

## Dr. Sam Leinhardt

### Reinventing nature

Technology entrepreneur explores the convergence of art and science using digital cameras and Adobe® Photoshop® CS2



Sam Leinhardt

Some of the greatest nature photographers originally trained in unrelated fields. Ansel Adams, for example, was a professional musician, and Eliot Porter a Harvard-educated physician. These pioneers traveled boldly in the land where science and art intersect, creating unforgettable images that continue to captivate viewers decades later.

Like Adams and Porter, Dr. Sam Leinhardt—scientist, educator, inventor, and entrepreneur—captures and interprets unique moments in the natural world. Unlike them, he uses digital cameras and Adobe Photoshop CS2 software as his means of expression.

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*Dr. Sam Leinhardt,  
technology entrepreneur  
and amateur photographer*

The perfectly formed petals of a water lily, the delicate wings of a butterfly, or the serene beauty of a parkland grotto all become arresting studies in light, color, and exquisite detail in Leinhardt’s talented and capable hands. “I want viewers to see flowers, insects, and other natural elements as I see them,” says Leinhardt. “I want to isolate them in the context of time and place, so that they become something else entirely. It’s what painters do.”

### **The digital plunge**

Since the age of 12, Leinhardt has been a photography enthusiast. It is a pursuit he says “keeps him sane” in the wake of his hectic business schedule. Over the past 50 years, he has witnessed the evolution of photographic technology from film to digital and passionately embraced the latter for its ability to blend his technical interests and artistic proclivities.

“I absolutely adore digital photography,” he says. “It changes the nature of the game by offering increased freedom of expression and ease of manipulation. The parameters are no longer controlled by the film producer, the camera manufacturer, or the paper company. Digital technology returns control to the photographer so that, like a painter, you become the chemist as well as the artist.”

### **From ordinary to extraordinary**

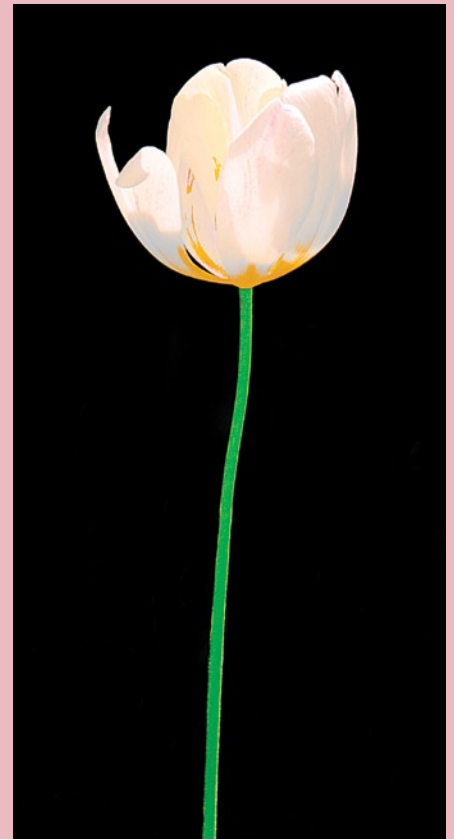
To realize his vision, Leinhardt begins with a simple shot, such as the lone white tulip he spotted in a home garden. “The flower was glowing with backlighting from the afternoon sun,” he explains. “I rested my Canon EOS 20D, fitted with a zoom lens, on the old stone fence in front of the house and shot. The result was an ordinary image of a tulip with a lot of background material that was intentionally out of focus.”

The image would not stay ordinary for long. Back at home, working in Photoshop Camera Raw format in the Adobe Bridge file browser, Leinhardt first warmed up the image by turning up the color temperature, reducing the exposure to darken and simplify the background, increasing the contrast, and increasing the color saturation to heighten the brilliance of the white petals, yellow base, and green stem. He then cropped out the background material and removed vignetting around the edges of the flower, gradually isolating just the flower and stem. The Camera Raw workflow enhancements in Photoshop CS2, such as multi-image processing, made this process extremely efficient.



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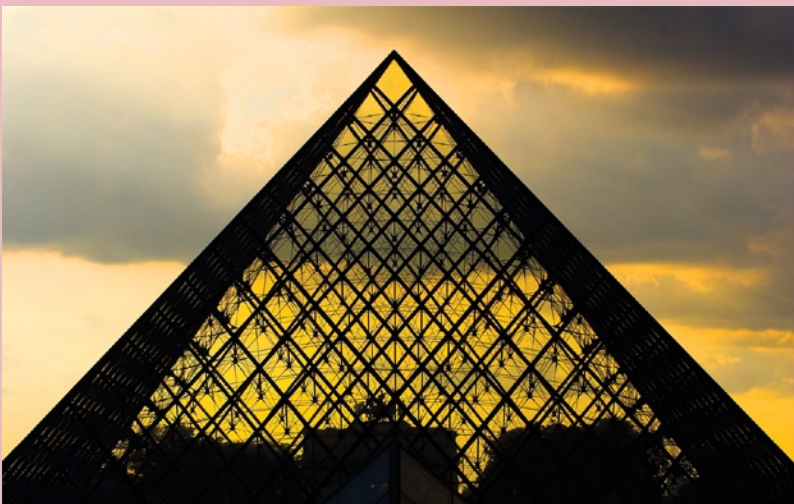
Using Adobe Photoshop CS2, Leinhardt turns simple shots into arresting images. “I’ve found that there’s so much I can do with the basic tools,” he says, “that I work them to the fullest before going on to more complex layers and masks.”



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Wherever he travels, from Welsh parklands to Parisian landmarks, Leinhardt captures digital images that he transforms into works of art using Adobe Photoshop CS2 in his home studio.

In Photoshop CS2, Leinhardt used the Clone Stamp tool to eliminate unnecessary detail; the Spot Healing Brush to erase blemishes and dirt on the tulip petals and smooth out color inconsistencies; and the Smart Sharpen tool to precisely correct blurring. With the Pen and Lasso tools, he selected the bulb and stem—being careful not to lose the fine detail—inverted the selection, and then de-saturated it to turn the background color completely black.

“In proceeding this way, I achieve the isolation I desire and draw the viewer’s eye toward the parts that I find most attractive but are often lost in the confusion created by similar color and brightness values in natural lighting situations,” says Leinhardt. “By shooting in raw format, and sorting and processing the files in Adobe Bridge and Photoshop Camera Raw, I can achieve the starkness I seek while protecting my image as originally shot.”

In typical fashion, Leinhardt printed the enhanced image on a large-format inkjet printer, on watercolor paper. The combination of the inks and matte finish enhances the glow of the tulip on the dark background. “The result is everything I saw in the shot when I took it,” he says.

### Art imitating work

During his career, Leinhardt has founded four high-technology companies, sold them to corporate giants such as Lockheed Martin and Nokia, and in 2005 formed a fifth—Penthera Technologies—to develop software for broadcast mobile TV. He holds a bachelor’s degree, a master’s degree, and a doctorate from the University of Chicago; has taught at universities around the world; and today is an adjunct professor of computer science in the Human-Computer Interaction Institute at Carnegie Mellon University in Pittsburgh, Pennsylvania.

At FORMTEK, the second company he founded, Leinhardt helped develop methods for stitching together computer-aided design (CAD)/computer-aided manufacturing (CAM) drawings to create panoramic views of aircraft wire harnesses and other large objects. Lockheed Martin subsequently bought the company, but Leinhardt retained his love of panoramic images, a concept he explores regularly in his photography.

To create an Andy Warhol-like montage of tulips, Leinhardt joined multiple frames using the Photomerge® tool in Photoshop and then modified the image for artistic effect. The result looks like a single large frame.

# “If the marginal cost of a frame is zero, you can shoot to capture the moment and experiment endlessly.”

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Indulging his passion for panoramas, Leinhardt created both this tulip montage and Pittsburgh skyline from multiple shots, stitching them together and applying artistic effects with Adobe Photoshop CS2 tools.



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Similarly, for a hyperrealistic, 180-degree Pittsburgh cityscape, he used Photoshop tools to stitch together multiple images and to remove unwanted elements and correct the lighting, which changed as he set up and shot each frame. He's now experimenting with creating panoramic images of botanical macros, moving the camera horizontally on a rack-and-pinion track to preserve the depth of field, rather than rotating the camera on a fixed point.

## Many images, many hats

With so many ideas and inspirations, Leinhardt may shoot a hundred frames in a field session and use one. His archive currently exceeds 10,000 raw and enhanced images. He uses Adobe Bridge to quickly review and sort shots, and help keep his inventory under control.

As a trained economist, Leinhardt appreciates the affordability of digital photography. “The capture process is almost cost-free after you purchase your equipment and software,” he says. “If the marginal cost of a frame is zero, you can shoot to capture the moment and experiment endlessly.”

As a responsible software developer, he's vigilant and methodical about data security. “It's taken me a long time and disastrous losses to fine-tune my backup system,” he says.

Leinhardt typically uses a Hitachi Microdrive in the field and then copies the raw images onto an Epson P-2000 photo viewer as well as his PowerBook G4 laptop. In his home studio, he copies the files onto the hard disk of his Power Mac G5 workstation and onto the attached archival disk. Only then does he erase the Microdrive, photo viewer, and laptop files.

As an educator, Leinhardt knows a good teacher when he sees one. He has studied digital capture techniques with George Lepp, digital workflow with Seth Resnick, and Photoshop processing with Katrin Eismann.

As an inventor, Leinhardt has a vision for the future. “Bring digital cameras and Photoshop even closer together,” he says. “My dream would be to modify images during the capture process.”

**Dr. Sam Leinhardt**  
Pittsburgh, Pennsylvania

## Challenges

- Realize an artistic vision that requires isolating and enhancing natural images against stark backdrops
- Create seamless hyperrealistic panoramic images
- Easily sort hundreds of shots per session and manage more than 10,000 stored images

## Solution

- Use Adobe Photoshop CS2 to process images
- Apply Photoshop tools such as Clone Stamp, Spot Healing Brush, Pen, and Lasso to perfect and isolate images while preserving fine detail and driving background to black
- Use the Adobe Photomerge tool to make multiple images appear as one large frame
- Employ Adobe Bridge to quickly review and sort shots and keep a growing archive under control

## Benefits

- Dramatically increase image processing ability
- Produce images as visualized while maintaining complete creative control
- Capture and process images economically for maximum freedom to shoot and experiment
- Easily store and access raw and enhanced images for future projects

## Toolkit

- Adobe Bridge
- Adobe Photoshop CS2
- Apple Power Mac G5 and PowerBook G4 computers running Mac OS X
- Canon EOS-1Ds Mark II, EOS 20D SLR, and PowerShot S70 digital cameras with Canon 100-400mm image-stabilized zoom lens
- Epson raster image processors and inkjet printers
- Epson P-2000 photo viewer
- Hitachi Microdrive
- LaCie archival disk

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