Science in culture

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A composite photograph of surgical gloves and masks discarded in Cardiff, UK, in December 2020.

The global frenzy of COVID collecting

Records of past pandemics are patchy. What are archivists keeping for future historians? **By Laura Spinney**

fonly somebody had counted the orphans. That was one wish I had while trawling archives on the 1918 influenza pandemic to research my book *Pale Rider*. Another yearning? If only someone had saved biological samples of the unidentified respiratory disease that ravaged China in late 1917.

Historians a century hence will, I think, have a lot more to go on.

On 30 January this year, the World Health Organization (WHO) sounded a global alarm when it designated an outbreak of respiratory illness a 'public health emergency of international concern'. On the same day, the US National Library of Medicine (NLM) launched a web archive for the incipient pandemic. "The disease didn't even have a name yet," says Susan Speaker, a historian at the NLM in Bethesda, Maryland. "We collected the tweet in which the WHO named it."

Since then, the NLM has archived thousands of websites and social-media posts from governments and non-governmental organizations, journalists, health-care workers and scientists around the world. That's in addition to all the COVID-related publications in its literature database, PubMed.

Efforts to document the pandemic for posterity have been under way everywhere since early in the year. Government agencies such as the US Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, and scientific institutions including the Pasteur Institute in Paris weren't far behind the NLM. Their archives are being complemented by those of museums, libraries, historical societies and community groups. The global frenzy of collecting has even prompted talk of curatorial burnout.

Museum curators are on the lookout for discarded ventilators and failed prototype COVID-19 tests – but they must choose the moment they ask with care. "We can't just say to busy people, 'Would you stop developing the vaccine and talk to me about collecting stuff?'" says Natasha McEnroe, keeper of medicine at the Science Museum in London. "We have to tread very, very carefully."

Others are storing souvenirs of people's lived experience – video diaries, mask fashion, recordings of the quiet of locked-down streets. Or they're salting away objects that the pandemic has rendered iconic: the signage around the lectern from which UK Prime Minister Boris Johnson spoke to the press; a wooden spoon that a little girl broke while banging her family's cooking pots in support of medical personnel. For the first time, a pandemic has triggered institutional plans for rapid-response collecting – an initiative pioneered by London's Victoria and Albert Museum (its virtual COVID-19 collection even includes a toilet roll).

Collectors are motivated by an awareness that something historic is unfolding, and that past pandemics were relatively poorly documented. Some archivists warn that future historians will have more data than they can make sense of. Others worry about blind spots. Either way, COVID-19 could buck a trend, says Astrid Erll, a memory scholar at the Goethe University Frankfurt in Germany. "It is the first worldwide digitally witnessed pandemic," she wrote in September in the journal *Memory Studies*¹: "a test case for the making of global memory in the new media ecology."

What to save?

In the decades after the 1918 influenza pandemic, the only people who really paid attention to it were virologists, medical historians and actuaries employed by insurance companies. Later in the twentieth century, its study became multidisciplinary, with economists, sociologists and psychologists showing an interest – along with 'mainstream' historians. But by then, much was lost, if it had ever been preserved.

The absences are eloquent in themselves: the lack of a reliable lab test for flu led to massive diagnostic confusion, for example, and women's accounts are relatively rare.

So twenty-first-century archivists are trying to think ahead, to save material that might otherwise pass into oblivion (while trying to distinguish the real from the fake news). At the Pasteur Institute, for example, all internal documentation is being collected, including meeting reports; the same is true at the beleaguered CDC. "We are also beginning to ramp up efforts to collect more personal materials from CDC staff, including video diaries, journals and photographs," says Judy Gantt, director of the David I. Sencer CDC Museum in Atlanta.

The 1918 flu outbreak, like all epidemics that have been measured, highlighted inequality. Today's public-health organizations are – to a greater or lesser extent – documenting that dimension of the current pandemic. For example, Gantt's team is collecting data on how CDC guidelines are being implemented in communities, as well as on health disparities, social justice and activism.

International archiving projects are trying to capture the interconnected and globally variable nature of what we're living through. The NLM, for example, contributes to an effort launched by the International Internet Preservation Consortium (IIPC) in February. With members in more than 45 countries, including national, regional and university libraries and archives, the IIPC aims as far as possible to sample the multiplicity of the pandemic across the world. "We want to get a lot of nitty-gritty detail about individual countries, selected by experts in those countries," says Alex Thurman, a librarian at Columbia University in New York City and one of the collection's lead curators.

At the other end of the scale, there are local and specialized initiatives. The National Library of Israel in Jerusalem is documenting the impact of COVID-19 on Jewish communities globally through what it calls "ephemera" - e-mails about synagogue services that have moved online, for example, or announcements of innovative Jewish law rulings. The American Institute of the History of Pharmacy in Madison, Wisconsin, is gathering pharmacists' testimonies in any and all media. The Museum of the Home in London is asking Britons to submit photos of their domestic lives, in a project called Stay Home.

Data deluge

Archivists are aware that it's not for them to decide what future historians will consider relevant. In 1918, many people doubted that the first wave of the pandemic, which resembled seasonal flu, was caused by the same pathogen as the much more lethal second wave (it was). As evidence comes in, new connections are made while others fade. The tendency today has therefore been to collect everything, within each organization's broad remit. Hence the ocean of data – and the pandemic rages still.

"We had to slow our colleagues down early on because we were using our data budget so quickly," says Thurman. The IIPC's 2020 allocation, fixed before the outbreak at 3 terabytes, was full by June. The Internet Archive, a non-profit organization that is sponsoring the IIPC's COVID-19 collection, gifted it another two, and it has used nearly four so far – storing archived copies of close to 11,000 selected web resources in 66 languages.

Data mining and machine learning tools are going to be needed to explore such large data sets, and Speaker worries that those tools are not yet as well developed as the ones for collecting. It's a concern others share. "The interesting thing about this pandemic is that we may end



An iron lung, a breathing aid for people paralysed by polio, in the Science Museum, London.

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up with too much information and very little sense of how to sort through it," says historian Erica Charters at the University of Oxford, UK.

Pandemics pose logistical problems – one reason they have tended to leave such light archival footprints. "Collecting infectious disease is a real challenge," says McEnroe, speaking from her son's bedroom. Many museums have closed, and archivists have been working from home. Physical collecting has health and safety risks, and raises ethical concerns. Samples of infected lung tissue taken from patients in 1918 were used in 2005, controversially, to bring the virus back to life² – something that nobody in 1918 would have dreamed possible.

So there are holes in the wealth of collected material. Senior scientists and politicians might have their deliberations captured by normal reporting mechanisms such as Hansard, the official transcriptions of UK Parliamentary debates, but they tend not to have time to keep video diaries or screenshot their Slack channels. Nor do patients or frontline workers - especially those from vulnerable groups. "Those who will be suffering the most ... will have the least time, energy, and ability to create a full documentary record of what's going on as it unfolds," wrote Eira Tansey, a digital archivist at the University of Cincinnati in Ohio, in a blogpost in June (see go.nature.com/2kci5vp).

Geographical coverage is patchy, too. The Russian Museum of Medicine in Moscow plans to collect information about the medical response across Russia's 'red zones' – where infection rates are high – but the project has been delayed by the pandemic. At Krea University in Sri City, India, historian John Mathew didn't have his proposal to collect the oral histories of migrant workers approved until October. The IIPC has only one member in Africa and few in Asia. Thurman and his co-lead curator, Nicola Bingham at the British Library in Boston Spa, are conscious of the organization's membership bias towards wealthier nations.

During the 1918 pandemic, the continents that experienced the highest mortality rates – Asia and Africa – were the least well documented. Something similar could happen again. "There is a privilege in being able to collect, in having the resources to do so," says Charters.

Whose record?

Debates around the recording of epidemics – or any historical event – are not new. The choice of recording tools changes according to culture and period, too. In some places, the personal COVID-19 diary has flourished, be it on paper, Instagram or TikTok. But the diary as an everyday tool for introspection was developed in Christian cultures, Charters says, and might not be privileged in the same way in non-Christian ones.

And when should you have started your

diary – or your archive? People living in countries where epidemics are rare perceive a clear before and after for COVID-19. That is not true everywhere. For instance, many Kenyans see the pandemic as a continuation of an old and unremitting drama. As anthropologists Wenzel Geissler and Ruth Prince at the University of Oslo observed in July³: "People in this region have experienced a long century of epidemics and anti-epidemic measures of varying duration and intensity".

"If its social and economic consequences linger for years or decades, when do we say it's over?"

We're no more likely to agree on the end of the pandemic. If COVID-19 becomes a regularly circulating disease, as many predict, and if its social and economic consequences linger for years or decades, when do we say it's over? Archivists need to fix an end date, if only to manage their dwindling resources. They know that date will be arbitrary, yet it will shape the histories that will be written. Convention in the global north is that the 1918 pandemic lasted for 18–24 months. It raged in the Pacific islands well into 1921.

The only comfort, says Charters, is that histories can be rewritten in light of accumulated knowledge, and in ways that it's difficult to predict. Think of the less well known influenza pandemic of the 1890s. There is now debate about whether it was actually caused by a coronavirus, thanks to some results⁴ that have resurfaced this year. "A hundred years from now, they really will write a completely new version of COVID-19 that it's very unlikely we would recognize," says Charters.

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The pandemic bookshelf grows

Outbreaks have long wrought fear, lies, intolerance, inequality and ruin – will we ever learn? **By Tilli Tansey**

o make sense of a year in which decades' worth of events have happened in weeks, books help – from those that are centuries old, to those that are out of date as they hit the shelves. Just as diarist Samuel Pepys showed us the Great Plague of 1665 through the eyes of a government administrator, pandemic-era scientists, doctors, historians and journalists are already refracting history-in-the-making through the prism of their own experiences.

Adam Kucharski's *The Rules of Contagion* makes eerie reading now. Written pre-pandemic, it was published in February when, according to the World Health Organization (WHO), SARS-CoV2 was a public-health emergency of international concern but not yet a pandemic. The words 'coronavirus' and 'COVID-19' don't even appear in the index; Chris Whitty, the chief medical officer for England and an almost-daily fixture in the UK media for much of 2020, makes only a fleeting appearance as an advocate of mathematical models, saying: "[T]he key is usually not that they are "right", but that they provide an unpredicted insight."

Unpredicted insights are what the author, a mathematician at the London School of Hygiene & Tropical Medicine, reveals by considering the concept of contagion in biology and society, from financial markets to social media and fake news.

As a toddler, Kucharski had the rare immune condition Guillain–Barré syndrome (GBS). Discharged from hospital with a toy horn to test his respiratory muscles, his long recovery faded from memory until many years later, when he came across the disease again as an epidemiologist working in Fiji. A WHO report of unusual clusters of GBS across several Pacific islands ultimately pointed to Zika virus infections as the cause, which Kucharski and his team then modelled mathematically.

Kucharski's examples range widely: British physician Ronald Ross's early investigations into the role of mosquitoes in malaria transmission; physician John Snow's experiments in cholera-ravaged Soho; the flu of a century ago;



Cemetery workers wear personal protective equipment to prepare graves for those who have died from COVID-19 in Juárez, Mexico.

and more recent investigations into the spread of HIV/AIDS. He notes that Gaëtan Dugas was misidentified as Patient Zero in the US HIV epidemic as a result of the misreading of his clinical record card that was marked 'O', not zero, for 'Outside California'. How often do such errors occur? And his accounts of tracking Dengue, Ebola, Zika and severe acute respiratory syndrome (SARS) trace the conflicts and convergences between biological evidence. political necessities, social control and the awful rise of fear, racism, inequality and economic strife. With every disease comes missed opportunities, obfuscation and marginalization - see, for instance, Laura Spinney's outstanding account of the 1918-19 pandemic, Pale Rider (see T. Tansey Nature 546, 207-208; 2017) and journalist David Randall's tale of the 1900 plague outbreak in San Francisco (see T. Tansey Nature 568, 454-455; 2019).

Kucharski considers other clusters. Suicide rates can increase in the wake of a celebrity taking their own life; a study from Columbia University in New York City identified a 10% increase following the suicide of comedian Robin Williams, for instance. One-quarter of gun murders in the United States in 2015 occurred in areas containing less than 2% of the country's total population. And he explores economic panics, from seventeenth-century tulip mania in the Netherlands to the Bitcoin craze of the past decade, and the way that markets spread economic problems from country to country. Clearly, his role as an intern at a London investment bank during the 2007–08 financial crash made a lasting impression.

The most pressing question he tackles is why do contagions stop? There is no neat answer on the final pages. But it is clear throughout that the prompt interaction between understanding and control is key. This rule applies for biological pandemics, financial

The Rules of Contagion: Why Things Spread — and Why They Stop Adam Kucharski Wellcome Collection (2020)

COVID-19: The Pandemic that Never Should Have Happened and How to Stop the Next One Debora Mackenzie Hachette (2020)

Apollo's Arrow: The Profound and Enduring Impact of Coronavirus on the Way We Live Nicholas A. Christakis Little, Brown Spark (2020)

Understanding Coronavirus Raul Rabadan Cambridge University Press (2020)

The Pandemic Century: A History of Global Contagion from the Spanish Flu to Covid-19 Mark Honigsbaum WH Allen (2020)

The Plague Cycle: The Unending War Between Humanity and Infectious Disease Charles Kenny Scribner (2021) disruptions, crime, violence and every form of social-media contagion Kucharski identifies.

Righteous fury

Of several authors that explicitly address the present pandemic, two take similar approaches: Debora Mackenzie (COVID-19) and Nicholas Christakis (Apollo's Arrow). Mackenzie, who writes on health for New Scientist, and physician and sociologist Christakis are players in the stories they tell, and both have produced crucial works at phenomenal speed (Mackenzie's was published in July. Christakis's in October). And, like The Lancet editor-in-chief Richard Horton in The COVID-19 Catastrophe (see S. Buranyi Nature 582, 478-479; 2020), they are angry. Angry at the mistakes that allowed the virus to flourish, and at the inequalities that the epidemic has exposed and amplified. Still, neither matches Horton's fury that so many have died owing to the complacency of governments.

Christakis directs Yale University's Human Nature Lab in New Haven, Connecticut. He focuses particularly on the US experience of COVID-19 from epidemiological, social and medical perspectives. As befits an erstwhile hospice physician and friend of the late medical ethicist Renée Fox, to whom the book is dedicated, he gives moving accounts of patients, their experiences of the disease and their sad, lonely deaths. He bears witness to the doctors and nurses forced to use refuse sacks because of a lack of personal protective

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equipment, and turned out of their accommodation by landlords and neighbours fearing contagion. And he recognizes the personal and community grief that has resulted – for the lives and ways of living lost across the globe.

His rage at health inequalities and lack of access to universal health care for homeless people, prisoners and low-income workers is palpable, as is his wrath, for example, at the threat of enforced water shut-offs in the middle of the pandemic, with an estimated 15 million Americans unable to pay their utility bills. Not surprisingly, much of his anger is directed at US President Donald Trump and his administration, and in particular the snake-oil salesmen peddling unsubstantiated 'cures', such as bleach, silver solutions and the antimalarial drug hydroxychloroquine, encouraged by the confusion emanating from the White House.

Yet Christakis is an optimist. History suggests, he argues, that humanity will emerge from COVID-19 with renewed senses of purpose and possibilities, "albeit after tremendous sorrow". He foresees a licentious era beginning around 2024, akin to the Roaring Twenties that followed the First World War and the 1918 flu pandemic. We can look forward to increased religiosity, risk-taking and intemperance.

Mackenzie relates the United Kingdom's catastrophically slow response compared with other research-rich economies, such as New Zealand, Singapore and Taiwan, where COVID-19 was swiftly contained. She quotes some of her own prescient reporting from years past. In 2013, after watching a less-than-satisfactory simulation of a birdflu pandemic at the WHO's headquarters in Geneva, Switzerland, she wrote in New Scientist: "Information will flood in: body counts will mount. Governments will be told that their demands for vaccines and drugs cannot be met. [The WHO] will issue declarations. hold briefings, organise research, tell people to wash their hands and stay home. Mostly, though, it will just watch helplessly."

She reflects on how COVID-19 has brought home the terrible power of pestilence to wealthy countries, which for too long have been oblivious to the toll of malaria, tuberculosis, HIV and more in the global south. How could this have happened, she asks, despite all the wonder drugs and high technology? Mackenzie's diagnosis points to global ecological problems: too many people, increasing pressure of space for food and habitation, and the encroaching dangers of forests as intensive farming pushes people and livestock into wildernesses that harbour new animal-borne diseases.

Paul Rabadan's *Understanding Coronavirus* is a very different offering. This pocket volume offers a series of questions and answers, ranging from basic virology, such as 'What is a coronavirus?', to more complex issues such as 'How does the COVID-19 outbreak compare to the SARS outbreak in 2003'? There is a 'Summary of common misunderstandings' and a couple of pages of notes added as the book went to press. Although the text is clear and cogent, the problems of balancing content with presentation are clear in the illustrations - many are too small, and several are too complex for the non-specialist. Some sections have inevitably dated quickly, such as 'Are there vaccines for coronaviruses?'. That said, this small book could be required reading for many politicians and journalists - along with Carl Bergstrom and Jevin West's book, Calling Bullshit, on data presentation and interpretation, and their significance in the contagion of ideas (see E.-J. Wagenmakers Nature 584, 36; 2020).

Until next time

Two more volumes take broader historical sweeps. Mark Honigsbaum, a medical historian and investigative journalist, has reissued his well-received 2019 volume The Pandemic Century with new material addressing the current pandemic. A gripping read, it covers the usual wide range of infectious diseases plague, flu, Ebola, AIDS, SARS, Legionnaires' and Zika (see B. Kiser Nature 567, 459; 2019). There is also a chapter on the outbreak of psittacosis, or parrot fever, that started in 1929 in the United States: a respiratory disease caused by the bacterium Chlamydia psittaci. In a similar way to COVID, psittacosis can be mild or appalling. It is now very rare, thanks to widespread antibiotic treatment of infected people and commercial flocks of birds, especially domestic poultry.

In the new final chapter on 'Disease X', now known as COVID-19, Honigsbaum also blames complacent politicians but bemoans the lack of medical research into coronaviruses, too. He calls them the "Cinderellas" of the virus world: ambitious young microbiologists were warned that the waxing and waning of interest and funding for such research was no way to ensure a successful scientific career.

An economist at the Center for Global Development in Washington DC, Charles Kenny (The Plague Cycle) takes an even longer view. His starting point is a discussion of prehistoric humans' susceptibility to disease, focusing on 2,500 years of civilization's interaction with infections, especially in today's urban societies. This is big-picture medical history. It takes in pestilence including plagues, malaria, smallpox and polio. It snapshots antibiotics and vaccines, and the problems of drug development, anti-vaccine campaigners and drug resistance. And he looks at social and medical reform, including sanitation, nutrition and the development of professional medical science and public-health systems. This all-encompassing view of humanity's battles against disease provides a useful background to the more-specialized COVID-19 volumes.

The conclusion of *The Rules of Contagion* makes poignant reading. Kucharski writes that close analysis of previous outbreaks – learning what was predicted and what was ignored – offers the opportunity to prevent or control future outbreaks. Unfortunately, as the rest of these books relate, memories are short, political wills are weak and effective contingency plans are tweaked, ignored or forgotten. Reading Pepys' diary entry for 31 December 1665 – "Now the plague is abated almost to nothing ... to our great joy, the town fills apace, and shops begin to be open again" – we know there's always a next time.

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Correction

The global frenzy of COVID collecting

This article gave an incorrect affiliation for Ruth Prince. She is at the University of Oslo. See https://doi.org/10.1038/d41586-020-03554-0