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Forum
New Perspectives: Innovation in a crisis: rethinking conferences and scholarship in a pandemic and climate emergency

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It is a cliché of self-help advice that there are no problems, only opportunities. The rationale and actions of the BSHS in creating its Global Digital History of Science Festival may be a rare genuine confirmation of this mantra. The global COVID-19 pandemic of 2020 meant that the society's usual annual conference – like everyone else's – had to be cancelled. Once the society decided to go digital, we had a

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hundred days to organize and deliver our first online festival.[1] In the hope that this will help, inspire and warn colleagues around the world who are also trying to move online, we here detail the considerations, conversations and thinking behind the organizing team's decisions.

Despite its rapid gestation, the festival emerged as one of the society's largest-ever events. In total, we hosted over 1,500 participants from fifty-nine countries, who took part in fifty-four different sessions across five days. The programme blended formal academic meetings with social activities and provided opportunities to informally socialize at a distance with colleagues from around the world. This unprecedented globality aided us in our central programming aim, which was to foster British history of science's developing inclusion of post-colonial, indigenous and other marginalized knowledge communities. We planned from the outset for the festival to be 'born digital', built from the ground up in response to the opportunities and challenges of the online environment. After all, you wouldn't try to re-create a digital environment in the 'real' world, so why would you try and replicate a physical conference online? This principle became our guiding ethos.

This article is divided into three sections. First, we outline the philosophical, political and cultural considerations that led the BSHS to begin thinking about sustainable conferencing well before COVID-19 forced our hand. Second, we explain how the online festival worked at the practical level and the reasons for our decisions. What we provide here is not a step-by-step technical guide to our chosen software or communication platforms – the current urgent pace of development will probably render most of the specifics obsolete before long – but a set of principles and considerations which we found important and think will be applicable for other organizations. In the final section, we consider the lessons learned, note what we would like to have done differently, and reflect on the opportunities we see for the future.

We should probably start at the beginning. To do so, we must go back to a time before the COVID-19 outbreak, and revisit some of the conversations that have been taking place both formally and informally in recent years regarding the global purpose and future role of our society, as we reflect on the many facets of the political, intellectual and environmental impacts of our activities as a learned society.

Opportunity: the new normal?

Following the IPCC's 2018 call for the world to reach net-zero emissions by 2050, the BSHS has been exploring strategies for ensuring its activities meet this target.[2] Conferencing is intensely carbon-hungry. A short-haul flight emits on average around 234 kg carbon dioxide equivalent (CO_2e), while an intercontinental visit can emit 1,000 kg CO_2e for a single researcher.[3] For those who have travelled by more

1 In February 2020 the society organized an online Twitter conference. More information about this event can be found at www.bshs.org.uk/bshs-twitter-conference.

2 The IPCC's report can be found at www.ipcc.ch.

3 Short-haul based on flight from London to Rome, long-haul London to New York City; see www.theguardian.com/environment/ng-interactive/2019/jul/19/carbon-calculator-how-taking-one-flight-emits-as-much-as-many-people-do-in-a-year. For a more detailed consideration see Sarvenaz Sarabipour, Benjamin

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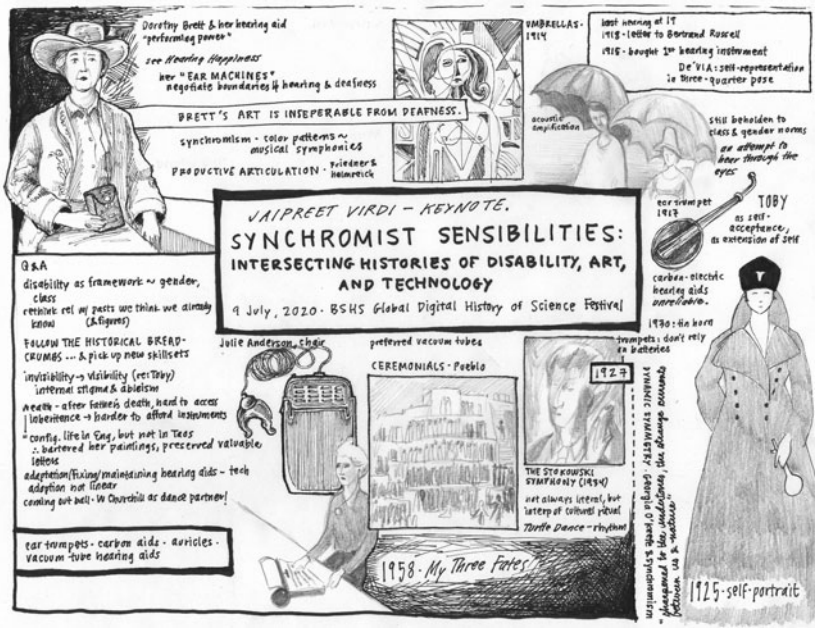

Figure 1. Artwork by Alona Bach (@bachwards).

sustainable means, the highest impact of a conference is typically accommodation and its associated activities – a high turnover of bed linen and so forth.[4] IT and other electrical activities are also problematic. In the long term, one can hope that conference venues will turn to passive methods of heating and cooling and use renewable power for these requirements, but at present their impact on the climate emergency remains high.

The climate emergency is, of course, also closely related to the current pandemic (at time of writing, it is September 2020). Years before the current outbreak, health researchers were drawing attention to the likely role of human-made ecological and climate change in the increasingly frequent appearance of unfamiliar viral diseases.[5] In this sense, COVID-19 was not a coincidental circumstance that enabled the BSHS and others to focus on possible responses to the climate emergency – it is itself a product of the climate emergency. But it is the pandemic that has provided the necessary impetus for many organizations, as well as the BSHS, to think about online activity as

Schwessinger, Fiona N. Mumoki, Aneth D. Mwakilili, Aziz Khan, Humberto J. Debat, Pablo J. Sáez, Samantha Seah and Tomislav Mestrovic, 'Evaluating features of scientific conferences: a call for improvements', *bioRxiv*, doi: https://doi.org/10.1101/2020.04.02.022079. See also http://flyinglessresourceguide.info.

4 Julien Arsenault, Julie Talbot, Lama Boustani, Rodolphe Gonzalès and Kevin Manaugh, 'The environmental footprint of academic and student mobility in a large research-oriented university', *Environmental Research Letters* (2019) 14, at https://doi.org/10.1088/1748-9326/ab33e6.

5 Jonathan Sleeman and Hon Ip, 'Global trends in emerging viral diseases of wildlife origin', in Institute of Medicine, *Emerging Viral Diseases: The One Health Connection: Workshop Summary*, Washington, DC: The National Academies Press, 2015, at https://doi.org/10.17226/18975.

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an alternative to carbon-intensive forms of travel and interaction. Anecdotal evidence suggests that academics are conflicted about this change of practice. Most accept that carbon emissions from travel need to be cut, but many colleagues object that 'it just isn't the same' if they cannot meet colleagues in person. This may very well be true, but it does not represent a reasoned argument against a shift to online networking. After all, even in person, we can no longer greet old friends with a hug, or shake hands with a new acquaintance – but this is a change we have collectively agreed to make in response to new circumstances. The climate emergency provides an even more serious and longer-lasting context and set of reasons to agree to behavioural change. Until a later generation can figure out zero-carbon travel, we are now at the very beginning of figuring out how to research and conference without flying.

It is also worth noting another apparent coincidence in the context of the climate emergency, the pandemic and the digital shift. The climate emergency has been produced by global inequalities in resources, and continues (with some countercurrents) to exacerbate those inequalities. Access to academia and its resources, both tangible and intangible, and in particular to conferences and archives, continues to be very difficult for scholars and would-be scholars in the global South. As states in the global North become more concerned about protecting their resources, visa restrictions tend to become more restrictive, even for those scholars from the South who can afford to travel. There is a growing danger that our conferences will even become occasions of privilege as immigration barriers become more impermeable.

However, a digital meeting can go some way to overcoming these physical, economic and political barriers to participation. Facilitating this became a major aim of the festival. Of course, the digital approach is not a panacea. As the historians of technology in our community will appreciate, access to hardware and the Internet is not universal but constrained by cost, geography and political control; and, as Morgan Ames argued in *The Charisma Machine*, information technology does not in and of itself produce participation in learning.[6] But at the very least, making the festival financially completely free to access was a very deliberate policy regarding participation. For us, the fact that any scholar – or, indeed, member of the public – was free to attend and participate in the festival was almost as important as its digital nature.

Besides enjoying the company of scholars from the global South, the BSHS – especially as a British scholarly society – wanted to create a space in which to listen to, and hear, the intellectual perspectives of post-colonial and indigenous participants. These perspectives are crucial to the continued growth of our historical understanding of science as a cross-cultural set of practices. They are essential in demonstrating how the history of science can help communities think differently about future possibilities.[7] A world that mitigates

6 Morgan G. Ames, *The Charisma Machine: The Life, Death, and Legacy of One Laptop per Child*, Cambridge, MA: MIT Press, 2019.

7 Linda Tuhiwai Smith, *Decolonizing Methodologies: Research and Indigenous Peoples*, Dunedin: University of Otago Press, 1999; Prakash Kumar, Projit Mukharji and Amit Prasad, 'Decolonizing science in Asia', *Verge: Studies in Global Asias* (2018) 4(1), pp. 24–43; Sadiah Qureshi, *Peoples on Parade: Exhibitions, Empire, and Anthropology in Nineteenth-Century Britain*, Chicago: The University of Chicago

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and adapts to the climate emergency will need scholarship that rethinks both science and politics in a multivocal and consensual manner.

As we sought to facilitate this, news of the police killing of George Floyd in the United States broke. The global response to this, in the form of protests led by the Black Lives Matter movement, was another manifestation of these bigger issues, and of the need to challenge the taken-for-granted assumptions of society in the UK. We were very conscious, as we prepared for the event, of the many 'heroes' and contentious issues within the history of science that need to be academically and publicly recontextualized.[8] To a degree, white and Western scholars in the history of science are already well equipped to critique lazy narratives of heroism, though recent critiques suggest that this work needs to go further (and certainly can be further advanced in the public arena).[9] At the same time, the baby must not be thrown out with the bathwater. Consensual science needs to be defined – using the historical methods of seeing how it can be otherwise – and defended as a tool in such pressing areas of concern as climate and epidemiology.[10]

With these political issues in mind, the question of intellectual leadership came to the fore as another aspect of festival planning. It was important to the BSHS council that early-career scholars be given the freedom to define the agenda of the festival. Though not always younger in demographic terms, early-career researchers (ECRs) are typically more attuned to the political and ecological priorities of the coming generation.

But we also need to note that the BSHS decision to facilitate leadership from ECRs was a creation of virtue from necessity: the volunteers who developed the festival were, with only a couple of exceptions, postgraduate students or working in junior, precarious academic roles. This is a telling state of affairs. The motivation of ECRs to volunteer is probably a mixture of enthusiasm and idealism, but is also somewhat born of desperation – a desire to earn CV points that may (or may not) ultimately pay off in the search for secure academic work. Established scholars are (mostly) ensconced in employment situations that post-docs, bouncing from short contract to short contract, can only dream of

Press, 2011; Kapil Raj, *Relocating Modern Science: Circulation and the Construction of Knowledge in South Asia and Europe, 1650–1900*, Houndmills: Palgrave Macmillan, 2007.

8 This problem has been long identified but change has been slow. See Simon Schaffer, 'Scientific discoveries and the end of natural philosophy', *Social Studies of Science* (1986) 16, pp. 387–420; David Wade Chambers and Richard Gillespie, 'Locality in the history of science: colonial science, technoscience, and indigenous knowledge', *Osiris* (2000) 15(1), pp. 221–40; Sujit Sivasundaram, 'Sciences and the global: on methods, questions, and theory', *Isis* (2010) 101, pp. 146–58; Suman Seth, 'Colonial history and postcolonial science studies', *Radical History Review* (2017) 127, pp. 63–85; Andrew S. Curran, *The Anatomy of Blackness: Science and Slavery in an Age of Enlightenment*, Baltimore: Johns Hopkins University Press, 2011.

9 See Ludmilla Jordanova, 'On heroism', *Science Museum Group Journal* (Spring 2014), at http://dx.doi.org/10.15180/140107; Rebekah Higgitt, 'Challenging tropes: genius, heroic invention, and the longitude problem in the museum', *Isis* (2017), at https://doi.org/10.1086/692691; Anna Maerker, 'Hagiography and biography: narratives of great men of science', in Anna Maerker, Simon Sleight and Adam Sutcliffe, *History, Memory and Public Life: The Past in the Present*, London: Routledge, 2018, pp. 159–80.

10 Naomi Oreskes, *Why Trust Science?*, Princeton, NJ: Princeton University Press, 2020; Andrew Pickering, *The Mangle of Practice: Time, Agency, and Science*, Chicago: The University of Chicago Press, 1995; Thomas S. Kuhn, *The Structure of Scientific Revolutions*, Chicago: The University of Chicago Press, 1962.

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inhabiting.[11] The traditional conference exists to support a particular model of academic employment and career advancement, and as such shapes both the content and the form of research that is valued and rewarded. It is an odd and arguably unsustainable state of affairs that established scholars should have their modes of research maintained for them, in conference form, by junior colleagues who are mostly unlikely to attain similar modes themselves. The context for academic work in the coming generation is different, and historians of science, above all, appreciate that context determines the content of research. It did not escape the notice of many of us how strong the reflexive link is between what we study and our own professional lives and practice. The history of science is about how knowledge is produced – the affordances, practices and systems that make it possible. The same issues bracket our labour as academics – indeed, much of the science that we research was produced within a university context itself. New contexts (climate, pandemic, Black Lives Matter, academic precarity) should become new priorities.

Within the context of a ruthless academic world, itself critically weakened by neoliberal economic and political forces, it was important to BSHS that our labour practices should reflect the best possible ways of working. The festival organizers hoped to create a positive and collegial working model that resisted the sector's demand for atomized measurable outputs, valued within a particular and short time frame. Concepts such as 'slow scholarship' and 'care-ful' academic working have been gaining traction and these implicitly inspired our activities.[12] On top of this, we were very aware of the increased levels of anxiety that exist amongst postgraduates and new scholars today, and with that their (reasonable) concerns about identity-based marginalization.[13] We wanted to make it possible for all the organizers to feel that they could make any criticism or suggestion and have it positively received, and to take account, as far as possible, of ideological and practical concerns from organizers and participants alike. We became acutely aware of the enormous unpaid labour (time expended) that our organizers put

11 Sophie A. Jones and Catherine Oakley, 'The precarious postdoc: interdisciplinary research and casualised labour in the humanities and social sciences', *Working Knowledge/Hearing the Voice*, Durham University, UK, at www.academia.edu/download/56561782/WKPS_PrecariousPostdoc_PDF_Interactive.pdf, accessed 8 September 2020; UCU (2019), 'Counting the costs of casualisation in higher education: key findings of a survey conducted by the University and College Union', at www.ucu.org.uk/media/10336/Counting-the-costs-of-casualisation-in-higher-education-Jun-19/pdf/ucu_casualisation_in_HE_survey_report_Jun19.pdf, accessed 8 September 2020.

12 Alison Mountz, Anne Bonds, Becky Mansfield, Jenna Loyd, Jennifer Hyndman, Margaret Walton-Roberts, Ranu Basu, Risa Whitson, Roberta Hawkins, Trina Hamilton and Winifred Curran, 'For slow scholarship: a feminist politics of resistance through collective action in the neoliberal university', *ACME: An International Journal for Critical Geographies* (2015) 14(4), pp. 1235–59; Yves Rees and Ben Huf, 'Training historians in urgent times', *History Australia* (2020) 17, pp. 272–92; Yvonne Hartman and Sandy Darab, 'A call for slow scholarship: a case study on the intensification of academic life and its implications for pedagogy', *Review of Education, Pedagogy, and Cultural Studies* (2012) 34, pp. 49–60.

13 Thirty-seven per cent of PhD students have sought help for anxiety or depression caused by PhD study; 25 per cent of PhD students feel they have been bullied and 47 per cent believe they have witnessed bullying; 20 per cent of PhD students feel they have been discriminated against and 34 per cent believe they have witnessed discrimination. Bethan Cornell, 'PhD life: the UK student experience', HEPI report number 131, 25 June 2020, Higher Education Policy Institute, at www.hepi.ac.uk/2020/06/25/phd-life-the-uk-student-experience, accessed 25 September 2020.

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into the festival. Some colleagues (who were not themselves volunteering) did explicitly critique this mode of production. What's particularly interesting, though, is that, while the financial model of the festival as we ran it did not make it possible to pay our volunteers, what would have changed if we had monetized the process? If it had been possible to pay our organizers for their time, would that have changed the willingness of the society to hand over the festival's intellectual leadership (to the society's 'employees'), and compromised the feeling of collegial working? Could it be that events such as this can form part of an alternative economy within academia, one that is not based upon the monetary concerns that have done so much damage to the university sector?

The desideratum of full involvement extended to our attendees, whom we regarded as co-participants in a shared intellectual enterprise. To this end, questions surrounding accessibility were centrally important to the committee and stretched from asking potential presenters to rethink their session structures to facilitate active participation, to questions such as overall scheduling. What kinds of event should we put in which time zones? Britain is conveniently placed between the Americas and Europe/Asia, but, even so, it was not possible to put everything at a time when everybody could attend. We were aware that having keynote events in the evening, as is conventional for a conference, made them accessible to the Americas but not to Asia. Live sessions are expected, but could we easily make them available to participants afterwards? The capacity to facilitate asynchronous attendance – something that is almost impossible in a physical conference – was an early point in favour of the digital world. Could the opportunity to record events also help avoid the awkward desire to be in two sessions at the same time?

We also wanted to create time and space for face time between participants. Digital media provide an opportunity for mediation and intentional manipulation of social interactions, avoiding the conference phenomena whereby one only speaks to one's existing friends, or to people who unconsciously seem one's own 'type'. They are an opportunity to mix up different types of people and different levels of seniority, in ways that are refreshing and can breed unexpected outcomes. Culturally speaking, we spent considerable time considering how to brand our evening social slot – should we call it the 'pub'? For some, this would be exclusionary; to others, it would be impossible to imagine a conference that did not, at some point, involve a visit to a pub.

Accessibility for all types of ability was another priority. We wanted to ensure that those for whom English is not their first language, those with visual or hearing impairments, would all find a welcoming space at the festival. It soon became clear that while the digital could be a profoundly enabling space, it could also impose unexpected limits. All of these questions of accessibility connect to the importance of ensuring the participation and input/critique/agenda-setting by a full range of scholars.

Our plans, however, became even more ambitious. In making the festival completely free to access, we hoped for audience engagement beyond our academic fields, and even beyond academia itself. We adopted active strategies for this, reaching out to parents and teachers, for example, through offering online child-friendly activities during a lockdown. In the long term, however, achieving a bigger and more diverse audience would require the development of a careful, organic strategy of outreach. But the

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digital space does seem to make this possible if given a longer preparation and planning timeline. Remember: we only had a hundred days.

Fundamentally, creating an online festival of science led us to reconsider the nature and purpose of academic conferences, run by scholarly societies. This 'taken-for-granted' activity needs re-examination. In an era where university jobs are becoming harder to find, and more precarious and short-term when found, the notion of conferences funded by and for securely employed scholars becomes somewhat anomalous. We have already raised the climate emergency and global inequity problems posed by the traditional conference format. But even if we only consider the needs of scholars working within the United Kingdom, conferences need to be reformed if they are to be fairly accessible in a rapidly changing world. Making academic events open to wider audiences – most easily done online – is potentially a double benefit, taking our scholarship into wider circles, as well as extending its financial support base. This does not have to mean paying for attendance, either: other models, such as *The Guardian*'s donation-based system, or commercial sponsorship, are also possibilities. Note, however, that adopting these in the medium to long term would require considerable thought and planning. Similar sets of questions emerge concerning journals and open access, of course. Learned societies, which have traditionally relied on income from their journals (such as this one), must, in the medium term, face the loss of that income in the move to open-access publication. Problematic though this transition may be in some respects, it must be faced squarely and used to the advantage of scholars and scholarship. Rather than doing the same things as before, we could seize the opportunity to do something else with our content – something that could better reflect our responsibilities as scholars and citizens in a democratic society. The history of science has an unparalleled ability to help us see how science, technology and society have been – and therefore can be – configured otherwise. As such, it is potentially of great value to a wide audience.

Finally, it is notable that almost everything that provoked the development of the digital festival – climate, virus, structures of intellectual institutions – has been or is itself a focus of research in the history of science. As such, it is fitting that as an academic community we wish to embody this reflexivity in our scholarly and professional practice. But still, even as all that was solid melted into air around us, we had to consider how we were going to run something in the digital sphere. In the next section, we outline the more practical side of the festival, as we examine the technical decisions and considerations involved in running a large global online history-of-science event.

How we did it: approaches and systems

Our most crucial early decision was that this would not be a matter of adapting the cancelled annual conference to take it online. Instead, the festival would be a distinct venture, designed from the ground up around the opportunities and constraints of the new medium. Though members who had been planning sessions were understandably keen to salvage as much of their work as possible, we saw that a straight translation would simply not work for the audience. The necessary but problematic experience of

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hastily converting taught courses from physical to online delivery in the spring of 2020 meant that some of us were familiar with the pitfalls at first hand.

For this reason, we dispensed entirely with the conventional backbone conference format of two-hour sessions featuring four panellists talking through slide shows. Such sessions are exhausting to watch attentively as a video stream, in a way they would not be with the same four panellists in the room. We set a standard session length of one hour and favoured the formats we felt audiences could best engage with over that duration: single-paper keynotes, series of short 'lightning' talks, and relatively informal discussions. Similarly, we did not refer to the typical annual-conference structure of four or five simultaneous session tracks running over two to three days: this depth of parallel tracking would have been both unmanageable, given the limited size of our tech support team, and pointless, given our new-found freedom to spread to additional days without venue charges or travel complications.

We also needed to recognize that our audience was not as captive as usual: attendees might vanish instantaneously at the end of any session to attend to childcare, admin, or another online conference hosted on the other side of the world. The welcome flipside of this situation was that we could include visitors in individual sessions without expecting them to invest heavily in the overall event, bringing novel opportunities for engagement with current non-members. Social media, particularly Twitter, helped to promote the festival in ways that would not have been possible for a physical event: presenters and other interested people could promote individual sessions to followers on the very day of the session, and there would still be time for prospective audiences to sign up. Such promotion may well have been responsible for a large proportion of the festival's 1,500+ digital attendees.

With this opportunity came the challenge of building a sense of community among participants. This, in the end, proved to be one of the strongest innovations of the festival, again driven as it was by necessity. Networking, one of the most important aspects of any conference, takes place almost entirely outside the formally organized sessions, and often outside the conference venue and schedule altogether. Our priority was to keep this in mind in building engagement opportunities as far as possible online: in place of social distancing, distant socializing.

The social programme was one area where we did take inspiration from physical annual conferences, more as a best first focus for development than with any specific expectations. Each day, two informal drop-in video chat sessions, the morning (UK time) 'Coffee House' and late evening 'Public House', allowed the kinds of chance interaction that BSHS regulars might expect from breakfast at the venue and the post-session pub respectively (participants, of course, being responsible for providing beverages as appropriate for their inclinations and time zones). Social activities from past BSHS meetings also inspired the evening social events before the Public House: a trivia quiz, film night, and historical tour of the Internet, explicitly presented as a substitute for the guided walks we might provide around a physical host city.

The Public House format explored an opportunity provided by the Zoom platform: the tech volunteer looking after the session would reassign participants randomly to new 'digital tables' – groups of around six participants each – every twenty minutes.

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This proved useful in helping participants to meet new people, breaking down the social barriers posed by the attendees' different career stages and creating connections across disciplinary boundaries.

But the most effective aspect of online 'distant socialization' was the facility for audience members to discuss the sessions while they were going on, using the text chat feature of the Crowdcast platform used for session delivery. The chat, which on a typical screen display appears to one side of the presenter video and updates in real time, allows conversation and reflection, open to all audience members, at a level that could never be tolerated at a physical conference. Far beyond whispering occasionally to the person in the next seat, the digital audience could comment, joke or add in links to relevant resources, enriching the panellists' talks – which the moderators could then pass on to the panellists too. Another Crowdcast feature allowed the audience to vote on a choice of options, with the results displayed automatically: this added greatly to the effect of the *Call My Bluff* game show, with the viewers pitting their wits against the panellists to determine the right answers. It also provided support. Although many technical tasks can be performed using free or nearly free software, this approach generally leaves it down to the individual user to resolve any problems they encounter. Given the BSHS's generosity in funding the festival, it made sense to use a paid service offering direct specialist support to make sure the public side of the festival worked reliably. In the event, there were relatively few issues that we could not resolve for ourselves, but these things are best not left to chance.

More generally, several individual session organizers made creative use of the opportunities of a 'born-digital' event. Tim Boon's 'text film' played around with the medium by revisiting a talk given by his early BSHS presidential predecessor, Frank Sherwood Taylor, in 1951, re-creating Taylor's text in audio and offering reflections with the aid of extensive video editing. James Sumner's tour of the Internet incorporated playful use of multiple cameras, which received immediate acclaim in the chat from viewers. Other sessions were built around particular tools or exhibitions accessible online, including a computer simulation of the medieval cosmos as described in Robert Grosseteste's *De Sphaera*, the MEDEA-CHART database of medieval and early modern nautical charts, and the Royal Society/Met Office Library and Archive collaboration to redevelop a planned physical exhibition on weather and climate science into six digital 'stories'.

A further benefit, as compared to physical conferences, was that – subject to the participants' consent – all sessions were recorded and available afterwards for those who had missed them or wanted to recap. It was also possible to add to the text chat discussions so that conversations could potentially continue for weeks afterwards. Nonetheless, the festival had, to the majority of attendees, the feel of a distinct real-time event – to the extent that, the morning after the closing session, more than one person involved felt the effect of the sudden transition from festival time to post-festival time (albeit without the hotel-lobby suitcase forests commonly found at the end of physical meetings).

As we noted earlier, however, considerations of accessibility – in its many different senses – strongly informed our planning. Online delivery creates many access challenges while resolving or significantly reducing others. Most obviously, video conferencing and

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the absence of a registration fee opened the possibility of involvement to people who might never be able to attend a physical BSHS conference owing to lack of funds, workplace or care responsibilities, illness or disability, or geographical separation. This had the effect of making those barriers that remained more visible to the organizers, particularly around disability. Although the very short development time meant we could not put into effect all the responses we identified as potentially useful, we encouraged organizers to provide subtitles for the pre-recorded sessions where possible (Jaipreet Virdi's subtitles for her keynote session being a particular highlight) and had automatic transcription from the Otter service available for all sessions.[14] The discussions with disabled audience members that resulted from the festival will prove useful for future planning, particularly around visual impairment, for which we were less well prepared: in future, we will be advising presenters to describe important slide visuals and to avoid the 'as you can see here …' formulation.

The other main accessibility consideration that informed our technical planning was the drastic disparities in Internet access between users in different geopolitical and personal circumstances, whether due to governmental restriction policies or the vagaries of connection speeds. Though our opportunities for addressing these were limited, we at least ensured that our chosen delivery system was largely unrestricted (see below) and that the content could be accessed at some level with the poorest connections, even if only by downloading the recordings rather than watching live.

It is worth summarizing the technical arrangements and the thinking behind them: the particular systems available to future organizers will no doubt change rapidly in the months and years ahead, but some of the principles will hold. Central to our planning was the early decision to use two different products to manage different elements:

1 Speakers gave their talks, took part in discussions, and responded to audience questions using Zoom, the video telephony service which grew rapidly in the early stages of the pandemic to become the most familiar system for workplace and informal calling in much of the world.[15]
2 Audience members experienced the sessions, commented and submitted questions in their Web browsers via Crowdcast, a commercial service originally geared to supporting corporate 'webinars' and other live video events online, which in 2020 has been notably widely used by large international festivals such as the Hay Literary Festival.[16]

The two platforms were carefully compartmentalized: audience members never had access to the Zoom calls, and speakers and chairs never needed to use Crowdcast. The interconnections between the two – transmitting the Zoom discussion to Crowdcast, and relaying audience questions from Crowdcast back into Zoom – were managed entirely by the festival tech team. This required a great deal of work from

14 Otter.ai is a spoken-voice transcription service. More details available at otter.ai.
15 See https://zoom.us.
16 See www.crowdcast.io.

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the volunteers, both in pre-planning and throughout the festival, but had several major advantages.

Most importantly, it meant that our sessions were digitally secure. Compartmentalizing made it virtually impossible for malicious intruders to derail the session or distract the speakers. This was high on our list of concerns given the relative ease of online as compared to physical intrusion in general, and the specific – and often horrific – spate of Zoom-bombing incidents that became notorious during Zoom's early growth.[17] Though we were careful to password-protect, our ultimate line of defence against Zoom hijacking was to keep Zoom entirely away from the public side of the festival. Since only the identified speakers, chairs and tech hosts had any business even knowing that the Zoom call was available to join, any intruder would have been highly noticeable and swiftly ejected by the tech host responsible for monitoring. Had they got as far as sharing offensive content before removal, it would not have reached the audience: the video stream from Zoom into Crowdcast imposed a time delay of around 40 seconds, within which the tech hosts could stop the broadcast.

The only real option for intrusion, then, was to join as an ordinary audience member via Crowdcast, which required registration using an email address, and where opportunities for mischief were limited to posting offensive messages in the text chat. This, again, was monitored throughout by a member of the tech team, armed with a facility to ban and remove individual users built into Crowdcast – which turned out to be necessary only once during the whole course of the festival. The speakers, in any case, would not have seen any of the Crowdcast text chat unless the tech team specifically forwarded it for their attention.

Second, this combination meant that our sessions were technically stable. Video conference calls involving large numbers of participants have a notorious tendency to glitch, suddenly lose audio/video quality, or cut out altogether, sometimes affecting different users to differing extents. We avoided this problem as far as possible by keeping the directly interacting participants in one small Zoom call and making sure that most people were viewing the session through Crowdcast, a paid-for service designed primarily for the reliable one-way delivery of video over the Web. Our impression, confirmed by attendees' feedback, was that the result was generally delivered smoothly and in consistently high quality, displaying as well as possible for users with slower connections and older machines. Of course, the output could only be as good as what was fed into it from the speakers' computers, and there were occasional glitches here – but any problems would show up identically for the whole audience, making it relatively easy for the tech team to diagnose and fix them.

Third, the sessions were globally accessible. We were concerned to make sure that the widest possible public audience could access the sessions with no specific software beyond a standard Web browser. We were also mindful that some well-known platforms which tend to be thought of as default options in Europe and North America are restricted or prohibited in many parts of the world – notably, the question of how far

17 See www.vice.com/en_uk/article/m7je5y/zoom-bombers-private-calls-disturbing-content, accessed 8 September 2020.

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and under what terms Zoom is permitted in China is complex and still evolving at the time of writing.[18] Although there is no perfect solution to this problem, Crowdcast was, as far as we could establish, preferable to many alternatives.

Finally, one further benefit of the compartmentalized set-up – which, fortunately, did not come into play – was redundancy. Theoretically, we could have kept much of the festival going in the event of a major global failure, such as the one that hit Zoom in August 2020: this would have been a matter of switching the participants to a different video-conference platform and streaming into Crowdcast as before.[19] (Note, though, that if the Crowdcast site itself had failed, we would have had no such protection; organizers who feel the cost is worth it can protect themselves from this kind of problem by signing up for an alternative streaming platform and being ready to manage a quick transfer.)

Equally important to this largely prearranged set-up was the extensive dialogue that took place between the tech team and most of the participants in the two weeks leading up to the festival. This was managed largely through 'training' sessions, organized over Zoom. At a minimum, these sessions served the purpose of taking the participants through the reasons behind the overall approach and made sure they knew what to do on the day, but they also provided crucial opportunities for the contributors to test their connections, their equipment and the effectiveness of their slides or other visuals in the intended setting, while also allowing the tech volunteers to test how their equipment performed while hosting. Having a sense of the participants' varying pre-existing technical expertise, access to facilities, and working environments while presenting was particularly valuable to the organizers in shaping the guidelines sent out to contributors and the approaches to session management taken by the tech volunteers.

What did we learn?

Following the festival, we sent a survey by email to all of the more than 1,500 participants from fifty-nine countries who had watched any session via Crowdcast. We received nearly two hundred responses. In this section, we will examine the answers given to those questions most closely related to either our biggest concerns before the festival or those areas where we feel we learned the most.

A key consideration was how global participants would engage with the festival. Our support team was not sufficiently globally distributed to run sessions at times that would work for participants in Australia and Asia, Europe and Africa, North and South America alike. But early on, we realized that operating on UK time would allow us to span a global audience across the course of the day – and one of the features of Crowdcast is that recordings would be available to access afterwards. We didn't know how many people would utilize this feature since it is certainly not something that could be offered by an in-person conference. Whilst 42 per cent of respondents

18 See https://technode.com/2020/08/03/zoom-will-be-local-version-only-for-chinese-users, accessed 8 September 2020.

19 See www.theguardian.com/technology/2020/aug/24/zoom-apologises-after-being-hit-by-partial-global-outage, accessed 8 September 2020.

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indicated that they had only watched sessions live, 58 per cent had to some extent made use of the re-watch capabilities. When asked why they did so, a variety of reasons were offered. Some did so simply because they had missed a session. Others were fitting the conference around other work or caring commitments. Still others found that the ability to watch sessions whilst utilizing the Otter transcript made things easier to follow, and again, as mentioned earlier, the ability, and encouragement, of others to put links to resources in the chat (that Crowdcast also made available afterwards) meant that some attendees would pause presentations to follow up those links, and would return to the presentation enriched by their wider reading. This flexibility in how, where and when an audience member might engage with content is something to consider, along with the extent to which the replay facility makes online events more globally accessible.

Another question was just how much of the event our audience members would consume. Most participants at a physical conference feel an unspoken obligation to maximize their session attendance, extracting as much value from the financial and time investment as they can. This inevitably leads to what is commonly referred to as conference fatigue. Now, whilst there was festival fatigue for members of the tech team, as we ran multiple events over five long days, the experience was different for attendees. There is something about attending a conference whilst going home to your bed each night that seemed to make the next-day recovery somewhat quicker. Most of our respondents (52 per cent) attended two to five sessions – roughly equivalent to attending for a day or picking up a few sessions over the week. But what it also shows is that most people, having attended one session, were sufficiently encouraged to stay for another. As for the 22 per cent of respondents who stated that they had only attended one session, it seems likely that the online environment makes dipping an academic toe into a conference in an adjacent field both possible and attractive. At the very least, those attracted by a Twitter hashtag could follow up their interest, rather than simply being told about what they had missed. From the survey, we know that many of these visitors had never previously attended any history-of-science conference, and would be unlikely to do so in person. Numbers attending for one session were smaller than those who attended for between six and twelve sessions (that is, an attendance level more in line with what might be expected for an in-person conference). But of most interest for the BSHS – and, indeed, potentially for scholarly societies more generally – is the response to the question "Have you ever attended a BSHS event before?" Fifty-one per cent of responders stated that they had never done so, and only 28 per cent said they were regularly involved in participating in BSHS events. We succeeded, we think, in widening our audience base.

Finally, it is worth reflecting on the content of the festival, its global aim and ambition. To this end, we asked three questions and asked respondents whether they strongly agreed, agreed, disagreed, or strongly disagreed with the following statements:

- 'The Festival showcased new, creative and challenging ideas.'
- 'There was something at the festival that encouraged me to think differently or try something new.'
- 'Overall, the festival was well organized.'

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Figure 2. Photo credit: Sarah Qidwai.

The responses to all these questions were overwhelmingly positive. In all cases, over 80 per cent of respondents agreed or strongly agreed with the statements. These responses suggest to us that the online-festival concept has something to recommend it beyond the immediate necessity of the pandemic and the ongoing necessity of the climate emergency. It also suggests that our very basic ambition to put something together that would be enjoyable was met, and probably exceeded.

We think we succeeded. But we still think we can do better. The BSHS festival was faced with an extraordinary opportunity to meet challenges faced by the pandemic as well as broader issues of academic conduct within in-person conferences. There is still work to be done to ensure that academic space within the history-of-science community is intellectually, institutionally and spatially inclusive. The BSHS festival showed that this is possible in a digital arena. We acknowledge that closer engagement with critical race, gender and class frameworks is needed, and that this means we still have improvements to make in the future. It is important to engage with presenters concerning questions of appropriate language and verbal signposting such as providing cues for content warnings. While much of the presentation and performance of academic papers falls beyond the control of the organizers, such measures are important for consideration in academic arenas, especially those that seek to be global, inclusive and open.

While there is still much to do for the future, we want to end on a familiar note. One of the unexpected outcomes of the digital space was how it opened up the discipline to friends and loved ones in a way that the traditional conference normally does not allow us to do. While professional conferences expect a degree of prior engagement with, and investment in, the field, attendees could join our festival for any session with no prior knowledge of the subject. The virtual environment made the academic space more open and inviting. The pandemic has meant that our working lives are even more embrangled with our personal lives. Our online festival meant that our

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families could see us explaining what we were researching and why we were doing it – and could see how the wider world responded to us. Taking a community-oriented approach to building the field might be the very best way forward.

There is no better way to end this article than with this picture (Figure 2) – one very proud grandmother, engaging with an international history-of-science conference in a way none of the organizers (or the presenter) foresaw. Perhaps our greatest achievement, certainly our happiest.

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