

Institution: University of Oxford		
Unit of Assessment: 27 – English Language and Literature		
Title of case study: Enhancing appreciation for Victorian citizen science and advancing citizen science and medical education today		
Period when the underpinning research was undertaken: December 2013-December 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:
Prof Sally Shuttleworth	Professor of English Language and Literature	1 February 2006-30 September 2020
Dr Sally Frampton	Postdoctoral Research Fellow	2014-present
Period when the claimed impact occurred: April 2014-July 2020		
Is this case study continued from a case study submitted in 2014? N		
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>An AHRC project exploring Victorian and 21st century Citizen Science transformed public engagement by the Natural History Museum (London) and Missouri Botanical Garden, generating high-quality citizen science and creative impacts through two Zooniverse projects: 'Orchid Observers' compared Victorian data with fresh observations, evidencing UK climate-change; 'Science Gossip' enhanced professional animation and design. A new platform was created to emulate Victorian magazine-based citizen science, generating 100 million data classifications and descriptions, including manuscript transcriptions. A Royal College of Surgeons exhibition alerted 38,000+ visitors to long-standing disputation of medical authority and an educational card game enhanced critical training at the Royal College of Nursing.</p>		
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>i. <i>Shuttleworth's 'Science and Periodicals' (2016)</i> identified distinct ways in which Victorian periodicals engaged with science. In literary-oriented periodicals, scientific thinking inflected fiction and poetry exploring selfhood and personal responsibility, as much as debates about science and religion. The essay presented periodicals as key sources of insight into a society grappling with rapid social and cultural change – advocating for similarly integrated publication forms today.</p> <p>Understanding cultural mediation of science through the Victorian periodical press was foundational to the AHRC 'Constructing Scientific Communities' (ConSciCom) project (PI: Shuttleworth). University of Oxford researchers, with collaborators at Leicester, combined literary-critical and historical work on 19th century public engagement with science, offering models for present-day communication and primary resource-enhancement. Overlapping networks of citizen scientists were uncovered in fields including meteorology, astronomy, public health and economic entomology – Victorian concerns frequently anticipating today's. The role of numerous natural history journals in fostering amateur naturalist communities became apparent, as did the influence of amateur forms of medicine, from nursing and the first aid movement to technical innovations (e.g. prosthetic limbs). 54 grant-linked research publications bolstered the case for rethinking the emergence of professional science, taking more account of expert non-professional contributions. Key publications:</p> <p>ii. <i>Science Periodicals in Nineteenth-Century Britain</i>, co-edited by Shuttleworth, Dawson (Leicester), Lightman (York, Toronto), Topham (Leeds) (2020). 10 essays extended historical and literary-critical understanding of scientific and medical periodicals, examining their precise role in Victorian science and charting shifting scientific communities and practices. Shuttleworth's chapter tracked the rise of Public Health journals, 1850s-1890s, showing how they facilitated public health movements and wider community involvement in campaigns for improved 'National Health', from citizen science monitoring of air and water pollution to championing the health-giving benefits of gardening for women.</p>		

iii. Frampton's chapter in *Science Periodicals in Nineteenth-Century Britain*, 'A Borderland in Ethics', identified a new ethical framework for medical journalism emerging in the 1880s with the founding of several general-readership medical journals. It examined anxieties around female readers' consumption of medical literature – reactions complicated by their growing participation in public health movements.

Two online database resources:

iv. Working with Zooniverse (the world's largest open platform for citizen science projects) and the Natural History Museum, London, Shuttleworth and Lintott (Oxford, Department of Physics) designed the 'Orchid Observers' project, analysing historic herbarium sheets and adding new amateur naturalist field observations. Identifications of orchids photographed in 2015 were combined with classifications and transcriptions of museum specimens. 1,956 volunteers from 10 countries generated a dataset of 53,580 classifications.

v. 'Science Gossip', conceived by Shuttleworth and Belknap (Leicester) with Zooniverse, utilized voluntary public participation to help classify illustrations in 19th century natural history periodicals, tagging discoveries in botany, geology, palaeontology, microscopy, and more. Over half a million classifications enabled the Biodiversity Heritage Library to provide image searching of their vast database.

vi. Frampton's chapter for the *Edinburgh History of the British and Irish Press* (19thC volume) (2019) examined the changing face of Victorian medical journalism, with close attention to three genres: the professional press, journals devoted to non-orthodox medical practices such as homeopathy and mesmerism, and public-facing medical and health journals.

3. References to the research (indicative maximum of six references)

- i. [Chapter, available on request] Sally Shuttleworth, 'Science and Periodicals: Animal Instinct and Whispering Machines', in *The Oxford Handbook of Victorian Literary Culture*, ed. Juliet John (Oxford: Oxford UP, 2016), 416-37. ISBN: 9780199593736
- ii. [Edited Book, available on request] *Science Periodicals in Nineteenth-Century Britain: Constructing Scientific Communities*, ed. S. Shuttleworth, G. Dawson, B. Lightman, and J. Topham (Chicago: Chicago UP, 2020). Includes a chapter by Shuttleworth: "'National Health is National Wealth': Publics, Professions, and the Rise of the Public Health Journal', 337-71. ISBN: 9780226676517
- iii. [Chapter, available on request] Sally Frampton, "'A Borderland in Ethics': Medical Journals, the Public, and the Medical Profession in Nineteenth-Century Britain', in *Science Periodicals in Nineteenth-Century Britain* (ii. above).
- iv. [Website content] 'Orchid Observers' – archived Zooniverse project, <https://www.orchidobservers.org>. Designed by Sally Shuttleworth, Chris Lintott, and John Tweddle (Natural History Museum, London); implementation by Jim O'Donnell (Zooniverse). Accessed 21 December 2020 via <https://web.archive.org/web/20201221124758/https://www.orchidobservers.org/>
- v. [Website content] 'Science Gossip' – archived Zooniverse project, <https://www.sciencegossip.org>. Designed by Sally Shuttleworth, Gowan Dawson (Leicester), and Geoffrey Belknap (Leicester ConSciCom postdoctoral researcher); implementation by Jim O'Donnell (Zooniverse). Accessed 21 December 2020 via <https://web.archive.org/web/20201221125547/https://www.sciencegossip.org/>
- vi. [Chapter, available on request] Sally Frampton, 'The Medical Press and Its Public', in *The Edinburgh History of the British and Irish Press*, vol. 2: *Expansion and Evolution, 1800-1900*, ed. D. Finkelstein (Edinburgh: Edinburgh UP, 2020). ISBN: 9781474424882

Associated external funding:

- Arts and Humanities Research Council (AHRC) Large Grant (Science in Culture theme), AH/L007010/1: 'Constructing Scientific Communities: Citizen Science in the 19th and 21st Centuries' (2013-19). **GBP1,950,000**. PI: Shuttleworth; Co-Is: Chris Lintott (Oxford and Zooniverse) and Gowan Dawson (Leicester). Postdoctoral researcher at Oxford: Frampton.
- AHRC Follow-On Funding, AH/P014194/1: 'Mind-Boggling Medical History' (2017-18). **GBP33,799**. PI: Frampton; Co-I: Shuttleworth.

4. Details of the impact (indicative maximum 750 words)

Use of the two datasets generated by ConSciCom cit-sci projects **raised awareness of the range and depth of Victorian citizen science, increased recognition for the value of Victorian science data and enabled new advancements in science:**

'Orchid Observers' (April 2015-July 2016), designed by Shuttleworth and Lintott with the Natural History Museum's citizen science lead, involved **1,956 interested beginners and amateur-experts** from the orchid community and Botanical Society of Britain & Ireland (f. 1836). The 53,580 classifications (5.1.i) **enhanced professional respect for citizen contributions to climate change science** – supervising botanical specialists observing that, for 19 of 29 species studied, identification accuracy was 'close to 100%', for 'trickier species' 70-90%. Comparison of 2015 data with Victorian flowering times **showed that the median 2015 flowering date was at least 10 days earlier than for 1830-1970** (5.1.ii). A free ConSciCom funded orchid identification guide on the Natural History Museum website enabled **ongoing identifications** (5.1.iii).

'Science Gossip' (SG) (launched March 2015) **engaged new enthusiasts with Victorian natural history periodicals**. A collaboration with Missouri Botanical Garden (MOBOT), this project **gave global access to the creative inspiration in scientific illustrations** hitherto 'locked away in ... periodicals such as *Science Gossip*, *Recreative Science* and *The Intellectual Observer*'. Title selections were made by Shuttleworth and Belknap – the Biodiversity Heritage Library (US-based consortium) digitizing material not already in its collections. As of September 2018, 10,000+ site users had **classified 160,000 images and added 575,000 annotations**, 'ask[ing] questions' to ConSciCom researchers and conferring with 'fellow citizen scientists' (MOBOT letter, 5.2.i, pp. 5, 1). 'We the Curious' science centre, Bristol, **created a Citizen Science programme using SG** (6,477 visitors, 110 on-site classifications) (5.2.ii). Promoted by the 'Taxonomic Data Working Group' (not-for-profit biodiversity group) and attracting wide media coverage (e.g. *Scientific American* and *Nature Conservancy*), SG engaged **10,204 registered contributors from 75 countries**; achieving **94,942 classify page views by 31 December 2020**, with US and UK participants most represented (5.2.iii). Sample feedback: 'I liked that connection between me being a citizen scientist today and them being citizen scientists back then ... being able to rescue some of these images and get them [to] the public' (5.2.iv). The SG 'Talk' function (**13,774 posts, 680 participants**) generated amateur research findings (e.g. identifying female illustrators, 5.2.v) and **wide creative industry take-up including wallpaper and fashion photography** (5.2.vi). **A glass sculptor was inspired by oceanographic images**: 'Finding detailed illustrations of certain ocean life forms can be very difficult. ... these 19th century illustrations are a wellspring of inspiration' (5.2.i). Sydney Padua, ConSciCom artist in virtual residence, created **popular online animations of Victorian periodical illustrations** (5.3.i) (2,823 visits to her website, 5.3.ii). Her workshops '**sparked the imagination**' of children (visitor feedback, 5.3.ii) at (e.g.) Bradford's National Science and Media Museum, 2019 (citizen science programme led by Belknap: **2,161 visitors**, 5.3.iii). An online interview (**240 views**) explored lines of descent from Victorian periodical illustrations. Work with SG alerted Padua to how animation goes 'beyond your critical faculties, directly to the animal part of your brain'. She **benefitted from access to a wealth of art in an embryonic mass medium** – the 'cute and slightly distanced' 19th century forms of illustration making animals 'more approachable' (5.3.iv).

A new tool, Panoptes, was created within Zooniverse – conceived by ConSciCom to act like the small magazines of the 19th century, allowing widespread participation in making and sharing science. Between July 2015 and March 2019, this online do-it-yourself citizen science platform **generated 419 new projects, with 100 million classifications** by 534,000 registered users. Projects include transcription of Humphry Davy's Notebooks (5.4).

Insights into historic citizen science disseminated via Shuttleworth and Frampton's publications for science enthusiasts (e.g. *Science Museum Group Journal*) **prompted Natural History Museum (NHM) staff to pioneer 'visiteering' days** – non-professionals dedicating time to assist museum collections. Trialled with Orchid Observers (2015), the model rolled out across the museum from 2016, attracting extensive media interest. The NHM's lead credits visiteering with improving citizen science participation, imparting new knowledge and 'practical skills' (from

'transcribing herbarium sheets, to deciphering handwriting and investigation skills') (5.5.i). Non-academics reported 'learning about the way scientific data is collected and collated'; 'feeling we were part of the whole scientific process' (5.5.ii). Subsequent visitation projects, building on the Orchids model, assisted a steady rise in volunteering charted in annual reports, 2015-19 (5.5.iii). 'Pop Science', an NHM evening co-designed by Shuttleworth and her team (2017), drew **4,500+ attendees of all ages** (the largest attendance for two years, with visitors staying 'significantly longer' than usual) (5.1.iii) to explore online citizen science projects, observe a magic lantern show, take part in a Padua animation workshop and hear project poet Don Paterson read '**The Garden**', inspired by ConSciCom (5.6). The event attracted 1,800 reactions, 106 comments, 110 shares on the NHM Facebook page (5.7). The Museum changed the format of subsequent 'lates' events to build on the participatory element at the heart of the event's success (5.1.iii).

An **exhibition at the Hunterian Museum, Royal College of Surgeons**, 'Vaccination: Medicine and the Masses', April-September 2016 (ConSciCom funded, led by Frampton), 'charted the turbulent history of vaccination from the late 18th century to the present' (5.8.i). **38,571 visitors** scrutinized display material ranging from Jenner's first experiments to the MMR controversy, with educational days for adults and children (e.g. 'Snot, Sick and Scabs'). Medics and health workers valued the pro-vaccination public health messaging and insights into why vaccination incurs resistance ('It is the CARRIER AND PRESERVATIVES which are giving vaccinations a bad name'); non-expert visitors, young and old, appreciated the visceral charge of displays 'NOT FOR THE FAINT HEARTED' (5.8.ii). Reviews show that the exhibition corrected triumphalism ('a timely reminder of what used to be normal ... and how dangerous the anti-vax movement can be' – blog-guide to London, 5.8.iii) and put today's anti-vaxxers in context by revealing a long history of 'furious – and often violent – struggle between public and state' (*Pharmaceutical Journal*, 5.8.iv): 'I had no idea that Leicester in the 19th century had been such a hot-bed of anti-vax sentiment' (prominent medical historian, *The Lancet*) (5.8.v). The Hunterian Keeper of Science and Technology reports that ConSciCom collaboration benefitted the museum by 'introducing mechanisms for effective knowledge-transfer' – e.g. 'embedded' postdoctoral researcher placement within 'heritage practice'; enabling more 'active, co-productive' engagement with patients; and 'introducing new audiences and users' (5.8.vi)

With AHRC follow-on funding, Frampton (PI) and Shuttleworth (Co-I) **developed** 'Mind-Boggling Medical History' (MBMH), **an educational card game** (5.9). Based on primary historical sources, it asks players to distinguish current from past practice. Engaging players with the history of disputed medical interventions, MBMH was trialled with small groups at the Royal College of Nursing (RCN), 2014-15 ('fantastic ... making me realize ... you need to constantly keep up-to-date with knowledge!' – student nurse feedback, 5.10.i), then released in physical and online form targeting nursing practitioners and students. Evaluation by the Heritage Support Group museum consultancy assisted redesign to reflect educational priorities. Take-up over 2018 was aided by RCN website promotion, an *RCN Bulletin* (430,000 recipients) competition for free copies, and demonstration stalls (e.g. RCN Education Congress, 100 student nurses). Use of the game in (e.g.) the Basildon and Thurrock University Hospitals NHS Foundation Trust induction programme for student nurses and midwives (48 students) and RCN Library regional support sessions around England **increased nurses' understanding that best health-care practice requires up-to-date evidence; facilitated access to historical information** (including past practices back in favour, e.g. certain uses of leeching); and **assisted safe patient care by building nurses' critical confidence** (amalgamated feedback, 5.9.i). The RCN Head of Library Services welcomed 'an excellent resource to help' nurses 'develop critical thinking skills ... and use evidence to continue to develop their practice' (5.10.ii). The development process **shed light on under-representation of nurses** in public-facing accounts of medical history (5.10.ii). Initially free to users, the game is now under commercial development via Oxford Innovation. Physical copies have been requested by nursing educators, public health specialists, school teachers, medical library staff and museum professionals around the world – Nigeria to New Zealand (5.10.iii).

5. Sources to corroborate the impact (indicative maximum of 10 references)

1. Orchid Observers impact.
 - i. Statement from Head of Life Sciences and Head of Centre for UK Biodiversity, Natural History Museum, 21 January 2021 (further data in 5.1.ii).
 - ii. 'Results so far: Orchid Observers', Natural History Museum blog, 22 July 2016, <https://naturalhistorymuseum.blog/2016/07/22/results-so-far-orchid-observers/> (pdf excerpt; full document available on request).
 - iii. K. Castillo and L. Robinson, *Orchid Observers Identification Guide*.
2. Science Gossip impact on Missouri Botanical Garden and volunteers (further data in 5.4).
 - i. Statement from Project Manager, Center for Biodiversity Informatics, Missouri Botanical Garden, 9 October 2018.
 - ii. Open City Lab report on 'We the Curious' events, including audience data.
 - iii. Email with data from Zooniverse (to 31 December 2020), 21 January 2021.
 - iv. Sample feedback: transcription of interview with Science Gossip volunteer, 29 March 2019 (audio file available on request).
 - v. New findings relating to female illustrators posted on Science Gossip Talk (screenshot).
 - vi. MOBOT, NEH Art of Life final grant report. Wallpaper, p. 18; fashion, p. 20.
3. Artist Sydney Padua Science Gossip animations and workshops.
 - i. Sample animations on <http://sydneypadua.com/sciencegossip-gallery/> (pdf exported), including 'Snipe' (443 retweets, 1.1K likes on Twitter by end of 2020).
 - ii. Email from Sydney Padua, 20 January 2021, containing impact statement and data.
 - iii. Statement from Director, National Science and Media Museum, Bradford, 18 Sept 2020.
 - iv. Collated scans of participant feedback postcards.
 - v. 'An interview with Sydney Padua', <https://www.youtube.com/watch?v=8l6QIP0OVKY> (screenshot).
4. Humphry Davy Notebooks transcription project on Panoptes (screenshots).
5. Visiteering at the Natural History Museum (NHM).
 - i. Post by Project Lead on Orchid Observers blog, 18 December 2015, including collated feedback, <https://orchidobservers.wordpress.com/author/kcastillo50/> (screenshot).
 - ii. 'Visiteering' page on NHM website, <https://www.nhm.ac.uk/take-part/volunteer/visiteering.html> (pdf exported).
 - iii. Selected examples of further visiteering projects: NHM blog, 27 June and 15 December 2017; excerpts from NHM Annual Reports and Accounts, 2016-19 (see also 5.1.i).
6. Don Paterson, 'The Garden', in *Zonal* (London: Faber and Faber, 2020).
7. Natural History Museum Facebook post, 19 October 2017.
8. 'Vaccination and the Masses' exhibition at Hunterian Museum, Royal College of Surgeons.
 - i. Exhibition webpage, <https://www.rcseng.ac.uk/museums-and-archives/hunterian-museum/past-exhibitions/vaccinations/> and blogpost, <https://www.rcseng.ac.uk/library-and-publications/library/blog/vaccination-medicine-masses/> (screenshots).
 - ii. Transcriptions of exhibition feedback cards (originals available on request).
 - iii. IanVisits London blogpost, <https://www.ianvisits.co.uk/blog/2016/06/20/exhibition-looks-at-the-victorian-anti-vaccination-protests/>
 - iv. W. Moore, 'Exhibition on the history of vaccination in the UK illustrates the struggle between public and state', *The Pharmaceutical Journal* 296 (May 2016).
 - v. M. Honigsbaum, 'Vaccination: A Vexatious History', *The Lancet* 387 (May 2016), 1988-9.
 - vi. Statement from Keeper of Science and Technology, Hunterian Museum, 7 March 2019.
9. Online version of *Mind-Boggling Medical History: Past, Present, or Fictional? You Decide!*, <https://mbmh.web.ox.ac.uk/home> (screenshot) (card version available on request).
10. *Mind-Boggling Medical History* impact.
 - i. S. Chaney and S. Frampton, 'Mind-Boggling Medical History: creating a medical history game for nurses', *Science Museum Group Journal* 11 (Spring 2019) DOI: [10.15180/191104](https://doi.org/10.15180/191104)
 - ii. Quote from Head of Library and Archive Service, Royal College of Nursing on <https://www.ox.ac.uk/research/research-impact/mind-boggling-medical-history>
 - iii. Example of use: Clinical Knowledge Network, Australia, <https://www.ckn.org.au/content/fact-pregnancy-can-be-detected-injecting-woman's-urine-frog-or-toad>