Bench philosophy (6): Picture presentation

Seven Golden Rules

Eye-catching illustrations symbolise the cherry on the cake of a scientific publication or presentation. If you flick through scientific papers, however, you often find hard-to-grasp figures and pictures. Katharina Hien and Steffen Rümpler explain how to prepare well-arranged illustrations that attract the reader's eye.

Pictures and illustrations play important roles in papers, posters or PowerPoint presentations. Explaining, for example, a 20-step enzyme cascade using only words is a rather difficult task. Instead of endless columns of figures, a scientist prefers to illustrate his findings through a spectral curve or an X-ray structure. Moreover, figures and pictures render a paper more comfortable to read. Pages, densely packed with monotonous texts, are like deserts of lead in which the reader "dies of thirst".

Humans are "visual animals". In daily life we are surrounded by illustrations and pictures coming from the mass media such as TV and the Internet. In scientific publications you usually find two kinds of pictures: illustrations and logical-analytical pictures. Illustrations like photos, drawings, film and video show an image of an object that comes very close to the original. They make sense if used to illustrate the outward appearance of an object, e.g. the difference between the beaks of Darwin finches. Logical-analytical pictures show abstract structures like scheme drawings, diagrams or formulas. They are used to clarify, for example, effect mechanisms or time-based processes like signal chains. Similarly, a three-dimensional drawing of a molecule often explains more than a lengthy description.

There are seven golden rules for presenting clearly structured, easy-to-grasp pictures and figures that attract the reader's eye.

Planning your Illustration

Choosing the right tool is very important for preparing an illustration. An appropriate programme may save a lot of time and enables flexibility in the way you present your data. Today, the state-of-the-art programmes are "Microsoft Visio" for preparing diagrams and schematic drawings and "Adobe Photoshop" for editing photos and images.

Before preparing a picture, consider the scientific conclusion(s) you wish to visualise. Always keep in mind it is essential to emphasise your substantial findings and avoid presenting data of minor importance. Keep your figure or picture as simple as possible. Additional graphics such as shadows or relief fonts are irritating and divert from the central message. Only use three-dimensional images if it is necessary to simplify the picture's message. Don't forget to consider the audience that will be viewing your picture. For a press statement you need a picture that a layman understands, whereas a picture appearing in *Science*, for example, mainly addresses your colleagues in the scientific community.

Seven Golden Rules for the perfect scientific picture

1. Planning: choose the right tools, leave out unimportant factors, note the target group
2. Draw optimal attention by using cut-outs, contrasting sizes, degrees of abstraction
3. Emulate nature: use stark contrasting colours and calm backgrounds
4. Use frames and outlines
5. Be sparse with arrows and place inscriptions in no more than two directions
6. Use one character typeface and size, avoid inverse typeface
7. Lead the reader's eyes: position important things in the centre and along the line of view

Draw attention

Choose the central part(s) of your picture to focus on important information. You can draw your reader's attention to specific parts of the image with size and colour contrasts. Place larger picture elements opposite smaller ones. Stress important structures by using a strong colour that contrasts to the background colour. For example, a speck of yellow pollen upon a blue flower petal stands out most prominently. If you want to really focus on the picture's message, keep it as abstract as possible. A complex enzyme can be shown as a circle without losing any relevant information.

Colour, Contrast, Backgrounds

The colour of the picture should correspond to the article. Don't be guided by your personal taste, for example, by choosing your favourite colour. Avoid extremely colourful pictures. Too much colour distracts the viewer from the essence. Just use the number of colours necessary to convey the picture's message.

Some colour combinations are rather "dangerous". Especially complementary colours like the compilation of blue and orange, violet and yellow, green and red but also grey and red are very irritating. A significant contrast in the colour brightness is also advisable, as it ensures that every object is visible in good quality on a black-and-white photocopy. Several combinations of red and green shades or green and blue shades with similar colour brightness are inappropriate for black-and-white copies. Similarly, a bright yellow tends to "disappear" on photocopies. Check this by taking a look at your graphics in "Photoshop" using the grey scale module or making a photocopy, since in most cases the colours on your screen differ somewhat from those printed.

Use a calm background without pattern or structure for a better viewing of your graphic. The objects have to be sharply silhouetted against the background to be recognisable. The best results can be achieved by choosing a bright (but not radiating white) background. A dark or black background is very exhausting for the observer's eyes.

Fancy composing an installment of "Bench Philosophy"?

Contact Lab Times
E-mail: *editors@lab-times.org*

How (not) to do a scientific illustration

(Fig. 1) Example of a confusing presentation.

(Fig. 2) Example of a clearly arranged illustration.

(Fig. 1) This background suggests an increase in concentration towards the top of the illustration. Single steps are placed from the bottom left corner to the upper right corner, i.e. opposite direction to the view control. The arrows are too large and are of varying sizes. All objects are extremely ornate. The many colours used render the text hard to read. Besides which, the coloured objects will not be visible on a black-and-white photocopy.

(Fig. 2) A calm background draws the attention to the embedded objects. Successive steps are neatly arranged along the view control line, from the upper left to the bottom right corner and are clearly structured. Framed, plain-coloured objects highlight the text. The colouring reflects the course of the drafted events. Discreet arrows do not deflect the viewer from the depicted objects.

Frames and Outlines

By framing your picture, you can make it stand out against the text. But be careful! The result shouldn't look like a bereavement notice. Choose a narrow line to match the picture size.
Individual structures of abstract or logical pictures should be contoured with an "Outline". This gives the observer the impression that they are embedded. Leave out hatches and shadows as well as any other details – they only distract the viewer from the important things.

Arrows and Inscriptions

Arrows are very important for pointing out time-dependent processes or showing a cause-effect structure. However, they should not be too prominent. Apply different colours and forms to stress their messages. A green arrow for example may stand for "go on!" if referring to a proceeding reaction. A red arrow in contrast means, "stop!" and points to the last substrate in a cascade. For example, narrow arrows are useful to link up different steps in a cascade, whereas thick arrows may indicate that substrate A transforms into substrate B. As a rule, arrows and boxes should be used very economically. Apply very thin lines between a relevant structure and descriptive text to label your illustration. However, it should be clear to your reader which structure is being referred to. Don't label your illustration randomly from every side but place all text labels on one side to achieve a clearly laid-out arrangement.

Typeface

Use one typeface and just a few typeface sizes for your illustration. Restrict yourself to "bold", "italic" and "underlined". You can apply sans-serifs fonts (for example, Arial or Tahoma) for short texts, longer texts are better to read if they are printed with serif fonts (for example, Times New Roman or Courier New). Don't use comic or other hard-to-read motive typefaces. Choose a dark typeface colour for better reading. A bright typeface on a dark background (inverse typeface) exhausts the eye and is difficult to read. Inverse typefaces must be large enough to be visible upon a dark background. These are more suitable for slogans and headings.

View Control - the visual story

Whilst looking at an illustration, the observer's eyes naturally follow a particular direction. This imaginary line runs from the upper left to the bottom right corner of an illustration. By arranging the important subjects of your illustration along this line, you effectively guide your viewer to take in the content as best as possible. Always try to tell a "visual story" along this line with the essential information in the centre.

With these simple rules in mind, your images and pictures will be transformed into eye-catchers no one can resist. However, do not forget that the quality of your data should be as high as the quality of your images.

The authors

Steffen Rümpler holds a diploma in biology and design. He teaches at the "Grafikschule Freiburg" and produces websites and scientific illustrations for his own company "mediastart".

Katharina Hien holds a diploma in biology and works as a science journalist. She produces scientific TV contributions and has been writing as a freelancer for Laborjournal (the German sister journal of Lab Times) since 2002.