

## Livingstone Briefing: Forensic criticism through ink analysis

### What is so innovative about the 'scientific' critical analysis of the diary text?

One of the crucial innovations demonstrated by the Livingstone Spectral Imaging Project (<http://livingstone.library.ucla.edu>) is the way that traditional literary criticism techniques can be enhanced through the application of new scientific and technical processes – in this case spectral imaging – as they are applied to old and damaged manuscripts. The innovation has important implications for the cross-disciplinary field we refer to as 'forensic criticism'.

The difference between interdisciplinary and cross-disciplinary research is significant. It is common for major research projects to take an interdisciplinary approach, where existing insights from several disciplines are used for literary analysis of a manuscript. By contrast, cross-disciplinary analysis encourages innovation *across* disciplines in the service of the project. In the first phase, each group of specialists (e.g., scholars, scientists) working on a project makes discoveries that will be of interest to specialists in their own field. In the second phase, the innovations from multiple fields are brought together and integrated to produce new, cross-disciplinary discoveries. The outcome is a project that holds interest for specialists in each field, but that also has appeal across fields.

### What does traditional literary criticism tell us about the diary?

Traditional literary criticism focuses on the written word. It analyzes the language, the form or mode (biography, diary, letter, novel, etc), the syntax, and, in the case of hand-written manuscripts, it also takes into account the appearance of the script and the circumstances in which it was created.

We know from the publishing process of two earlier expeditions in Africa that Livingstone intended to write three versions of events: the field diary, which was a personal and private record of events; the journal, where he began his editing process; and the book, which he published on his return.

On his third and final expedition this process was interrupted. He wrote his field diary (stage one), and transcribed most of this into his journal (stage two) – and then he died. Horace Waller edited the posthumous book, published in 1874 as *The Last Journals of David Livingstone*.

So, Livingstone did not intend this 1871 Field Diary to be published. As a private diary, he wrote in a form of shorthand. Although Livingstone generally writes with a very neat hand, the handwriting analysis suggests that his primary concern was recording his experiences in a simple and concise manner rather than producing elaborate and refined (ie publishable) entries. His sentence structure is compressed, which means that he misses out words and also uses shortened versions of names and places with which he was familiar. The text is littered with dashes, words that are underlined for emphasis, and truncated sentences. As a result the syntax and punctuation appear awkward, while the spelling is decidedly idiosyncratic. He included maps and small sketches, which appear in the margins.

We also know that he was writing in extreme environmental conditions. In particular, since he had run out of clean paper and iron gall ink – a contemporary ink that generally has survived well over time – he made 'ink' from the crushed seeds or berries of indigenous plants, as the following diary entry makes clear:

7<sup>th</sup> April 1871 made this ink with the seeds of a plant called by the Arabs Zingifure  
It is known in India and here is used by the Manyema to dye virambas [a locally produced  
cloth woven from a special type of grass] and ornament their faces and heads

Therefore we know that Livingstone wrote the 1871 Field Diary in at least two kinds of ink: iron gall ink and ink created from Zingifure pigment. The pigment was bright red, although it has now faded and appears faint orange or yellow.

### **What does spectral imaging add to the literary critical analysis?**

For the first time the material page of the diary (its creases, deliberate folds and environmental damage, eg from water stains) and the various inks Livingstone used have been subjected to advanced scientific and technical analysis. In particular one of the project team's imaging scientists, Dr. Roger L. Easton, Jr. (Rochester Institute of Technology), in collaboration with external adviser Dr. Fenella France (U.S. Library of Congress), has developed a technique to identify and characterize the chemical ingredients of inks and colorants. Dr. Easton has analysed the precise composition of the ink compounds Livingstone used, to the extent that we can now see how this 'ink' changes, even over the course of a single page of text.

### **What does the ink analysis show?**

The example we present here relates to a single diary page – the page on which Livingstone recorded his eye-witness impressions of the events immediately preceding the massacre and the actual scene of the atrocity, in which 400 innocent people in the market at Nyangwe were gunned down.

In the images provided on this press website, we show the page in natural light and again after processing. In the first image ('Livingstone imaging massacre page natural light'), you can see that the printed text of the *London Standard*, over which Livingstone wrote, is quite clear, whereas Livingstone's script is faded. In the second page ('Livingstone imaging massacre page processed') the under-text has been suppressed and Livingstone's writing enhanced, so that it can be read.

Dr. Easton's ink spectra graph ('Livingstone imaging massacre page, ink analysis'), which should be viewed in conjunction with these 'before and after' images, shows the variations in the ink composition over this single page. Most importantly, it demonstrates through scientific data that mid-page Livingstone decided to change from one type of ink to another. (This ink switch cannot be determined with any certainty by studying the page just with the naked eye). The first paragraph is in Zingifure ink, the second, apparently, in a combination of Zingifure and iron gall ink.

This switch in ink reveals a clear connection between text and material document; a link that is lost in a simple transcription of the diary's words. The material evidence of the page, coupled with the textual content (the narrative of the opening stages of the Nyangwe massacre), suggests that Livingstone realised that he was witnessing an event of great importance and turned to his remaining supply of iron gall ink in an attempt to preserve his words more permanently on the page.