

The Imaging an of Erased Manuscript Page

The Jewish Theological Seminary of America owns an illuminated prayerbook from Renaissance Italy, MS 8224. The origin of this manuscript was unknown, because the colophon, the page which normally gives the name of the person who copied the manuscript, the place and date of the reproduction, and the person who commissioned the copy, had been erased.

To the human eye, only slight traces of the writing still exist on the colophon. Nothing on the page is legible. If the page is viewed under ultraviolet illumination, the writing is still illegible. Even infrared photography produced no results.

While exploring other possibilities, the JTSA came in contact with researchers at the Chester F. Carlson Center for Imaging Science at the Rochester Institute of Technology. For the last decade, Dr. Roger Easton and Dr. Keith Knox have developed methods to reveal degraded text on ancient manuscripts. Initially they worked on photographs of the Dead Sea Scrolls and have found characters that were previously unknown by the scholars. Most recently, they have been working with the Walters Art Museum of Baltimore, MD, to recover the writings of Archimedes from a thousand-year-old manuscript that has been erased and overwritten.

The technique used is a two-part process. First, the manuscript is illuminated with different types of light, ranging from infrared through the visible to ultraviolet. The images are recorded with a professional-quality digital camera. Next, the images are processed using specially developed software to enhance and extract the text from the background noise.

These steps are shown in the figures below. Figure 1 is an image of the colophon, as it appears in visible light. The general shape of the writing can be seen, but the characters are illegible.

The image in Figure 2 was taken with ultraviolet light. Many characters can now be read in this image. Unfortunately, the most important characters that reveal the names of the copyist and owner are not distinct. More can be seen in this image, than can be seen directly with the eye under ultraviolet exposure, because the digital camera can record a greater range of gray levels than can be seen directly.

Figure 3 shows a processed version of the ultraviolet image. An algorithm was developed to smooth the noise in the background of the image, without blurring the characters. This processing helps one to see the characters that have been most severely degraded. The copyist, place and date have now been determined from this image.

Keith Knox, Roger Easton
Chester F. Carlson Center for Imaging Science
Rochester Institute of Technology
17 January 2002

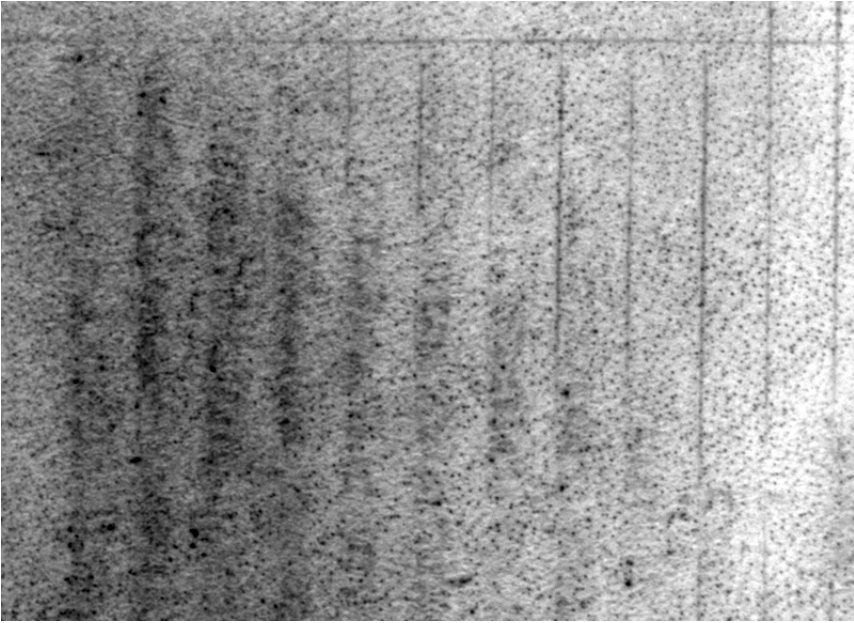


Figure 1. Colophon seen in visible light.

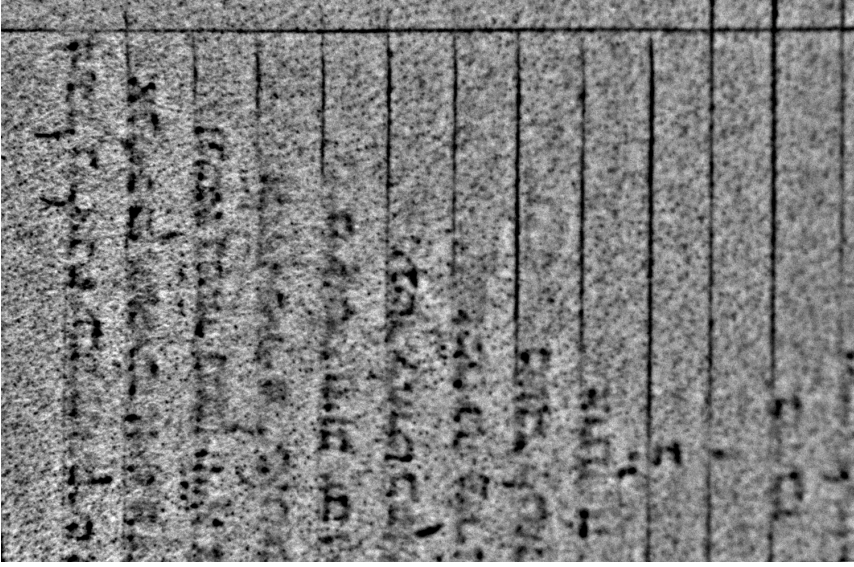


Figure 2. Colophon in ultraviolet light.

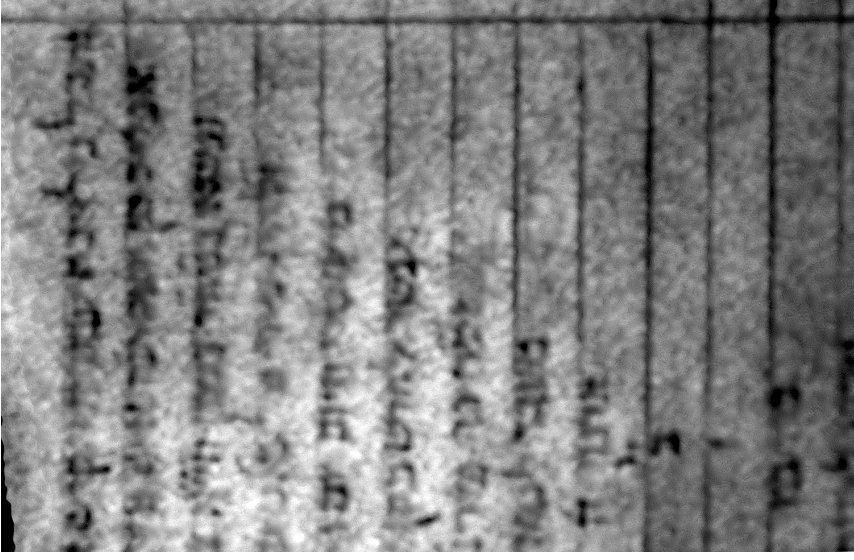


Figure 3. Processed to suppress noise.