COMPOSING EFFECTIVE FIGURE CAPTIONS IN SCIENTIFIC ARTICLES AND POSTERS

This guide will help you develop and compose effective and concise figure captions to accompany your data visualizations in scientific articles and posters.

FIGURE CAPTIONS IN SCIENTIFIC ARTICLES

Readers of a scientific paper are dependent on the caption to be their guide to the visualization(s) in each figure. Consequently, identifying the information your audience needs is a key first step for composing each figure caption in your article. Whether your figure is intended to convey location information, structure, process, or data trends, providing critical information in the caption so readers can interpret the visualization without flipping back and forth to the ***Methods*** and ***Results*** sections is a good practice.

FIGURE CAPTIONS IN SCIENTIFIC POSTERS

Audience members reading a scientific poster are often more reliant on the presenter, rather than the caption, to be their guide to individual figures. In addition, the limited size of a poster necessitates careful caption construction to provide essential information while still ensuring adequate space remains for all figures, non-caption text, and white space. With these considerations and constraints, captions in posters are often limited to an *Announcement*, *Orienting statement*, *Panel identification statements*, and *Symbol key*. Some presenters choose to incorporate their methods into figure captions instead of a separate ***Methods and Materials*** poster section, and in these cases, *Experimental conditions* may also be included in the caption. Similarly, some presenters choose to include a *Guiding narrative* statement that interprets the figure instead of an *Orienting statement*.

Disciplinary differences

This guide is not intended to exhaustively describe the nuances of figure caption presentation in each field. Writers are advised to seek specific guidance about the presentation conventions of their discipline from mentors and published articles or posters in the field. For example, in biology, it is common to include an *Announcement* in poster captions, but other disciplines omit this element and begin with an *Orienting statement* or a *Guiding narrative*.

Figure Caption Checklist

- ❑ Announcement
- ❑ Orienting statement
- ❑ Panel identification statements (*multi-panel figures*)
- ❑ Symbol key or legend (*when appropriate*)
- ❑ Define key acronyms and abbreviations (*when appropriate*)
- ❑ Experimental conditions (*optional*)
- ❑ Guiding narrative (*optional*)
- ❑ Statistics (*optional*)
- ❑ Scale bars (*when appropriate*)
- ❑ Acknowledgements (*when appropriate*)

ANATOMY OF A FIGURE CAPTION

Announcement: *e.g.*, Figure 1. This element is important for helping the reader navigate between text and figure. Within the text of the article, citing figures is important so readers know when and where to go view the data supporting a specific statement. For posters, this element can provide guidance to readers about how the figures are ordered.

Orienting statement: This opening sentence follows the announcement and provides either *a*) an orienting statement so the reader knows what information is being conveyed in the figure or *b*) a summary statement that highlights the key finding being shown in the figure. This opening statement should not simply repeat the labels on figure axes.

Panel identification statement(s): For multipaneled figures, a brief description of each panel. Typically, individual panels in multipaneled figures are identified by letters (a or A, b or B, etc.), and these letters connect the text with individual panels. Just as the orienting statement describes the overall pattern, trend, or process of an entire figure, panel identification statements provide readers with necessary information about individual panels.

Symbol key or legend: When multiple symbols are employed to represent data trends in different groups, these symbols must be linked with specific groups or conditions. For 3 or fewer groups, incorporating the symbol into the caption and clearly identifying the group or condition associated with each symbol can be effective. When visualizations include more than 3 groups, a legend in the white space of the figure panel that links each symbol with a group or condition may be more effective.

Define acronyms and abbreviations: Because figures are often read independently of the text, it is helpful for readers to define uncommon acronyms and abbreviations used in the figure. When acronyms and abbreviations are used repeatedly in a series of figures, defining them in the first usage should suffice. Common-use acronyms, *e.g.*, DNA, do not need to be defined.

Experimental conditions: A summary statement that provides essential information the reader needs to interpret the data that are being displayed. For example, environmental conditions such as pH, pressure, or temperature may be appropriate to present, especially if they are not being manipulated but still influence the study system. In some situations, a brief overview of the experimental design, procedure, and/or sample size can aid the reader.

Guiding narrative: In some disciplines, authors narrate major trends on display or point out specific features in a figure. Other disciplines rely on terser presentation, with the expectation that readers will evaluate the data on their own. Regardless of discipline, visualizations that depict processes *e.g.*, Figure 1 in Ambrogio *et al*. 2023, typically require more extensive description in the caption to narrate what is being conveyed in the figure.

Statistics: This component could include summary and/or test statistics. If test statistics or other statistical metrics are provided, ensure the reader can accurately interpret the output that is being provided. This could include identifying the tests or analyses that were implemented. This does not mean that every aspect of the analysis needs to be explained, nor do authors need to explain common data representations, *e.g.*, the parts of a boxplot. Summary statistics can be useful in some situations, provided they do not repeat information that is being shown in the figure.

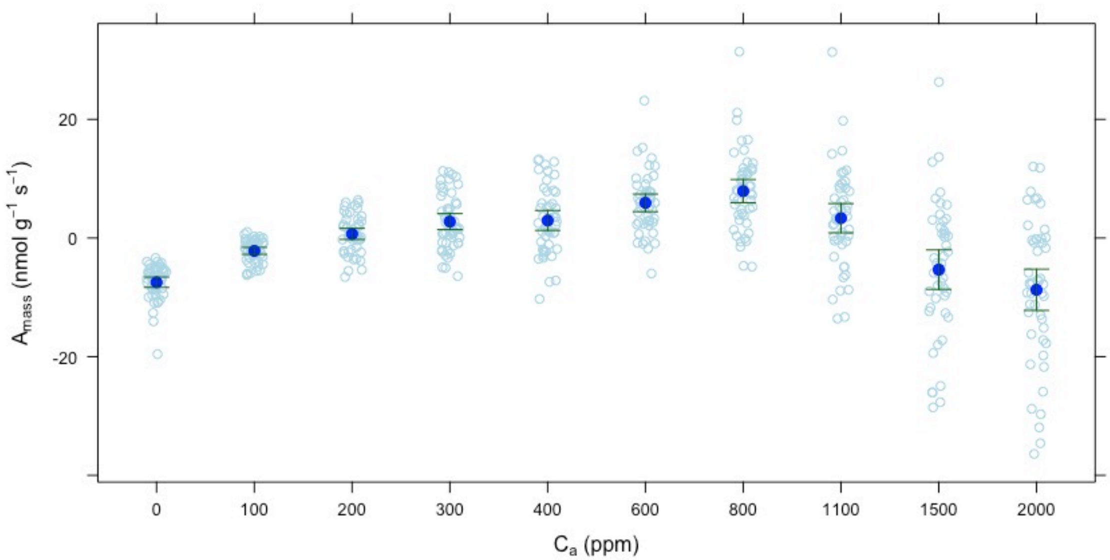
Scale bars: For micrographs or other visual elements that depict microscopic information, scale bars should be included to facilitate comparison with other figures in the paper or relevant literature. In addition, if figure panel construction necessitates some panels having different axis scaling, it may be appropriate to note in the caption that axes are scaled differently so readers do not make erroneous comparisons between panels.

Acknowledgments: Any photos or figures not attributable to the authors should be noted, and creators should be credited. Similarly, figures adapted from other publications should provide appropriate citation information.

TAILORING FIGURE CAPTIONS FOR ARTICLES AND POSTERS

Below are two examples of how an author might compose a caption differently for the same figure when it is being delivered in different forums. For each figure, the first example captions (Figure 1a, Figure 2a) are intended for a journal-reading audience, where the author is absent, and details are provided to convenience the reader and allow them to evaluate the data being presented without repeated referral to other sections of the paper. The second example captions (Figure 1b, Figure 2b) are intended for a different audience: a research peer who is scanning the poster at a conference. In this situation, the author is likely present and can provide supplementary information to the audience. This difference, combined with the limited space of a poster, gives the author greater leeway to provide a terser caption.

Illustrative example I: Biological data trends



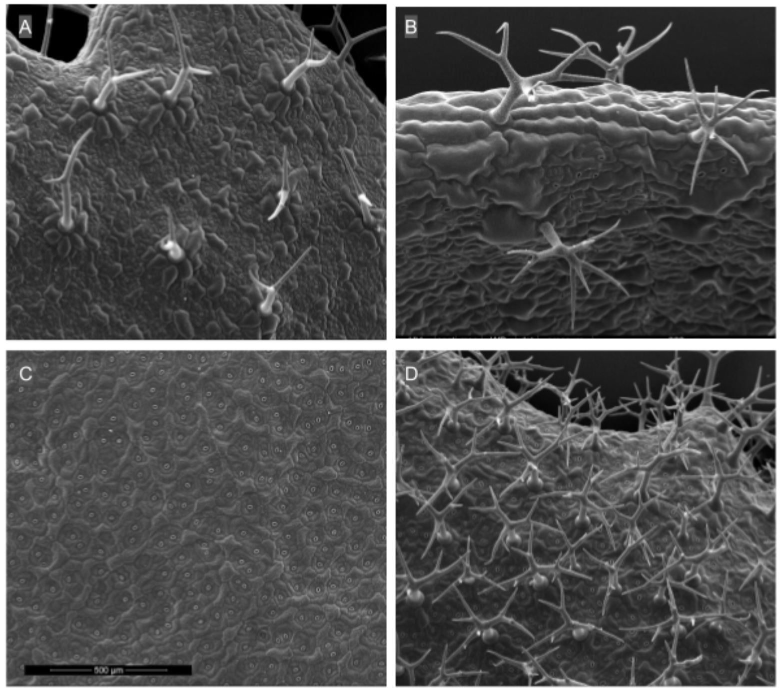
Journal article presentation

Figure 1a. *Sphagnum* photosynthesis exhibits reverse sensitivity to CO_2. Net photosynthetic rate is expressed on a mass basis (A_{mass}) in response to atmospheric CO_2 concentration (C_a). Measurements were conducted at saturating photon flux density (900 µmol m^{-2} s^{-1}) and an air temperature of 25°C. Filled dark blue circles represent mean A_{mass} at a given C_a, with error bars representing ± 1 standard error of the mean. Light blue circles represent individual measurements collected from experimental units (n = 32).

Poster presentation

Figure 1b. On a mass basis, *Sphagnum* photosynthesis exhibits reverse sensitivity to CO_2. Filled dark blue circles and bars represent mean (± 1 SE) A_{mass} at each C_a. Light blue circles represent individual A_{mass} measurements (n = 32).

Illustrative example II: Structural data presentation



Journal article presentation

Figure 2a. Variation in trichome density and morphology on adaxial leaf surfaces of *Pachycladon*. (A) Forked and simple trichomes on *P. enysii* leaves. (B) Low density dendritic trichomes on *P. cheesemanii* leaves. (C) Glabrous leaf surface of *P. fastigiatum*. (D) High density dendritic trichomes on *P. stellatum* leaves. 500 µm scale bar in panel C applies to all panels. Image credit: Matthias Becker.

Poster presentation

Figure 2b. Variation in trichome density and morphology on adaxial leaf surfaces of *Pachycladon*. (A) *P. enysii*, (B) *P. cheesemanii*, (C) *P. fastigiatum*, (D) *P. stellatum*. Methods follow Mershon *et al* (2015): leaf samples were dehydrated in a graded ethanol series, critical point dried, sputter-coated with gold, and observed using an FEI Quanta 200 SEM. Image credit: Matthias Becker.

Works Consulted

We consulted a number of works on this topic to create this handout, and you'll find their references here. This is not an exhaustive list of all resources on this topic, and we encourage you to seek out additional resources as needed. (Note to resource authors: Use MLA style for citations unless there is a compelling reason to do otherwise. Do not use handing indentation.)

Ambrogio, S.; Narayanan, P.; Okazaki, A.; Fasoli, A.; Mackin, C.; Hosokawa, K.; Nomura, A.; Yasuda, T.; Chen, A.; Friz, A.; Ishii, M.; Luquin, J.; Kohda, Y.; Saulnier, N.; Brew, K.; Choi, S.; Ok, I.; Philip, T.; Chan, V.; Silvestre, C.; Ahsan, I.; Narayanan, V.; Tsai, H.; Burr, G.W. "An analog-AI chip for energy-efficient speech recognition and transcription," *Nature*, vol. 620, 2023.

Hofmann, Angelika H. *Writing in the Biological Sciences, Third Edition*. New York: Oxford University Press, 2019.

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