

Evaluating Scientific Illustrations: Basics for Editors

Erin M Loos

For centuries, science and art have complemented one another. Leonardo da Vinci wielded both a scalpel and a pencil to enlighten scholars about the inner workings of the human body. John James Audubon's famous bird illustrations appear in both field guides and art museums.

Drawings and diagrams are important in communicating scientific information. Not only do they diminish any confusion a reader has while reading an article, but they also enhance the appearance of a publication. Illustrations also can save space. Intricate mechanisms such as molecular bonding and genetic mutation can sometimes be explained in a single illustration rather than several pages of text.

Although professional artists produce most scientific illustrations, sometimes scientists produce their own artwork. In the latter case, it is important for editors to be familiar with what constitutes a good scientific illustration. However, even illustrations by professional artists must be evaluated.

"Do not be so impressed with a beautifully rendered piece that you do not study it carefully", says Elaine R S Hodges, founder of the Guild of Natural Science Illustrators and editor of *The Guild Handbook of Scientific Illustration*.

It is not necessary to have an art background to evaluate scientific illustrations. An editor needs to answer only five basic questions about an illustration to determine whether changes are to be made before publication.

Is the Illustration Accurate?

Both journal editors and scientists pay close attention to the accuracy of the text

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of an article. However, the quality of illustration copy can be overlooked. Just as one word can make an entire sentence false, the smallest slip of a pencil can make an entire illustration inaccurate. For example, if extra cells are added to an insect wing, a different species might be depicted.

"Accuracy is paramount for the quality of the artwork", says Hodges. "A beautiful but inaccurate drawing is useless for science."

The artist, scientist, and editor should repeatedly check for accuracy. Hodges says that editors should ask themselves several questions when evaluating the accuracy of an illustration. Does the illustration make sense and communicate the desired message? Do parts connect properly? Are there any minute errors in detailing that would cause another species of the specimen to be depicted? Are structures properly labeled?

Can I Immediately Determine the Central Message of the Illustration?

An illustration must have one dominating element, or a focus, if it is to communicate a message effectively, says Diane Bouchier, founder of the American Society of Botanical Artists. The focus is usually the most detailed section of the artwork. It should be the first thing one notices when viewing the illustration.

For the eye to be drawn to the focus immediately, the components of an illustration need to be evenly distributed around the most detailed section. When all the components of an illustration are balanced, the reader will be able to determine immediately what part of the illustration is the most important.

Arrows, labels, and empty spaces also need to be evenly distributed around the focus. These additions should orient readers, not distract them from the focus of the artwork.

An easy way to assess the balance of a

composition is to rotate the illustration until it is upside down or to hold it up to a mirror. The illustration should look balanced and evenly distributed no matter which way it is turned or flipped.

Can I Tell Where Structures Are in Relation to One Another?

"An illustration should be readable", says Bouchier. "It should be able to communicate to scientists which structures are in front and which ones are in back."

Artists produce a readable illustration by using shadows, highlights, and contrast. These elements add depth, dimension, and life to illustrations. If the artist misplaces them, the drawing will appear flat and unrealistic. However, the artist must make sure that shadows will not be mistaken for parts of the depicted structure.

The use of a light source, whether or not the artist actually observes it, is important to ensure that shadows are placed correctly. In scientific illustration it is standard to locate the source of light at the upper left corner of the artwork. The shadow would thus show at the lower right. This direction helps the viewer "read" the illustration correctly.

Does the Illustration Provide Appropriate Detail?

Editors must determine whether the way a specimen is depicted will communicate information most effectively.

What level of detail should an illustration show? The focus of an illustration will be even more apparent and more clearly identified if surrounding elements are simplified. If an object is not necessary for understanding or orientation, it should be eliminated. Botanical illustrations often do not include the entire stem of a specimen. An artist will simply show how and where the stem was broken.

Should distorted or imperfect parts of the specimen be reconstructed? When

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illustrating certain subjects, artists may reconstruct distorted or imperfect parts. This is often the case when illustrating species that are easily damaged or broken. For example, the crushed wing of an insect will usually be drawn as perfect. When reconstructing some subjects, illustrators may use such conventions as dots, dashes, or blank spaces to represent broken areas.

Will the Illustration Survive Print Reduction?

To ensure that an illustration will appear the same after print reduction, editors must examine several components of the artwork. First of all, no imperfections, including smudges, should be present.

"People sometimes count on reduction to improve their drawings by hiding imperfections, but all reduction does to big, bad drawings is make small, bad drawings", says Hodges.

During print reduction the spaces between lines and structures become smaller. This results in some darkening of the illustration. When the artwork has stippling (a small dot pattern that produces shading), the dots should be large enough not to disappear in print reduction. The dots should also be well-enough spaced so that they do not fuse or turn to black.

There should be high contrast between the black areas and the white areas of an illustration. Lines and solid areas of the artwork should be dense black with sharp edges. A minimal amount of gray shading should be present. Detail may be lost in these areas during reproduction.

The amount of shading should be examined with particular care. If too much shading is used, the darkest areas of the illustration may fuse and become black.

Hodges recommends photocopying drawings at various reductions to determine what will reproduce well.

"This provides a crude estimate but may show what will run together, miscommunicate, or disappear after reduction", she says.

The Future of Scientific Illustration

Changes in technology are allowing new illustration techniques. Some artists are

replacing paintbrushes and pencils with a computer mouse.

"The use of conventional media is not going away", says Steve Buchanan, a freelance scientific illustrator. "But because the use of a computer may make illustration more efficient, there are commercial pressures for illustrators to use them." Buchanan recently produced two US Postal Service stamp series entirely with his personal computer.

Buchanan says there are both advantages and disadvantages of computer illustration. Because publications use computers to manage print production, illustrations that are produced by computer allow easier transfer and editing. Also, the color reproduction is excellent when a computer is used to produce artwork. However, Buchanan notes that computers aren't very portable. This hinders him from producing illustrations in a subject's natural environment.

Larry Lavendal, lecturer in science illustration at the University of California, Santa Cruz, says that the use of the computer in his field will open up many new possibilities for illustrators, including multimedia and Internet work.

However, Lavendal says that artists who use computers to produce illustrations face additional demands. "With computers, illustrators have to be production people", he says. "It can be difficult to just concentrate on illustrating because your time is split up into different areas, such as typography."

Lavendal says that there was an initial drop in the quality of computer illustrations, but that has changed. "Several years ago people could tell if an image was



Stamps showing illustrations by Steven Buchanan. To see the stamps online, go to www.stampsonline.com, click on "collector's corner", go to the listing "1999 issue", and look for "Insects & Spiders - October 1".

produced with unconventional methods", Lavendal says. "Now people ask, Was that really done on the computer?"

It does not matter whether a scientific illustration is produced with a computer or with a pencil. Editors can evaluate all illustrations correctly by asking themselves the above questions. And remember, today's journal illustrations could be hanging in tomorrow's art galleries. 

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