Sarah Craske, *Biological Hermeneutics* (2017).

The Art of Biological Hermeneutics

Sarah Craske with Dr. Charlotte Sleigh

Our literary archives are a record of our written culture, revealing what we value most to future generations. For Sarah Craske, it is not their textual content but their support of microbial life that opens up new ways to read an archive. In this interview, Sarah asks how microbial life challenges our understanding of archival practice and the institutions that keep it in place.

We are accustomed to think of physical archives as stable repositories for knowledge but their future seems increasingly under threat. How are archives changing today, and how does your work help us think about that process differently?

SC: Over the last decade, libraries and archives have gone through a huge process of change. As technology continues to develop, so does our relationship with knowledge. In consequence, the status of knowledge, and access to it, is continually being redefined: Knowledge acquisition and storage is moving from the real to the virtual world. Libraries, as interdisciplinary research centres, act as both an archive of knowledge artefacts and as a digital information highway. Both roles are being expanded, but also merged, over time as a focus on digitising archival materials increases. The expansion of digital material prompts the question: What will our relationship with the physical archive eventually become? Will it hold any value at all? Digital archiving is not unproblematic; unlike physical artefacts that can survive for centuries, digital data can become corrupted and digital data formats soon outdated. Through fast-paced consumerism, even the equipment needed to access data created a decade ago is becoming

rarefied. A dystopian prophet might predict a digital world where physical objects are no longer conserved and safely stored but, rather, discarded and scattered across a landscape – their perceived value lost once digitally appropriated.

'Biological Hermeneutics' is an artwork I have developed in collaboration with Dr. Charlotte Sleigh, Dr. Simon Park, and Chethams' Library in Manchester to interrogate this situation further. As a project, it essentially reveals a transdiscipline – one that questions the tension between these digital and physical states through enquiry that crosses scientific and artistic boundaries. Through it have emerged new theory, writing, and a variety of mixed media exhibitions and performances. The premise of Biological Hermeneutics is that the physical archive is not merely made up of written or printed text; it also contains data embedded within its biological forms that reflect its usage and those who use them – books as centres of microbial data and data transfer that forces us to question how we interpret texts and the means by which we interpret them. In this way, we are asking whether a move from traditional conceptions of archival taxonomy and practice might be possible, so opening up forms of archival knowledge and understanding that might not even be conceivable at present. In the background to this work is a deeper acknowledgement of society's imperative need to move from an object-based, commercial, and material-use culture to a sustainable, ecologically concerned, object-less culture. As such, it reflects on the 'death of the object' in art history, in museology, and, quite literally, the process of decay in physical and digital objects.

How does the concept of Biological Hermeneutics bring together the different scientific and humanistic methods required to form a new understanding of the archive in this way?

CS: Hermeneutics concerns the process of interpreting texts and probing the ineliminable gap between author and reader. Hermeneutics came to

fame as a method of biblical study in the early-to-mid 19th century through its questioning of the many assumptions underlying biblical literalism. We see here that early critical questioning of Christianity came initially from literary methodologies, not scientific methods as is commonly imagined. We want to understand how hermeneutics can be performed in relation to something assumed to be open to scientific research but closed to humanist study – in this case, biological life.

SC: Biological Hermeneutics is, then, a form of study in which books are read for their biological, rather than textual, content, such as the microbial life (e.g., bacteria or viral) on their pages. Our use of the phrase is deliberately ambiguous in grammatical terms: It can mean doing hermeneutics through biology, or doing biology through hermeneutics. This strikes a connection with natural philosophy ; this is particularly important since this early modern form of scientific practice included the kind of philosophical inquiry towards meaning that is often excluded from the Sciences today. There is, therefore, an important symmetry here of approaching biological subject matter through humanities-style methods on the one hand, and looking at a text through scientific methods on the other.

CS: There has been a trend for the latter more recently, for example, in new concepts such as neurocriticism or neuroarthistory. Here, there is a risk that a particular type of knowledge – the correspondence between brain activity and human behaviour, such as when enjoying a poem – is seen as trumping or subsuming humanist knowledge: Even if we can detect through a brain scan that a reader has a strong response to a poem, it is not the case that we no longer need to spend time elaborating its interpretation. In my opinion, these two angles of approach (from scientific and arts/humanities methods) must be held in constant tension, without allowing one to overcome the other through disciplinary bias.

As part of this new transdiscipline, how have you gone about uncovering the microbial life of archival materials?

SC: We have developed what we call the Biological Hermeneutic Print. Through it, we are able to isolate and recover viable bacteria from the pages of a book. This is done in a way that preserves their spatial relationships on the surface of the page itself.

First, a 'Molten blood' agar base (a highly nutritious general-purpose agar) was poured into bioassay dishes and allowed to set. This is a type of agar used to grow organisms with complex (termed fastidious) nutritional requirements; it is highly suited to reviving damaged bacterial cells from very old books. Using aseptic technique, we pressed pages from Book Three of a 1735 copy of Ovid's Metamorphoses onto the agar plate surface we had prepared. After 20 seconds, the pages were removed and the plates incubated at 25°C for at least a week to encourage bacterial growth. Where bacterial cells were transferred from the book onto the agar, they multiplied over time to form visible colonies (now containing billions of bacterial cells). In order to allow colonies to fully develop, they were left to form over a period of many months. A wonderful twist in our method is that not only microorganisms but the paper indentations arising from the original letterpress printing some 300 years earlier were captured on the agar's surface – maintaining something of the relationship between a text's biological and symbolic content.

Once developed, we were able to isolate colonies from our prints and use a technique called dilution streaking to generate new colonies (subcultures) with pure bacterial strains ready for DNA analysis. Here we found a type of bacteria that only exists 20,000 feet into the Earth's atmosphere, which can only be explained by the flight I took to New York with the book in my luggage! (The ways in which we are unexpectedly complicit in the life of the archive emerges once more.) We also learned something of how readers from the past have physically interacted with the text itself. This

has included finding more bacteria common to the human skin on the Latin rather than English translation of the text. On one of the pages, a sneeze could also be evidenced, both in how the bacteria had been dispersed across the page and the type of bacteria identified (one commonly found in nasal passages). Rather than ending our research here and disposing of the used agar plates, we carefully dried the agar to generate a thin glass-like film that fixes and preserves the bacterial life on their surface. I then designed and built an archive ready to store the bacteria harvested from the book. After DNA analysis, the samples were then labelled and stored in the archive, so creating our own 'microbial library' – the first expression of our Biological Hermeneutic transdiscipline. We will continue to update the library with more samples as the opportunity arises.

By uncovering the microbial life of archives, you reveal forms of living process and exchange that have been sustained over very long periods of time – even over centuries. How would you characterise this ecology (or these ecologies) long-hidden from view?

SC: History, as is implied in the word itself (from a western perspective) is the *written word* – stories constructed with intent. Unknowingly, or without consideration, we have created agents to collect alternative and unmediated histories – from the microbial life of those who have constructed the texts to collections of environmental data that can offer unmediated socio-political narratives. Each ecological community is also singular, which becomes apparent when you compare different archives: All have their own unique profile depending on the focus of the archive and, for example, the demographics of its users. Archives can, controversially, be profiled according to their unique composition of microorganisms.

CS: The humanities are at an interesting moment in their development. For three hundred years, we have been the inheritors of human exceptionalism,

an exceptionalism that asserts our view (sometimes aggressively, sometimes resignedly) as the only view that is obtainable to us. In other words, this is a perspective that leaves no room for a God's-eye view and no form of objective view from outside of our own selves. The philosopher Kant proved that we cannot grasp the fundamentals of the cosmos (the noumena) apart from through the limitations of our human senses and experiences. But now we see post-humanism challenging this: We are starting to talk about how 'critters' (Donna Haraway) and 'things' (Bruno Latour) have lives of their own. As a counter to human-centred hubris, this seems like a good thing. However, the Kantian question remains: Can we actually see, take account of, and interact with these *other things in the world* apart from through our human goggles? In other words, can we ever relate to them – through knowledge, through relationships – in their own right? We do not know the answer to this question, but the perspective of giving archival microbiota space to grow and interact on their own terms (outside of our control) seems a beautiful and mysterious meditation upon this, perhaps, unanswerable question.

With the concept of Biological Hermeneutics, you make explicit the web of human interactions and reasons-for-action that are the life of an archive. How does this work reveal connections between different elements of cultural, social, economic, and natural history that constitute the archive?

CS: The archive is deeply constituted by connections between these different elements. This is why *the archive* is a problematic term in that it materialises and canonises assumptions of value – the culture that matters – in a way that has, historically, reflected various skews on gender, race, ability, sexuality, and so on. But what we have enjoyed discovering is a little bit more about how our bodies, too, are an archive of microbiota from deep and recent times. This radicalises and opens up the archive – and often in

very problematic ways. With the concept of Biological Hermeneutics, we are interested in questions of how representation and reality can convolve [1], i.e., how the map of the landscape becomes the landscape itself or how the archive of the world becomes, in itself, the world (a very Borgesian idea). This is more easily illustrated with an example from Sarah's work – one in which the institution involved has to remain anonymous.

SC: Whilst Artist-in -Residence, I implemented a couple of public engagement events, one of which specifically targeted the staff at the site (numbering over 100 people). The research activity (built around the 'microbio ta collection trolley') involved was very simple: They were asked if they would voluntarily impress their fingers onto an agar plate; the samples were then fully anonymised but linked to information on which parts of the site, and specifically which archives, they had visited. Subsequently, the microbiota samples were nurtured on agar plates and their growth documented photographically. Through visual results alone, clear patterns became visible. You could, for example, identify which archives had been visited based on the visual similarity of microbiota growth patterns, i.e., a group of people who worked more exclusively on one archive had similar microbiome characteristics – perhaps even convergently so – through interacting with common objects. Further, the results seemed to suggest trends that matched the hierarchy of staff: Those higher up the status ladder had less microbiome diversity than those further down the ladder. You could also start to identify teams: The personal assistant of one member of staff shared similar results to the person they were assisting. This work highlighted relationships and interactions within the archive that had not really been questioned before. The exchange with microbial life through interaction with archival materials has always been present (and will continue), only it was not apparent to our human senses. In an institutional setting that strives for stability and consistency, this uncovering of a hidden truth can be unsettling.

[1] We are indebted to Romén Reyes-Peschl for introducing this term, which is of his own devising.

If we become aware of the microbial life picked-up, left behind, or transmitted to others through interaction with the archive, is there the possibility for new practices to emerge that use the archive as a targeted means of a symbolic cultural and intellectual exchange?

When the question was raised as to whether individuals, or an individual's socio-economic status, could be identified from the microbiota samples – *a question I simply could not answer* – the results of the project became highly controversial, causing extensive debate within the institution. Their ethics committee became involved, and, finally, over fears that the work might be breaching data privacy and intellectual property law (as each sample is a unique reflection, indeed creation, of an individual), the project's results were pulled and I was restricted in what I could publish as an artist. There were questions about the legal status of individuals, the social function of archives, and the ethics of institutions that the department was not ready to 'deal with'. What the operation of the human microbiome means for these issues is genuinely an open question.

It is interesting to me that, rather than embracing the potential for exploring this exchange between the physical archive and archivists, such defensive measures were taken within the institution. I choose to work with archives in this manner precisely because it is so different from the flexible interdisciplinary space I work in. Therefore, I always acknowledge the risk that something unpredictable might be uncovered in my work that creates tension with a knowledge-stabilising mentality of the institution. I had hoped that new approaches to cultural and intellectual exchange with archival life would be possible, but it might just be too soon. Instead, I can certainly envisage policies being written in the future to *manage* archival microbiota, with new value systems put in place to navigate the *risk* it presents. Unfortunately, like any resource, I can only see it being mediated and exploited to some end other than a potentially exciting, and highly original, form of cultural exchange.

CS: What that alternative might look like is anyone's guess. The archive is already, symbolically speaking, a heavily freighted object of cultural value and exchange. Perhaps thinking of their microbial content could drive a democratising move – a spur to broadening who gets to participate in archival life? This also puts me in mind of faecal microbio ta trans-plants (a means of transferring critically important bacteria from healthy individuals to the guts of individuals who are health-impaired); perhaps, we should be thinking of scholarship along these lines too – a form of microbiota transfer that brings us closer to the lives (and agency) of other scholars and scholarly communities. That would certainly up-end a few things!

With this new outlook on what constitutes a material archive, archival practice, and the interactions that give an archive life, do you now think about the cultural movement to digitise archives differently?

SC: Once we recognise the central issues around how data is essentially mediated (who chooses which data is to be shared, in what formats, how it is edited, what is valued in that data, etc .), the digitisation movement becomes so much more problematic. With over a decade's experience of working in libraries, it seems clear to me now that the digitisation of knowledge is directly linked to neoliberal capitalist principles that have a different value framework to those of the archives themselves. Libraries are constantly having to reduce or manage their physical archives due to the demands they make on 'space' – which of course has a fiscal value. The short-termism of converting space into income is threatening the life of the physical archive. This is ironic as the storage of data requires enormous server centres across the world, each with their own huge demand on energy. The physical consequences of the digital world are now a topic that needs much more attention.

What I find particularly interesting is that the physical archive – especially vellum and the older print materials – are actually more stable than their digital counterparts. Libraries face a constant battle in how best to preserve their digital archives as technology and data formats continue to be updated. One of the libraries I have worked in was spending significant amounts of money trying to restore historic tape machines and deciding on an appropriate digital policy – a decision that will give them probably around five years breathing space before their hardware/software is no longer able to read that file format. With digital policies constantly updated, there is a question of how much data should be collected and stored at any given time. One library I know scanned thousands of detailed Victorian-era maps in order to dispose of the original materials, only to find that much of that detail had been lost due to their choice of image resolution. Marginalia and text metadata can be just as valuable as the text itself: They can provide insight for translation and the basis for new knowledge. Ironically, whilst these conversations take place in the main library, the special collections, often with centuries-old texts, sit quietly in their climate controlled room, potentially for generations.

Of course, there is a central tenet that digitising information democratises data for everyone. But I think this is a false notion, especially if some are then restricted in their access to the physical archive as a direct result. The risk is a further entrenching of the physical archive in its already-elitist status. With a few rare exceptions, original texts may increasingly end up confined to, what are in effect, private libraries and collections. Here, they will develop ecologies of microbio ta that reflect – maybe even one-day betray – this restriction of who gets to use them. Fundamentally, a digitisation movement that essentially *puts the breaks* on those interactions that make archival microbiota possible – without first asking what the consequences might be for the loss of new types of insight – is a little troubling.

CS: We live in the era of big data, and with that comes a sense that data trumps everything else. There are theorists, like Yuval Harari, who go so

far to claim that data is all that matters, that we are obliged to facilitate the exchange of data, and that the material carriers of data – animals, plants, humans – take second place. As a Marxian, and an inheritor of Judeo-Christian notions of embodiment, this is a troubling perspective. Losing a physical library might seem like a minor problem, but we have to ask how this is all part-and-parcel of the same 'commodity fetishism' for data (a Marxian term used deliberately). Here, subjective aspects of economic value are transferred into the objective things (in this case data) at the expense of human relationships that actually give data value.

Any discussion about the archive needs to touch upon concepts of media, both as material and communication. Your work reveals the many ways in which we can become inextricably part of an archive's material form and performance. Should we understand this as a process of `becoming media'?

SC: Yes, absolutely. Media studies are increasingly important to the history of science (e.g., in the work of Jim Secord) as we come to realise that no knowledge can come into existence or operate unless it is mediatised: We need to look at media if we are to understand knowledge discourse. I like the pun of media in our work: Both agar gel and books are media for microorganism growth, but also for the growth of human knowledge. In this instance, then, media is not just mere textual material, as it also includes microbio ta, people (archivists and archive users), and forms of exchange that help shape this wider concept of archival life. It is important to recognise that, prior to my residency, archival staff were completely unaware of how they were contributing to an archive's microbial life and working *in relationship* with it – essentially developing another level of *shared experience* or encounter between human and archive. A microbial conversation was occurring, if you like, and, arguably, this could have consequences for a staff member's biological, mental, and emotional states.

The effects of this are not to be underestimated. We like to think of objects (such as archival materials) as rather unassuming in their own right, with no perceived agency, and of a time and place distant from us in the present. When you start seeing how new forms of archival materiality and the interactions between human and non-human agents are deeply part of the archive in the present, that distance diminishes considerably – the media that is the archive includes us. So, I believe we need to start asking different questions about where boundaries do or do not exist between objects, forms of agency, and so on. Do we need to start thinking about how our *own* agency is actually distributed across living and non-living objects? Should an understanding of our agency *include microbiota* as an inherent component rather than as something *other?* To what degree microbiota have their own agency (and whether there are consequences that follow from it)?

Transdisciplinary project outputs are inevitably the start of new conversations, pointing to lines of inquiry that could fall within more established disciplines or orient work towards new unknowns. How has the tension between different disciplinary demands played out so far?

CS: Fundamentally, we think this work adds an important dimension to our appreciation of old texts by seeing them as a medium for microbial life and exchange. That archival microbiota might be used to detail individual's socio-economic status, literary interests, and social interactions has already been raised, but now we are starting to see how this work pushes other lines of inquiry within the natural sciences (such as the science of microbiology), the social sciences, the arts, and the humanities. It is really only through future work that we are going to make sense of some of the insights so far and work out exactly what questions we should be asking in the future.

SC: Certainly, there is more we can ask about how archival materials contain traces of their own history (including their own microbiological history).

So far, as discussed earlier, we have had the opportunity to examine a 1735 copy of Ovid's metamorphoses for both layers of microbial life and atmospheric mineral deposits. The question of whether archival materials can serve as a record of changing genetic information contained within microbiota over time is a tantalising research question to pursue in the future. In theory, this is possible to study: Books may contain dormant bacteria, extremely long-lived active bacteria, or spores released at the point of a bacterial death. It is entirely feasible, therefore, that the genetic information extracted from these samples could illustrate shifts in evolutionary history. From here, it is not a huge leap to imagine how a historic archive could help in the battle against current microbial-related challenges: The scientists on our team, for example, were keen to find older bacterial DNA from a time when antibiotic resistance had not yet occurred. Our initial project, however, lacked the budget to explore these types of enquiry in any further depth.

To be honest, the enormity of the world that has opened up since I started to study these texts through this different lens has forced me to rethink my own role as an artist; it has meant prioritising those elements of the work most important to me. At the moment, these concern questions about how we reframe the relationship between our individual selves and our microbio ta and how we can develop collaborative frameworks that allow these relationships to be studied in a truly transdisciplinary way. Who knows what new ways might emerge for us to *read the archive*?

What, for you, is the promise of transdisciplinary working, and what are some of the challenges you face in putting it on a more stable foundation?

CS: For me, what all this demonstrates is the potential – but also enormous challenges – of transdisciplinary working, something we have written about in two recent articles (1, 2). Transdisciplinary approaches have in

their favour that they can be targeted where needed (e.g., object-focused or problem-orientated) and leave behind a lot of disciplinary baggage. (Although, it goes without saying, in any new formulation of inquiry, traces of its predecessors will remain). They can also be positioned in a world where complex problems are not amenable to mono-disciplinary solutions; in this way, they bear some resemblance to 'post-normal science'. Finally, they carry an implication of democratic engagement – if the right processes can be put in place to support them.

SC: There is, of course, a risk that a transdisciplinary approach might efface valuable disciplinary perspectives and methods of critical questioning that they can offer: This means drawing on different disciplinary perspectives in a productive fashion is rarely easy. On the other hand, transdisciplinary working can highlight (as I have seen all too often) priorities stemming from disciplinary culture that then require workarounds in order to remain true to a project's core values. This problem-orientated approach also excludes a whole realm of knowledge creation, namely science or art for their own sake – something which I still believe has an important place in the world.

CS: How we construct transdisciplinarity in a neoliberal culture that values only economically calculable solutions is another important question. Moreover, transdisciplinarity must actively address the charge that can be levelled at any form of investigation potentially *tainted* by its historical siting in spaces of privilege: To do, for example, a form of 'pure science' requires first having no worries about your own rudimentary health, living conditions, income, etc . Transdisciplinary working offers the promise of taking this into account through opening up participation and challenging such issues head-on. For me, the figure of the 17th century natural philosopher Robert Hooke making microscope drawings of tiny organisms found on the pages of his own books is an irresistible image: Recuperating the richness, the epistemological quirkiness, and the phenomenological experience of Hooke's approach to science reminds us of what transdisciplinary working might also achieve today.

Author Biographies

Sarah Craske is an artist working at the intersection of Art, Science, and Technology. She works with multi disciplinary spaces and organisations to drive new transdisciplinary collaborative partnerships. Her work interrogates a range of practices: research, writing, installation, film, performance, sculpture, casting, engraving and printing, synthetic biology, and architecture. Sarah graduated in 2016 from Central Saint Martins in London with an MA degree in 'Art & Science', receiving a distinction and the NOVA award. She was shortlisted for the 'John Ruskin Prize – Agent of Change' in 2019. Recent solo exhibitions include 'Biological Hermeneutics' at the Chethams Library in Manchester, and 'THERIAK – The Past In The Present' at The Pharmacy Museum, University of Basel. Sarah is currently director of SPACER – a purpose-built space for transdisciplinary practice. She is an Honorary Research Fellow at the Centre for the History of the Sciences, University of Kent, and a visiting lecturer at Central Saint Martins. Sarah is co-curator of the Science and Arts Section for the British Science Festival. More on her work can be found at http://www.sarahcraske.co.uk/

Charlotte Sleigh is Professor of Science and Humanities at the University of Kent, UK. Originally a historian of science, her work now touches on science in its relation to literature, art, and communication, amongst others. It is her understanding of science as a social process, mediatised through cultural forms, that underlies these interests. She is the author of numerous books and editor of the *British Journal for the History of Science*.

References

(1) Sleigh C and Craske S. Art and science in the UK: a brief history and critical reflection. *Interdisciplinary Science Reviews*. 2017;42: 313–330. Available from: doi.org/10.1080/03080188.2017.1381223.

(2) Sleigh C, Craske S, and Park S. Lowering the tone in Art and Science collaboration: An analysis from Science and Technology Studies. *Journal of Science & Popular Culture*. 2019;2: 37−51. Available from: doi.org/10.1386/jspc.2.1.37_1.