



**Re: Final processed images**

Saturday, August 27, 2011 5:09 PM

**From:** "Keith Knox"

**To:** [awisnicki](mailto:awisnicki)

Adrian,

Here is the description of the extra work:

There were a few unusual aspects of the image processing on the Livingstone Diaries project that were not anticipated. The standard, readily available processing routines to generate pseudocolor and sharpie images produced results, but not of sufficient quality to enable the scholars to read all of the handwriting.

Several experimental methods were developed to reveal Livingstone's handwriting in three difficult regions, i.e. handwriting on top of printed text, ink that has bled through the paper, and a few places where external blotches were covering the handwriting. A fourth process was developed to reveal the surface topology of the paper.

A spectral ratioing process was developed that divided a visible image by its corresponding infrared image and then enhanced the contrast of the ratio. The resultant images suppressed the printed text so well that Livingstone's handwriting was clearly legible, with no interference from the printed text.

A second process was developed that combined scanned images from both sides of a page to suppress the writing that had bled through from the back side of the paper to the front side. The result of this process was to color the text from the two sides different colors, making the writing on the front side easier to read.

A method to extrapolate the spectral nature of the handwriting further into the infrared was developed. The method successfully extended the spectral range beyond what was measured, but it did not help the handwriting covered by the blotches to be read. However, as part of that process, an "intercept" image was generated that revealed the characters under one of the blotches, enabling all of those characters hidden by the blotch to be read.

The last process used the raking light images, taken from opposite sides and in infrared light. These images were divided by the corresponding non-raking, infrared image and the difference of the ratios was computed and contrast enhanced. The result show the surface topology of the paper with the writing removed, revealing the tears, folds and wrinkles.

As a result of these new processes, about half of the total writing, that would was very difficult to read, is now clearly legible. In addition, the surface topology of the paper has been revealed and recorded for scholars to study.

Keith