Pictures from a Revolution

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As a cartographer, I find the most revolutionary event in the making of maps was not the introduction of the computer, but rather the introduction of photography. As a *Children's Book Review* editor, I find, in a different way, that same photography has made radical transformations in children's literature, especially in informational books.

Prior to photography, all printed maps had to be engraved on wood blocks or copper plates, or drawn on lithographic stone in mirror-image. Leonardo da Vinci, for instance, to maintain his engraving skill, wrote his journal in mirror-image writing; that is, you had to hold it up to a mirror to read it. Some modern psychologists who know nothing of the history of printing suppose that there is some dark, hidden meaning in Leonardo's reverse-reading journals. In the same way, I still write an italic hand from the days when maps were lettered by hand in italic. But I never had to write backwards. Photography takes care of all that. A wrong-reading negative, when turned over, becomes right-reading.

In children's books photography is used to capture images. Then photographic processes are used to make the images into a printable format. Now, even the text is printed by a photographic process. When artwork is used in a book, it too must undergo photographic processes to make it printable.

In 1839, Louis Jacques Mandé Daguerre (1787-1851) invented the first photography to utilize a latent image. That is to say, in a modern sense, that the action of the light reduces a few atoms of the photosensitive silver salts to black metallic silver, and as a result, one hundred million additional atoms are converted to metallic silver when acted upon by the developer. This makes the latent image visible to the eyes. In the daguerreotype process, the "developer" was mercury fumes, which were lethal. Samuel A. B. Morse, the inventor of the telegraph, died of mercury poisoning as a result of his experimentation with the daguerreotype process.

The basis for modern photography was laid by Fox Talbot. Initially, he could not stop his photographs from turning solid black. Using a piece of gauze, he broke the photographic image into dots of varying sizes which he attempted to print, so as to get a permanent image. Shortly thereafter, he discovered from Herschel that hyposulphite of soda would dissolve the unexposed silver salts that could then be washed away, thus "fixing" the image. Modern photography was born. If photographic history interests you, *The Latent Image* by Beaumont Newhall will be captivating.
At first, all that photography changed in the printing process was that block makers could copy photographs of important events onto wood blocks that would be printed as line drawings. It was also possible to modify the photograph. For instance, in the Russell photograph of the wedding of the rails at Promontory on May 10, 1869, the men standing on the pilots of the two railroad engines Jupiter and Engine 119, are extending bottles of whiskey. As Harper's Weekly had high moral tone, when the photograph was made into a wood block for their publication, the hands are extended in heroic gestures, sans spirits. If interested, see my book Transcontinental Rails, 1969, pp. 43, 45 for both versions in woodcuts, and the book Westward to Promontory, for the halftone made from the original glass negative.

The problem is that the photograph is a continuous-tone image and, as such, is not printable. The printing press can leave an area white or print black but it cannot print grey. As the photograph became more common, it was desirable to print photographic images. Talbot's work with the gauze was remembered, but was too crude to be useful. The principle was achieved by engraving two plates of glass with about 65 lines per inch. These two plates of glass were then cemented together so that the lines were perpendicular giving the device its "screen" appearance. Where intense light hit the glass screen, it would allow large dots to be printed. Where faint light hit the screen, only very small dots would be printed. In the final printed form, large black dots form the shadow areas, and small dots occupy the highlight areas. Examine a picture in the newspaper with a lens and this will be clear.

Admittedly, the progression of alternating negative and positive images make this rather complicated, but once the halftone process was developed, it made it possible to print photographs in books. The fact that the block maker, to produce the new metal block for photographic reproduction, had to use Dragon's Blood, a photo-sensitive vegetable gum, only adds to the mystique of printing. (When I was attending London College of Printing, I went to Cornelissson's and purchased some to keep on my desk lest the less colorful silicon chip make my profession too drab.)

Even so, halftones were expensive, and so most of the books I grew up with were some form of line art. Lippincott's Fifth Reader, 1883, had finely executed engravings with a photographic quality. Meigs's The Wonderful Locomotive was lavishly illustrated with pen-and-ink drawings that lent themselves to line reproduction and letterpress printing. It would be two generations before someone like Barry Moser could flaunt the wood block without apologies to the photograph.

Even more wondrous was the invention that allowed the halftone process to be used to print colored photographs. Color photographs have been around in one form or another for well over a hundred years, but it was not until after World War II that the present three dye
layer forms became common. *National Geographic Magazine* had published a sort of color photography before the war, but color photography as we know it came later. There had, of course, been a great deal of color printed from mechanical separations ala *Dick and Jane*, but this is outside the scope of this essay.

Throughout most of my life, the way of preparing a color photograph for printing in a book, whether it was a color photograph of the real world or a color photograph of a piece of artwork, was to mount the photograph on the copyboard of a process camera. By shooting through a green filter and a halftone screen (on which the dots are aligned at 75° from the horizontal), a negative film was produced called a magenta printer. Then the color photograph was shot through a red filter and 15° halftone screen to produce the cyan printer, which was used to burn the printing plate. A blue filter and a 0° halftone screen were used to produce the yellow printer. A light green filter and a 45° halftone screen were used to produce the black printer. This seems complicated until you know that a blue filter transmits blue light and absorbs the red-green light and that since this process is in negative and the complementary of blue is yellow. Therefore, a blue filter produces a yellow printer. Right!

The different screen angles are used to insure that the screen patterns do not produce a moiré effect. Take a hand lens and look at a printed color photograph. Cyan dots mixed with yellow dots produce what appears to the unaided eye as green. Magenta and yellow dots produce red. When well printed, the dots fall into tight little patterns called rosettes. If the image were not broken into tiny dots, the printing press could not reproduce the color image. To make all of this work, it is also necessary to maintain very precise registration. Presently, color films have a resolution of over 2,000 lines to the inch. This technology has transformed informational books.

Nowadays, a high-speed electronic scanner using a laser beam breaks a color transparency into the four printers and generates a very precise dot pattern at the same time. The printed pictures that have been scanned are clean and sharp as a result of the dot formation and registration. Nowhere is the new scanner technology shown to better advantage than in the new edition of *The Complete Tales of Beatrix Potter*.

When we started *Children's Book Review* ten years ago, the majority of books were fiction. My favorite informational book was *A Natural History of Zebras*, illustrated with silhouettes by Ugo Mochi. Now, whilst the number of children's books published annually is fairly constant, the percentage of full-color informational books has sharply increased at the expense of fiction. The percentage of picture books remains about the same as ten years ago.

I have never believed the old clichés that of the five senses, the visual is the easiest to manipulate. Seeing in our world is *not* always believing; it may be special effects. Sometimes a picture is worth only one word: rot!
The other day, the Children's Book Review editors were looking at a book on deserts. The opening pictures were pure sand; barcan dunes absolutely without flora or fauna. In sharp contrast, the next chapter, focusing on animals who live in the deserts, was filled with pictures not of deserts but of steppes with near-continuous vegetation with a variety of animals. Because the photo editors chose pictures of extremes and had not given it a balanced view, we decided not to review it nor to add it to the collection.

Anyone who has studied John Hedgecoe's The Working Camera will understand that the lens focal length, and the composition of a picture can radically change what we think we are seeing. How a picture is cropped changes what we see. The way a picture is color proofed affects what we think we see.

About all the computer has done for books is to load it with "typos" and "u-gly hyp-henation." Photography has completely transformed children's books. Even my beloved grade one reader, Work-a-Day Doings on the Farm, with its simple line art, is light years away from the lavish, full color of Edith Kunhardt's I Want to be a Farmer. Here, the author is the photographer, and the unity of the idea is captivating. Tiger, by Michael Bright, has to depend on many photographers. In addition, tigers are not as cooperative as little boys. A tiger book without photographs would not as successfully elicit support for the survival of the tiger. In addition, photography has made possible art reproductions. What would any of Paul Goble's sacred Indian stories, e.g., Buffalo Woman, etc. be without the lavish India ink and water color art photographically reproduced in the books? And what would the Scribner classics be without the reproductions of the N. C. Wyeth paintings?