Institution: King's College London
Unit of Assessment: 27 English Language and Literature
Title of case study: Digital Victorians
Period when the underpinning research was undertaken: 2013–2020
Details of staff conducting the underpinning research from the submitting unit:

Name(s):	**Role(s) (e.g. job title):**	**Period(s) employed by submitting HEI:**
Clare Pettitt	Professor of Nineteenth-Century Literature & Culture	From 2005
Cassandra Newland	Postdoctoral Researcher	2013–2017

Period when the claimed impact occurred: 2014-2020
Is this case study continued from a case study submitted in 2014? N

1. Summary of the impact

King's researchers across Literature, Art History and Engineering found new ways of bringing alive the past by using innovative interdisciplinary techniques with a four-year programme that created an argument against the idea of digital culture as purely technical and modern. By locating the shift into digital culture in the mid-19th century, King's research succeeded in:

- transforming public perceptions of the cultural history of communications and empowering a variety of people to improve their technical understanding and grasp the potential of interdisciplinary creativity.
- changing the practice of artists and material scientists through deploying historical research offering new contexts for understanding political concerns about coding and security of information in our era of deep connectivity and big data;
- transforming practices in classrooms and creating opportunities for science-art creativity through accessible resources, including GCSE course materials, a public database, machine-building and photography competitions: all supporting people to control their own digital lives;
- changing practice in major London cultural institutions with tangible and ongoing consequences by demonstrating the cultural, historical and artistic importance of communications technology and inspiring museum and gallery programming designed to work more creatively across the Art/Science divide.

2. Underpinning research

Between 1857 and 1866, public attention was caught by attempts to lay a submarine cable across the Atlantic for the transmission of telegraphic messages. Before our project, research about the telegraph was limited to technical histories and biographies. Literary studies had discussed telegraphic communication very literally, and almost no work had been done in the history of art. The project set out to establish that the pleasures and dangers of the telegraph were productive of new cultural forms from its inception. We won a AHRC Research Grant (2013–17) to explore the cultural and material impact of the telegraph in the 19th century. All four AHRC peer-reviewers saw the project as innovative and ambitious in its interdisciplinary scope with the potential to create a new disciplinary model.

Recovering and opening up the evidence. We started locally at KCL where Charles Wheatstone was Professor of Experimental Physics from 1834. Wheatstone was one of the inventors of the electric telegraph. The grant funded the cataloguing, archiving and digitising of the Wheatstone Archive. The PDR (History of Science) made a deep investigation of his library, instrument collection and laboratory notes, using objects and papers in other collections to contextualise Wheatstone's work. By establishing the functional principles of, e.g., the Wheatstone Induction Generator, we discovered how function rests on idealised properties ascribed to real materials (e.g. copper) whose fallibilities were exposed by experimentation and use. From these encounters with Wheatstone's 3D thinking, we developed what one AHRC reviewer called a *"set of tools for re-examining Victorian culture"*, and identified key research themes that later organised our exhibition: distance, transmission, coding, resistance. The PhD students (English, Art History)

mined Victorian periodicals and graphic reportage to establish the range of public commentary and visual imagery produced in response to the Atlantic Telegraph. We 'opened up' Wheatstone's archive by embedding his research in a rich cultural context, which revealed the global significance of the telegraph. This resource is available on the project website and is used by historians of science and technology, music and visual culture, eg a musicologist at Berkeley said: *"we desperately needed the Wheatstone collection for the central three chapters of Sound Knowledge: Music and Science in London"* [I].

Changing research practice. Technology, art and literature are all mutually implicated, but our disciplinary frameworks make it hard to align them. We improved our group understanding of the interdisciplinary issues at stake by building material models of key conceptual problems at the same time as describing them in words. We presented our project to the National Maritime Museum; the Museum of London; the Porthcurno Telegraph Museum; the Wellcome Collection; and the Science Museum (London) and used their collections to interrogate our key themes. We discussed democracy, surveillance and digital agency with digital artists, which helped us uncover the hidden politics of 19th-century programming and messaging. Our 'onto-epistemology' underpinned the design and delivery of our public exhibition and enabled us to produce unorthodox outputs that are changing all our fields, such as Pettitt's essays in the Victorians Decoded exhibition catalogue, in the Sherlock Holmes book [7], the joint essay with Arscott in *Coding and Representation,* the collection of essays from our international conference in January 2017 [2]. Pettitt's forthcoming monograph, *The Digital Switch: Writing, Race and Resistance 1848–1918*: a global history of digital inequality will use the project's findings to further change the field.

Transforming disciplinary practice. Pettitt's widely-published research on time and distance is internationally recognised as an important departure in research methodology, offering, according to one reviewer, *"the best example … of how a critic can retain many of the values of historicism while also orienting herself toward our newer focus on form and aesthetics"* [3,6]. Pettitt's monograph series, *Serial Forms* (vol.1), *Serial Revolutions: 1848* (vol.2) and *The Digital Switch* (vol.3), examines the history of the digital across the 19th century from 1815–1918 [1]. These take the interdisciplinary findings of the project back into Pettitt's own discipline, showing how disciplinary work is transformed and strengthened by deep interdisciplinary research. Peer reviewers judged *Serial Forms* to be *"original, intellectually exciting … reach[ing] across disciplines"*; *"a major contribution to literary studies, with strong relevance to a number of proximate fields such as media studies, print studies, the sociology of everyday life, and theories of modernity"*. The three-book series *"is a hugely impressive work of scholarship: not so much a 'contribution' to Victorian studies as a dramatic extension and partial re-modelling of it."*

Empowering a variety of people. Science and technology are still perceived to be 'hard' and often 'male' subjects. King's researchers asked how the telegraph *felt* and what were the particular bodily practices generated by telegraphic communication and how they were gendered and racialized. In a paper given at a major American conference, Pettitt argued that Morse's artistic practice and nativist racist politics were significant in the development of the Morse Code. This strand of the research showed how inequality was built into electronic systems, shedding light on ongoing digital inequalities today. It informed Pettitt's exhibition catalogue essay, 'Dispersed consciousness', her book chapter, 'Mermaids Amongst the Cables', and her article 'Henry James tethered and stretched'. Talking about science in these human terms allowed us to make the history of the telegraph publicly accessible to diverse people from different backgrounds.

3. References to the research

1. Pettitt, C. (2020). *Serial Forms: The Unfinished Project of Modernity, 1815–1848.* Oxford: Oxford University Press. Included as output in REF 2021.

2. Pettitt, C. & Arscott C. (2021). Signal Markings in Victorian Miscellanies. In A. Chapman & N. Hume (eds), *Coding and Representation from the Nineteenth Century to the Present: Scrambled Messages* (pp.137-160)*.* London: Routledge [delayed output].

3. Pettitt, C. (2020). At Sea. In S. Qureshi & A. Buckland (eds), *Time Travellers: Victorian Perspectives on the Past* (pp.196–219)*.* Chicago: University of Chicago Press. Included as output in REF 2021.

4. Pettitt, C. (2019). Mermaids Amongst the Cables: The Abstracted Body and the Telegraphic Touch. In P. Fielding & A. Taylor (eds), *The Literary 1880s* (pp.15–34). Cambridge: Cambridge University Press. Included as output in REF 2021.

5. Pettitt, C. (2016). Henry James tethered and stretched: the materiality of metaphor. *Henry James Review* 37(2),139–153. Listed as output REF 2021.

6. Pettitt, C. (2018). 'By the *Herald*'s Special Wire!: Technology and Speed in Transnational News', *International Herald Tribune Historical Archive 1887-2013*, Essay online from May 2018. Gale Cengage.

7. Pettitt, C. (2014). Sherlock Holmes the Throwaway Detective. In A. Werner (ed.), *Sherlock Holmes: The Man Who Never Lived and Will Never Die* (pp.174–197). London: Museum of London and Ebury Press. Written for the public exhibition, Sherlock Holmes, Oct 2014 – Jan 2015.

4. Details of the impact

The AHRC review of the project commended *"an incredibly impressive 'pathways to impact' structure"*. We set out to address several key audiences: exhibition goers, curators, artists, material scientists, school children and teachers. Instead of seeing the Victorian telegraph as a quaint and antique technology, we challenged each of these target groups to re-encounter its world-changing and world-making potential at the start of our digital world.

Transforming public perceptions. We used our research on the Victorian period to demonstrate the complex ways in which technological innovation has shaped culture and is in turn shaped by culture. At the free public launch event of the project at KCL's arts festival in 2014, we spliced a cable underwater (c50 attendees). At the other end of the project, we used our research to change the perspectives of 8,253 individual exhibition goers at the Victorians Decoded: Art and Telegraphy free public exhibition at the Guildhall Gallery (Sept 2016–Jan 2017). We chose the Guildhall because of its exceptional permanent collection of Victorian painting. Using the methodology developed in our research sessions, we brought together telegraphic equipment from the Wheatstone archive and elsewhere, art and specially designed objects. This was a sophisticated but easily accessible exhibition that asked the public to look differently at Victorian genre painting in the light of 'the telegraphic imaginary' using our four themes: distance, transmission, coding and resistance.

Exhibition-goers (from the UK, the Netherlands, Lithuania, the US, France, Spain, Hong Kong, Canada and Luxembourg) reported a transformed understanding of the two-way relationship between technology and culture: it *"heightened my understanding of how tech shapes culture and art"*; *"The Leighton painting and ideas about touch and transmission really shaped how I think about art/science and how we communicate with each other"*. The exhibition created high levels of engagement on social media, for example: *"Great #victoriansdecoded exhibition … intrigued with attempts to create coding for ease and privacy"* and *"fascinated how disrupted comms and secret codes infiltrated art"* [A]. The Gallery were particularly pleased by the 440% uplift in engagement on their Facebook pages. Exhibition reach was achieved partly through the free open-access online catalogue, which ensured our research changed views beyond the duration and locale of the exhibition. Between Sept. 2016 and June 2019, it was downloaded 14,000 times and has had international impact, eg a university academic in Sweden who could not visit the London exhibition writes that the online catalogue *"has significantly influenced both my research and teaching"* and that he has used this freely-available resource with students because it *"provides an innovative approach to multidisciplinary research"* [C].

The media recognised that the exhibition opened up new ways of demonstrating the relationship between technology and culture. A reviewer on *Litro Magazine* said: *"I found it a fresh and interesting way of forcing visitors to the exhibition to look at an idea from the points of view of multiple different disciplines"*. *Apollo Magazine* (readership: 30,000) praised this *"compact, playful"* exhibition for using new methodology to bring together the conceptual and material elements of technology: *"[b]y setting the relics of telegraphic technology in the context of 19th-century painting, what this exhibition suggestively shows is that telegraphic messages were transmitted by a medium that was as conceptual as it was material"*. *The Guardian* (readership: 1,027,000) praised the exhibition for making new connections between art and science: *"We do not tend to think of Edwin Landseer or James Tissot in connection with galvanometers and transmitters, yet they certainly lived within and responded to this changing world. The exhibition has been created through a suitably Victorian collaboration of art, science and engineering"* [B].

Changing practice in major London cultural insitutions. Before our project, technology and art were often baldly juxtaposed in museums and galleries with little theoretical connective tissue. King's researchers intervened and changed curatorial and exhibitionary practice in some major

museums. The commissioning curator at the Guildhall Gallery, now Director of the Geffrye Museum, described Victorians Decoded as *"a ground-breaking exhibition for the Gallery"'* because of its *"cross-disciplinary content that used painting as a lens through which to explore technological developments"*. She highlighted that King's research had pushed her team *"to work in new ways"*, *"erod[ing] traditional boundaries between art and science"* [H]. The Chief Curator agreed that the collaboration *"brought a whole new perspective to our collection at the Guildhall Art Gallery. It was a fantastic experience for our curatorial staff as it enabled them to see the paintings with fresh eyes and to consider new interpretations linking to science, technology and empire …. [The] innovative exhibition… reached new audiences… and it has resulted in enduring cross-sector relationships"* [H]. Head Curator of the Sherlock Holmes exhibition at the Museum of London, which attracted more than 82,000 visitors, said: *"[t]he research findings of the Scrambled Messages project helped to inform sections of the display that examined the representation of the late nineteenth and early twentieth century metropolis and the way that a number of new technologies were seeping their way into modern life"* [H]. Subsequently, Pettitt was invited onto the Academic Advisory Board of the Museum of London and has been involved in planning content for the new Smithfield site museum. Head of Collections and Principal Curator at the Science Museum London said: *"Scrambled Messages provided new insights into the relationship between communications heritage and its culture, showing how important it is to understand intertwining of artistic and scientific work. The exhibition and website were a rich resource for exploring the creativity of our Victorian ancestors, but also challenging the separation of art and science today"*. According to the Head of Collections, our exhibition based on King's research had a major effect on Science Museum London programming by providing the inspiration for the 2019 Science Museum exhibition, The Art of Innovation, accompanied by a book and Radio 4 series [H]. The exhibition, therefore, influenced the subsequent practice of several major museums and embedded new research-curatorial links for the future.

Changing the practice of artists and material scientists through deployed historical research. Before our project, artistic practice around digital comms was largely focused on the present. We changed this, making available our research to change the practices of digital artists by focusing them on the technological past. We invited the contemporary artists' collective, Random International (RI) (known for Rain Room, exhibited at MoMA), to join our project. A dramaturg at RI said she found *"a striking synergy"* between our thinking and their *"ongoing exploration of the human condition in an increasingly mechanised world"* and together we tracked the *"quotidian changes and nuanced developments in the relationship between human and machine"*. We have published an exchange between our project and the RI artists in the form of a dialogue as a chapter in our book, *Coding and Representation* [D], explaining our joint mission *"not to work with technology as such, but with the consequences of technology and its applications … the ways that technology increasingly impacts on our emotional and instinctive states"* [D].

Simultaneously, we changed the practice of material scientists, using our research to enable them to move beyond instrumental views of materials and technologies to consider them in the widest cultural context. Our interdisciplinary seminars run by an academic at the Institute of Making, UCL, took applied scientists, as one of them said, *"far beyond the world of materials research and engineering … this was such an eye-opening project. Working with specialists in Art History, Archaeology and English Literature really made clear to me the far-reaching effects that the materials and technologies we develop and design with can have on literature, art and the creative imagination"* [G]. Our project affected the design of subsequent projects at the Institute of Making and established new sustainable research links between engineering and humanities faculties. In the run-up to Victorians Decoded, we organised a competition for architecture/engineering students to design and build a scientifically conceived but creatively orientated machine for the exhibition. A student at the Bartlett School of Architecture was the winner with her Great Grammatizor: a 'steampunk' machine that converts text input into randomised poems, which print out on a piece of paper to be taken away by the visitor. She said that: *"the competition has been kind of life changing for me"*, as before she had been *"doing a few codes and building a few things on my own"* but the project gave her *"the space to explore my ideas and turn them into something real"* [G]. *The Guardian* wrote that *"the Victorians would certainly have loved the Great Grammatizor, which will scramble and code messages from the public into eccentric poems"* [B]. The machine takes its name from Roald Dahl's story, 'Someone Like You', and proved particularly popular with a media-conscious younger audience. A quarter of

respondents to the exhibition questionnaire were aged 16–25 and were enthusiastic about trying it out [A]. A 10-year-old visitor wrote,"*The Great Grammatizor is extremely fun! The poems it comes up with are inventive and quirky, unlike any others. It made my mind boggle.*"[A]

Empowering young people and transforming practices in classrooms. Our school activities changed pedagogic perceptions of technical and thinking skills as separate and supported a move towards cross-curricular learning. Teachers recognised, for example, that alongside the coding in our KS2 exercise, *"[t]here was a bit of history, a bit of detective genre and lots of interaction"*. We transformed children's perception of history, technology and, crucially, the relationship between these (the contingency of technology on culture; the relevance of the past in the present). We reached c150 children through a school takeover day at the exhibition and in-school testing (in comprehensive coastal schools) of primary, GCSE and A-Level materials [F]. The materials were downloaded 3000 times between Sept. 2016 and June 2019, reaching many more pupils.

At **primary** level, King's researchers developed a KS2 English pack on telegrams that drew on our research on coding and asked children to code and decode the messages in 'Sherlock Holmes' stories using Morse code.The activity spoke to contemporary experience, which teachers welcomed: *"We talked about imagining having to pay £1 for every word and how short we'd make our texts"*; *"I also referred to Twitter which has a word limit so you have to really be clear which words you select"*. A teacher praised the pack for *"motivating"* even the lower-attaining children to think with its 'blended learning' approach. One enthusiastic teacher planned to use the materials in *"other forms across the school next year … Can do in Yr 3, 5 and 6!"* [F]. Because they are freely available online, the materials are not limited to school-use: one exhibition-goer thought they would be *"a useful resource"* for *"[m]y grandchildren [who] are being home-educated"* [A].

At **secondary** level, we developed two KS4 English packs for GCSE students entitled '*The Sign of Four:* Place and Communication' and 'Nineteenth-Century Literature: "Hole in the Wall" and Responses to Technology', which address National Curriculum statutory requirements and GCSE assessment objectives. KCL research into how new technologies produce a new sense of place, and research into the engineering of new forms of attention through technology, underpin these. *The Sign of Four* asks students to trace communications within the text and think about the development of modern communications in Britain from the 19th century. The 'Hole in the Wall' uses an 1866 description of visiting a railway signal box to create a discussion around the embedding of new technologies into ordinary life and the new kinds of attention/distraction they create. A teacher reported that *"the feedback was positive and the students engaged with the extracts and were able to respond, developing ideas and extending the modelled paragraph. The pictures worked well and they provoked some good discussion and greater understanding of the Victorian/Industrial contexts for the text"* [F]. We also devised teaching packs for GCSE and A-Level Art based around paintings featured in our exhibition [F].

In November 2016, we ran a takeover day at the exhibition in partnership with the charity Kids in Museums. Sixth formers from Trinity Catholic High School, Woodford Green, came in for workshops and then 'took over' the gallery space for a day. The Gallery Curator said the takeover day *"aim[ed] to empower students"*, and their Art teacher said: *"[t]here is immense value and importance of getting school students from all kinds of backgrounds involved early with galleries, museums and out of the classroom to encounter big ideas about culture. Our day at 'Victorians Decoded' really stimulated our pupils to reflect on history, art, and their own use of communications media".* The day was reported in the *Ilford Recorder* [E].

5. Sources to corroborate the impact

A. Portfolio of questionnaires and social media feedback on Victorians Decoded.
B. Reviews of Victorians Decoded exhibition: *Litro Magazine*, *Apollo Magazine*, *The Guardian*; Rose Media Group report.
C. Testimonial from user of online catalogue.
D. Testimonial from Random International dramaturg and interview from the project book *Coding and Representation from the Nineteenth Century to the Present: Scrambled Messages*.
E. Takeover day testimonial and media coverage.
F. Teacher/student survey and feedback; portfolio of primary material; teacher testimonials.
G. Testimonials from Bartlett School of Architecture student and UCL materials scientist.
H. Museums and cultural sector testimony: Guildhall Gallery, Museum of London, Science Museum
I. Testimonial from musicologist at UC Berkeley.