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VIEWPOINT

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Polar Climate Science

Exploring the history of environmental research
in some of the world's coldest regions



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Editorial

From Greta Thunberg's address to the UN, to Extinction Rebellion protests across the world, questions surrounding the issue of climate change and the state of our environment have loomed larger than ever in 2019. In light of these events, this issue takes a look at the history of science in relation to the natural world.

Ed Armston-Sheret leads the way in our cover feature by exploring the history of climate science in the polar regions. Then, Franziska Kohlt examines attitudes towards insects at the intersections of history, science, and literature, while Daniela Sclavo's article investigates the impact of gender and masculinity in the historiography of Victorian naturalist Richard Owen.

Also this time, we have a special report on initiatives designed to increase the uptake of history of science in the classroom – projects supported by the the BSSH Outreach and Education Committee.

Our interviewee is Katayoun Shafiee, Assistant Professor of the History of the Islamic World at Warwick University.

Let us know what you think of the issue on Twitter [@BSSHViewpoint](https://twitter.com/BSSHViewpoint) or by email. Contributions to the next edition should be emailed, by 15 January 2020, to viewpoint@bshs.org.uk.

Hazel Blair, Editor

Lyell notes saved for nation

The University of Edinburgh has been successful in its campaign to stop 249 notebooks of the Scottish geologist Charles Lyell (1797-1875) from being exported abroad.

Expanding on the work of others, including James Hutton (the 'father of modern geology'), Lyell brought the theory of 'uniformitarianism' to the public in his book *Principles of Geology*, (1830), and was a significant influence upon Charles Darwin's *Origin of the Species*. Throughout his lifetime, he revised the accepted theory of how Mount Etna was formed, contributed to education reform at Oxford University, and studied the prevention of mine disasters.

The notebooks contain the daily records of Lyell's private thoughts, reading notes, travels, field observations, and conversations from the mid-1820s to his death half a century later. They are an unparalleled collection of 19th-century private scientific journals.

The journals are currently held in a private collection and were sold to a buyer abroad, but the UK government imposed a temporary export ban to allow time for fundraising to purchase the journals, with a view to keeping them in the UK and making them available to the public.

The campaign to save the nationally significant journals was led by the University of Edinburgh and supported by institutions across the UK and Europe, including Bodleian Libraries, the University of Oxford, the British Geological Survey, National Libraries of Scotland, and The Royal Society.

The buy-out price was initially set at £1,444,000, to be raised by 15 July this year. HMRC agreed to remove the



sale tax, and the price was reduced to £966,000, with the deadline extended to 15 October. Close to £1 million has been raised from some 1,000 generous individual supporters, a grant from the National Heritage Memorial Fund, and a contribution from the University of Edinburgh.

Once purchased, Lyell's notebooks will be conserved and made freely available online. Jeremy Upton, the university's Library and Collections Director, said, 'The acquisition of Sir Charles Lyell's notebooks is one of the most significant additions to our archive collection for many years and we are thrilled that they will be freely accessible to all. I would like to thank everyone involved in this campaign – especially those who made a donation, however large or small, to make this notable purchase possible.'

For more information, visit: www.ed.ac.uk/giving/save-lyell-notebooks.

Great Exhibitions winners

The results are in for BSHS the 2018 Great Exhibitions Prize, first established in 2012 to reflect excellent exhibits delving into all areas of the history of science, technology, and medicine (HSTM). There were two categories eligible for the prize, with one winner and one commendation selected for each category.

The winner in the 'large' category was the Norwegian Museum of Science and Technology's *FOLK: From Racial Types to DNA* (see *Viewpoint 118* for Dominic Berry's review). BSHS judges praised the museum's exploration of the history of scientific attitudes towards race and the legacy those attitudes have today.

The 'large' commendation was awarded to *Being Brunel* (at Bristol-based museum ship the SS *Great Britain*), which explores the life and legacy of engineer and innovator Isambard Kingdom Brunel

(1806-1859) – the man behind the Great Western Railway, the Thames Tunnel, and the Clifton suspension bridge.

In the 'small' category, the commendation was awarded to *'This Vexed Question': 500 Years of Women and Medicine* by the Royal College of Physicians. This exhibition explores pioneering women in medicine and uncovers their hidden histories.

The 'small' winner was *200 Years of Being Digital*, part of Royal Holloway's 50th anniversary. This exhibition celebrates the history of computing technology and discusses its effect on society. The judges said the exhibit shone in portraying the overlooked contribution of women to the field and caught the audiences' imaginations with its display of 3D prints, animations, and a live steam engine. •

Periodic table turns 150

This year marks the 150th anniversary of the Periodic Table. Russian chemist Dmitri Mendeleev announced his 'Periodic System' to the Russian Chemical Society in March 1869, after researching patterns in the chemical properties of different elements. This was the predecessor of the periodic table we know today.

Scientists had been organising elements before 1869, but Mendeleev uncovered periodic law, and left gaps for future elements (three of which he predicted – gallium (1875), scandium (1879), and germanium (1886)).

The UN declared 2019 as the International Year of the Periodic Table of Chemical Elements (IYPT 2019). As part of the year-long celebration, the London Science Museum is hosting a new display, featuring the first publication of Medeleev's



table – not on public display since 1980.

The Science Museum is also joined by the V&A, Imperial College London, the Royal College of Art, the Royal Commission for the Exhibition of 1851, the Royal Albert Hall and the Royal Society of Chemistry in holding *Chem Fest 2019* – a festival of chemistry in South Kensington designed to celebrate the anniversary. In a similar spirit, the University of Waterloo has created the *Timeline of Elements Project*, charting over 5,000 years of human discovery, as well as the Mendeleev Mosaic, which features 327 original portraits of Mendeleev within a larger mosaic image of the scientist. •

New home for Blue Plaque

A blue plaque for dentist Lilian Lindsay (1871-1960), the first fully qualified female dentist in Britain, was relocated earlier this year.

Having been rejected by the Royal College of Surgeons and the National Dental Hospital, Lindsay travelled to Edinburgh and attended the Edinburgh Dental Hospital and School. She also established Britain's first dental library.

English Heritage installed the plaque in 2013 at 3 Hungerford Road in Islington, London – Lindsay's former home – but the site was torn down in breach of planning permission rules in 2017. Developer Panos Eliades (director of Hungerstone Ltd) argued that demolition was necessary because the house was not structurally sound, but the builder nevertheless pleaded guilty to permitting relevant demolition without planning permission and was ordered to pay some £60,000 in fines and fees.

The plaque has now been moved to the British Dental Association headquarters in Russell Square, where Lindsay worked and lived. •

Hughes Prize shortlist

The BSHS has unveiled the shortlist for its coveted Hughes Prize, awarded every two years to books that bring the history of science which capture the public imaginations whilst conforming to the rigorous standards of academic research.

Those nominated are: James Delbourgo for *Collecting the World: Hans Sloane and the Origins of the British Museum*; Lee Alan Dugatkin and Lyudmila Trut for *How to Tame a Fox (and Build a Dog)*; Merve Emre for *What's your type?: The Strange History of Myers-Briggs and the Birth of Personality Testing*; John Gribbin and Mary Gribbin, *Out of the Shadow of a Giant: How Newton Stood on the Shoulders of Hooke and Halley*, and David Quammen, *The Tangled Tree: A Radical New History of Life*.

The prize has been renamed this year from the Dingle Prize in memory of the late Jeff Hughes. The winner will be announced in October and will receive £500. •



Sub-Zero: Climate Change & the History of Polar Research

Ed Armston-Sheret reflects on a BSHS Engagement Fellowship at [The Polar Museum](#).

Every day throughout the Antarctic winter of 1902, members of the British National Antarctic Expedition left the relative warmth and comfort of their ship *Discovery*. They ventured into the cold, dark world outside to collect meteorological observations. This task was not an easy one. The explorers often faced almost total darkness, sub-zero temperatures, and howling blizzards. By today's standards, these early efforts at studying the polar climate seem rather haphazard: the explorers' equipment was basic and their training limited. Yet, such research played an important role in 20th-century meteorology and contributed to contemporary understanding of climate change.

As part of a British Society for the History of Science (BSHS) Engagement Fellowship, I worked at the Polar Museum — part of the Scott Polar Research Institute at the University of Cambridge. The project there focused on improving

the historical content in the museum's section on climate science to highlight the role of polar research in scientific understandings of climate change. Working with the [Museum's](#) curator, Charlotte Connelly, I spent most of my time at the museum developing content for new touch-screen displays on the history of climate science. In doing so, I sought to foreground the role of polar research in understanding of climate change and to highlight some of the different scientific practices that have been carried out in the polar regions.

In order to make the topic interesting and engaging to the museum's visitors, Charlotte and I ~~decided~~ focused each page on an individual who had made a contribution to polar science, using quotes and images to bring their stories to life. The new touch-screens cover [numerous](#) aspects of polar science: from how the meteorological records kept by whalers are useful to modern scientists, to more

recent expeditions to Antarctica to find out the cause of the hole in the Earth's ozone layer. One of the new touch-screen displays has now been installed in the museum. Alongside this, I began work on some new displays that, once installed, will address how climate change threatens polar heritage itself, including the huts where polar explorers carried out much of their research and the struggles of some Arctic communities against fossil fuel extraction.

Polar science & meteorology

One of the main stories we focused on within the new digital displays was the role of polar travellers in the development of meteorology. One touch screen page focused on Dr George Simpson, the meteorologist on Scott's *Terra Nova* expedition. Simpson was an influential figure within British meteorology, going on to lead the Met Office between 1920 and 1938. In Antarctica, he undertook a

Charlotte Connelly, Curator at the Polar Museum

It was fantastic welcoming Ed into our team for a few months. We set him the challenge of doing something concrete: developing content for our new touch-screen (now installed and being enjoyed by visitors to the museum), doing some forward planning: developing ideas and content for an updated display of objects and graphics (now firmly in the pipeline), and perhaps the most challenging, something big and vague: helping the whole museum team to think again about how the history of climate and environmental studies could be woven into all our work.

Environmental change

One of our goals at the Polar Museum is to make sure that environmental change does not get relegated to the 'science corner' of the museum, but instead appears throughout. The indigenous peoples of the Arctic are disproportionately affected by climate change today: the 19th-century search for the Northwest Passage sought to survey territories that might be claimed and exploited while also gathering wide ranging data about the natural world; and

Captain Scott's expeditions to the Antarctic set the tone for scientific exploration of the Antarctic for the 20th century. Ed rose to the challenge of thinking about how some of these ideas could be incorporated into the museum brilliantly.

Ed's work was wide ranging and explored some relatively well-known stories, including the meteorological work of Scott's expeditions and some less well-known actors in global stories (like the work of South African palaeobotanist Dr Edna Plumsted on interpreting and publishing evidence of continental drift). He also explored more contemporary issues including the effects of global warming on heritage sites (like Fort Conger in the Canadian Arctic) which are now at risk, and the recent efforts of the Gwich'in Nation to challenge the opening of the Arctic Wildlife Refuge in Alaska for drilling.

I'm delighted that our visitors are already benefiting from Ed's work and accessing some of the stories he researched and wrote about in a clear and accessible way. For the museum, there has been a deeper benefit. We are a small team and it is impossible for us to keep up with all the fascinating research that takes place in and about the



polar regions. Ed helped us in an area we wanted to improve our knowledge about, and provided clear and informative introductions to some important stories that we otherwise would not have known about. His work will continue to inform our displays, events, and even what we choose to collect – shaping our collections and how we interpret them for many years to come. We have developed a strong relationship with Ed that I hope will benefit him throughout his PhD and beyond.' •

pioneering programme of meteorological research, using balloons to collect information on the air temperature at different altitudes. The data collected helped Simpson to understand Antarctic weather patterns, and his experiences in the polar regions also played an important role in shaping his understanding of global climate. The page also highlighted the contemporary relevance of Simpson's work, as these polar observations have proved vital for modern scientists trying to understand how Antarctica has

Ed Armston-Sheret, BSHS Engagement Fellow

'Overall, the BSHS Engagement Fellowship was a great experience. In many ways, the project built on my own PhD research on the history of 19th-century exploration, in which I address the relationship how explorers used and represented their bodies in relation to questions of science, heroism, credibility, and identity. Some of this interest in bodily experience came through in the new touch-screen content and displays, particularly my interest in the bodily experience of polar science.'

New skills

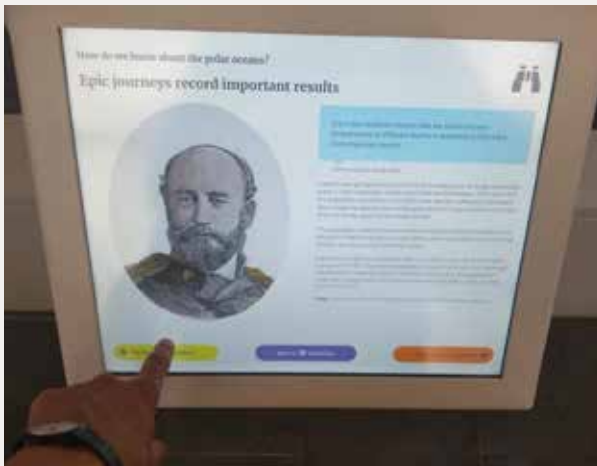
At the same time, the project also allowed me to develop a new set of skills. For me, the main challenge of the project was trying to condense complex theories or histories into small, three-sentence captions. However, I also found this challenge a great learning opportunity: the small amount of space forces you to focus on the main points and why they're important. The skill is something I'm going to hold on



to in my wider academic work.

The feedback and support I received from Charlotte Connelly, the museum's curator, was particularly important to my learning during the fellowship. The welcoming and supportive attitude of the rest of the team also ensured that my time at the museum was a positive and enjoyable one.' •

“The fellowship was both a challenge and a learning opportunity.”



Top-left One home page of the new touch-screen, using questions to encourage engagement.
Bottom-left Biographies of important figures are used to communicate the history of polar research.
Right A touch-screen monitor in location.

changed over the last hundred years.

But it is not only scientists and explorers who contributed to our understandings of the polar climate. Another touch-screen page examines how the journals of whaling captains have proved useful to contemporary scientists trying to understand Antarctica's past climate — a topic currently being studied by one of the Scott Polar Research Institute's PhD candidates, Praveen Teleti.

Another page from the display examined the Scott Polar Research Institute's own role in polar research. This focused on the Institute's former director Gordon Robin. Robin played an instrumental role in efforts to survey Antarctica using planes equipped with radio-echo technology in the 1960s and 70s. These flights allowed scientists to see what lay below the snow and ice that covered the continent for the first time and led to the discovery of subglacial lakes. The results

of these this survey flights have helped scientists understand both how the continent has changed and potential impact of climate change on sea levels.

Arctic communities

When discussing the impact of climate change, we thought it was important to highlight its impact on Arctic communities in the new displays — particularly indigenous communities whose voices have all too often been ignored by policy makers. We therefore included a page describing how indigenous Arctic communities have been affected by climate change. This page focused on the work of Mary Simon, an advocate for Inuit rights and culture in Canada, and on the work of the Arctic Council in promoting collaboration between nation states indigenous organisations.

The story of the Ozone Hole was also included in the new touch screen

displays. In examining this topic, we focused on the different methods used by scientists to study the Polar Regions. The Ozone hole was first discovered by scientists based in Cambridge, but it took Susan Solomon's overland journey during the Antarctic winter to establish that CFC gasses, then used in fridges and aerosols, were causing the hole. After her discovery, the 1987 Montreal Protocol banned their use. Because of both polar research and international action, the hole is now shrinking. We felt that this story was important in that it demonstrates how international cooperation can have meaningful and positive effects — an important point when juxtaposed with the other stories about climate change. •

Ed Armston-Sheret
 Royal Holloway, University of London

Insects Through the Looking Glass

Franziska Kohlt reflects on the results of a BSHS Outreach Grant and the intersections between science, literature, and history.

No matter how you feel about insects, they have always fascinated us humans. Egyptians worshiped them as Gods, they inspired the most famous scientists in history, and they are characters in some of our favourite stories – they have become deeply woven into our culture. But we also depend on insects for a healthy environment and our own survival. They pollinate our crops, remove waste from the environment, and create healthy soils. Recent headlines tell us about the sharp decline in bee populations, and entomologists warn us that if insects disappear, so do the vital services they provide us and our environment, putting us all in danger.

Despite their importance, insects are often portrayed as objects of terror and spreaders of disease. However, a quieter revolution has been happening for over 150 years in the stories we read to our children, in which insects have slowly conquered the role of heroes to challenge these negative attitudes. Insects Through the Looking-Glass (part-funded by the BSHS alongside the Royal Entomological Society and hosted by The Story Museum in Oxford) explored how ‘the little things that run the world’ inspired such famous children’s writers as Lewis Carroll, Roald Dahl, and M G Leonard – award-winning author of the Beetle Boy trilogy.

“No matter how you feel about insects, they have always fascinated us humans.”



Top Fran, Chris, and the Entomologists’s Desk, with replica of Darwin’s and Wallace’s specimen, which visitors could explore in detail with magnifying glasses and replica manuscript material in the drawers.

Bottom Bringing research to life: Fran and a praying mantis from the Travelling Insectarium.

Entomology in literature

Giant insect illustrations, historical entomology books, author readings, an illustration workshop, expert talks, and even real insects (living ones from The Travelling Insectarium, and historical ones from the Oxford Natural History Museum’s collections), brought to life a

literary journey from the Victorian era to the environmental revolution of the 20th century, and to the information revolution of today – to explore how the unique perspective of children’s literature has always led the way in shaping and challenging how we perceive nature around us, and engage with it.



One of the centrepieces of our exhibition was the 'Entomologist's Desk' – funded by a BSHS Outreach and Education Committee Project Grant – designed to showcase some of the real entomological science that inspired the authors. With magnifying glasses, pencils, and paper provided, visitors themselves became the explorers of entomological history. On top of the desk we displayed reproductions of specimens collected by Charles Darwin and Alfred Russel Wallace on their journeys, upon which they devised their theories of evolution by natural selection. Some drawers contained displays of Victorian children's science books, which we know Lewis Carroll referred to. These were displayed alongside actual specimens from the museum where he worked.

For a chance to handle these often fragile historical books, other drawers

“Using magnifying glasses, visitors themselves became the explorers of entomological history.”

contained laminated reproductions of the books displayed, but also Victorian science-fairytales, such as Charles Kingsley's *Water-Babies* (1862-3), a story about actual and metaphorical metamorphosis in the natural worlds, and Margaret Gatty's *Parables from Nature* (1855), which contained a story about an indignant caterpillar not quite dissimilar from Carroll's in *Alice's Adventures in Wonderland* (1865). With this we wanted to show how the historical environment influenced writers, and how such details (for instance, Carroll's caterpillar) already had currency in a literary, scientific, and philosophical context – in the case of the caterpillar, as a vehicle for exploring the meanings of metamorphosis and transformation in nature, evolution, and (in children's literature) child development. This traced a process whereby scientific exploration blends into literary imagination, and

Opposite page Entomologists in the making: the exhibition's interactive elements were enjoyed by children of all ages, with the insects from the Travelling Insectarium proving a particular highlight.

inside our desk's drawers imaginary bread-and-butter-flies and rocking-horse flies happily intermingled with the real, but similarly portmanteau tiger-moths, crane-flies, and mole-crickets of 'real' science.

Curiouser and Curiouser

As we were located in the Story Museum, we really wanted to illuminate the creative process of our authors through the lens of their preoccupation with entomology (the study of insects and their relationship to humans). We arranged an author reading by M G Leonard, who also recounted how she overcame her fear of insects when she started researching them for her books, discovering what these little creatures were capable of. She also explained why her books have a clear mission: 'We think the world is ours, but the micro-world is surprising in ways we don't even begin to understand,' she said, warning that 'we need to get our children appreciating and understanding the needs of all manner of wildlife. It is more important now than ever that we form a relationship and attitude to the natural world, or we risk losing it.'

Two further talks focused on the entomological interests of J R R Tolkien and Lewis Carroll, and were aimed at different audiences. The talk on Tolkien was a stand-alone event which attracted a wide variety of members of the public, from Middle Earth enthusiasts to Tolkien scholars who joined us from the major Tolkien exhibition at the Bodleian Library. Dimitra Fimi spoke illuminatingly about insects being a firm part of Tolkien's world-building; he even had words for several species in his various imagined languages. A real highlight of the talk were Carim Nahaboo's especially-commissioned illustrations of Tolkien's insects, which showed the detail of how species adapt to their environment (the Mordor-flies were particularly haunting).

Finally, as part of Alice's Day (a free, annual family event that attracts diverse audiences and celebrates all things Wonderland), we also welcomed some younger audiences, who all now know where Disney went wrong (anatomically) in their portrayal of Carroll's caterpillar.



Top Meet the cast: Chris handling one of the live giant insects.

Bottom A grasshopper and a millipede in a giant peach-shaped terrarium, re-enacting a scene from Roald Dahl's children's classic

As curators, Chris Jeffs and I split our talk between the literary-historical and scientific sides of 'Insects in Wonderland', and while I explained literary attractions of the idea of metamorphosis, Chris showed why it is such a successful concept in evolutionary terms. As to further desti-

nations of our exhibition, stay tuned, and if you'd like us to travel your way, please get in touch. •

Franziska Kohlt
University of Oxford

This article is an edited extract from Franziska's blog, franziskakohlt.com.

‘Your affectionate Richard’: Gender & Natural History

Daniela Scavo re-examines the professional personality of 19th-century naturalist Richard Owen, using underexplored sources to shed new light on the man behind the word ‘dinosaur’.

Richard Owen was one of the most important naturalists of the 19th century. Yet he has been widely criticised and conceptualised as a difficult and envious scholar. This is not unjustified, as he was involved in many disputes and was a highly political person. But when read through the letters written to his wife, mother and sisters, he seems to be quite a different person. What might this reveal about the life and personality of a ‘man of science’ such as Owen? Can we expand the long-held vision of his difficult personality?

Owen is perhaps best-known as the man behind the establishment of London’s Natural History Museum, and as the person who coined the term ‘Dinosaur’ (presenting these reptiles as a distinct taxonomic group for the first time). In the 1830s he became the known as the ‘British Cuvier’, after French naturalist Georges Cuvier (a founding-father of palaeontology), and by the 1850s he was one of the best-known scientists in Britain. Yet – as Darwin’s contemporary and, later, opponent – Owen has been described as a generally-disliked scientist, while his oeuvre has been obscured by the Darwinian paradigm. As such, Owen’s history has tended to focus on certain aspects of his character; mainly his difficult personality, rivalries, and keenness on power, resulting in a generalised presentation of the naturalist as envious, egoistic, and vengeful.

But historical study of Owen’s life and career has been based almost exclusively on his professional correspondence with other men. Consequently, words like ‘angry’, ‘jealous’, ‘selfish’, ‘competitive’, and ‘petty’ have prevailed in historical descriptions of Owen, since these words often feature in the contemporary professional discourse of his male colleagues. Curiously, this picture stands in stark contrast to the one that emerges from another, frequently-ignored source base: his correspondence with

female relatives. So what do these letters offer us and what makes them special?

Personal correspondence

Owen’s personal letters (mainly to his wife, mother and sisters) reveal a more sensitive side to the scientist, and some different attitudes towards his work. While letters to his colleagues or patrons are generally short and concise, those written to members of his family are (unsurprisingly) much longer, and frequently filled with detailed reflections on his work.

“What makes these letters so special?”

To the women in his life, Owen described his travels, encounters, and social events, and articulated profound expressions of longing and caring, lamenting things like, ‘How I yearn to be with you again’, before signing off ‘Your affectionate Richard’. It is my suggestion that the emotionally-grounded discourse within these letters opened up space for dialogue that was particularly important for Owen’s professional development. That is, with his family, he expressed his professional hopes and fears in ways he could not with his colleagues, writing to them about what made him feel proud and content with himself and his work, as well as his daily routine, his anxieties, and his intellectual preoccupations.

For example, regarding the moa bird or *Dinornis* (a giant flightless specimen he famously described), Owen wrote to his sisters in 1843:

Grace [Owen’s youngest sister] has witnessed a fortunate fulfilment of one of my scientific predictions relative to the existence or former existence — though within the memory of man — of a huge bird in New Zealand. I had a fragment of one of its bones three years ago and ventured to build it up into a “a heavier bird than the ostrich but as big;” it turns out, however, to have been much bigger, and has excited I think more interest than anything that has occurred in my line.

Owen also received significant support and counselling from his mother, who wrote to him in 1827 with professional advice upon his appointment as Assistant Curator at the Royal College of Surgeons:

It is evident to me that your good conduct, added to your abilities and industry have gained you the motive of the Professors, and doubt not that you will still endeavour to retain and deserve their patronage, and should you, my dear boy, be in want of money before your quarter becomes due, do not hesitate to say so.

Again, in 1831, after Owen had returned to London from a trip to Paris, she wrote:

Your being noticed by Cuvier was fortunate, and your having access to his museum would be an advantage in your profession on many accounts, and I trust you will reap the benefit of it ultimately...

In my opinion, these passages reveal that among his female personal correspondents, Owen procured an emotional niche that he could not find elsewhere. This space functioned as a lever that allowed him to build and manage his social, intellectual, and professional life in order to fulfil his ambition of becoming a leading scientist of comparative anatomy.

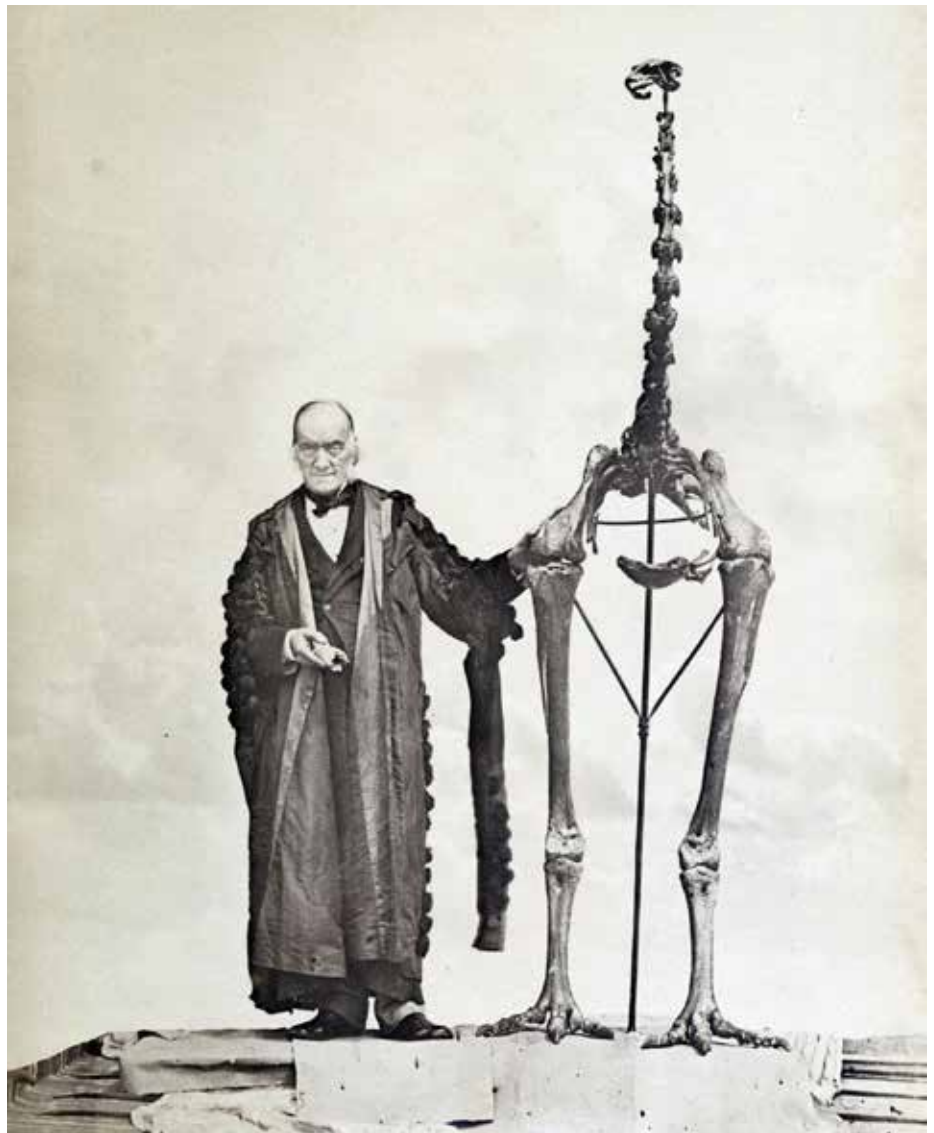
Why was there such an emotional distinction between Owen’s personal and professional worlds? How could he

be both 'rivalrous' Owen but also 'Your affectionate Richard'? This is not to suggest that Owen was 'emotional' with his family and 'unemotional' in a professional context, but rather to highlight that he expressed his emotions in different ways with different communities, according to when and where it was (or was not) acceptable to show or express certain kinds of feeling .

Masculinity and emotion

The growth of Owen's scientific career took place in the first half of the 19th century, so his scientific endeavour was shaped and limited by a context in which 'gentlemanly' science and patronage was merging with a growing professionalisation of science. During this period, a marked emotional demarcation – an ideal of masculinity – delimited the meaning of what it was to be a 'man of science'.

As historian Heather Ellis has pointed out, the characterisation of a 19th-century professional scientist went beyond specialised knowledge and training. Indeed, the ideal character of a respected science professional was greatly defined by masculine-oriented attributes, such as strength and rationality. Thus, while immersed in an often asymmetrical, political, and combative professional environment driven by 'masculine' values, Owen might have found it difficult to manage his professional life in an environ-



Above Owen, who became director of London's Museum of Natural History, was the first to recognise that a bone fragment he was shown in 1839 came from a large bird. When later sent collections of bird bones, he managed to reconstruct moa skeletons. In this photograph, published in 1879, he stands next to the largest of all moa, *Dinornis maximus* (now *D. novaezealandiae*), while holding the first bone fragment he had examined 40 years earlier.

ment where certain types of behaviour were discouraged.

In contrast, among his female correspondents, Owen was able to assert his abilities and achievements, as well as cope with his fears and preoccupations because he was in a safe-zone where he could share what he was not able to in other circles. This permitted him to grow and maintain his intellectual and emotional capital in order to pursue his professional ambitions. As he expressed to his wife: 'The prospect of joining you... will stimulate me to finish my works as soon as possible.'

To conclude, Owen's personal correspondence with his wife, mother and

sisters has usually been regarded as unimportant in relation to his professional projects. The ideas posed here challenge this interpretation. Owen received support from the women in his life and used this to bolster his development in an all-male professional environment. This is important to recognise, because it unseats the long-held view of Owen as a difficult professional personality and sheds light on the importance of personal (and particularly women's) letters in recovering the history of science. Indeed, being 'your affectionate Richard' played a key role in Owen's enterprise. •

Daniela Scervo

University College London

“Among his female correspondents, Owen procured an emotional niche that he could not find elsewhere.”

History of Science, Technology, & Medicine in Schools

A **special report** on BSHS-supported efforts to increase the uptake of history of science in the classroom.

In 2019 and 2020, the Outreach and Engagement Committee (OEC) are considering how they can best promote the uptake of the history of science in schools. Via the OEC Project Grants, we regularly support work that reaches school students (further details available at www.bsbs.org.uk). In the longer term, we hope to be able to provide something more systematic.

During a residential workshop planned for 2020, we will be asking teachers how we can best support them. We would also like to celebrate the innovative and imaginative ways through which BSHS members are bringing their research into classrooms. The two short pieces below provide some reflection on existing opportunities and challenges. If you are generating educational activities or

resources, please do consider getting in touch, we would like to create a central hub for these on the BSHS website – to facilitate access for teachers and as inspiration for colleagues. Please do get in touch (outreach@bsbs.org.uk) if you would be further involved. •

Elizabeth Haines
Chair, BSHS Outreach
& Education Committee

Lessons for History of Science

As part of the European Society for the History of Science (ESHS) conference in September 2018, the BSHS Outreach and Engagement Committee organised a pair of panels on how history of science works and can be put to work outside of the academy. Framed as ‘provocations’, the sessions urged participants to reflect on how, where, and why history of science can take a more public profile. How can learned societies use their institutional positions to encourage wider perspectives on science, technology, medicine, engineering, or maths? How can these efforts help build critical engagement with the global disciplines as they exist today?

In the ‘schools’ panel, a group of fascinating speakers (Dr Marina Castells from the University of Barcelona; Karen Davies, Head of Learning Research and Resources at the Science Museum Group; Professor Maria Rosa Massa Esteve, UPC, Barcelona; and, Dr Huiyi Wu, Needham Institute, University of Cambridge) introduced projects they had been involved with, as participants reflected on how and why international historians of science should go back to school. In fact, almost all of

the presenters spent relatively little time talking about history of science in school itself, instead reflecting on a range of projects based in other locations and institutions: for instance, how an important first step to teaching history of maths in schools was to lobby for its inclusion in national curricula (Castells; Massa Esteve); using museum

collections and school visits as opportunities for developing new modes of enquiry and reaffirming the relationship between the sciences and technology and life in the 21st century (Davies); or building study abroad programmes around collaborations with research programmes, providing students with opportunities to conduct their own



projects and to see archival collections and historical work over more sustained periods of time (Wu).

It was frankly acknowledged that several common problems are often encountered when attempting initiatives of this sort: including the lack of confidence (or interest) in dealing with history of science on the part of teachers (who probably will not have been trained in the subject before) and the disinterest of students (who probably will not have encountered the subject before). Indeed, where this interdisciplinary topic should sit in the exam-focused school timetable is not at all self-evident: should students learn about the history of science as part of Monday morning's history lesson, or in double science on Thursday afternoon? For many teachers, the answer would be that such opportunities would have to lie outside of the school timetable completely, and lack of time was another reason cited why these topics were not habitually addressed.

Without a clearly articulated purpose for studying new areas, problems were also encountered with students asking why they needed to know these things

— if it's not being examined, what's the point? Perhaps historians of science need to be better at clarifying to ourselves and our audiences, as well as to our funding bodies, why we are studying certain topics. Without diminishing the significant practical and motivational challenges outlined here, the panellists demonstrated the rich opportunities available to scholars of history of science, technology, and

How can we widen perspectives?

medicine who would like to work with school groups. In particular, the potential for student-led research, collaborative projects, emphasis on innovative modes of enquiry, or for working on resources for teachers, were all highlighted. Examples discussed included the Science Museum's current emphasis on what they term 'science capital'; Galileo's dialogues; mapping Needham;

and electrostatics. As a historian of science education, it was particularly interesting for me to see many approaches which had previously been employed for teaching science reappearing to teach history of science: dialogues, object lesson-style enquiry, hands-on activities, and collaborative work. Both consciously and unconsciously, it seems, many of these activities are recapitulating the history of science education. There also seemed many ways in which these activities could be brought firmly into the present context (we drew out connections between themes of the 'schools' and the 'activism' panels).

History of science in schools could be used as a means of critical reflection on our discipline and the kinds of stories we want to tell, as they are most clearly articulated for young and beginning audiences, rather than via an outdated deficit model approach. In these ways, history of science for schools might shape new contextualised narratives (both historically and politically) rather than reproducing the old. •

Melanie Keene
University of Cambridge

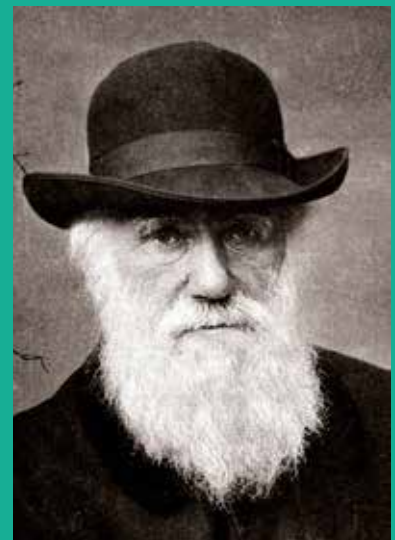
Putting Charles Darwin Back in the Classroom

Charles Darwin was rather unsuited to the classroom. Mathematics was 'repugnant' to him. He was an impatient student and did not believe he 'should ever have succeeded beyond a very low grade.' Famously, he conducted his most important work far outside of the classroom. It is unsurprising then, that teaching Darwin in a conventional 21st century school setting can be challenging.

Darwin straddled the blurry boundaries of scientific disciplines and modes of education in 19th-century Britain. Studying Darwin therefore invites us to think creatively about teach in interdisciplinary ways. In the National

Curriculum for England Darwin's life is addressed in History classes; his theory of evolution through natural is explored in science and religious studies. But in many classrooms, understanding of Darwin is limited to a few 'buzzwords' – chiefly 'evolution' and 'the Galapagos Islands'.

Thanks to the generous support of a BSHS OEC grant, this year a team of PhD students set about addressing this pedagogical problem. We fostered collaboration with Cambridge University Library (UL), which houses the largest single collection of Darwin's manuscripts, and is also home to the Darwin Correspondence Project. Sally Stafford, the Darwin Project Education Officer offered vital support



and experience in planning activities and UL staff were key in granting us access to the Milstein Exhibition Room, meaning that we could host the event at an accessible location with free parking for families. Our main collaboration was with the History for Schools project. The Faculty of History has been running an outreach programme for children aged 7 to 14 for several years, which often receives requests for similar events that move beyond history and into STEM subjects. In partnership with the History for Schools networks, we were able to reach out across Cambridgeshire to create a unique event engaged more than 60 individuals, aged between 2 and 75.

We first advertised our inaugural session of 'History of Science for Schools' in late March and within two hours had received more than 50 signups. Critically, we opened our event to families, enabling everybody to be involved in all our activities and encouraging parents and children to learn together. Given that nearly everyone has heard of Darwin, we wrapped the workshop in a familiar package and advertised the session as 'Charles Darwin, Detection, and Discovery in the Galapagos Islands (1831-35)'.

We ran the event on 27 April. Families were seated at tables of six to eight, which were equipped with all sorts of intriguing materials – from the usual coloured cards and pencils to stretches of grass and egg cartons (soon to be fashioned into herbaria and barnacles). We also laid out trickle-in activities to ease comfort levels and allow space for latecomers. I introduced the session by opening up the floor: what did anybody in the room – children, parents, grandparents, teachers, PhD students – know about Charles Darwin? The predictable answers came in and I was keen to endorse factually accurate standard ideas, but then to dig deeper.

The event was structured around three key activities, before each of which I gave a 5-minute presentation, introducing the topics and task. We were able to cover gendered aspects of



science through examining the letters between Darwin and female scientists in the making. All activities reinforced our slated learning outcomes using hands on small group work. During each activity, PhD students engaged in one-on-one conversations with the children to provide factual information and guidance, breaking up the workshop into little talks. The event ran for two hours on a Saturday afternoon. Everyone took away activities we had prepared to enable the learning to continue at home (including a night-time activity involving the observations of moths).

We hope that the infrastructure is now in place to make History of

Science for schools to become an annual event. We received 40 feedback forms and amassed a waiting list of another 30 families eager to attend future sessions. This shows clear demand for repeated events. In the next phase of the project, we aim to engage with secondary school teachers to think about ways to teach Darwin in schools. To this end, we have already begun collaboration with the Whipple Library (HPS) to host future events, and hope to establish a thriving programme over the months and years to come. •

**Laura Brassington
& Jeremy Garsha**
University of Cambridge

“We hope to make History of Science for Schools an annual event.”

Further Information

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Web: hist.cam.ac.uk/schools/introduction

E-mail: Hist4Schools@gmail.com

Twitter: @STEMforSchools

Instagram: @historyforschools

See also: S. Stafford, "Pester Them with Letters": Using Darwin's Correspondence in the Classroom' (2015) & The Darwin Project: darwinproject.ac.uk.

Viewpoint Interviews...

Katayoun Shafiee, Assistant Professor of the History of the Islamic World at the University of Warwick (where a new interdisciplinary history of science research hub has recently opened).

Who or what first turned you to the history of science?

I have a background in science having completed a Bachelor's degree in Biology. I then decided to study the world outside of the laboratory and completed a Master's degree in Near Eastern Studies and continued in History for the PhD. As I was studying for my PhD, I realised that the role of nature, science, and technology was missing from the historiography on the modern Middle East, particularly concerning the politics of oil.

What has been your best career moment?

One of my best career moments was that I could successfully open my students' eyes to the political possibility of applying an STS (Science and Technology Studies) analysis to the world. It was especially rewarding to read that very first essay that successfully challenged the standard historiographical approaches to the field.

And worst?

The worst was when a scholar of social history offered me a post-doc on the condition that I would stop using 'this STS methodology' in my work. Although I really needed the post-doc, I declined the post.

What is your best dinner-table history of science story?

Amusingly, my best dinner-table STS story occurred at the dinner table of Bruno Latour to which I had been invited by my dissertation adviser, Timothy Mitchell. As a PhD student, I expected a dry discussion of weighty matters of STS but instead, the conversation centered around the Hollywood film *Avatar* that had just been released. In that animated discussion, it was so much more enlightening to highlight the machinery that went into making the film a spectacle rather than taking the effect of its virtual reality for granted.

Which historical person would you most like to meet?

Rather than one person, I would like to meet the first group of Iranians sent by the



Anglo-Iranian Oil Company and the Iranian government to be trained in 'Western science' abroad. I would ask them about the connections they saw between their technical training and the political impact of transforming southwest Iran into one of the largest oil producing regions in the Middle East and the world in the mid-20th century.

What are your favourite history of science books?

Networks of Power (Thomas Hughes); *Rule of Experts* (Timothy Mitchell); *Pandora's Hope* (Bruno Latour); *Radiance of France* (Gabrielle Hecht); *Reading Darwin in Arabic, 1860-1950* (Marwa El-Shakry).

If you did not work in the history of science, what other career would you choose?

Now that I have researched and written about the politics of energy and infrastructural development in the Middle East, in another career, I would do something connected with global climate change and finding long-term ways of shifting to renewable and sustainable forms of energy systems (but that also factors political and economic forces).

What would you do to strengthen the history of science as a discipline?

I would open the field further to histories of non-western contexts as well as interdisciplinary tools from STS.

How do you see the future shape of the history of science?

I think that the new History of Science and Technology Hub that my colleagues here in the History Department at the University of Warwick have set up is indicative of the direction the field is going in the sense that it is cross-pollinating with interdisciplinary methodologies from STS, exploring non-western contexts in more depth, and thinking about how we can configure new tools for addressing contemporary crises in the Global South as well as Global Climate Change. •

Katayoun's book, Machineries of Oil: An Infrastructural History of BP in Iran, was published by the MIT Press in 2018. For more on the History of Science and Technology Hub at the University of Warwick, visit www.warwick.ac.uk/fac/arts/history/sat & @HistSciTechHub (Twitter).



The British Journal for the History of Science

- Daryn Lehoux, 'Why does Aristotle think bees are divine? Proportion, triplicity and order in the natural world'
- Matthew Wale, 'Editing entomology: natural-history periodicals and the shaping of scientific communities in nineteenth-century Britain'
- Felix Lüttge, 'Whaling intelligence: news, facts and US-American exploration in the Pacific'
- Coreen McGuire, '"X-rays don't tell lies": the Medical Research Council and the measurement of respiratory disability, 1936–1945'
- Anna Simmons, 'Trade, knowledge and networks: the activities of the Society of Apothecaries and its members in London, c. 1670 – c. 1800'
- Oliver Marsh, 'Life cycle of a star: Carl Sagan and the circulation of reputation'
- Michael Wintroub, 'The Pharmakon of "If": Working with Steven Shapin's A Social History of Truth' (essay)

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