



SESSION REPORT

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Title of Session *New findings and ancient texts*

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The panel dealt with the interface between technology and philology. The vast majority of literary, technical, scholarly and scientific work from ancient Greece and Rome has long since disappeared, victim to larger cultural and political developments. But new texts continue to appear, for instance from excavations in Egypt, which give physical form to the work of authors previously known only by name or through sparse references in later texts, or which expand the corpus of other authors by restoring works previously lost. In some cases the finds turn received wisdom on its head. Some of these texts are so damaged, by erosion or erasure, by overwriting or by fire, that they require the intervention of modern technology simply in order to make the words on the page visible. The three papers proposed will address the issue of making visible these seemingly lost words and the way in which the act of rescue forces us to rethink what we know about our past.

Intervention 1

Prof Robert Fowler, University of Bristol, Robert.Fowler@bristol.ac.uk

Ancient papyrus books carbonised in the eruption of Vesuvius in AD 79 were found in their hundreds at the Villa of the Papyri, Herculaneum, in the 18th century. Early attempts to unroll them were disastrously destructive, but did expose many layers of blackened papyrus with barely legible writing on them. In recent decades the application of multispectral imaging (MSI) enabled the decipherment of large stretches of these papyri, by finding frequencies of light in the infra-red range which the ink, but not the background papyrus, reflected back at the scanner. More recently still, philologists are teaming up with physicists and computer scientists in an effort to discover a way to read the scrolls that are still rolled up, without physically touching these incredibly fragile objects. First experiments with X-ray computed tomography (XCT) enabled the layers within the rolls to be mapped, but did not identify ink on those layers. The challenge is to distinguish carbon-based ink from carbon-based papyrus; where metal is present in the ink (as it was routinely in later antiquity), CT has little difficulty in telling them apart. In a second

stage, investigators have been using X-ray phase-contrast tomography (XPCT), which measures not the intensity of absorption (as in ordinary CT scanning) but changes in the character of the rays as they pass through the ink. Some hazy letters are emerging from this method, encouraging further exploration. Finally, a team led by Prof. Brent Seales at the University of Kentucky has found that ordinary CT scanning at lower power levels can identify ancient ink at a success rate of about 60%. They propose to apply computer learning to refine the process. In the same way that your emailer, on the basis of ever more samples, becomes better and better at identifying spam, a computer can 'learn' how to distinguish ink from papyrus using millions of images, in a range of settings, of papyri where we already know what is ink and what isn't; ultimately, the rolled-up papyrus with its unknown contents can be put under the scanner, for (one hopes) the great eureka moment.

Intervention 2

Dr Kathryn Piquette, Senior Research Consultant and Imaging Specialist, UCL, k.piquette@ucl.ac.uk

Advances in modern imaging techniques are enabling the recording and study of ancient documents in unprecedented detail. The immediate material world of the document—surface colour, shape, texture, reflectance, and so on—can now be systematically documented, characterised and analysed. Largely non-destructive techniques such as Decorrelation Stretch, Spectral Imaging and Reflectance Transformation Imaging can recover hidden text or enhance difficult-to-read writings on papyrus, parchment, and tablets of wood, metal and clay, and so on. One of the more user-friendly and affordable techniques to appear in the last decade, and with the added benefit of being Open Access, is Decorrelation Stretch or “DStretch”, a plug-in for the open source software ImageJ. DStretch can be usefully applied to colour (RGB) digital photographs to enhance faded pigment. DStretch has been used primarily for rock paintings, but success has also been achieved for painted inscriptions and graffiti. Cases arise where more advanced and costly techniques are required, such as multispectral imaging. The average human eye can perceive radiation emitted in wavelengths between 390 to 700 nanometres but some materials the inks and paints used for writing are only visible in the shorter ultraviolet (UV) or longer infrared (IR) wavelengths. Applications range from the recovery of inks and paints on papyrus on parchment and other surfaces to detecting colourants in textiles. Spectral imaging equipment is costly and requires a relatively high level of expertise, but close range digital UV-VIS-IR imaging is becoming more accessible with off-the-shelf consumer-grade digital cameras. Some text-objects have complex surface shapes which present challenges for such fixed-light imaging techniques, however. Depending on object shape, material type and texture, writing may be lost in shadow or specular highlights. Reflectance Transformation Imaging (RTI) describes an image-based recording techniques for accurately capturing colour, surface shape and reflectance information. Based on photometric stereo, which entails comparison between images acquired with a fixed camera and object locations but varying lighting, RTI provides the appearance of 3D shape through virtual relighting and artificial enhancements of surface texture. RTI visualises fine surface texture, subtle relief, impression and other modifications to material surfaces. This multi-light method of digital photography is relatively easy to learn and the cost of equipment required for the manual method, Highlight RTI (H-RTI), is within the budgets of most projects. In addition to revealing lost writings or enhancing those that are difficult to read, high-resolution imaging techniques are providing a new window onto text-object life histories, revealing in compelling detail traces left behind by the writer and readers of the distant past, including marks from writing implements that reveal technique and habit, as well as evidence for use and re-use. While digital imaging techniques are rapidly advancing the study of ancient documentary evidence and providing with more holistic research opportunities, modern techniques also raise important questions about access, knowledgeable use of image data and data management.

Intervention 2

Prof Chris Carey, UCL, c.carey@ucl.ac.uk

The text I discuss, the Archimedes Palimpsest, is a prime example of the riches which can come from collaboration between specialist in different disciplines across the Arts and Humanities and Scientists.

We think of recycling as a modern concept. But it's been around forever. Old tombstones built into city walls. Pagan temples turned into mosques or Christian churches. Writing materials are a prime target for recycling. Especially expensive and hard wearing writing materials like parchment. Parchment is expensive to produce and too valuable to waste. In the case of parchment the recycling process involves painstakingly rubbing the surface to scrape off the ink and produce a new surface for writing on. That's all a palimpsest is – a page scraped clean with a new text written on top. The scraped text almost always leaves traces but the traces are difficult, sometimes impossible, to read.

In 1229 a Byzantine monk did this to a number of pagan texts from ancient Greece so that he could copy a prayer book. The prayer book found its way to France by the early twentieth century. At this point it simply disappears from public view. During that period, its state deteriorated. By the end of the century quite a number of pages had been badly affected by mold, which not only obscured but actually destroyed some of the ink. During this period someone forged paintings (copied from book miniatures) on some of the pages, presumably to enhance its potential sale value. Finally the book came on to the open market; it was auctioned by Christies in New York in 1998 and was bought by a US buyer with a love of books and the means to take care of it. He handed it to the Walters Art Museum in Baltimore for curation. The book had to be carefully dismantled and mended and previous mistreatment and crude repairs reversed.

At this point they started imaging. Initially the scientists worked to strip off the top text in order to read the older text underneath. The problem was that the top text sits on top of the undertext and so large portions of the undertext are removed at the same time. The team therefore worked to create a system for keeping both texts but differentiating them. The imaging process relied on the fact that different materials respond to different wavelengths of light. Paper and ink; different kinds of ink. The pages were imaged in 12 different wavelengths of light and images were processed and combined to produce an image which shows both scripts with one seemingly superimposed on the other. The result is elegant, though horribly difficult to read. But it can – mostly - be read. It takes several pairs of eyes and the texts have been extracted by scholars in several countries working together to pool time and expertise.

One of the ancient authors recycled in this text was the mathematician Archimedes and the palimpsest also included fragments of works which had not survived. Another was an Athenian writer and politician from the fourth century BCE named Hypereides. Still another was an ancient commentary on the work of Aristotle. My involvement was with the Hypereides section, an author known almost entirely by name and scattered references in ancient texts until modern discoveries provided us with substantial fragments and in this case the new text provided new insights into Athenian political history and Athenian law.

Remarks, conclusions and recommendations

The session raises interesting questions about the structure of CIPSH conferences. This conference was designed to emphasize the contribution which the Humanities can make. Consequently it was organized with a focus on public policy, on opportunities and threats for the Humanities, and on their impact. This was a wise decision for the first conference of its kind. This session was one of a small number designed to foreground questions of research method, developments and results. Both dimensions clearly are important and subsequent CIPSH conferences will wish to strike a balance between the two approaches. CIPSH will wish both to show at a macro level how the Humanities can make a practical impact on our world and the implications for support for the Humanities; but it will also need to demonstrate at the level of delivery what distinguishes the Humanities in terms of research method and what emerges from a Humanities-based approach to aspects of human experience.