

INTERDISCIPLINARITY

Inside Manchester's 'arts lab'

Peter E. Pormann on the revelations a meshing of technology and humanities can yield.

Digital pioneer Steve Jobs delivered a potent commencement address at Stanford University, California, in 2005. He described how, as an undergraduate, he had studied calligraphy rather than his prescribed curriculum (he later dropped out). Calligraphy may have seemed at the time to have no practical application, but a decade later, when Jobs was working on the Mac, it enabled him to promote proportional fonts and establish Apple as the gold standard in desktop publishing. Jobs fruitfully combined the “liberal arts and technology” — a phrase he used repeatedly in his last keynote addresses before his death in 2011.

Productive interaction between the arts and sciences is at the heart of the John Rylands Research Institute at the University of Manchester, UK. Founded in April 2013, the institute (which I direct with associate director and head of special collections Rachel Beckett) now has a staff of more than two dozen. It brings together scientists, conservators, curators, digital-imaging specialists and humanities scholars to unravel, reveal and realize the research potential of the University of Manchester Library's special collections. These run from clay tablets to e-mail archives. Highlights include Greek, Coptic and Arabic papyri, medieval Hebrew and Persian manuscripts and early-modern printed books — such as one of the world's finest collections of volumes printed by Renaissance humanist Aldus Manutius. The institute was established in response to the rise of digital humanities, a field that enables the study of books and manuscripts in ways that were unimaginable a generation ago.

There have been triumphs and tribulations. We have raised more than £3 million (US\$4.6 million) in funding from sources such as the British Academy and biomedical-research charity the Wellcome Trust. The institute sits in the already-crowded John Rylands Library, where its rapid growth is a challenge. But our 'arts lab' is taking research into uncharted territories by shattering disciplinary and institutional divisions.

To make complex collaborations work, we instigated a buddy system. All researchers — PhD students, postdocs, visiting academics and colleagues with funding for pilot



Erased text in the Syriac Galen Palimpsest is made visible by multispectral-image analysis.

studies — are allocated a curator with intimate knowledge of the materials they study. Art-history postdoc Elizabeth Savage, for instance, won a three-year early-career fellowship from the British Academy to study thousands of fifteenth- and sixteenth-century prints collected by Hiero von Holtorp, a nineteenth-century scholar of early printing technology and aesthetics. Her buddy is visual-collections manager Stella Halkyard, who helped to rediscover this remarkable legacy. Savage also works with colleagues at the library's Centre for Heritage

Imaging and Collection Care (CHICC), who pioneer innovations in colour print photography, such as lighting techniques for imaging gold. Combined with close-ups of pigments, these techniques have helped Savage to identify some of the earliest examples of printed gold ink.

Work at the CHICC is also revolutionizing understanding of papyri and palimpsests — manuscripts from which text has been erased to allow reuse of the page. Researchers have made detailed images of artefacts using cutting-edge technology: a 60-million-pixel



INTERDISCIPLINARITY
A Nature special issue
nature.com/inter

digital sensor, combined with a MegaVision EV LED illumination system. This combines high-resolution photography with multispectral imaging, which captures data at frequencies across the electromagnetic spectrum. It can reveal once-unreadable texts, because different inks reflect light in different spectra differently. Thus papyrologist Roberta Mazza has discovered the ‘Last Supper amulet’, a papyrus with biblical passages on one side and a grain-tax receipt on the other. Mazza traced its provenance to near ancient Hermopolis in Egypt, close to modern Al Ashmunayn.

We are also collaborating with scientists including Mark Dickinson, a physicist and medical-imaging specialist at Manchester’s Photon Science Institute. Medical imaging is rich in techniques that can be used to analyse artefacts, such as optical coherence tomography, which is usually harnessed for imaging tissue or visualizing blood flow. Dickinson has tested it on carbonized papyri too delicate to unroll, revealing hidden text.

Also key to investigating the collections is image analysis. We are using statistical techniques such as canonical variate analysis (CVA), which compares group structures in multivariate data, to read erased text on palimpsests. CVA is applied to a multispectral image and an algorithm is trained to recognize overlying text, the erased underlying text and areas where the two coincide. This effectively maximizes the contrast, so the under-text ‘pops’ out and becomes more readable.

A £1-million image-analysis project that grew partly out of a collaboration with the

CHICC and has received funding from the UK Arts and Humanities Research Council is studying the Syriac Galen Palimpsest. This is an eleventh-century liturgical work that carries an erased sixth-century undertext — a Syriac translation of *On Simple Drugs* by the classical physician Galen (around AD 129–216). We already had a large data set of multispectral images; now images of the same page are being combined to make the under-text more legible (see picture). Overseeing this is computational primatologist Bill Sellers, who ordinarily uses computer modelling to reconstruct the movements and evolution of extinct species.

All of this work generates large sets of images, stored as TIFF files. These raise the question of how to store and analyse big data. A challenge will be establishing integrated systems to allow comparative research across platforms. For Greek papyri and Hebrew and Persian manuscripts, we plan to develop solutions with the Cambridge Digital Library; this will feed into the iLibrary strategy to bring our digital collections and projects under one roof. We can also look at large amounts of texts and metadata with the tools of computational corpus linguistics — which studies language through samples of real text — and text mining, which hunts through text to extract data. One such tool is the language-processing software system U-Compare.

“The nature of the institute binds ancient artefacts to state-of-the-art science.”

Some of our collections are born digital — for example, we hold the e-mail archives of local literary publishing house Carcanet — and future researchers will undoubtedly approach these differently from how they look at hand-written correspondence. We have begun to collaborate with computational linguists at Manchester’s National Centre for Text Mining, as well as colleagues at the nearby Centre for Translation and Intercultural Studies, who have vast experience with large sets of multilingual texts. And with palaeography — the study of ancient handwritings, their dating and their classification — artificial intelligence might offer research avenues that the institute is keen to explore. By training software to recognize certain hands and writing styles, one might be able to query vast virtual collections of manuscripts in unprecedented ways.

Delivering the institute’s inaugural lecture, historian Ann Blair of Harvard University in Cambridge, Massachusetts, said: “In embracing new media, we must never discard the old ones.” The interdisciplinary nature of the institute is its signature, the tie that binds ancient artefacts to state-of-the-art science. These form a dual legacy for future generations, who will want to ask different questions of the library’s remarkable holdings. ■

*Peter E. Pormann is founding director of the John Rylands Research Institute at the University of Manchester, UK, and principal investigator on the Syriac Galen Palimpsest project.
e-mail: peter.pormann@manchester.ac.uk*

ANTHROPOLOGY

One-man multidisciplinarian

Clare Pettitt reassesses the legacy of Victorian polymath Richard Francis Burton.

Richard Francis Burton (1821–90) thirsted for and mastered knowledge in so many fields — from geography to sexology — that his real legacy for science is muddled. The flamboyant polymath was an eminent explorer, a pioneer of ethnography and a linguist fluent in more than 25 languages (from Arabic to Swahili) and a number of dialects. He wrote or translated more than 40 volumes, including *The Lake Regions of Central Africa*, published 155 years ago, and the first English edition of *The Arabian Nights* (1885). He was also an enthusiastic amateur of botany, geology and zoology, even running an experiment on monkey communication while living in Sindh (now Pakistan). Overall, this furiously energetic multidisciplinarian both

contributed vastly to knowledge of other cultures and continents, and sometimes misread them to his — and their — cost.

These complex interests were the fruit of a turbulent mind. The eldest son of an army family, Burton had a protean character shaped on the road as his parents moved their young family restlessly around France and Italy. He started to learn Latin at three years old and Greek at four, and quickly picked up French, Italian and local dialects. At the University of Oxford, UK, contemptuous of the teaching methods, he honed his mastery of languages but was expelled for attending a steeplechase. He was soon propelled into the Bombay Infantry and immersed himself in Indian languages and culture. Violent and mesmerizing by turns, he was viewed as both

prodigiously gifted and morally suspect by his contemporaries — as an ‘other’, just as he himself was possessed by otherness.

By 1853, Burton had turned to exploration. Still beset by inner conflicts, he could also attract conflict with others. His great 1856–59 expedition to East Africa with John Hanning Speke, instigated by the Royal Geographical Society in London, was a case in point. It made “formidable contributions to imperial knowledge production”, according to historian Adrian Wisnicki. Although both men were seriously disabled by disease, Burton became the first European to see Lake Tanganyika. He kept dense geographical and cultural notes and meteorological records, and collected specimens for what are now the Royal Botanic Gardens, Kew, and the ▶