

◆ Keynote Address: Making Good Science Look Good

Speaker:

Felice Frankel

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Felice Frankel's keynote address was more visual than verbal, so it is somewhat difficult to report on for *Science Editor*. Frankel, who has had her science photographs published in such prestigious publications as *Science* and *Nature*, not to mention on the cover of *Science Editor*, presented a series of her slides to a captivated audience. She claimed to be a science photographer rather than an artist, but if art can be defined as something of beauty that instructs and delights, much of her work appears to meet the test for artistic expression.

Frankel, a research scientist in electrical engineering and computer science at the Massachusetts Institute of Technology (MIT) and project director of the National Science Foundation's ENVISIONING SCIENCE project, spoke about the importance of visual communication in interdisciplinary and international scientific communication and about "Image and Meaning, Envisioning and Communicating Science and Technology", an initiative to promote new collaborations among scientists, image experts, and science writers. Much of the talk consisted of her explanation of how the images being displayed to the audience were created and manipulated to communicate the underlying science better.

Researchers who focus on scientific data can be sloppy in their presentation of visual material. However, when encouraged to pay attention to the visual aspect of their work, they can be taught to communicate differently, and the images they present

with their text can greatly enhance readers' ability to understand the science.

Small changes in how subject matter is photographed can make a dramatic difference in communication to readers. Frankel showed examples of how a slight change in camera angle or lighting changed the colors, resolution, and clarity of the image being presented. Most scientists (with the noted exception of microscopists and some biologists) do not have sufficient expertise in manipulating the photography process. Scientists need to learn to trust the science illustrators and photographers with whom they work and allow them to experiment to achieve the best results.

Technology has facilitated manipulation of visual images, and it is important not to let the process affect the science. Frankel admitted to having at times created images that publication editors felt would misinform readers. Above all, one must maintain the integrity of the science and not let "art", or visual appeal, take precedence over honest and accurate representation of the scientific data. When images have been enhanced digitally, the publisher should devote space to describing the specific manipulation techniques that have been used.

A good photographer can give scientists choices in how to present their images and can nudge them to consider different points of view that might communicate their information better. Sometimes the photographic medium does not accurately represent what was seen by the eye, in which case it is acceptable to manipulate the image to reflect what the object looked like to the scientist and the photographer. One should focus on the features that readers are intended to see and not let extraneous information detract from the central message.

Science photography can help to attract children to science. Frankel has been involved with a project in which children photograph phenomena, the images are posted on the Internet, and the children

can ask MIT scientists questions about the images.

Frankel sees science as a landscape of form and structure. "It's all about looking, and I try to bring a fresh and loving point of view to visualizing science."

A brief question-and-answer session followed the slide presentation. Asked about digital photography, Frankel replied that although digital photography can achieve excellent resolution, she is not convinced that it is as good as film photography in capturing nuances of color. She has started experimenting with a Nikon D1X camera with 20-MB file-size capability and may have more to report on this topic later. Her preference at this point is to scan film images with a high-end scanner.

With regard to science images on the Internet, no two computer screens display an image in exactly the same way. Nothing can be done yet to overcome computer limitations and convey scientific photographs with complete accuracy via the Web.

In answer to a question about the quality of printing of her books, she said that printing in general is not up to as high a standard as she would like. However, when pushed, even some printers who have claimed that they are not up to the challenge of printing high-quality images can "push the envelope" and achieve excellent results.

To archive her photographs, Frankel keeps the film, scans the important images in TIFF, and saves high-resolution files to a CD. She also maintains low-resolution files to use as e-mail attachments to send to art directors. She is not certain whether a digital file or film is a better archival medium.

Frankel is author of two books related to the topic of her presentation: *Envisioning Science: The Design and Craft of the Science Image* and *On the Surface of Things* (George M Whitesides, coauthor). 