Charles Elton's Accounts of Expeditions from Oxford to the Arctic in the 1920s

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Charles Elton's Accounts of Expeditions from Oxford to the Arctic in the 1920s

by Caroline M. Pond

DURING THE 20TH CENTURY, university-sponsored expeditions to remote places gradually replaced war and colonization as a young person's chance to demonstrate enterprise, courage, endurance, and organizational ability. Such adventures often set participants on unanticipated career paths and formed lifelong, highly productive friendships. These days, institutions have formal structures for the organization and conduct of expeditions, but there were no such guidelines in the early 1920s, when three groups set out from Oxford to explore the area now known as Svalbard.

One such young adventurer was Charles S. Elton, who a decade later established and directed the Bureau of Animal Population in Oxford and became founding editor of the *Journal of Animal Ecology*. Over the following 35 years, his students and collaborators, who included North Americans Tom Park, Richard Miller, Robert MacArthur, Eugene Odum, Monte Lloyd, William Murdoch, and Dennis Chitty, developed field ecology and population dynamics. Elton participated as a naturalist on all three expeditions, but published only the scientific findings from them. I have recently digitized his unpublished accounts of his personal experiences, which are now freely available as downloadable, searchable files (Elton, 2014a, b, c).

The first expedition (Fig. 1) in June–August 1921 was initiated by Julian Huxley (grandson of Thomas Henry Huxley and brother of Aldous), recently returned from active service in World War I, Demonstrator in Zoology and Fellow of New College, Oxford. His main interest was bird behaviour and reproduction, so the 18 expedition members included five ornithologists and others with assorted expertise, including a taxidermist! Much of their equipment was war surplus, including items Charles Elton had acquired from his brother, Leonard, who served with the Army Cyclists Corp. Traveling in a former sealing ship, the *Terningen*, they camped on Bjørnøya (Bear Island), because it had an "enormous population of sea-birds, especially Guillemots," on 13–23 June 1921; on Prins Karls Forland, off the west coast of Spitsbergen north of Isfjord, on 30 June–10 July; and near the great Nordenskjold Glacier at the head of Klaas-Billen Bay on 19 July–16 August.

The second expedition to Svalbard, the Merton College Expedition (Fig. 2), also planned in Oxford, took 13 Britons to the Arctic for a month, from 23 July to 23 August 1923.

FIG. 1. The 1921 expedition on board the Terningen*; left to right: Huxley, Binney, Paget-Wilkes, Brown, Summerhayes, Jourdain, Elton, R. Pocock (cook, etc.), Longstaff, Segnit, H.L. Powell (taxidermist). Names featured in Table 1 are abbreviated. Carr-Saunders, Frazer, Odell, Slater, R. Stobart (in charge of sledge-dogs), G.J. Walton (botanist) and the Norwegians are absent.*

As in 1921, the group set out from Tromsø on the *Terningen*, this time staffed by nine Norwegians led by Captain Isak Isaksen. They explored Nordaustlandet, the second largest and most northerly island of the archipelago, and Hinlopen Strait between it and northeastern Spitsbergen. Being farther from the warmer seas to the southwest, these areas consist of tundra and permanent ice cap and are still almost uninhabited.

The third expedition (Fig. 3), from 7 July to 5 September 1924, concentrated on northwestern Spitsbergen, especially the Woodfjorden and Liefdefjorden areas around 79˚40′ N. With 20 participants, it was the largest and best-equipped expedition, with two ships (*Polar bjørn* and *Oïland*), a seaplane, and three sledging parties, and had the most diverse scientific objectives. The Norwegian support team included Captain Helmer J. Hanssen (1870–1956), ice-pilot, expert dog-handler, and explorer, who accompanied Amundsen on several Arctic and Antarctic expeditions and was among the group to reach the South Pole on 14 December 1911.

Spitsbergen, Bjørnøya, and Nordaustlandet were far more challenging to visit then than they are now. Interested parties, including the United States, Britain, Netherlands (whose explorers, especially Willem Barentsz, first mapped the area in the 16th century), Sweden, France, and

FIG. 2. The 1923 expedition. Bottom row, left to right: W.D. Gundry, Longstaff, Binney, Odell, Frazer; lower middle row: Relf, G. Summers, A.T. Wilder (with furry hat), Clutterbuck; top row: I.R. Bruce, G. Milling, Irvine (at top), Elton. Names featured in Table 1 are abbreviated. The Norwegians are absent.

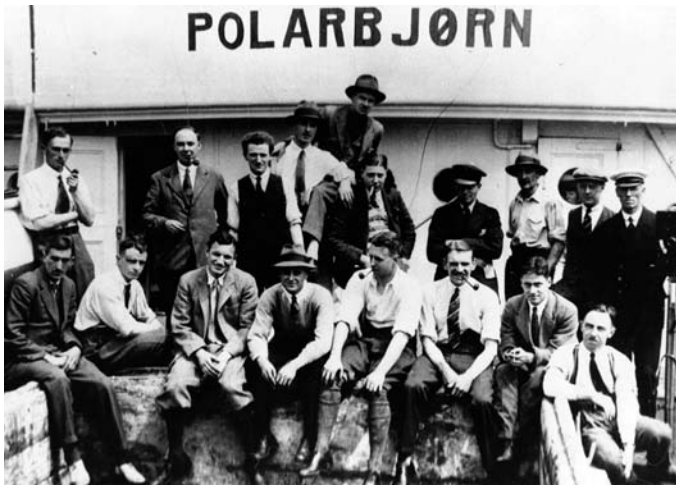

FIG. 3. The 1924 expedition on their largest ship, the Polar bjørn*. Lower row, left to right: Frazer, Elton, T. Stonborough, Lt. H. Baker, Aldous, Taylor, Florey, Tymms. Top row, left to right: Sandford, Relf, E. Law, Clutterbuck, Binney, Tennant, Colquhoun, Rankin, Mason. Names featured in Table 1 are abbreviated. Montague, Carslake and the Norwegians are absent.*

Japan, had agreed in 1920 that the Norwegians would have sovereignty over this region of the Arctic starting in 1925. When it took charge, Norway, then a very new and (compared to its modern wealth) poor country, celebrated by renaming the archipelago "Svalbard." So at the time of the Oxford expeditions, the areas were *terra nullius,* without formal government, inhabited only seasonally by whalers, coal-miners, hunters, and a very few scientists. By 1921, unregulated hunting had taken its toll: of Bjørnøya, Elton wrote, "The Arctic fox, formerly common, has been almost exterminated by man, as in Spitsbergen. None was seen by us" (Summerhayes and Elton, 1923:221). *Vulpes* (formerly *Alopex*) *lagopus* is now widespread throughout the archipelago as general scavenger and predator, especially of nesting birds (Pond et al., 1995; Eide et al., 2005).

THE EXPLORERS

The participants were quite different on each expedition. Only geographer George Binney, biologist Charles Elton, and mathematician Bob (Alec) Frazer went on all three journeys. The diverse, eclectic character of the personnel is demonstrated by the biographical information that I have assembled for 28 of the 39 recorded members (other than Norwegians) in Table 1. The diversity of their expertise and their previous and later achievements are very impressive; they were probably recruited with open-mindedness and shrewd judgement by Binney, general organizer of all three expeditions. Elton's texts mention the presence of a few lesser participants dubbed "Binney's bloodsuckers."

In the best tradition of Edwardian gentlemen, most participated as amateurs (and probably paid their own way). Only about half had any direct connection with Oxford University and some had no higher education; several were officers in the armed forces, bringing valuable experience and probably equipment from World War I. The British honours system is arcane and should not be taken too seriously, but it is worth noting that, although fewer than one in a thousand ever receive any honours, several of these expedition participants were awarded some of the highest. Three of the 18 participants in 1921 were later knighted (Binney, Carr-Saunders, and Huxley), three were elected Fellow of the Royal Society (Elton, Frazer, and Huxley), and several others received military decorations.

Huxley, who was active in many aspects of science, both in Britain and worldwide, for the following 30 years, probably became the best known. He supervised the undergraduate Elton at New College, Oxford, where comparative anatomy, palaeontology, and embryology dominated the curriculum. His understanding of the field in which his pupil would later become eminent, establishing the Bureau of Animal Population in Oxford and setting up Wytham Wood for world-class ecological research, is well summarized in this recollection:

> We camped [7 July 1921, on the east coast of Prins Karls Forland] in small tents and were pretty cold. I shared one with Huxley, and clearly remember that, as we lay in our sleeping bags, he asked: "Tell me, Elton, what as a matter of fact *is* Ecology?" This rather defines the state of zoological thinking at that time. After our return home, I remember that Professor Poulton remarked: "Are not ecologists an obscure sect of the followers of Lamarck?"

Another of Elton's contributions was to found, with two others, the Oxford University Exploration Club in 1927. He

TABLE 1. Principal non-Norwegian participants of expeditions to Bjørnøya, Prins Karls Forland, and Klaas-Billen Bay (1921), Nordaustlandet and northeastern Spitsbergen (1923), and Vestspitsbergen (1924), with biographical notes added. Names include any titles shown in Elton's reports. Abbreviations: UNESCO = United Nations Educational Scientific & Cultural Organization; WWF = World Wildlife Fund; WWI/II = World War I/II. British honours: Military: DSO = Distinguished Service Order; MC = Military Cross. Scientific: FRS = Fellow of Royal Society; PRS = President of Royal Society. Public service: CBE = Commander of British Empire; OBE = Order of British Empire; OM = Order of Merit.

Name	Dates	Expertise	1921	1923	1924	Career, service, achievements, and honours
Lieut. J.R.T. Aldous	1898 – 1985	Surveyor	X	X	Sledging	Senior army officer WWI and II, France, UK, India, mountaineer, poet. Brigadier, Royal Engineers. MC, CBE
F.G. Binney[1]	1900 – 1972	Geographer	Organizer	Leader/ Organizer	Leader/ Organizer	Explorer, naval officer, author. Hudson Bay Co. Canada; WWII special operations, Sweden. Knighthood, DSO
J.D. Brown[1]	1899 – 1971	Ornithologist	Scientist	Photographer	X	Ornithologist, forester, businessman (Affleck & Brown), farmer, trade advisor; Manchester and Kirkcudbright. OBE
Professor A.M. Carr-Saunders	1886 – 1966	Zoologist	Scientist	X	X	Lawyer, soldier, sociologist, demographer, government advisor, mountaineer. Oxford and Liverpool. Knighthood.
W.B. Carslake	1893 – 1959	Mountaineer	X	X	Sledging	London lawyer, mountaineer (Alps and UK), explorer. Army in France WWI and Home Guard WWII. MC
H.M. Clutterbuck[1]	1900 – 1942	Botanist	X	Naturalist	Asst. organizer/ Naturalist	Explorer, plant collector; Himalayas, Akpatok Island, Canada. Fighter pilot WWII in N. Africa, Middle East, Far East.
Lieut.-Col. Sir Iain Colquhoun	1887 – 1948	Army Officer	X	X	Sledging	Soldier, landowner, administrator. Lord Lieutenant of Dumbartonshire; Rector of Glasgow University. DSO
C.S. Elton[1]	1900 – 1991	Ecologist	Scientist	Scientist	Chief scientist	Ecologist, author, lecturer, government advisor. Bureau of Animal Population and Wytham Wood, Oxford. FRS
Dr. H.W. Florey[1]	1898 – 1968	Physician	X	X	Medical officer	Penicillin research. Sheffield, Oxford, Adelaide. Provost, The Queen's College. Nobel prize, peerage, OM, FRS, PRS.
R.A. Frazer	1891 – 1959	Applied mathematics	Surveyor/ Sledging	Surveyor/ Sledging	Surveyor/ Sledging	Mathematician, aerodynamicist, government advisor, author, mountaineer. National Physical Laboratory. FRS
S. Gordon[1]	1886 – 1977	Photographer	Scientist	X	X	Naturalist, photographer, author, folklorist; mostly Scottish highlands. CBE
Professor J.S. Huxley[1]	1887 – 1975	Ornithologist	Scientist	X	X	Biologist, author, political advisor, broadcaster, humanist. Oxford, London, USA; UNESCO, WWF. Knighthood, FRS
A.C. (Sandy) Irvine[1]	1902 – 1924	Engineer	X	Sledging	X	Inventor, oarsman, mountaineer: disappeared near summit of Mount Everest, June 1924.
Rev. F.C.R. Jourdain[1]	1865 – 1940	Ornithologist	Leader	X	X	Naturalist, ornithologist, egg collector, author. Anglican vicar/rector in Suffolk and Berkshire. Founder of BTO.
Dr. T.G. Longstaff[1]	1875 – 1964	Physician/ Ornithologist	Scientist/ Physician	Scientist/ Physician	X	Physician, soldier, ornithologist, mountaineer, author; WWI officer Indian army, WWII army medical corp.
J.C.B. Mason (J.C. Bee-Mason)	1875 – 1957	Cinematographer	X	X	Photography – Ciné film	War photographer, wildlife film maker naturalist, apiarist. Arctic and Antarctic expeditions (with Shackleton in 1921); Bolivia
F.A. Montague[1]		Ornithologist	X	X	Sledging	Ornithologist, author, collaborated with Huxley.
N.E. Odell	1890 – 1987	Geologist	Scientist/ Sledging	Scientist/ Sledging	X	Geologist, explorer, mountaineer, soldier, lecturer; Royal Engineers WWI and II; Everest expedition 1924.

TABLE 1 – *continued:*

Name	Dates	Expertise	1921	1923	1924	Career, service, achievements, and honours
A.H. Paget-Wilkes[1]		Ornithologist	Scientist	X	X	Anglican vicar, Royal Air Force chaplain, missionary.
A.N.T. Rankin[1]	1904 – 1965	Photographer	X	X	Bird photography	Landowner, soldier, explorer, author still and ciné photographer especially of Arctic and Antarctic seabirds.
E.R. Relf	1888 – 1970	Physicist/ Electrician	X	Surveyor/ Wireless	Surveyor/ Wireless	Aerodynamicist, aeronautics, musician author. National Physical Laboratory, London, Cranfield College. FRS
K.S. Sandford[1]	1899 – 1971	Geologist/ Glaciologist	X	X	Sledging	Geologist, author, lecturer; Oxford University. Glaciology in Alps, Arctic and Africa.
R.W. Segnit[1]		Geologist	Scientist	X	X	Geologist; Adelaide. Geological Survey of South Australia.
G. Slater	1874 – 1956	Glaciologist	Scientist	X	X	Glaciologist, author; Imperial College, London. Research in East Anglia, Germany, Canada, Denmark, S. Africa.
V.S. Summerhayes	1897 – 1974	Botanist	Scientist	X	X	Soldier WWI. Botanist, orchid taxonomist; Royal Botanic Gardens, Kew. Collaborated with Elton. OBE
Capt. J.C. Taylor		Engineer	X	X	Seaplane	Pilot, engineer. Royal Air Force; Hudson Bay Company.
Capt. J.E. Tennant	d. 1941	Surveyor/ Sea captain	X	X	Commander of *Polar bjørn*	Surveyor, aircraft fighter pilot in both world wars; killed in action 1941. DSO, MC
Capt. F. Tymms	1889 – 1987	Navigator/ Meteorologist	X	X	Meteorologist/ Seaplane	Aerial surveyor WWI, navigator, aviation administrator, pilot, author. UK, Africa, and India. MC, Knighthood.

[1] Connected with an Oxford College through either education or employment or both.

participated in the 1930 expedition to Lapland, one of the club's first ventures, and duly wrote the report (Elton, 1931).

Many of those on the later expeditions also became distinguished though careers or hobbies. Australian Howard Florey, then studying in Oxford on a Rhodes scholarship, shared the 1945 Nobel prize with Fleming and Chain for developing penicillin and, as Lord Florey, became eminent in medicine and higher education. His enduring friendship with Elton led the Bureau of Animal Population in Oxford to study the epidemiology of wildlife diseases. Seton Gordon wrote 27 popular books about landscape, people, and wildlife of highland Scotland. Captain (later Sir Frederick) Tymms became a major figure in British civilian aviation, while Frazer and Relf's research in aerodynamics underpinned advances in aircraft design. Sandy Irvine and Noel Odell are remembered for the 1924 expedition to climb Mount Everest, during which the former, with George Mallory, disappeared near the summit.

The first expedition, which consisted mainly of ornithologists, was led by Reverend Francis Jourdain, one of the last of a distinguished British tradition of clerical amateur scientists (notable naturalists include the Reverends John Ray (1627 – 1705), Gilbert White (1720 – 93), and William Buckland (1784 – 1856)), whose enthusiasm and determination enabled them to make substantial and original contributions to science, in spite of (or perhaps because of) their lack of relevant training, equipment, or funding.

In 1921, Jourdain was 56 years old, rector of the parish of Appleton (10 km southwest of Oxford), married with several young children, and well known as an amateur in the rapidly developing and increasingly popular science of ornithology. For the previous 20 years, he traveled widely every summer to study the diet, range, and breeding habits of the birds of Britain and western Europe. His collaboration with other bird enthusiasts, and the (then very few) professional ornithologists led directly to the establishment of the British Trust for Ornithology (BTO). True to his Victorian roots, he had no qualms about raiding nests for eggs, and he left an extensive collection of birds' eggs and oological data that are still useful today.

In the same genre was Arthur Paget-Wilkes, who later followed his father and other relatives into Holy Orders and served as a missionary in Africa and a World War II chaplain. Their cheerful collaboration with the atheist Huxley, agnostic Elton, and eugenicist Alexander Carr-Saunders in the interests of science does quiet credit to what is now called "tolerance and respect" but was then unnamed and unreported because it was just assumed.

Discrimination on the basis of age was also conspicuous by its absence (although far fewer frailties would have been curable then than now): Tom Longstaff, John (Bee-) Mason, and George Slater were all over 45 years old when recruited (see Table 1). The mountaineers in particular maintained impressive standards of physical fitness. Elton (1923)

FIG. 4. Klaas-Billen Bay, Isfjord showing the Terningen *moored among icebergs from the Nordenskjold Glacier (to right) with Petunia Bay beyond, July 1921. Photographer: Seton Gordon.*

FIG. 5. Elton's view northeast across Andrée Land taken from summit of Mount Scott-Keltie at the southern end of Woodfjorden, that he and Hugh Clutterbuck climbed on 21 August 1924. The highest mountain's basalt-type dolerite cap overlying Devonian Old Red Sandstone is very clear.

described searching for sanderling nests on Reindeer Peninsula, Liefdefjorden on 28 July 1923 by citing Longstaff's (1950) autobiography thus: "I had many walks over this tundra: the surface of the ground melts in high summer and the foot sinks into the mud at every depression. One day, with Charles Elton I walked for twelve hours, and doubt if we covered twenty-five miles…."

The previous experience of crew members differed greatly: many of those born before 1890 enjoyed the Edwardian enthusiasm for foreign travel, but unless sent abroad to fight in World War I, some younger members, including Elton, had never previously left Britain. Some treated the expeditions as glorified holidays on which to indulge hobbies and try new equipment, while the dedicated scientists such as Elton and Kenneth Sandford collected data and specimens.

THE EQUIPMENT

Fast-developing technologies improved in successive expeditions. In 1921, photographs were mostly of posed people and landscapes taken by Seton Gordon (Fig. 4), Longstaff, Relf, Brown, and by Elton himself. They carried their cumbersome equipment long distances over difficult terrain, achieving spectacular and scientifically valuable images like Figure 5. For the later expeditions, the organizers recruited experts, including Niall Rankin, then an undergraduate student, who set up his camera in hides on cliffs and in bogs. For their time, Rankin's close-up images of wild birds in their natural habitat and landscapes under awkward light conditions were remarkable (Fig. 6). The ornithologists and photographers may have been aided by the virtual extermination over previous decades of the breeding birds' main terrestrial predator, the Arctic fox.

The *Terningen* was at the disposal of the explorers throughout the 1923 expedition, enabling them to venture into much more remote areas than two years earlier. There was nothing similar to the ruined whaling station or the Scottish Spitsbergen Syndicate's huts they had occupied in 1921, so they mostly lived on the ship, which became icebound in Hinlopen Strait in early August. They brought wireless equipment for the first time, expertly set up by Ernest Relf on "vacation" from Britain's National Physical Laboratory, but wisely avoided relying on the new technology. The 1924 equipment was more elaborate, with more trained users, but sometimes proved more trouble than it was worth, as Elton described:

> [We have experienced] the breakdown of the wireless communications, from the following causes:
> *Polar Bjørn*: Generator out of action. Can receive but not send. *Oïland*: Can send but not receive, since accumulators have run out. Base Camp: could receive if anyone here knew how, but they don't. Could not send, since the valves are burnt out. Sledgers: have probably given up listening and thrown away their gear, owing to the *Polar Bjørn*'s failure. Seaplane: Has thrown out both sending and receiving sets, at the call of weight considerations of absolute urgency.

The technological challenges posed by wireless technology were dwarfed by those of the Avro 504 seaplane, a mass-produced World War I biplane specially converted to have three seats and to land on or take off from water. This unique aircraft was transported in three sections, which were floated ashore on improvised rafts, along with the huge quantities of fuel needed, and assembled on the beach. Its crates were redeployed as sleeping hutches. Tymms was its chief "manager," and used his experience as an observer in the Royal Flying Corps (WWI) to take some "air-photos" from it.

Human senses proved superior to wireless when, on 14 July 1924, the seaplane was stranded for 12 hours on the Greenland Sea in worsening weather after a piston shattered.

> Tymms was very anxious, because the aeroplane party had decided to fly across the mountains by the Monaco

FIG. 6. Niall Rankin's image of a Richardson's Skua standing beside its two eggs at Reindeer Peninsula, ca. 13 July 1924.

> Glacier [Monacobreen, Haakon VII Land] instead of going round by sea, and we could see from here [Green Harbour, Reindeer Peninsula] that there were big patches of cloud over it. T. said they were "damned fools" to try it.

Fortunately, a Norwegian meteorologist on an evening stroll spotted the floating plane and, with two associates and a small boat, managed to rescue the craft and its crew.

RECORDING AND PUBLICATION

Recording of the first two expeditions was rather haphazard. Jourdain, leader in 1921, kept a diary of that expedition, as did Douglas Brown for the 1923 journey, but neither bothered to publish. Elton wrote (and typed himself) three lengthy unpublished reports of the scientific findings from the 1921 expedition. Huxley added a comprehensive account of his studies of courtship in the Red-throated Diver (modern name: *Gavia stellata*) (Huxley, 1923) to his impressive list of publications in learned journals, and, already an adept publicist, produced several popular articles for *The Times* newspaper.

The writing up of the 1924 journey was much more prompt and efficient, starting with Binney's detailed account, illustrated with many photographs, in *The Geographical Journal* less than a year later (Binney, 1925a). The next issue contained supplements on special topics: three on meteorology, navigation, and the seaplane from Tymms, two on geophysics and wireless from Relf, as well as Sandford's reports on geology and glaciology and Elton's on biology and geography (Tymms et al., 1925). Contemporary enthusiasm for aviation and exploration prompted a popular book (Binney, 1925b) about the logistics, sledging, and seaplane of the 1924 expedition. Tom Longstaff (1950) briefly described his Arctic experiences in 1921 and 1923 in his memoirs, and they feature in various secondary accounts (e.g., Thompson, 1953).

Elton later published papers in other learned journals, alone (Elton, 1927a, 1929) or with his lifelong friends, Victor Summerhayes (Summerhayes and Elton, 1923, 1928) and geologist Donald Baden-Powell (Elton and Baden-Powell, 1931). Some of the information and concepts developed from his observations were later used in his seminal books on ecology and population dynamics (Elton, 1927b, 1966). But Elton, who combined diligence and perseverance with personal modesty to a degree unusual even among his self-effacing contemporaries, deferred writing about his personal impressions and experiences of the three 1920s expeditions until after he retired in 1967.

The three expedition reports include around 100 carefully documented photographs, some of which appear in reports for journeys other than those on which they were taken. Elton was one of the youngest participants (see Table 1), and the last to die, so he must have acquired the materials derived from his colleagues many years earlier. Elton's family still hold many of the 100 × 75 mm negatives of photographs that he took. If analyzed by modern image-processing equipment, they may yield further scientifically valuable details.

Elton was quick to notice unexpected events and question colleagues for relevant information, as in this entry for 19 August 1924 (Elton, 2014c). (The observations were later written up in Elton, 1929):

> There was one most extraordinary discovery. One day, while the big depression was coming up, and strong southwesterly winds were blowing, there was a large deposit of huge *Syrphus* hover-flies and black "mosquitoes" on the snow. In the case of Frazer's [sledging] party there were many of these, and I have narrowed down the times pretty well. The other two parties (on N.E.Land ice-cap) also met the flies after this storm. They are not Spitsbergen species, at any rate the yellow and black *Syrphus*, and must have been blown right over from Europe.

These reports were written 45 years after the events they describe, so many of the scientific conclusions clearly were reached in the light of later research. For example:

> It was remarkably hot on the island today [7 July 1924, Kongsfjorden], and one had to discard clothes a good deal. I think the factors causing the richness of Deer Bay Island are (a) being in an inner fjord i.e. much sunshine (because föhn winds down the glaciers warm the air as the pressure increases during their descent) (b) a complete ring of sheltering mountains (c) reflection of heat and light from 7 surrounding glaciers (d) manuring by terns and eiders (e) being open to the south.

Three copies of these unpublished documents, partly handwritten and with more than 100 photographs, maps, and drawings on loose-leaf quarto, were filed in simple ring binders. One set was deposited with the Norsk Polarinstitutt, another with the Scott Polar Research Institute, Cambridge, and the third was inherited by his family, who lent them to me for digitization. In electronic form, they are now

available through the Norsk Polarinstitutt's website (Elton, 2014a, b, c). I have also transcribed and edited Elton's much more extensive records of wildlife in and around Oxford, especially Wytham Wood, from 1942 to 1965, adding explanatory notes. The Elton Archive is available as downloadable, searchable PDF files through Oxford University's Research Archive (University of Oxford, 2015). His family and I hope these resources will prove useful for historians of science and technology and biographers, as well as those interested in how the climate, landscape, and wildlife have changed during the past century.

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