

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 ▶

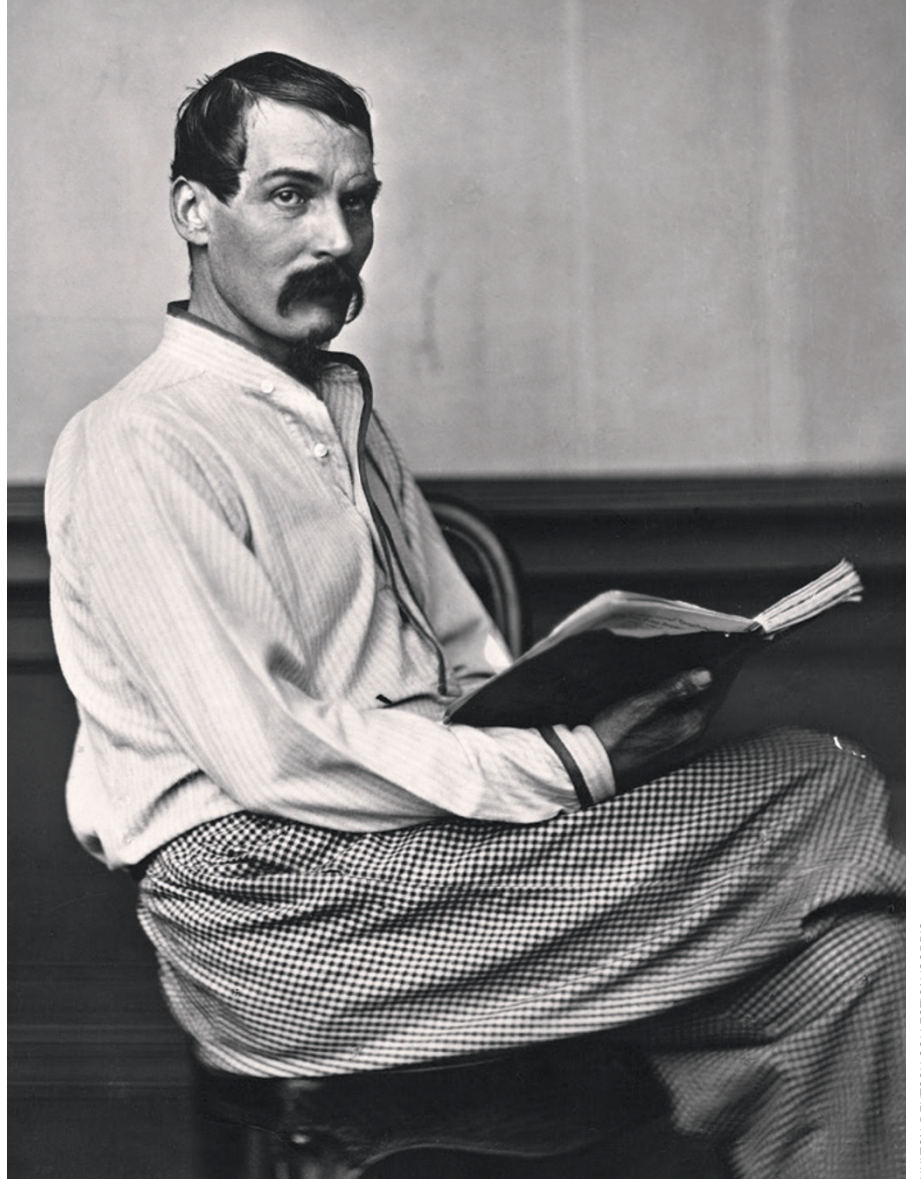
► Royal School of Mines in London. But the expedition led to a bitter rivalry between the two over the source of the Nile, with Speke claiming it as the lake that he dubbed Lake Victoria, and Burton feeling that the evidence failed to add up. Long after their return, in 1864, the British Association for the Advancement of Science called for a debate in London, but Speke died of an unexplained gunshot wound the day before. “The charitable say that he shot himself, the uncharitable say that I shot him,” Burton wrote to a friend.

Burton was shocked, but published *The Nile Basin* that year, reiterating his position in the Nile controversy first detailed in *The Lake Regions of Central Africa*. Burton felt that Speke’s account, *Journal of the Discovery of the Source of the Nile* (1863) had dressed Africa

**“Burton’s immersion in a multitude of languages and cultures gave him a unique perspective on humanity.”**

up in flowery, fundamentally unscientific rhetoric, claiming for instance that a mass of dirty huts (in Burton’s words) was a village built on the most luxurious principles. Burton insisted on using indigenous names and learnt local languages so that he could communicate directly with people he met — and his investigations would prove invaluable to future explorers. “I undertook the history and the ethnography, the languages, and the peculiarities of the people,” he is quoted as saying, adding scornfully that to Speke “fell the arduous task of delineating an exact topography”. Geography, Burton established, was a social as well as a physical science. The explorer Henry Morton Stanley would prove in 1875 that Speke had correctly identified the source of the Nile, but he used Burton’s notes to get there. As Burton put it in *Zanzibar; City, Island, and Coast* (1872), future expeditions “had only to tread in my steps”.

Throughout a life of trailblazing travel and diplomacy — from Somaliland to Benin, Arabia, the Middle East, Asia and the Americas — Burton’s first epistemological framework for colonial encounters was the ‘Orientalist’ one of linguistic scholarship. But as an ethnographer, he was original. He mingled with the people whose cultures he studied, understanding that knowledge is embodied and must be historically contextualized. This was criticized in Victorian England, with its horror of ‘going native’, but places him ahead of his time. Burton was always quick to acknowledge the contingencies and accidents that brought him into contact with local people, and never tried to efface himself from his narrative. Only in the late twentieth century did anthropologists such as John and Jean Comaroff suggest that the obvious weaknesses of ethnography as a ‘science’ are also its strengths, as “participant



HULTON-DEUTSCH COLLECTION/CORBIS

Ethnographic pioneer and explorer Richard Francis Burton, photographed around 1860.

observation... connotes the inseparability of knowledge from its knower”. Studies from the 1970s onwards supported this view, including Annette Weiner’s *The Trobrianders of Papua New Guinea* (Holt, Rinehart and Winston, 1988), a reappraisal of Bronislaw Malinowski’s study of the Pacific Trobriand Islands, *Argonauts of the Western Pacific* (Routledge and Kegan Paul, 1922).

In other ways, and much less attractively, Burton was very much of his time. His respect for Muslim culture did not preclude his succumbing temporarily to a vicious racism that became particularly extreme in the 1860s and cannot be exonerated. By the mid-1860s he had become one of Britain’s foremost promulgators of the polygenist thesis that Africans constituted a distinct and inferior species, and he helped to found the Anthropological Society of London, established after a dispute with the monogenist Ethnological Society. By his last decade, Burton had come to his senses,

embracing the view that all of civilization came from Africa, and felt that “negroes... have shown themselves fully equal in intellect and capacity to the white races of Europe and America”. But the damage had been done.

Despite this sorry chapter, Burton’s immersion in a multitude of languages and cultures gave him a unique perspective on humanity, with “the enormous advantage of being capable of comparing native with foreign ideas and views of the world”. He knew that other cultures could never be fully ‘translated’ or subsumed into English, and that this militated against the ethos of Empire. He was perhaps less Orientalist than comparativist and relativist. His contribution to the fledgling social sciences was all the more powerful, perhaps, for having been fed by so many streams of knowledge, even if this makes it less visible to us today. ■

**Clare Pettitt** is professor of nineteenth-century literature and culture at King’s College London. She is the author of *Dr Livingstone, I Presume?* and many articles about exploration and travel in Victorian print culture. e-mail: [clare.pettitt@kcl.ac.uk](mailto:clare.pettitt@kcl.ac.uk)



## INTERDISCIPLINARITY

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