuthing.

AI tools that journals use to spot duplicated images (**Proofig**, **imagetwin**), and also some activist individuals like microbiologist Elisabeth Bik
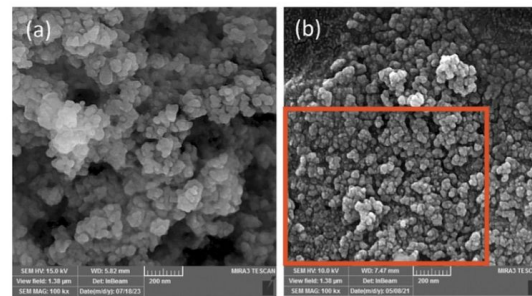
Figure 4. FE-SEM images of (a) Fe₃O₄@SiO₂@Pr-NH₂ and (b) Fe₃O₄@SiO₂@Pr-NH₂@DAP nano-particles.
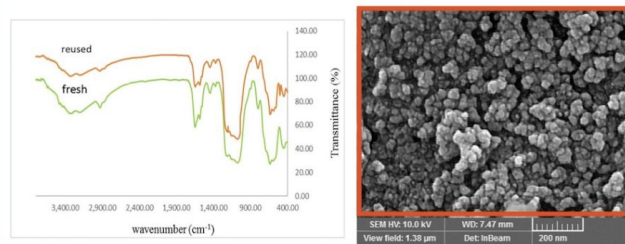
Figure 13. FT-IR spectrum (red spectrum) and FE-SEM image of the recovered catalyst.

Sources

Figure Image sources
Title page: Perry, E., Weber, J., Pataranutaporn, P. *et al. Nat Biotechnol* (2022), Nyerges, A., Vinke, S., Flynn, R. *et al. Nature* (2023)
Slide 1: Schmied C, Jambor HK. Effective image visualization for publications - a workflow using open access tools and concepts. Figure 1. F1000Res. 2020 Nov 26;9:1373. doi: 10.12688/f1000research.27140.2. PMID: 33708381; PMCID: PMC7931257.
Slide 3: Schmied C, Jambor HK. Effective image visualization for publications - a workflow using open access tools and concepts. Figure 4. F1000Res. 2020 Nov 26;9:1373. doi: 10.12688/f1000research.27140.2. PMID: 33708381; PMCID: PMC7931257.
Slide 4: Schmied C, Jambor HK. Effective image visualization for publications - a workflow using open access tools and concepts. Figure 4. F1000Res. 2020 Nov 26;9:1373. doi: 10.12688/f1000research.27140.2. PMID: 33708381; PMCID: PMC7931257.
End slide: How to be a dad. https://www.howtobeadad.com/2012/11903/banana-added-for-scale-origin, retrieved 01/17/2025, 18:35

Thank you for your attention!

Sometimes close enough is good enough, and when it isn't, it's still all you're gonna get!

The Banana
A New, More Forgiving Unit of Measure

0   1/4   1/2   3/4   1