

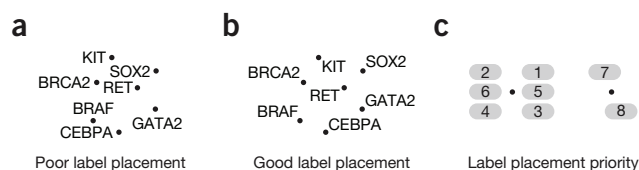
## POINTS OF VIEW

## Labels and callouts

Figure labels require the same consistency and alignment in their layout as text.

Last month we showed how thickness and tone can be used to make axes, ticks and grids more effective by keeping them distinct from data. The principle of visual separability applies equally to labels, as do two strategies that are frequently overlooked: consistency and alignment. These are especially relevant for labels that are attached to the figure by a connecting line (callouts).

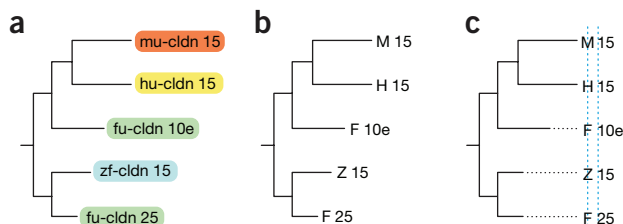
Complex figures rely on labels to identify components, define terms and acronyms, and focus the reader's attention. Labels should be formatted according to sound typographic principles<sup>1</sup>. Use one typeface of fixed size with alignment to enhance the perception of similarity and grouping in accordance with Gestalt principles<sup>2</sup>.



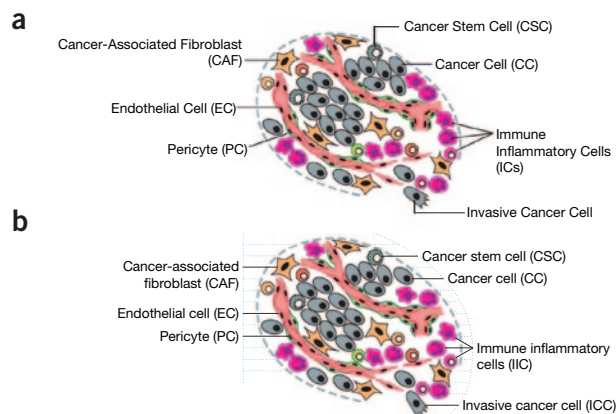
**Figure 1** | Place data point labels consistently while avoiding ambiguity. (a) Association of labels with points is muddled when the labels are inconsistently positioned. (b) Distance and alignment of labels should be fixed relative to their corresponding data points. (c) Priority strategies remove the guesswork in placing labels<sup>3</sup>.

Data labels should be positioned consistently in relation to their data points (Fig. 1). Use a placement priority scheme (Fig. 1c) to reposition labels when a fixed positioning would otherwise create awkward or ambiguous placement. Avoid aligning scatter plot labels to one another because this can weaken the association between the point and its label. Labels are annotations and thus are subordinate to their data points, not to other labels.

Keep labels concise but clear (Fig. 2). Remove common text that can be relegated to the legend, such as “-cldn” in Figure 2a. Because we are better at identifying differences when spatial variation is controlled, explore ways to present labels in alignment, using tab leaders where necessary to connect them to the figure (Fig. 2c). When in doubt, adhere to convention to maintain recognizability—space saved at the expense of clarity is not a good bargain.



**Figure 2** | Keep labels simple and easy to compare: refactor common text and align related components. (a) Avoid encoding the same information twice: for example, species need not be conveyed by both color and code<sup>4</sup>. (b,c) Shorter labels are parsed much faster (b), especially if their components are independently aligned (c).



**Figure 3** | Schematics with many callouts are improved by consistent line lengths and angles and uniform label spacing and alignment. (a) Unnecessary variation in callout lines and labels creates a disorganized figure. Reprinted from ref. 5 with permission from Elsevier. (b) Use horizontal callout lines; and if angled lines are necessary, use a fixed angle (30 or 45 degrees). Terminate the lines consistently at the edge of the corresponding element. Align labels if callout line length can be made approximately the same (left); otherwise, terminate the lines to follow the curvature of the schematic.

Schematics and illustrations should be designed to incorporate labels and callouts seamlessly, not as an afterthought. Take advantage of any freedom in placing components to create evenly spaced and intuitively grouped labels (Fig. 3). In the redesigned treatment of the tumor schematic (Fig. 3b), several cells have been relocated to make labels uniformly spaced with the help of a horizontal grid system. Uniform arrangement can be achieved using the ‘distribute objects’ or ‘distribute spacing’ tools, available in most applications (for example: in Illustrator, find the settings under Window > Align).

Capitalization is a type of variation, and thus is best limited by terminology or journal requirements. When possible, do not mix singular and plural forms (for example: in Fig. 3a, CC and ICs), define acronyms consistently (IC should be IIC) and be aware of the uncertainty caused by a single term without an acronym (ICC).

Limit the diversity in length and angle of callout lines. Note how none of the callouts for immune inflammatory cells in Figure 3a are horizontal; their symmetric layout in Figure 3b is more harmonious. Radial call lines can help lead the eye back to the figure, particularly if they appear to diverge from a single location. If your software permits, place callout lines in a different layer to evaluate their arrangement independent of other elements. If they appear as a jumble of lines, chances are that their placement can be further optimized. Refrain from using bubbles, bursts or other distracting visual trinkets.

Organize your figures by following the overarching principle that variety should be informed by data, not formatting.

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## COMPETING FINANCIAL INTERESTS

The author declares no competing financial interests.

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