

Special Commentary

A LOST ART: Geological Illustrations

Daniel Francis Merriam, University of Kansas, 1930 Constant Avenue, Campus West, Lawrence, Kansas 66047, USA, dmerriam@ku.edu

And what anatomy is to the figure painter such is geology to a landscape artist.

—Miss Lizzie J. Williams (1872)

In pre-computer days, if you can remember, illustrations for scientific papers were often prepared by the author either as sketches, line drawings, or in some other art form, such as watercolors or oil paintings. Natural scientists recorded their findings as sketches in the field or from photographs of perspectives of features they wished to convey to their audience. In this manner they could emphasize special features or landscapes as needed to make their point; these illustrations are a form of communication. Geologist's field notebooks, for example, could be full of sketches of field relations, measured stratigraphic sections, or fossils—many works of art. Some of these scientists were naturally talented artistically, and some could have made their living as commercial artists (Merriam et al., 2005, 2006; Merriam and Charlton, 2007; Merriam, 2007a) (Fig. 1).

A study of the conceptual uses of visual images in an early nineteenth century [pre-computer] science may help in a small way to counter the common but intellectually arrogant assumption that visual modes of communication are either a sop to the less intelligent or a way of pandering to a generation soaked in television.

—Martin J.S. Rudwick (1976)

Field conditions in the early days were usually stressful at best, and transportation was by foot, horseback (Fig. 2), or horse-drawn vehicles. Living outdoors was in make-shift accommodations, as pictured by Sir William E. Logan (1798–1875), first director of the Canadian Geological Survey (Fig. 3), or in none at all. Shipboard accommodations were crude and often very uncomfortable. These hardy souls made the best of the situation and recorded their findings as they went along.

Line drawings or sketches were and are the usual way of recording field observations by natural scientists, almost always accompanied by detailed field notes. These field or laboratory renditions, then, could be used for publication either directly from notes or redrawn for clarity. Those who were artistically challenged relied on artistic relatives or scientific illustrators to do their bidding. Later, some geologists, who were pressed for time, developed a technique of inking on photographs and



Figure 1. Wiley cartoon reproduced with permission.



Figure 2. W.H. Holmes' panoramic view of the Green River, which included in Peale's report in the U.S. Geological Survey Monograph of 1879.

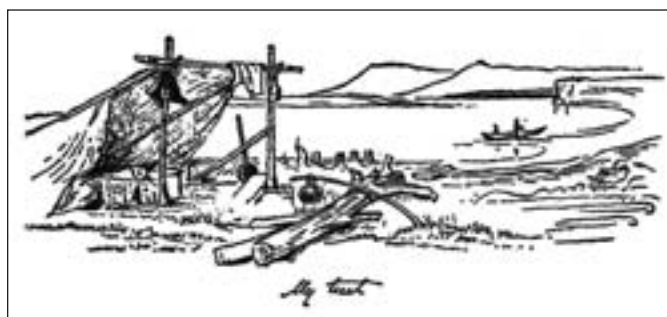


Figure 3. William Logan's field lean-to tent (Fenton and Fenton, 1945).

then bleaching the photo, or drawing on a photograph that had not been fixed, and the image naturally faded, leaving the line drawing.

Louis Agassiz (1807–1873), the Swiss Alpine geologist who immigrated to the United States, had a variation on the identifying features on his drawings. Instead of making the identification on his good sketch, he would make an outline accompanying sketch with all the features named and identified (1840; Fig. 4).

For many of the geologists, the talent for art came naturally; for others, it was developed. It should be remembered that pre-computer geology was mainly a historical science—qualitative, not quantitative. Artistic ability was a talent that gave a researcher extra and special benefits. There were no typewriters, no whiteout, no clear tape, no Xerox. Who were some of these multi-talented, now well-known scientists?

Carolus Linnaeus (1707–1778), the Swedish naturalist, is a good example of a scientist who took copious field notes with accompanying illustrations. True, other than his portrayal of plants, his drawings were crude, but served as reminders of adventures and sights (Blunt, 1971). Alexander von Humboldt (1769–1859), the German world traveler, kept a log on his extensive travels that included illustrations of flora, fauna, and places of interest (Botting, 1973; Fig. 5). Likewise, Charles Darwin (1809–1882), the English biologist/geologist, kept a journal on his round-the-world journey on the *Beagle* with hand-drawn illustrations (Moorehead, 1969; Fig. 6).

The way of scientific illustrating, however, changed with the introduction of the camera. Multiple records could be made easily and quickly almost anywhere a camera could be trans-



Figure 4. Agassiz's "Glacier de Viesch" (1840) with notations.



Figure 5. Alexander von Humboldt's fish illustration (Botting, 1973).



Figure 6. Charles Darwin's South American geology map (Herbert, 2005).

ported. Photography developed from glass-slide negatives taken with large cameras and equipment to digital instant photographs with pocket-sized cameras. With the introduction of computer graphics, hand-drawn illustrations have all but disappeared, although some representations, say of the three-dimensional (3-D) block diagrams, cannot be captured on camera. Nevertheless, the fashion of hand-drawn illustration has carried over into the twentieth and twenty-first centuries by a few outstanding scientists, and the literature still contains a few excellent scattered examples.

Early explorations in the American West were often made under difficult conditions and in areas of hostile Indians. Early reports of the U.S. Geological and Geographical Surveys of the Territories (popularly known as the King, Hayden, and Powell surveys) of the nineteenth century contain a multitude of beautifully hand-drawn sketches, maps, and cross sections (Fig. 7).

Many of these renditions were by William H. Holmes (1846–1933), the noted geologist/artist. Holmes illustrated Grand Canyon panoramas as "...marvelously accurate in their geology, [making] the atlas that accompanies Dutton's memoir perhaps the most beautiful American geology book ever published" (Faul and Faul, 1983, p. 204) (Fig. 8). The Dutton (Clarence E. Dutton, 1841–1912) reference is to his 1882 report on "The Tertiary History of the Grand Canyon District," for the U.S. Geological Survey.

William Morris Davis (1850–1934), the American geomorphologist and founder of the American school of physiography, constructed beautiful 3-D block diagrams to illustrate a progression of topographic landforms of an area through time.

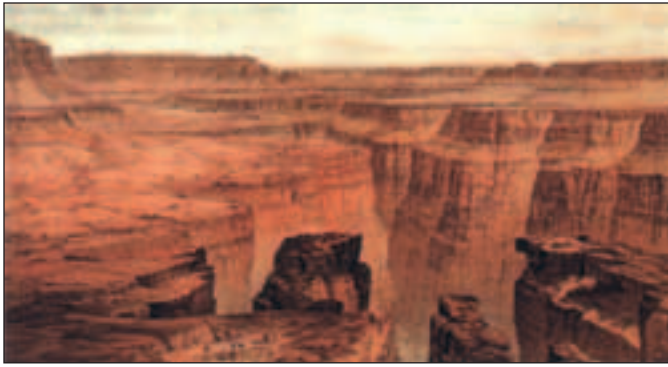


Figure 7. W.H. Holmes' Grand Canyon; a version was reproduced by A. Geike in his widely used textbook (1882).



Figure 10. Hans Cloos, upturned beds (1953).



Figure 8. W.H. Holmes' Grand Canyon in C.E. Dutton's monograph (1882).



Figure 11. Hans Cloos, river (1953).

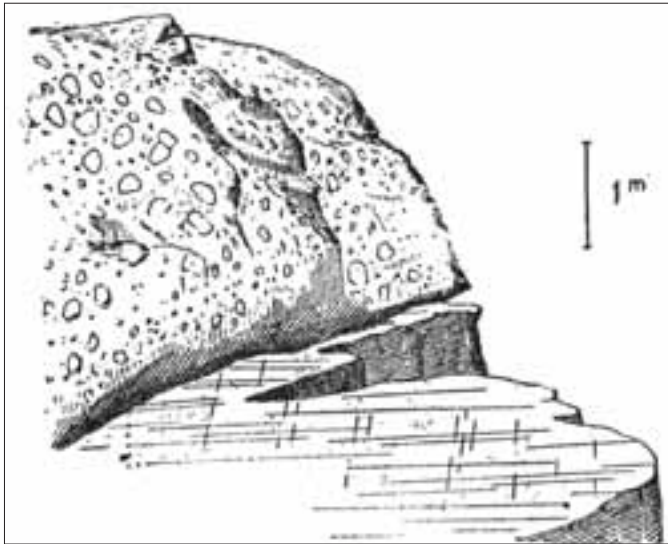


Figure 9. Amadeus Grabau's conglomerate outcrop (1920).



Figure 12. Hans Cloos, sand dune (1953).

Amadeus Grabau (1870–1946), a former professor at Columbia University and long-time professor at the Government University of Peking (China), illustrated his *Textbook of Geology* (1920) with drawings from a variety of sources (Fig. 9).

One of the more masterly works of art is in Hans Cloos' (1885–1951) autobiography (1953), which is profusely illustrated with beautiful hand-drawn 3-D block diagrams and hand-lettered maps and cross sections (Figs. 10–12). The illustrations accompanying his text show that “he had a keen source for aesthetic harmony and symmetry of form. His hand-drawn

sketches resemble those of Albert Heim (1849–1937), the great Swiss Alpine geologist, in many ways, and in his writings, he must have had a desire to maintain classical simplicity and elegance” (Balk, 1953, p. 91). Another beautifully illustrated book is by the Dutch geographer/historian Henrik Willem van Loon (1932). The features van Loon (1882–1944) discusses throughout the book are illustrated by maps, cross sections, and 3-D scenic views, some reproduced in color (Fig. 13). It is almost the ultimate for what can be produced by an artistic scientist.

Some more recent scientists preferred to augment their works with their own illustrations. Two good examples are the work of American Philip B. King (1903–1989) in his 1977 book on structural geology (Fig. 14), and Jean Goguel (1908–1987), the French geologist/engineer, produced wonderful sketches in his book on tectonics in 1962 (Fig. 15).

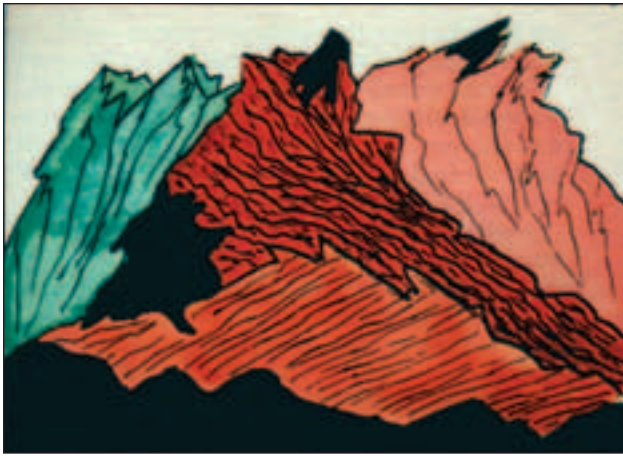


Figure 13. Henrik van Loon's book color illustration (1932).



Figure 14. Philip B. King's south seas (1977).

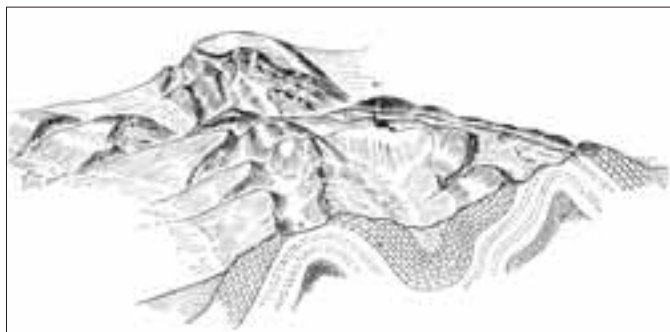


Figure 15. Jean Goguel's geologic structure (1962).

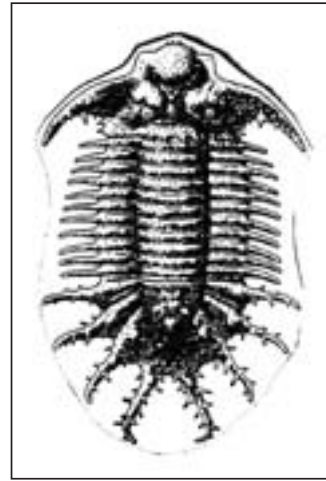


Figure 16. The trilobite *Teratespis* by R.C. Moore (Moore et al., 1952).



Figure 17. R.C. Moore's reconstruction of an ancient swamp (Moore and Merriam, 1959).



Figure 18. R.C. Moore's reconstruction of an ancient landscape (from author's personal collection).

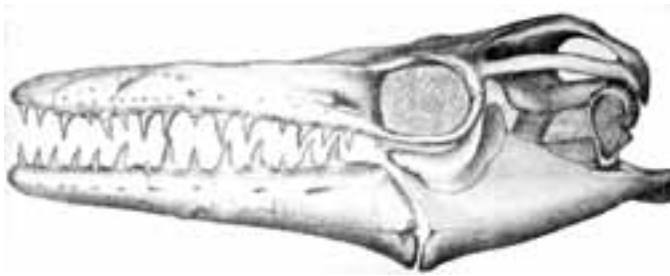


Figure 19. A mosasaur, *Mosasaurus*, by S.W. Williston (Shor, 1971).

The American paleontologist Raymond C. Moore (1892–1974) not only drew paleontological illustrations for his publications (e.g., Moore et al., 1952; Fig. 16) and field sketches, but crafted masterfully artistic restorations (Merriam, 2007b; Figs. 17–18). Samuel Wendell Williston, the famous paleontologist/biologist who taught at both the University of Kansas and University of Chicago, also drew his own illustrations of fossils and reconstructions of their living environments. Williston “never had a hired illustrator working for him, but, thanks to his own background in anatomy and competence in drawing, he could do all his own illustrations” (Shor, 1971, p. 178; Fig. 19). These geologists probably could have been successful commercial artists.

Some, if they did not have the talent or the time, had a relative produce the illustrations. Edwin H. Colbert (1905–2001), an American vertebrate paleontologist, had his professional artist wife, Margaret Colbert, produce superb illustrations, and Erasmus Haworth (1855–1932), state geologist and director of the Kansas Geological Survey at the University of Kansas, had his sister-in-law, Harriet (Hattie) M. Huntsman of Lawrence, prepare many of his illustrations for publication.

There is something satisfying to the reader about illustrations prepared by the author—it gives some insight into the scientist’s thinking and ability. This artwork, like music, transcends national, subject, and scientific interest and can be appreciated by all. In days of yore, the scientist took time to study the subject in depth and to render it as seen through his or her eyes and so noted. The examples given here are only a small sample of the fine artistic workmanship that can be found in the older literature. Look, read, and enjoy!

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