

## TIPS FOR AUTHORS

# Images: To Alter or Not to Alter? The Ethics of Image Modification

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The alteration or modification of images produced by that wonderful mechanical optical device, the camera, has been going on since the painterly application of water color enhancements to those photographic portraits of your great-great grandparents, hanging in the upstairs hall. Back then, no one objected to changing uniformly sepia-colored eyes to blue or brown or adding a little rose to a pale cheek.

In the almost 200 years since the invention of the camera, technologies for image production or reproduction have made amazing advancements. In recent years, the technology of image *enhancement* has also advanced and, in the scientific community (as elsewhere), new issues have emerged with these advancements. The advent of the digital camera and of software for manipulating digital images such as Photoshop (Adobe, San Jose, CA) offers opportunities for both more accurate clear representation of findings as well as for greater ease in the misrepresentation of outcomes.

As a result, journal editors and others have begun to draw up guidelines for the ethical management of digital images. Such guidelines will inevitably vary somewhat among disciplines. For example, while it may be acceptable to use color enhancement or other alteration tools to make structures in a histological section more visible, enhancing tooth color in an image of a prosthodontic appliance could be misleading. Still, certain principles for the ethical use of image altering software seem to hold across all disciplines. Based on a quick survey of the literature, the following is a preliminary list of guidelines for researchers using digital imaging technology. (A brief bibliography listing the reports from which these guidelines were drawn follows the conclusion of this discussion.)

- Retain and archive copies of all original digital images along with the files of other raw data associated with the study.
- If modifications of an image are made, they must be applied to the whole image, not just to one segment.
- Include a description of any modifications of images in the Materials and Methods section of the report.

- If the images are to be produced or modified by someone other than the author or authors (a technician, for example), make sure that the individual is aware of ethical guidelines. If the images are vital to your report, it is probably a good idea to acknowledge this person's contribution in your manuscript.
- Do not allow arrows or other annotations to obscure important elements in the image.
- If separate images are to be combined into one illustration (e. g., for purposes of comparison), denote the boundaries of the separate images with black borders or other similar clearly visible marking.

As the potential for image manipulation becomes more widely recognized, many editors are considering strategies for identifying inappropriate alterations. Not all editors agree that a special effort should be made by journal staff to weed out such images, however. According to *New York Times* science writer Nicholas Wade (cited below), Emilie Marcus, editor of *Cell*, has argued that the ethics of reporting research should be part of each scientist's training, not necessarily the responsibility of the journal editor. According to Wade, Marcus said, "Why say, 'We trust you, but not in this one domain?' And I don't favor saying, 'We don't trust you in any.'"

A recent article in the *New York Times* reports that a new engineering sub-discipline known as "digital forensics," using mathematical and computational techniques to detect alterations in digital media is under development.<sup>1</sup> When these techniques become established, the issues associated with ensuring that digital photography is unadulterated will be facilitated and establishing guidelines for the ethical manipulation of digital photographs may be moot.

In the meantime, The *JP* editorial board is in the process of developing a journal-specific policy for acceptable digital image manipulation. When complete, the policy will be posted with our online instructions for authors at [www.blackwellpublishing.com/jopr](http://www.blackwellpublishing.com/jopr).

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## For further information on image manipulation

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