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ARTICLE

The field and its prosthesis: Archiving Arctic ecologies in the 1920s

Johanne M. Bruun

Scott Polar Research Institute, University of Cambridge, Cambridge, UK

Correspondence
Johanne M. Bruun, Scott Polar Research Institute, University of Cambridge, Cambridge, UK.
Email: jmb283@cam.ac.uk

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Abstract

This paper examines the topological entanglements between the naturalistic field and natural history archives, arguing that the spatial categories of 'field' and 'archive' should be considered in terms of their indexical relations. Conceptually, it points to the prosthetic qualities of the archive, namely its capacity to simultaneously delimit and expand the field by facilitating novel ways of seeing and knowing it. The field, in turn, is a necessary source of plant and animal matter without which there is no archive. Bringing together geographical literatures on 'field' and 'archive' with literature on cultures and practices of collecting, this intervention is at once conceptual and empirical. The conceptual debate is hinged to, and inspired by, the practices of collecting, classifying, and ordering Arctic ecologies by the three Oxford University Arctic Expeditions to Spitsbergen (now Svalbard) in 1921–24. These expeditions have been hailed as significant episodes in the history of ecology. While ecology as a discipline shared an ordering impulse with the archive, early twentieth-century ecologists were explicitly distancing themselves from practices they associated with 'armchair science'. This paper exemplifies how field–archive dialogue remained central to the practices of ecology. Reading field collecting and subsequent specimen analysis as processes of active archiving, the paper hones in on select moments and practices which connected Spitsbergen-as-field and UK archival institutions, such as the British Museum of Natural History. In doing so, the paper draws out the distributed nature of archive and field alike, pointing to the non-limited locality of both localised field operations and archival practices, as well as the co-constitutional nature of these two sites of knowledge production.

1 | INTRODUCTION

The year is 1921, the month is August, the site is the northern slopes of Spitsbergen.[1] Having hiked for hours and overcome steep, rocky terrain, the collector reaches his destination: the nest of the Arctic tern. He quickly pockets a newly hatched chick alongside two eggs from a neighbouring nest. Chick and eggs in pocket, he flees a sustained attack from

the parent terns. The experience is significant. It matters that the terrain is rough and that the birds fight back. This is more than a mere anecdote. The collector subsequently recounts this embodied encounter with the Arctic field to add legitimacy and meaning to the chick-turned-specimen as well as to enhance his own status as knowing subject. He is collecting stories as well as specimens. The two are deeply entangled, the latter rendered meaningful by the former. The field in all its specificity, liveliness and complexity deeply impacts the formation of systemic natural knowledge derived from collected specimens. Yet pocketing this chick was not only an act of the field, but equally an act of the archive – the material and textual substrate which simultaneously draws on and informs enactments and imaginaries of that abstract, yet thoroughly material, spatial category of 'the field'.

This paper grapples with the topological relationship between the naturalistic field and archival natural history collections. Conceptually, it interrogates the prosthetic qualities of the archive, namely its capacity to extend and expand the field by facilitating novel ways of seeing and knowing it. Simultaneously, it points to the archive's dependency on the field as its external other. Approaching the archive as prosthesis and reading fieldwork as archival practice, it is argued that field and archive should be considered co-constitutional and co-extensive geographical spaces. Bringing together geographical literatures on 'field' and 'archive' with literature on cultures and practices of collecting, this intervention is both conceptual and empirical. Anchoring field-archive processes, the topic is approached by interrogating the collecting practices of three Oxford University Arctic Expeditions (OUAE) to Spitsbergen, 1921–24. In doing so, the paper draws out the distributed nature of the archive alongside the dispersed character of the field itself, pointing to the non-limited locality of both localised field operations and archival practices.

Counting influential scientists like Julian Huxley, Alexander Carr-Saunders and a young Charles Elton amongst their members, the OUAE have been cited as significant moments in the history of British ecology (Anker, 2001; Chew, 2006). British ecology emerged from the administrative-political culture of empire as an assemblage of economy, colonial management and classification (Anker, 2001, p. 39). Ecology shared with the archive an imperial ethos, utopian ideals of a society controlled by perfect information, and an underlying logic of conservation and orientation towards the future. Yet some ecologists of the 1920s explicitly distanced themselves from practices associated with archived collections in favour of fieldwork. Hence, studies of the history of ecology often focus on the impact of field encounters on ecological thought (Anker, 2001; Forrester & Cameron, 2017; Hagen, 1992). Drawing on this significant body of literature, this paper exemplifies how the field-archive relationship remained central to the making of ecological knowledge.

The meaning of archived collections is established and negotiated through circulation and dialogue across multiple sites of knowledge production, including the field (Driver et al., 2021; Kohler, 2002a). Scholars have pointed to the significance of libraries, museums, lecture halls and less formal places of contemplation such as pubs, cafes and private homes (Beer, 1996; Cornish, 2015; Kuklick & Kohler, 1996; Livingstone, 2006; Naylor, 2002; Secord, 1994, 1996). These spaces and more form intricate geographical networks through which the production of scientific knowledge takes place. In small ways, such spaces will inevitably seep into the story of this paper. In foregrounding the field–archive dialogue, this paper follows Daston (2012, p. 159) in examining not just the history *of* science, but the role of history and historical collections *in* science.

The paper begins by unpacking the conceptual bonds between field and archive, drawing on rich geographical literatures on these categories, and Derrida's (1998) suggestive allusion to the archive as prosthesis. This is linked to British ecological thought, illustrating the epistemological and ideological parallels between ecological and archival practices. The paper then turns to the OUAE, drawing out the archival underpinnings of expedition practices, before turning to the taxonomic work performed by non-expedition scientists, illustrating the significance of the archival substrate in bringing ontological stability to field specimens. The paper subsequently considers how expedition members capitalised on their collections, before concluding with a final reflection on the indexical relations between the spatial categories of 'field' and 'archive'.

2 | ARCHIVAL IMPULSES, ECOLOGY AND THE NATURALISTIC FIELD

"The archival impulse", Yusoff (2010, p. 76) writes, "is a well-established historical cultural practice, which has consistently been used to approach and respond to life, predominantly through the organization of its dead subjects". This impulse is underpinned by overlapping desires of archival discovery and collecting associated with curiosity, possession, domination and order amidst an ever-changing natural environment always beyond the grasp of human cognition (Asma, 2003; Daston, 2012). Prominent scholarship by Haraway (1984, 1989), Mukerji (1989) and Ritvo (1998) has evidenced the immense power associated with collecting and cataloguing the physical world and the role of such practices

in instituting colonial, sexual, racial and environmental structures of domination (Edney, 1997; Gopal, 2019; Greer, 2013; Richards, 1993; Yusoff, 2010). Archived collections, be they textual or object based, are central to reflecting, shaping and reinforcing not only scientific knowledge paradigms, but also how places are imagined, communicated and politicised (Craggs, 2008; Greer, 2013; Livingstone, 2006; Mitchell et al., 2019).

The term 'archive' carries many meanings: discourse, metaphor, mnemonic device, scientific instrument. Of particular relevance to this paper are notions of 'the archive' as a stable yet malleable technological framework, at once physical and conceptual, which structures scientific 'field' knowledges (Yusoff, 2008, p. 6). The production of natural knowledge presumes some archive to which new knowledge can be related (Edney, 1997, p. 41). When the chick ripped from its nest travels from pocket to expedition vessel and from there to museum archive, it undergoes a fundamental transformation, both materially and discursively, as it is incorporated into the structuring orders of a collection (Bowker & Star, 1999; Latour, 1999; Star & Griesemer, 1989). Here, the chick-turned-specimen becomes part of an archive of place, not merely an archive of species (Greer, 2013). It becomes a marker of Arctic Nature, one amongst many, forming a biopolitical network of signs and signifiers – specimens, texts, photographs – brought together to form an "informatics body-double" of an excessively complex field (Helmreich, 2009, p. 172). Such archives create powerful "synergies across the themes of 'nature' and 'culture'" (Mills, 2013, p. 702; Nesbitt & Cornish, 2016) through the ongoing collection and transformation of plants and animals into archival artefacts – thoroughly domesticated bodies susceptible to cultural imposition and control (Patchett, 2017, 2019a). In the archive, the essence of their life is made present in ways "possible only by their death and literal re-presentation" (Haraway, 1984, p. 25). As entities "made from parts of the natural system(s) under study" (Griesemer, 1990, p. 3), these bodies thus exist somewhere between plant/animal and object (Patchett, 2019a).

Taking inspiration from Derrida (1998), the relation between field and archive may be thought of as one of body and prosthesis – of life and that which seeks to replicate or mimic its essential qualities (also Haraway, 1984; Helmreich, 2009). The term prosthesis comes from the Greek *pros* ('in addition') and *tithenai* ('to place'). A structuring technology, the artifice of the archive is placed in addition to the living field. Prostheses support and extend what the body can do, yet their functioning is not same as living flesh. Prosthetic technologies alter how the original body is understood in terms of its workings and abilities, yet the prosthesis without its relation to the body loses part of itself. The prosthesis in isolation mirrors the archive of specimens whose ties to the field have been severed, most notably through the loss or lack of biography. Tracing the past life of a hen harrier cabinet specimen, Patchett et al. (2011) show how the specimen, qua its biography, connects the space where it was caught, through the taxidermy workshop, to the archive where it was stored. Their intervention is illustrative of how the archival prosthesis is enlivened by the absent-presence of the field embodied by the hen harrier and mediated through biography. In enacting the prosthetic relation between field and archive, they show how their own field encounter was impacted by the archive and vice versa.

The archival prosthesis fixes mobile bodies and fleeting presences in space and time. Yet 'fixed' does not mean inanimate or immutable (Greer, 2013). The archival prosthesis simultaneously extends and delimits scientific fields of vision by enforcing a structured sense of the normal, the typical, or the 'essence' of the naturalistic field. This 'essence' is both taxonomic and geographical. In her study of "the avian imperial archive", Greer (2013, p. 1321) demonstrates how archiving nature is central to conceptualising bio-geographical regions. In the process of archive-making, spatially and temporally dispersed sightings are correlated and become markers of 'Arctic Nature'. The 'essence' of the field is not static, but is constantly subject to negotiation as scientific paradigms and pedagogies shift. Negotiation happens, in part, through a process of visual and material calibration facilitated by ongoing circulation between field and archive (Daston, 2012). In other words, the archive shapes the field, and fieldwork enlivens the archive.

As the structuring material substrate of 'western' taxonomies of knowledge – a prosthetic technology at once expanding and conditioning the spatiality of the field – natural history archives are significant "monuments to particular configurations of power" (Stoler, 2007, p. 270; Haraway, 1989). Hence, such archives should be considered geopolitical structures as much as scientific ones to avoid masking any epistemological oppression they may facilitate by overwriting other knowledges (Greer, 2013). Yet as Yusoff (2010, p. 92) points out, "[a]n archive is not a concept in isolation that refers simply to a particular device of accounting for". Such representations betray the inherent messiness of archives and the extrinsic relations keeping archives alive (Cresswell, 2012; DeSilvey, 2007). As Derrida (1998, p. 11) writes:

> There is no archive without a place of consignation, without a technique of repetition, and without a certain exteriority. No archive without outside. (original italics)

This relation of exteriority forces us to consider the dispersed nature of the archive-as-prosthesis as well as the making of archives as an ongoing process (McCormack, 2010). Seeking to preserve essential qualities of life in an ever-changing field

(Yusoff, 2007, 2010), the archive depends on retaining meaningful textual and material links with the field. The many fields which feed natural history collections do not simply exist 'out there', endlessly open in an untouched, untainted and purely natural state (Beer, 1996; Forsyth, 2013; Haraway, 1989; Powell, 2017). The very notion of 'field' is historically rooted in disciplinary and colonial knowledge structures, and how the field is conceptualised, approached and performed is intimately entwined with the archive. As Yusoff (2008, p. 6) writes:

> The archive is an expanded technology that conditions the practices of fieldwork and being in the field. Control of the archive amounts to control of the 'fields' of inquiry that structure what is deemed to be knowledge, if not memory, and the practice of writing history (in light of the archive).

Together, field and archive form a system of entangled otherness – 'field' and 'not-field', 'archive' and 'not-archive'. As prosthesis, the archive functions as an ordering technology relying on processes of collection, curation, examination and valuation, extending beyond the formal structures of the archive itself (Cresswell, 2012; DeSilvey, 2007; Patchett, 2017; Stoler, 2007, 2009; Yusoff, 2008). Yet not all fieldwork is explicitly archival, and some might argue that experiment-based data collection relying less on specimens is not archival at all. However, field observations are never isolated events – they are always related to a structuring knowledge base. Hence, while field data might not end up in formal archives, the epistemic foundations of data collection align with archival logics (Helmreich, 2009). As this paper illustrates, archives not only structure field knowledges, but structure the field itself as a spatial category. Simultaneously, the field may be thought of as a site of reanimation and reactivation of archival knowledges (Lorimer, 2003; Turkel, 2011).

3 | ECOLOGICAL FIELDWORK AND THE OXFORD EXPEDITIONS

As sites of governmental knowledge production and accumulation, archives, following Richards (1993), were crucial to the operations of the British Empire. In centralising distilled geographical information (cultural, demographic, geo- and bio-logical), archives were central to the imperial project of managing distant cultures and natures by bringing the unfamiliar into the realm of positive knowledge (Ballantyne, 2005; Greer, 2013; Stoler, 2007, 2009). According to Richards (1993, p. 151), "[t]he search for the basic codes of life was the very lifeblood of the imperial archive". Notably, although such 'codes' are often presented as undisputable fact, scientific knowledges and concepts are always politically construed. As Greer and Cameron (2015, p. 451) note, citing Cruikshank (2005), "defining and bounding 'systems' of knowledge sets in motion the processes that fracture and fragment human experience". Relatedly, Yusoff (2010, p. 88) reminds us that "how the world is ordered through archival principles acts on the possibilities of experience and ethics". The archive is a powerful tool for homogenising field data and extending observations across geographical expands. Separated from the experience of being on the ground, ecological landscapes mediated through the generalising structures of the archive may easily overwrite local, site-specific cultures and knowledges. Human life-worlds may be completely absent, replaced by an image of pure, undistorted nature. The imperial archive with the fields supporting it is, as such, in part a colonial technology with the potential for violence (Greer, 2013; Richards, 1993; Stoler, 2007, 2009).

As a discipline coming into its own during the late nineteenth and early twentieth century, ecology, like the archive, was deeply rooted in imperial fantasies of controlled information and guided by an underlying managerial ethos (Anker, 2001; Hagen, 1992; Worster, 1985). Natural history, from which ecology grew, was part and parcel to imperial projects of 'taking stock' of the natural resources of Britain's colonies. Natural historians built extensive collections of bio- and geological matter and, in the process, laid the foundation for powerful institutions, like the British Museum of Natural History and Kew Gardens Herbarium (Nesbitt & Cornish, 2016; Richards, 1993). With the rise of laboratory science, many natural historians turned away from the unruly geographies of the field in favour of the laboratory-like conditions of the archive in search of 'pure knowledge' (Kohler, 2002a). Methodologically, this involved extensive taxonomic work – meticulously thick descriptions of individual organisms – to expose in intimate detail their inner mechanics.

Early twentieth-century ecologists saw natural history as key to understanding the living organism (Cameron, 1999). Yet as ecology carved out a space for itself as a distinct discipline, ecologists explicitly distanced themselves from what they perceived as overly descriptive natural history practices (Anker, 2001). Whereas natural historians had classified species according to hierarchical structures of a 'great chain of being' with God at the top and matter 'devoid of spirit' at the bottom, ecologists based their taxonomies on factors in the habitat. Rooted in Humboldt's 'natural wholes' and Darwinian theories of evolution, British ecology sought to map the intricate balances and patterns of energy flowing through ecological systems (Forrester & Cameron, 2017). Understanding this 'economy of nature' made it possible to

manage nature to increase its productivity or to intervene to conserve valued landscapes (Cameron, 1999). British ecologists, including Julian Huxley and Alexander Carr-Saunders of the first OUAE, envisioned utopian futures governed in accordance with scientific knowledges of interconnected social and natural systems (Anker, 2001; Renwick, 2012). According to Charles Elton (1927, p. vii), across the biosciences, ecology was "perhaps more able to offer immediate practical help to mankind than any of the others".

Inspired by Darwin's voyages, early twentieth-century ecologists valued fieldwork over practices associated with 'armchair science'. Elton (1927), for example, explicitly bemoaned how Darwin's inspiring field results had driven so many scientists to the archive. By producing detailed field knowledges of inter-species relations and species-life in the habitat, ecology could, according to Elton, be elevated to "*scientific* natural history" (Elton, 1927, p. 51, emphasis added).

It is well-established that early ecological theory was shaped by fieldwork. Place is central to the production of knowledge (Livingstone, 2006; Naylor, 2002), and in ecology, markedly different conclusions concerning nature's economy were reached depending, partly, on where fieldwork was undertaken (Anker, 2001; Cameron, 1999; Kingsland, 1985, 2010; Kohler, 2002b). Ecological systems could not be replicated in laboratories, nor could they be contained in archived collections. Intimate knowledge of animal morphology, such as could be obtained in archives, remained important to understanding the mechanics of animal bodies and, as such, understanding their ecological functions (Kalshoven, 2018). Yet with emphasis shifting from morphology to physiology, field knowledge ranked supreme (Anker, 2001). This, however, did not mark a shift from one site of knowledge production to another. As will become apparent, field ecology continued to rely on the prosthetic relation between field and archive.

The paper now turns to the practices of three Oxford University Arctic Expeditions to Spitsbergen, 1921–24. To the expedition ecologists, Spitsbergen presented as 'simplified nature', one with far fewer species compared to temperate locales. This rendered the interplay between the moving parts of its ecological system much easier to discern, inspiring enduring ecological concepts, most notably the so-called pyramid of numbers and niche theory[2] (Anker, 2001; Chew, 2006; Elton, 1927; Hagen, 1992; Summerhayes & Elton, 1923, 1928). Systems ecology continues to provide a privileged position for speaking with authority on behalf of nature. Recovering the histories and geographies of ecological concepts is critical to unravelling the latent politics of their current usage (Greer & Cameron, 2015; Hanrahan, 2017). Interrogating the field–archive dialogue helps further understandings of how ecological knowledge systems are brought into being.

The first OUAE was orchestrated by Julian Huxley, Oxford University professor of zoology, alongside biologist-cum-sociologist, Alexander Carr-Saunders. Inspired by Galton's theories of eugenics and Darwin's entangled bank of competing organisms, both believed ecological systems thinking was key to engineering a better society. Travelling north was like travelling back in time to draw inspiration from a geography yet untainted (Anker, 2001, p. 93). Huxley and Carr-Saunders brought together 18 scientists and undergraduates and secured the patronage of Oxford University alongside key scientific bodies, including the Royal Geographical Society and the Royal Society of London.[3] Notwithstanding their scientific agenda, these expeditions were underpinned by masculinist and colonial outlooks. Spitsbergen was envisioned as a stage for undergraduates to prove themselves against unyielding Arctic natures, and as the expeditions progressed, science was somewhat deprioritised (Bruun, in press).

The composition of the three expeditions was interdisciplinary, counting students of botany, geology and geography, aided by hired Norwegian experts in Arctic travel. When considering these expeditions as significant to the history of ecology, their interdisciplinarity is key (Chew, 2006). Some practices recounted in this paper were not necessarily envisioned by the individual collector, scientist or explorer as part of an ecological research agenda. However, as demonstrated by scholars of field science, the field is a place where disciplinary boundaries come undone as practical considerations mean that diverse actors become involved in fieldwork. Furthermore, the field is a space of encounter and knowledge exchange across disciplines (Forsyth, 2013, 2014; Kohler, 2002a; Kuklick & Kohler, 1996; Powell, 2017).

Ecologist Charles Elton, then an undergraduate at Oxford University and supervisee of Huxley and Carr-Saunders, cited interdisciplinary exchange during the Spitsbergen expeditions as formative to his thinking[4] (Elton, 1978-1983a, 1978-1983b, 1978-1983c, 1978-1983d, 1978-1983e); Pond, 2015). Widely considered the 'father of British animal ecology', Elton's later success is central to why these expeditions are considered significant to ecology's history (Chew, 2006; Crowcroft, 1991; Pond, 2015; Richardson, 2011). Following Elton's accounts, the work of OUAE ecologists should be considered part of an ensemble of practices.[5] Hence, what follows explores the wider practices associated with constructing what became, and remains, part of a significant ecological archive.

This paper is the product of in-depth engagement with this archive; in particular, its collections of field journals, periodicals, books, travel narratives, species lists, correspondence files, photographs, film and similar vehicles of inscription. In interrogating the field–archive dialogue, the prosthesis became a field in its own right, adding a layer of complexity to this already complex relation. The prosthesis was at once a point of access to distant elsewheres and itself subject of

scrutiny. Moving between repositories in London, Oxford, and Cambridge in a small way mirrored the circulation between the many sites involved in piecing together Spitsbergen's ecology a century ago. It served as a reminder that the field is dispersed, and so is its archival double in a very literal sense. Piecing together the story of this paper from remaining fragments brought into focus the imperfect nature of the prosthesis – and called to mind the invisible voids where epistemological oppression festers (Stoler, 2009). The relationship between field and prosthesis is maintained, partly, by narrative and specimen biography. Yet such narratives are both limited and selective, and often erase traces of local knowledge or assistance (Greer, 2013). As noted by McDonagh (2018, p. 1568), "any ... process of 'listening to ghosts' – or 'reanimating pasts lives' ... is necessarily gendered, racialized and classed". This paper does not escape the violence of the field–archive relation, but rather seeks to understand the mechanisms of the relation itself.

4 | FIELDWORK AS ARCHIVAL PRACTICE

Like any spatial assemblage, the field too is a crafted geography. It is not a 'wild' or 'untamed' space somehow external to or disentangled from culture, and it is never approached without some prescribed sense of vision. This is part of a necessary delimitation, as any environment will exceed attempts to approach or capture it in its entirety. As Haraway (1989, p. 84) notes, "[t]he naturalistic field is a culturally specific social space crafted by scientists in their historically mediated practices". The prosthetic relation between field and archive is central to this cultural-historical mediation. Particular styles of seeing, describing and collecting the field are enforced by the normative structures of archival collections (Daston, 2012; Yusoff, 2010). Fieldwork, in this context, becomes a phenomenology of the archival gaze, trained on the direct experience of objects and phenomena coloured by preconception (Richards, 1993).

Throughout the OUAEs, the influence of archives was not merely abstract. The allure of Arctic fields as spaces of adventurous travel motivated many expedition members (Binney, 1925; Bruun, in press; Longstaff, 1950). Yet archival desires to collect, claim and capture far-northern geographies should not be overlooked (Huxley, 1970). Archival institutions, including the British Museum of Natural History and the Kew Herbarium, played active roles in moulding the scientific fieldwork, and the 1921 expedition was motivated by desires to fill the "many gaps in our national collections".[6] This first expedition was sponsored by scientific bodies, including the Royal Geographical Society and the Royal Society, and such sponsorship came with set requirements of the scientific programme, including collecting practices. The British Museum, for example, supplied 18 cases containing tanks and jars for specimens, each of which had been pre-assigned a reference number.[7] The ordering structure of the museum was thus extended into the field, envisioned as a 'storehouse' from where animals and plants could readily be extracted and preserved as fact. These tanks and jars were cast as communication technologies - as vehicles of information flowing between field and archive.

The Oxford fieldworkers approached the field with an eye on the archive, mindful of the collecting project. Each member was contractually bound to participate in "collecting Flora and Fauna"[8] regardless of their training and personal motivations for travelling north. One of the most pronounced cases of archive fever inflicted Revered Francis Jourdain, Oxford University ornithologist and avid oologist (Cole, 2016). Jourdain (1922a) saw verification of historical observations as key to the first Oxford expedition. 'Verification' was an act connecting field and archive, involving bringing back "thoroughly representative collections of the birds and eggs" of Spitsbergen (Jourdain, 1922a, p. 2). In Jourdain's (1922a, 1922b, 1922c) publications, the collecting process dominated to the extent that birds and eggs themselves received little mention as objects of analysis. Emphasis instead was on archival possession.

Jourdain (1922c, p. 168) recounted how he "slowly toiled over the loose talus" towards a succession of grey bluffs, "scanning the crags closely with the glasses in the hope of seeing the white face of the setting bird". He spotted a barnacle goose guarding her nest. As he approached, the goose became "anxious and uttered a crackling note", unwilling to leave her highly incubated eggs until "fears got the best of her" (Jourdain, 1922c, p. 168). The goose fled, allowing Jourdain to claim her nest and its content. The description was highly charged, emotional, affective, and occupied half the pages of Jourdain's paper. Such collecting may, as Mukerji (1989) suggests, be considered an act of alienating nature in the service of science, whereby nature is abstracted from itself through the transformation of life into specimen. In Jourdain's account and others like it, the liveliness of the encounter and the fieldworker's ability to internalise nature's exigencies was highly significant (Cole, 2016; Outram, 1996). The strain of traverse, emotions like hope and fear, coloured Jourdain's collecting and provided biography for his eggs, notes on bird ethology and narrative verification of specimens as fact.

For Jourdain (1922c, p. 166), the crowning achievement of the first OUAE was procuring "the first fully authenticated specimens" of nesting barnacle geese, "shot from egg". Jourdain rendered such specimens meaningful as part of a series of data points. Contextualising a whimbrel shot and preserved in 1921, Jourdain (1922b, p. 172) wrote:

> A dead bird recorded from Bear Island in June 1898 (...) In Spitsbergen a dead specimen was picked up in Bell Sound in 1881; another was obtained by a Norwegian ship in 1891 and is now in Tromsö Museum.

Jourdain listed in detail where specimens comparable to his own were held. Old and new specimens served as references substantiating his field observations, enlisted as evidence of geographical dispersion over time. As Latour (1999) notes, the word 'reference' comes from the Latin *referre*, meaning 'to bring back'. Individual animals were collected and preserved in "valuable series of stages in the life history of the birds obtained – eggs and various stages of young".[9] In an instance where the expedition medic had shot at a pipit, "but failed to obtain it", Jourdain (1922b, p. 162) marked the sighting as uncertain. Mobile bodies and fleeting presences had to be preserved in the flesh and brought back to the archive. Only through physical evidence – dead bird in hand – could fleeting sightings become material fact.

Collecting, as Kohler (2013) writes, is not a singular activity (also Forsyth, 2013). Jourdain's focused collecting practices is but one example of an underlying archival ethos informing OUAE field practices. Concerned with plant and animal life at all scales, from large mammals to micro-organisms, the expeditions' collecting methods were many and varied. Parasites were collected from the cadavers of decaying seals and from the guts of animals hunted and killed for sport, food and science; insects were found under walrus skulls, on windowsills of abandoned huts and sitting on human dung; birds and mammals were stalked and shot, preferably together with their mates and their young. All nooks and crannies of the islands were seemingly searched – no rock unturned, no crevice unchecked.

The breadth of these collecting practices were, largely, due to the diligence and keen eye of Elton and his fellow ecologist and botanist, Victor Summerhayes (Figure 1). Elton, for example, was responsible for comprehensive sets of invertebrate collections, all accompanied by extensive biography. As taxonomists Carpenter and Phillips (1922, p. 11), not themselves expedition members, noted when studying Elton's collembola:

> The value of this collection is much enhanced by the careful records, not only of the exact localities whence the insects came, but also of the nature of the habitat in which each gathering was secured. These ecological notes (...) give special value to the collections.

The close relationship between field and specimen established qua Elton's biographical notes enhanced the life-like qualities of the archival prosthesis. Recognising this, Elton later praised Professor Paulton of the British Museum, who had liaised with the OUAE regarding the taxonomic work on their collections, for being "ahead of his time" when insisting that all Elton's "habitat data was transferred to the insect labels" rather than just the usual date and site of collection (Elton, 1978–1983a, p. 10).

FIGURE 1 Charles Elton collecting samples at cape eremite, 1923. Photo by A. Relf. Reproduced with the kind permission of the Bodleian archives and library

Specimen biography was not merely intended to aid the ecologists' own analyses, nor the immediate work of the scientists supporting them. Summerhayes and Elton (1923, 1928) were mindful that their field data fed into knowledge systems still under construction (Helmreich, 2009). Following Daston (2012, p. 162), a key characteristic of sciences of the archive is that practices of collection, collation and preservation are "conceived as an intrinsically collective undertaking". Scientists, Daston (2012, p. 164) continues, "self-consciously create the archive for an imagined community of disciplinary descendants, just as they embrace past observers in an imagined disciplinary lineage". Evidencing their archival consciousness, Summerhayes and Elton (1928, p. 194) deposited their "original detailed data (...) together with a number of unpublished observations" at the recently established Scott Polar Research Institute in Cambridge. Their rationale was clear:

> We are convinced that, in the past, many valuable ecological observations have not been recorded permanently, simply because it was impossible at the time for the observer to appreciate their significance. The deposition of such apparently disjointed notes in the form of archives at some suitable place, would, we feel sure, eventually result in the information of a mass of data of real use to anyone working on the subject afterwards. (Summerhayes & Elton, 1928, p. 194)

In the context of a discipline distancing itself from armchair science, this quote is illustrative of the continued significance of archives and, in particular, of their dialogue with the field. For Summerhayes and Elton, the field and the archive were entwined rather than separate, each rendered meaningful through the ongoing circulation between them. Here, the archive was a condensation of years of ongoing fieldwork (Gardiner, 2020), gradually morphing into an increasingly effective prosthesis.

5 | ARCHIVAL CIRCULATION AND SPECIMEN ANALYSIS

In the bio-sciences, Daston (2012, p. 160) writes, "the stability of the objects of inquiry depends crucially on a long disciplinary memory". The continuity of botanical and zoological knowledge upon which ecological thought depended, relied on archives to solve the problem of synonymy, i.e., the problem of successive scientists ascribing different names to the same species. Without stable nomenclature, the continuity and coordination of spatially and temporally dispersed observations cannot be secured (Daston, 2004). Archived specimens and their accompanying textual records are thus central to securing ontological stability of plants and animals as research objects. In an important sense, species do not exist as objects of science until they have been described and incorporated in archived collections (Gardiner, 2020). The names of species inhere not in plant or animal populations, but in singular individuals designated and preserved as 'type specimens' by the person who first publishes their description (Daston, 2004; Farber, 1976). Type specimens provide important 'touch stones' for scientists and are "the foundation of a taxonomical pyramid that links the individual plant [or animal] to the plant [or animal] kingdom" (Daston, 2004, p. 158).

Aided by handbooks and field equipment, the Oxford fieldworkers could perform some taxonomic work in the field. For example, Ward and Whipple's (1918) *Fresh-Water Biology* allowed Elton "to name, at any rate to genus, some microfauna" (1978–1983a, p. 10). Yet detailed taxonomic work relating in particular to insects, worms and micro-organisms alongside some plants happened not in the field, but in the archive and its cognate spaces. Across archives and laboratories, scientific memory became an act of coordination, activated through the labour of a significant network of taxonomists.

For Summerhayes and Elton, detailed taxonomic knowledge of species in the field was necessary to develop systemic knowledge of ecological relations. Put simply, to map the relations between plants, animals and habitats, one needed to know which species were present. Summerhayes and Elton's (1923, 1928) papers on the ecology of Spitsbergen later gained significant status within the discipline (Anker, 2001; Chew, 2006). Both papers began by drawing out substantial networks of actors involved in species identification, recognising that it was "only possible to work out the result of an ecological survey of this sort by enlisting the help of numerous specialists in the various groups of plants and animals studied" (Summerhayes & Elton, 1928, p. 194).

More than 30 specialists across 11 institutions, nationally and internationally, contributed to the taxonomic work of the OUAE. Many of these women and men used physical collections of plant and animal specimens collected by other expeditions across geographical locales. For example, F.W. Edwards (1922, p. 193), entomologist at the British Museum, worked on Elton's "very considerable collection" of diptera from 1921. To classify Elton's specimens, Edwards first compared them to 25 individuals from Iceland before positioning them in relation to the museum's

collection of about 400 British specimens. Finally, referencing his knowledge of international collections of Arctic specimens, he concluded that Elton's 700 specimens counted 29 species, nine never before recorded in Spitsbergen, and six entirely new. When Edwards received a second sending of insects in 1923, he travelled to museums in Stockholm and Paris to examine their collections, which finally enabled him to "establish definitely the identity" of Elton's specimens (Edwards, 1924, p. 163).

Because of the necessary relation between newly collected specimens and physical reference points – direct as exemplified above or indirect as mediated through reference books – discoveries of new species do not necessarily happen in the field (Gardiner, 2020). The taxonomic work of scientists, like Edwards, led to discoveries of species not previously recorded in the Arctic. With the recording and cataloguing of physical specimens, these species became "certified as an inhabitant of Spitsbergen" (Carpenter, 1927, p. 193). A new species of spider was documented and named *M. eltonii* after Elton (Jackson, 1922), and a triple-spine collembola, believed to be "the type of a new variety", was recorded (Carpenter, 1927, p. 195).

Many of the taxonomists published their own findings, comprising intimately detailed specimen descriptions, often illustrated by meticulous anatomical drawings at various levels of magnification or stages of dissection to examine their inner workings (Baylis, 1922; Jackson, 1922; Sandon, 1924). While important, description remained less reliable than direct comparison with type specimens when rendering observations compatible over time. As one taxonomist noted:

> It is extremely difficult to know which of the worms described by older writers, and designated by names that are still in use, correspond to forms met with at the present day. The older descriptions are so very scanty, according to present-day requirements, that they frequently fit several of the species now recognised. In course of time, other descriptions have been published under the older name, supposedly referring to the same worm; particulars have been taken from these descriptions and incorporated in the diagnoses. The result is a composite picture, which may or may not represent the worm which the original describer had under his eyes. (Stephenson, 1922, p. 1129).

Description could not fully capture and preserve the complexity of the specimen itself. Styles of scientific description had, as Stephenson indicated, changed to the point where older observations became near meaningless. While methods of preserving physical specimens also changed over time, plant and animal bodies were, as Asma (2003) suggests, perhaps more adaptable to changes in scientific pedagogy. For Stephenson (1922), the meaningful link between worm-in-archive and worm-in-field was supported by a material underlay facilitating ongoing dialogue between field and archive.

The circulation of matter was not always frictionless. Specimens were circulated in myriad ways: tubes of worms, tins of mites and lice, sterilised boxes of mosses. Some birds were dissected in the field, preserved as fleshless skins or skeletons, others were preserved whole in formalin. Plants were either "packed in the usual way in paper wrappers" or preserved in glycerine (Watson, 1922, p. 327). Each jar, tin or paper wrapper was assigned a numerical identity – an archival reference – and logged with information about where, when and by whom it was collected. For the link between field and archive to be as smooth as possible, many criteria had to be met. When ill-chosen, the method of preservation made it near-impossible for the taxonomists to situate specimens in relation to the archive (Baylis, 1922). Watson (1922, p. 327), curator at Kew Herbarium, described receiving samples of Spitsbergen liverworts wrongfully preserved in formalin, which had given them "a uniform dark tint" and caused them to "break up during subsequent handling and dissection". Some, Watson (1922, p. 329) complained, were "so much injured by formalin that determinations would have been little more than mere guesses". The formalin had rendered "the plant useless for preserving in the usual way" and hence it could not be incorporated in the Kew collections (Watson, 1922, p. 327).

As they became embedded in the archive – a process initiated in the field – the individuality of each plant and animal was effaced, elevating them to "a species representative rather than an idiosyncratic particular" (Asma, 2003, p. 36). Otherwise lively and dynamic individuals were frozen in a state of suspended animation, stripped of core characteristics, including being alive (Gandy, 2017; Haraway, 1989). Helmreich (2009) likens biological specimens to Agamben's (1998) notion of 'bare life', or zoë – "that vital minimum made to stand for 'life itself' and fit to be entered into calculations" (Helmreich, 2009, p. 101). Having been dissected, skinned, de-fleshed, pressed and conserved in chemical solutions, the vitality of the Oxford specimens was a preserved quality. In the archive, life was reduced to its barest form – life-like at best – separate from the bios of the field, namely "the form or way of living proper to an individual or group" (Helmreich, 2009, p. 101). Yet the transduction of the fieldworkers' experiences, sensations and observations into ecological text and sample biography can be interpreted as an attempt at retaining vital links between zoë and bios – between the bare life of the archive and the lively entanglements of the field. Thick descriptions of animal behaviour, their habitat,

interactions between species, sensory inputs like sounds, smells and even the tastes of species when cooked were registered (Forsyth, 2013).

6 | COLLECTIONS AS CAPITAL

While Elton appreciated the taxonomists' archival rigour and skill, he objected to being placed in their category. To Elton, the comparative zoologist was "another bird – a merchant who sits indoors all his days and compares bones of different beasts."[10] As merchants, scientists of the archive relied on economies of exchange and circulation between archival institutions and on the fieldwork of others (Cornish & Driver, 2020). Yet fieldworkers too needed these economies, both for accurate species identification, and to secure financial and cultural-moral capital for their fieldwork.

Mukerji (1989) likens natural history specimens to Oriental ornaments collected by European explorers. Specimens, she writes, "are to trained eyes exotic marvels from distant worlds; they are emblematic of the same cultural reach and ambition" (Mukerji, 1989, p. 146; Asma, 2003; Haraway, 1984). When the 1921 expedition was mentioned in UK newspapers, the procurement of prestigious specimens was highlighted as a particularly noble pursuit. As noted in the *Daily Telegraph*:

> Whatever scientific specimens have been gathered there [in Spitsbergen] are in Scandinavian Museums, and it is felt, entirely without jealousy, that one of the oldest Universities in the world should share in any more that may be forthcoming.[xi]

Similarly, the *Illustrated London News* applauded the expedition's ambition to bring back eggs of the barnacle goose, noting that "[n]o eggs of this bird ... exist in any British Museum, nor has any been discovered before by an Englishman".[12] Archival fever affected not only fieldworkers, but was a property too of the spectating masses.

For egg to become specimen was a delicate affair (Cole, 2016). In 1921, eggs were blown in the field by the experienced Jourdain who "once blew eggs until he fainted" (Elton, 1978–1983a, p. 15). Likewise, skins were preserved by a trained taxidermist. In 1923 and 1924, however, these processes were deferred until the expeditions' return and outsourced to a private company. When the specimens arrived, eggs were at the brink of bursting due to mounting pressure from gasses of decomposition,[13] and bird skins were losing feathers. The state of the eggs rendered "ordinary blowing out of the question".[14] When trying the water blast method through a larger hole in one egg, "a perfectly formed leg, complete with bone and claw" emerged.[15] The eggs were sent to the British Museum, where the embryo was extracted, but the egg shattered.[16] The best-preserved specimens were incorporated in the zoological collections of Oxford University Museum of Natural History and the British Museum or sold to private collectors. Badly damaged eggs were designated as "cabinet specimens" as cabinet display allowed the "'barn door' holes" caused by poor preservation to be hidden.[17]

Finding it "heart breaking to see the condition" of the ornithological specimens, Jourdain, who had not joined the 1923 or 1924 expedition, accused untrained fieldworkers of being "a rough and ready type of collector".[18] Like the discoloured liverwort, the above illustrates how plant and animal objects may resist archival order. It similarly points to the work, care and expertise involved in stabilising such objects and fitting them into systems which render them available to scholarship (DeSilvey, 2007, p. 880; Patchett, 2017).

OUAE archival ambitions extended to live animals, including polar bear cubs, to be presented to the London Zoo[19] – a living animal archive welcoming the suggested donations.[20] Bear cubs were captured, but never reached London. While never elevated to the status of specimen, traces of their young lives remain, preserved in photographs and cinematographic sequences showing them being taunted aboard the expedition ship for comic effect and stored in wooden crates[21] (Figure 2; Forsyth, 2016). Would-be donations of rare or hard-to-come-by specimens both legitimised fieldwork and extended to it some of the prestige of powerful archival institutions like the London Zoo. In this instance, archival ambition alone seemed enough to bolster the expedition's image.

Field specimens, dead or alive, were exchangeable for moral support from scientific communities and institutions (Mukerji, 1989; Naylor, 2002; Secord, 1994). As a senior explorer noted to George Binney, who organised the 1923 and 1924 expeditions: gifting specimens "will stand you in good favour if you go north again".[22] Hence, even specimens with no direct monetary value, like invertebrates, worms and plants, were enrolled into wider gifting economies to cement the expeditions' status. The main recipients of such gifts were the Oxford University museums and the British Museum of Natural History.[23] Other known recipients include Carlisle Museum, the Walter Rothschild Zoological Museum, Manchester Museum and Kew Herbarium. Support from influential institutions like these was cited across letters to

FIGURE 2 Polar bear cub in crate aboard the expedition ship, 1924. Still from film by F. Tymms. Reproduced with the kind permission of the Royal Geographical Society

potential donors, thus impacting the monetary economies of the expeditions. Significantly, feeding archival collections also bolstered the moral economies of fieldwork. Killing animals believed to be rare was at odds with the conservationist sentiments of 1920s British ecology, and Elton, for one, found it distressing.[24] Shooting for science, however, resolved them of guilt (Haraway, 1989).

To the archive, infusions of fresh animal matter were significant to retain a meaningful link with the animal bios – a link always at risk of decaying alongside ageing specimens and changing methods of preservation. In 1923, for example, the British Museum requested skins of ptarmigan and Sabine's gull despite holding exemplars of both. However, in addition to lacking biography, these specimens were in increasingly poor condition, one being from 1855 and the other from 1835–40. Hence, while they remained "of considerable historical interest", they were "practically useless as skins for working at".[25]

Over the course of the three expeditions, the influence of scientific bodies waned. Whereas the 1921 expedition was organised by scientific committee, the later expeditions were shaped by sporting ambitions. The new leader, George Binney, replaced funding from scientific institutions with money from wealthy expedition members attracted by promises of big game hunting and the prestige of polar travel (Binney, 1925; Bruun, in press). Distinguishing these members from the expedition scientists, Binney referred to them as "henchmen" (Elton used the less flattering "Binney's bloodsuckers"[26]). The henchmen had "no definite scientific qualifications" (Binney, 1925, p. 24). However, once in the field, Binney claimed they became much more interested in scientific work since shooting polar bears was as exciting as "shooting an old milch cow" (Binney in Earl of Ronaldshay et al., 1924, p. 212). Yet in a letter discussing the "necessary kill" for sports, Binney's chief henchman jokingly expressed his disinterest in scientific collecting:

> Who may I ask are flora and fauna? They sound like a couple of prostitutes especially if the latter is connected with fornication.[xxvii]

In the field, the henchmen took turns shooting at any bear sighted. Once killed, bears were examined for parasites and measured before being skinned to become trophy. Polar bears were highly sought-after trophies amongst British elites due to national obsessions with polar heroics (Bloom, 1993; Snæbjörnsdóttir & Wilson, 2008; Spufford, 1996). Demand for trophies exceeded what the henchmen could shoot, forcing them to buy additional skins from local hunters.[28] Bear skins and skulls became increasingly important to OUAE economies, serving as personal trophies for wealthy henchmen, gifts for benefactors and status symbols at public-facing exhibitions publicising the expeditions' achievements.[29] In exchange for donations, for example, one skin was gifted to British Petroleum and mounted on the wall of their boardroom[30] – an unsettling image seen through modern eyes.

The lines between animals hunted for sport or science were never firm, nor were distinctions between trophy and specimen or between specimen and curiosity (Patchett, 2019b). Bear skins were not the only economically significant animal artefacts sitting somewhere between personal memorabilia, scientific specimen and museum object. Eggs and skins of Arctic birds, particularly rare gulls, were also shifted for profit, both to private collectors and museums.[31] In 1921, no less than 734 eggs from 24 species were collected in one location alone[32] alongside as many as 300 bird skins. Demand was high,[33] and some specimens were sold even before the expeditions departed (Jourdain, 1922a).

Specimens were shifted for profit, presented as tokens of appreciation for financial or material provisions, and enrolled into wide-spanning archival gifting economies. The economies of fieldwork, both monetary and moral, were thus entangled in webs of archival desire. Materials from the OUAE did not feed one singular, coherent archival prosthesis. Reaching dispersed sites of imperial and scientific memory, both public institutions and private domains, the Oxford collections point to the inherently multiple, fragmented and topologically complex nature of collection and display (Driver et al., 2021).

7 | CONCLUSION: THE ENTANGLED BANK AND ITS PROSTHESIS

What Darwin famously referred to as the 'entangled bank' of biological life remained, as this paper illustrates, caught up in archival webs of natural knowledge. The ongoing circulation of matter, text and ideas between field and archive during the course of the three Oxford expeditions may be thought of as a process of transduction, involving the transference of energy between mediums or transitions of energy between forms. Plant and animal bodies were redrafted, materially and discursively, in transitions from animal to specimen, from life to bare life, or from one form of energy to another. Such transition allowed them to serve as biomedia, facilitating transfers of energy between field and archive, thus maintaining meaningful links between zoë and bios. This notion of energy flowing through an entangled natural system mirrors dominant ontologies of 1920s British ecology. Paralleling Summerhayes and Elton's (1923) epistemology, this paper has mapped out the contours of an entangled geographical system by honing in on particular moments in space and time. This too relies on a belief in the value of the particular when making sense of the systemic and the whole.

This paper has argued that the spatial categories of 'field' and 'archive' should be considered in terms of their indexical relations. In examining the practices associated with the OUAE, the paper has illustrated the dispersed nature of both field and archive, and how these sites bleed into each other. The field is a necessary source of matter without which there is no archive. Yet once archival structures are in place, fieldwork becomes, in part, a phenomenology of the archival gaze. In the abstract, the practice of archiving Arctic ecologies marks their deterritorialisation as nature and simultaneous reterritorialisation as archival simulacrum or idealised and transformed prosthesis. The archival substrate is prosthetic in the sense that it seeks to mimic and preserve essential qualities of life in the field. Yet it also redrafts dead matter, rendering it available to be seen, touched and engaged in ways never possible in the field. The archival prosthesis is both more and less than the field itself, and the hyperspatialised domain of the archive does not necessarily map back neatly onto Arctic geographies (Helmreich, 2009). The archive does not replace or stand in for the field, but rather extends and expands it by facilitating new ways of seeing and knowing which, in turn, colour the fieldworkers' field of vision.

Each specimen gathered in Spitsbergen embodied what Elton (1978–1983a) called a "species-event", representing a field encounter between animal and collector. Animal bodies came to mark the crystallisation of such events, arrested in space and time and archived by fieldworkers aided by a network of taxonomic specialists (Daston, 2012; Greer, 2013; Haraway, 1989; Patchett, 2017). Following Derrida (1998, p. 17), such "archivization produces as much as it records the event". It impacts both how species are known and understood (Daston, 2012; Patchett, 2019b; Patchett et al., 2011), and the spaces they inscribe (Greer, 2013). The inherently geographical species-event is always-already an artefact of the archive. It comes to inscribe both the field of encounter and the archival prosthesis it becomes part of, reinforcing material links between them.

As serialised records of individual species-events, OUAE collections became part of archived records of historical and geographical distributions of species – catalogues of sameness and difference across space and time. Correlating spatially and temporally dispersed sightings and using them as markers of Arctic Nature is a powerful means of empirically grounding bio-geographical regions (Greer, 2013). The generalising tropes of ecological knowledge easily subsumes grounded or indigenous life-worlds, human and non-human alike, under the structuring category of 'the Arctic' (Cruikshank, 2005; Greer, 2013; Greer & Cameron, 2015; Hanrahan, 2017). Deconstructing the co-production of field and archive means drawing out historically rooted structures wherein significant power to define Arctic Natures is embedded.

The OUAE marked the beginning of a series of similarly charged expeditions across the Arctic, including peopled sites in Greenland and Canada, extending the ecological work begun in Spitsbergen (Elton, 1934, 1960; Longstaff, 1929, 1932). Elton went on to apply his ecological thinking working for the Canada-based fur trading business, the Hudson's Bay Company (HBC). There, he used HBC archives of animal populations, alongside the archives of the Moravian Missions in Labrador, as basis for predictive modelling and strategic management of fur-bearing animals.[34] Also working for the HBC, expedition leader Binney published the now infamous *Eskimo Book of Knowledge* (1931) – an exercise in scientific paternalism advising indigenous peoples on their place within a colonial and supposedly natural order.

A century has passed since the first OUAE. Yet the archival substrate with which the expeditions were entangled remains in place. In the 1970s, Elton collated his field notes, photographs, and observations alongside information on where to locate expedition specimens and research data (Elton, 1978-1983a, 1978-1983b, 1978-1983c, 1978-1983d, 1978-1983e). Francis Jourdain's field diaries went to the Edward Grey Institute of Field Ornithology in Oxford. Similarly, the plant and animal specimens forged through the field–archive dialogue associated with the Spitsbergen expeditions remain embedded in the collections of the Natural History Museums in London and Oxford. Across these locales and more, specimens and texts alike remain available to scientists, continuing to deliver on the fieldworkers' archival pact with the future.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the archives and repositories cited throughout the manuscript. These include the Thomas H. Manning Polar Archive, the special collections of the Polar Library (Scott Polar Research Institute, University of Cambridge), the Archives of the Royal Geographical Society, the Merton College Archives (University of Oxford), and the Bodleian Library and Archives. The full dataset does not exist in digitised form.

ORCID

Johanne M. Bruun https://orcid.org/0000-0002-7910-2696

ENDNOTES

[1] Now Svalbard.

[2] Charles Elton, untitled, undated [Weston Library, Oxford University (WLOU), MS.Eng.c.3326, A.33].

[3] 'The Oxford University Expedition to Spitsbergen. 1921', undated; list of patrons, undated; 'The Oxford University Expedition to Spitsbergen 1921', undated [Thomas H. Manning Polar Archive, Scott Polar Research Institute (SPRI), MS732/4;ER].

[4] Diaries of Charles Elton, 1923, 1924 [WLOU, MS.Eng.e.2812, C.7; MS.Eng.d.2532, C.9; MS.Eng.d.2533, C.10; MS.Eng.e.2813, C.11].

[5] Ibid.

[6] 'The Oxford University Expedition to Spitsbergen 1921', undated [SPRI, MS732/4;ER].

[7] Regan to Binney, 13 May 1921 [SPRI, MS732/4;ER].

[8] Expedition contract, 1923 [SPRI, MS732/5;ER].

[9] 'Report on Biology (C.S.E. and F.A.M.)', undated [SPRI, MS732/4;ER].

[10] Elton and Sandford to Binney, 14 March 1925 [SPRI, MS732/6;ER, vol. 1].

[11] 'Spitsbergen and Oxford', *Daily Telegraph*, undated [SPRI, MS732/1;BPC].

[12] Untitled, *Illustrated London News*, undated [SPRI, MS732/1;BPC].

[13] Elton to Binney, 11. Nov. 1924 [SPRI, MS732/6;ER, vol. 1].

[14] Rankin to Binney, 21 Sept. 1924 [SPRI, MS732/6;ER, vol. 1].

[15] Ibid.

[16] Jourdain to Binney, 20 Oct. 1924 [SPRI, MS732/6;ER, vol. 1].

[17] Ibid.

[18] Ibid.

[19] 'Arctic Exploration – Oxford University Expedition', *The Times*, 19 June 1923; 'Off to the Arctic', *Leeds Mercury*, undated [SPRI, MS732/1;BPC].

[20] Binney to Rudmose-Brown, 25 Nov. 1920 [SPRI, Francis Jourdain Collection]; Chalmers-Mitchell to Binney, 26 March 1923 and 7 Apr. 1923 [SPRI, MS732/5;ER].

[21] Diary of Geoffrey Summers, 1923 [SPRI, MS983/6/1-5;D].

[22] Longstaff to Binney, 10 Dec. 1923 [SPRI, MS732/5;ER].

[23] Harmer to Binney, 9 Jan. 1924 [SPRI, MS732/5;ER]; Elton to Binney, 11 Nov. 1924 [SPRI, MS732/6;ER, vol. 1]; Lowe to Binney, 16 Oct. 1924, 2 Apr. 1925, and 11 June 1925 [SPRI, MS732/6;ER, vol. 2].

[24] Diary of Charles Elton, 1923 [WLOU, MS.Eng.e.2812, C.7].

[25] British Museum to Binney, 25 Sept. 1923 [SPRI, MS732/5;ER].

[26] Diary of Charles Elton, 1923 [WLOU, MS.Eng.e.2812, C.7].

[27] Clutterbuck to Binney, 1923 [SPRI, MS732/5;ER].

[28] Diary of Geoffrey Summers, 1923 [SPRI, MS983/6/1-5;D]; Diary of Noel Odell, 1923 [SPRI, MS431;BJ].

[29] Bruce to Binney, 28 Nov. 1923; Gundry to Binney, 4 Jan. 1924 [SPRI, MS732/5;ER]; Colquhoun to Binney, 18 May 1924 [SPRI, MS732/6;ER, vol. 1]. On the expedition exhibitions, see 'Spitzbergen Expedition – Exhibition and Oxford', *Daily Telegraph*, 24 Oct. 1921; 'Oxford–Expedition to Spitsbergen', *Yorkshire Herald*, 21 Oct. 1921 [SPRI, MS732/1;BPC].

[30] Brainthwaite to Binney, 26 Sept. 1924 and 7 May 1925 [SPRI, MS732/6;ER, vol. 2].

[31] Huxley to Gordon, 14 Sept. 1921 [SPRI, MS732/4;ER]; Jourdain to Binney, 23 Sept. 1923 and 2 Spr. 1925 [SPRI, MS732/6;ER, vol. 1].

[32] Francis Jourdain, list of eggs collected on Bear Island, 1921 [SPRI, MS732/4;ER].

[33] Jourdain to Binney, 20 Oct. 1924 [SPRI, MS732/6;ER, vol. 1].

[34] Charles Elton, untitled, undated [WLOU, MS.Eng.c.3326, A.33].

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