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Linnaeans outdoors: the transformative role of studying nature 'on the move' and outside

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Abstract. Travelling is an activity closely associated with Carolus Linnaeus (1707–1778) and his circle of students. This article discusses the transformative role of studying nature outdoors (turning novices into naturalists) in eighteenth-century Sweden, using the little-known journeys of Carl Bäck (1760–1776), Sven Anders Hedin (1750–1821) and Johan Lindwall (1743–1796) as examples. On these journeys, through different parts of Sweden in the 1770s, the outdoors was used, simultaneously, as both a classroom and a space for exploration. The article argues that this multifunctional use of the landscape (common within the Linnaean tradition) encouraged a democratization of the consumption of scientific knowledge and also, to some degree, of its production. More generally, the study also addresses issues of how and why science and scientists travel by discussing how botanical knowledge was reproduced and extended 'on the move', and what got senior and junior students moving.

Recently there has been a surge of interest in the spatial dimension to the production and consumption of science. The traditional notion that the universality of scientific facts renders the site and geographical location in which they were uncovered or learnt of little or no relevance has come in for criticism, and historians of science and geographers alike have come to focus on *where* science was done, notably by studying such spaces as laboratories and museums. This is not an isolated development; it reflects a general effort within the history of science to look beyond ideas and intellectual achievements in order to take cultural, social and political issues into account.[1]

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1 This is a rapidly expanding area of research. Central texts include Adi Ophir and Steven Shapin, 'The place of knowledge: a methodological survey', *Science in Context* (1991) 4, pp. 3–22; Steven Shapin, 'Placing the view from nowhere: historical and sociological problems in the location of science', *Transactions of the Institute of British Geographers* (1998) 23, pp. 5–12; Crosbie Smith and Jon Agar (eds.), *Making Space for Science: Territorial Themes in the Shaping of Knowledge*, London: Macmillan, 1998; and David

Discussions within this genre, of 'the field' as a site, have an obvious bearing on issues at the forefront of this article, which discusses the tradition of studying nature outdoors in the eighteenth century and the Swedish naturalist Carolus (Carl) Linnaeus and his students.[2] Although mainly concerned with examples from the nineteenth and twentieth centuries, the introduction to the topic in the 1996 issue of *Osiris*, 'Science in the field', by Henrika Kuklick and Robert E. Kohler, provides a suitable starting point for our discussion. Here the editors discuss developments among historians interested in field studies, and how, in particular, they compare to studies of the laboratory. While the laboratory is usually contained in a well-defined and controlled physical space where strict hierarchies divide different members of staff, the field tends to be much more open and loosely defined. Field studies are done everywhere, from inner cities to unpopulated and isolated regions of the planet, and by representatives of a wide range of subjects. Further, fields are rarely closed spaces: scientists cohabit them with local people (on whom they often depend for information), tourists, amateur scientists and collectors of rare and valuable specimens. The participation of amateurs and the types of issue on which the field scientists focused (often topics resistant to 'tidy solutions') have tended to result in the field scientist enjoying an academic status lower than that of his or her colleagues in the controlled laboratory environment, and Kuklick and Kohler argue that this lower status partly explains why the field has generally been neglected by historians of science.[3]

Even if the academic status of field scientists collectively is comparatively low, on an individual level the unregulated character of the field could offer advantages. As several scholars have argued, this quality can help the researcher to reinvent him- or herself. For example, Jane Camerini's works on travelling Victorian scientists, such as Alfred Russel Wallace and Charles Darwin, illustrate that the journeys and field studies these persons undertook were instrumental in establishing them as scientists. However, as Camerini also underlines, Wallace and Darwin did not operate in a vacuum: their fieldwork was shaped by their relationships with representatives of, among others, the Royal Navy, the scientific establishment in London, and European settlers and

N. Livingstone, *Putting Science in Its Place: Geographies of Scientific Knowledge*, Chicago: University of Chicago Press, 2003. For some very recent surveys and orienting discussions see Simon Naylor, 'Introduction: historical geographies of science: place, contexts, cartographies', *BJHS* (2005) 38, pp. 1–12; Richard C. Powell, 'Geographies of science: histories, localities, practices, futures', *Progress in Human Geography* (2007) 31, pp. 309–329; and Diarmid A. Finnegan, 'The spatial turn: geographical approaches in the history of science', *Journal of the History of Biology* (2008) 41, pp. 369–388.

2 Some of the results presented in this article have previously been published in Swedish in Hanna Hodacs and Kenneth Nyberg, *Naturalhistoria på resande fot. Om att forska, undervisa och göra karriär i 1700-talets Sverige*, Lund: Nordic Academic Press, 2007, see particularly Chapter 3, 'Att resa ut som student och komma hem som forskare' (Hodacs), pp. 37–64; Chapter 4, 'Att forska och undervisa längs med vägen' (Hodacs), pp. 67–97; Chapter 5, 'Att lära sig umgås i och runt naturen' (Hodacs), pp. 99–136, and Chapter 10, 'Sammanfattande diskussion' (Hodacs and Nyberg), pp. 211–255. Below I shall also frequently refer to Chapter 6, 'Att samla ära, meriter och naturalier', pp. 137–167, and Chapter 2, 'Linné, Lärjungarna och resandet i historieskrivningen', pp. 17–35 (both Nyberg). Since Nyberg's contribution was essential to the development of the main themes in our book, he also has a large stake in many of the ideas presented in this article (although, of course, any mistakes or errors it contains are mine).

3 Henrika Kuklick and Robert E. Kohler, 'Introduction', *Osiris*, 2nd Series (1996) 11, pp. 1–14, p. 1.

indigenous populations in the areas in which they operated. These relationships also highlight how the fieldwork of these scientists was situated in the broader historical context of Victorian colonialism and industrialization.[4]

Camerini's approach to the role and function of the field and field studies corresponds in several respects to the one I shall adopt here focusing on the Linnaean tradition of studying nature outdoors in the eighteenth century. Here, too, the scientific, political and social context is important. The scientific thinking of the time promoted the cataloguing and mapping of the world's plants, animals and minerals and Linnaeus and his students contributed to this project in various ways. Linnaeus's innovations, to do with nomenclature and taxonomy, were central to the provision of a structure.[5] The samples which his students brought back from their journeys provided Linnaeus with material for this work and for other projects of Linnaeus and his students.[6] We also know that Linnaeus inspired other scientific travellers, not least Joseph Banks. Further, Banks employed several of Linnaeus's students, perhaps most famously Daniel Solander (1733–1782), who accompanied Banks on Captain Cook's first venture.[7] Thus Linnaeus's students became instrumental in the European expansion of the eighteenth century, as has been discussed by scholars including Marie-Louise

4 Jane R. Camerini, 'Wallace in the field', *Osiris*, 2nd series (1996) 11, pp. 44–65; *idem*, 'Remains of the day: early Victorians in the field', in Bernard Lightman (ed.), *Victorian Science in Context*, Chicago: University of Chicago Press, 1997, pp. 354–377.

5 Gunnar Eriksson, *Botanikens historia i Sverige intill 1800*, Uppsala: Almqvist & Wiksell, 1969; Wilfrid Blunt, *The Compleat Naturalist: A Life of Linnaeus*, Princeton: Princeton University Press, 2001 (first published 1971); James Larson, *Reason and Experience: The Representation of Natural Order in the Work of Carl von Linné*, Berkeley: University of California Press, 1971; Tore Frängsmyr (ed.), *Linnaeus: The Man and His Work*, Berkeley: University of California Press, 1983; Paul Lawrence Farber, *Finding Order in Nature: The Naturalist Tradition from Linnaeus to E.O. Wilson*, Baltimore: Johns Hopkins University Press, 2000.

6 A number of the works mentioned in note 5 above discuss contributions of Linnaeus's students to their professor's work. See also Robert E. Fries, 'De linneanska "apostlarnas" resor. Kommentar till en karta', *Svenska Linnésällskapets årskrift* (hereafter *SLÅ*) (1950–1951), pp. 31–40; Sten Selander, *Linnélärjungar i främmande länder. Essayer*, Stockholm: Bonniers, 1960; Sten Lindroth, *Kungl. Svenska vetenskapsakademiens historia 1739–1818*, 2 vols., vol. 1: *Tiden intill Wargentins död*, Stockholm: Almqvist & Wiksell, 1967; Sverker Sörlin, 'Scientific travel – the Linnean tradition', in Tore Frängsmyr (ed.), *Science in Sweden: The Royal Swedish Academy of Sciences 1739–1989*, Canton, MA: Science History Publications, 1989, pp. 96–123; *idem*, 'Apostlarnas gärning. Vetenskap och offervilja i Linné-tidevarvet', *SLÅ* (1990–1991), pp. 75–89; Sverker Sörlin and Otto Fagerstedt, *Linné och hans apostlar*, Stockholm: Natur och Kultur, 2004; Bengt Jonsell, 'Apostlarnas resor och gärningar. Linnélärjungarnas roll i upptäckten av världen', in Paul Hallberg (ed.), *Ljus över landet? Upplysningen som drivkraft i 1700–talets svenska vetenskap och vitterhet*, Göteborg: Kungl. Vetenskaps- och vitterhets-samhället, 2005, pp. 79–98, and Nyberg, op. cit. (2), Chapter 6. For a discussion focusing particularly on the contributions of Linnaeus's students to Linnaeus's *Species Plantarum* (1753), see Mariette Manktelow and Kenneth Nyberg, 'Linnaeus' apostles and the development of the Species Plantarum', in *Species Plantarum 250 Years* (conference publication), Symbolae Botanicae Upsalienses 33:3 (ed. Inga Hedberg), Uppsala: Uppsala University 2005, pp. 73–80.

7 On the relationship between Linnaeus, Banks and Solander see John Gascoigne, *Science in the Service of Empire: Joseph Banks, the British State and the Uses of Science in the Age of Revolution*, Cambridge: Cambridge University Press, 1998; and Patricia Fara, *Sex, Botany and Empire: The Story of Carl Linnaeus and Joseph Banks*, New York: Columbia University Press, 2004. On Solander see also Arvid Hjalmar Uggla, 'Daniel Solander och Linné', *SLÅ* (1954–1955), pp. 23–64; Bengt Jonsell, 'Linnaeus and his two circumnavigating apostles', *Proceedings of the Linnean Society of New South Wales* (1981) 106(1), pp. 1–20; and Edward Duyker, *Nature's Argonaut: Daniel Solander 1733–1782, Naturalist and Voyager with Cook and Banks*, Melbourne: Miegunyah Press, 1998.

Pratt.[8] The journeys need also to be understood in the light of the political and economic context at home. Lisbet Koerner has highlighted ways in which Linnaeus was directed by cameralism – a theory of fiscal and economic governance which was popular in early modern northern Europe. Knowledge about nature, and more specifically how it could be utilized, was, Linnaeus believed, the key to the creation of a self-sufficient state and rational government. The natural historian could assist in reducing his country's dependence on expensive imports (such as tea) by finding alternatives that could be grown at home. This was also one of the reasons why Linnaeus encouraged his students and others to contribute exotic seeds and plants to his botanical garden in Uppsala, where he could study their adaptability to the Scandinavian climate.[9]

It is, of course, important to acknowledge, as Pär Eliasson has demonstrated, that the Linnaean travellers' main focus was on (preferably) 'new' singular objects or species (rather than biotopes) and that they did not develop an 'intimate' relationship with the field. In that sense they differ in a significant manner from the late eighteenth- and early nineteenth-century botanists and their followers who were interested in plant geography.[10] In order to avoid anachronisms I shall refrain from using terms such as 'fieldwork' or 'field studies' in my discussion. However, like the field scientists of the nineteenth and twentieth centuries, the Linnaean naturalists explored nature outdoors and often far away from home. Against that backdrop, journeys offered the Linnaean traveller possibilities for reinvention much as they did later scholars. Below I shall pay particular attention to the socially transformative role of studying nature outdoors, focusing on the role this activity had in turning students of nature into researchers. I am predominantly interested in the conception of the field as a training ground and a place where students 'graduated'. This specific focus has, perhaps surprisingly, received very little attention within the current discussion of field-located metamorphosis.[11]

8 Mary Louise Pratt, *Imperial Eyes: Travel Writing and Transculturation*, London: Routledge, 1992. See also Sörlin and Fagerstedt, op. cit. (6); Alexandra Cook, 'Politics of nature and voyages of exploration: some purposes and results', in Anna Agnarsdottir (ed.), *Voyages and Exploration in the North Atlantic from the Middle Ages to the XVIIth Century*, Reykjavik: University of Iceland Press, 2000, pp. 125–138; and Staffan Müller-Wille, '"Walnut-trees at Hudson Bay, coral reefs in Gotland": Linnaean botany and its relation to colonialism', in Londa Schiebinger and Claudia Swan (eds.), *Colonial Botany: Science, Commerce, and Politics in the Early Modern World*, Philadelphia: University of Pennsylvania Press, 2005, pp. 34–48.

9 Lisbet Koerner, 'Purposes of Linnaean travel: a preliminary research report', in David Philip Miller and Peter Hanns Reil (eds.), *Visions of Empire: Voyages, Botany, and Representations of Nature*, New York: Cambridge University Press, 1996, pp. 117–152; *idem*, *Linnaeus: Nature and Nation*, Cambridge, MA: Harvard University Press, 1999. The economic strands in Linnaeus's work have been discussed by other scholars too, most notably the Swedish economic historian Eli Filip Hecksher (1879–1952). See, for example, Eli Filip Hecksher, 'Linnés resor – den ekonomiska bakgrunden', *SLÅ* (1942), pp. 1–11.

10 Pär Eliasson, *Platsens blick: Vetenskapsakademien och den naturalhistoriska resan 1790–1840*, Umeå: Department of History of Science and Ideas Publications no. 29, 1999. See also Marie-Noëlle Bourguet, 'Landscape with numbers: natural history, travel and instrument in the late eighteenth and early nineteenth centuries', in Marie-Noëlle Bourguet, Christian Licoppe and Heinz Otto Sibum (eds.), *Instruments, Travel and Science: Itineraries of Precision from the Seventeenth to the Twentieth Century*, London: Routledge, 2002, pp. 96–125.

11 Some brief comments on this issue can be found Livingstone, op. cit. (1), p. 45; Simon Naylor, 'The field, the museum and the lecture hall: the spaces of natural history in Victorian Cornwall', *Transactions of the Institute of British Geographers* (2002) 27, pp. 494–513, p. 508; Kuklick and Kohler, op. cit. (3), p. 9. It is worth pointing out that the excursion tradition generally has received relatively little attention. For some

A possible explanation for this neglect has to do with a common partition within the historiography of travelling and field studies. Fieldwork and journeys in pursuit of knowledge are generally conceived either as educational or as research-focused.[12] The journeys of students to the centres of academic knowledge on the European continent have traditionally been assigned to the first category. Another classical case of educational travelling is the 'Grand Tour': the costly and stylish type of journey which sons of European aristocrats undertook, particularly in the seventeenth and eighteenth centuries. The second type of travelling – the research kind – is usually associated with the Enlightenment and subsequent periods (although one can find earlier examples) and with the European expansion. Although this division makes sense within a broad historical framework, it can also, as I shall demonstrate below, distract attention from important questions, particularly in respect of eighteenth-century developments in natural history but also, perhaps, within other fields such as the study of antiquity – I shall return to this issue at the end of the article.

Another reason why historians rarely touch jointly on educational and research aspects of travel may have to do with complications involving the application of concepts such as that of a 'graduate student' (for want of a less anachronistic term!) to historical and intellectual contexts which pre-date the professionalization of science and the development of research universities in nineteenth- and early twentieth-century Europe and America. The roles and identities of early modern scholars are complex issues.[13] In Sweden, few of those who were scientifically active in the eighteenth century held academic positions: most were medical doctors, others were clergymen and some were officials or held positions in local grammar schools (*gymnasiums*). Others (though not as many as, for instance, in Britain), were gentleman–scholars. What brought these men together was their use of jointly approved research methods, their publication records and their contacts with each other and with institutions that promoted science. There is also reason to believe that they considered natural history a means to improve their status and professional prospects more generally (though not necessarily with the explicit aim of securing a more academic position). A fellowship in the Royal Swedish

exceptions see Karen Reeds, *Botany in Medieval and Renaissance Universities*, New York: Garland, 1991; David Elliston Allen, 'Walking the swards: medical education and the rise and spread of the botanical field class', *Archives of Natural* History (2000) 27, pp. 335–67; Brian W. Ogilvie, *The Science of Describing: Natural History in Renaissance Europe*, Chicago: University of Chicago Press, 2006; and Alix Cooper, *Inventing the Indigenous: Local Knowledge and Natural History in Early Modern Europe*, Cambridge: Cambridge University Press, 2007.

12 There are some exceptions, for example: James A. Secord, 'The Geological Survey of Great Britain as a research school', *BJHS* (1986) 24, pp. 223–275; and Ana Simões, Ana Carneiro and Maria Paula Diogo (eds.), *Travels of Learning: A Geography of Science in Europe*, Dordrecht, Kluwer Academic Publishers, 2003.

13 For some insightful discussions of the history of early modern scientists and their identities see Roy Porter, 'Gentlemen and geology: the emergence of a scientific career, 1660–1920', *Historical Journal* (1978) 21, pp. 809–836; Steven Shapin, '"A scholar and a gentleman": the problematic identity of the scientific practitioner in early modern England', *BJHS* (1991) 29, pp. 279–327; *idem*, 'The man of science in the early modern period', in Lorraine Daston and Katharine Park (eds.), *The Cambridge History of Science*, vol. 3: *Early Modern Science*, Cambridge: Cambridge University Press, 2008, pp. 179–191; *idem*, 'The image of the man of science', in *The Cambridge History of Science*, vol. 4: *Eighteenth-Century Science*, Cambridge: Cambridge University Press, 2003, pp. 159–183.

Academy of Science could, for example, raise the status of a clergyman, doctor or professor, and, of course, such a fellowship could also help its holder to establish and consolidate contacts the benefits of which transcended the realm of natural history.[14]

A closer look at the role of travelling provides a way to comprehend the complex social world of natural-history scholarship in Sweden. My hypothesis in this article is that the Linnaean tradition of travelling provided one way (albeit not the only one) in which a student could 'graduate' as a natural historian: that is to say, secure entry to the community of scholars outlined above with all the benefits this could involve. As well as gaining invaluable knowledge in natural history, the journey or 'graduation' could also lend the traveller a new status as a naturalist, by which he could begin to establish contacts with other naturalists, in ways which have been illuminated by a number of classic studies of the Republic of Letters and early modern scientific cultures.[15]

Of course, the significance of this opportunity must be understood against the background of eighteenth-century Sweden – a society where, as elsewhere in Europe, educational and professional possibilities were determined by material wealth and social origin rather than by competence and talent. It is relevant here that in Sweden aristocratic youths typically matriculated in their early teens, while the average age for university entry amongst the less privileged was around twenty. Moreover, students from poorer backgrounds typically had to interrupt their studies to earn money to keep them at university, and after studying they frequently had to take up unpaid *pro tempore* positions before they could secure permanent and, more importantly, salaried positions. In contrast, students with higher social status were often recruited and promoted almost immediately after graduation.[16] Travelling, I suggest, offered a way to reduce these differences: it offered a way for persons of modest social status to win research experience, reputations and networks of contacts with whose help they could hope to secure attractive positions in the future. In other words, scientifically

14 The best overview of the scientifically active community in eighteenth-century Sweden can be found in Lindroth, op. cit. (6). See also *idem*, *Svensk Lärdomshistoria*, 4 vols., vol. 3: *Frihetstiden*, Stockholm: Norstedt, 1978, and vol. 4: *Gustavianska tiden*, edited by Gunnar Eriksson, Stockholm: Norstedt, 1981. For case studies and studies of social interaction between scientists in eighteenth- and nineteenth-century Sweden see Henrik Sandblad, *Världens nordligaste läkare. Medicinalväsendets första insteg i Nordskandinavien 1750–1810*, Uppsala: Almqvist & Wiksell, 1979; Jakob Christensson, *Vetenskapen i provinsen. Om baronerna Gyllenstierna på Krapperup och amatörernas tidevarv*, Stockholm: Atlantis, 1999; Hjalmar Fors, *Mutual Favours: The Social and Scientific Practice of Eighteenth-Century Swedish Chemistry*, Uppsala: Institutionen för idé- och lärdomshistoria, Univ., 2003, and Hodacs, op. cit. (2), Chapter 5.

15 Lorraine Daston, 'The ideal and reality of the Republic of Letters in the Enlightenment', *Science in Context* (1991) 4, pp. 367–386; Paula Findlen, *Possessing Nature: Museums, Collecting, and Scientific Culture in Early Modern Italy*, Berkeley: University of California Press, 1994; Anne Goldgar, *Impolite Learning: Conduct and Community in the Republic of Letters 1680–1750*, New Haven and London: Yale University Press, 1995; Laurence Brockliss, *Calvet's Web: Enlightenment and the Republic of Letters in Eighteenth-Century France*, Oxford: Oxford University Press, 2002.

16 Sten Lindroth, *A History of Uppsala University 1477–1977*, Stockholm: Almqvist & Wiksell Internationell; Magnus von Platen, *Privatinformation i skolan. En undervisningshistorisk studie*, Umeå: Acta universitatis Umensis, 1981; and Johan Sjöberg, *Makt och vanmakt i fadersväldet. Studentpolitik i Uppsala 1780–1850*, Uppsala: Acta Universitatis Upsaliensis, 2002.

motivated geographical detours can be thought of as potential educational and social 'short cuts'.

Taking into account for a moment all of Linnaeus's Swedish students, to how many persons did a journey offer a potential career break? First of all, Linnaeus had several hundred students (between 273 and 457) from Sweden (including Finland), though of course not all of these where budding naturalists.[17] Further, quite a few of these probably came from underprivileged social backgrounds. Higher education in Sweden was, by European standards, fairly accessible – a fifth of the University of Uppsala's students were sons of croppers or of people of even lower social ranking.[18] This circumstance must surely have increased the competition for distinctions among those whose ambitions transcended their social status, and consequently it must also have increased their willingness to travel. What we do know is that opportunities to travel were very much in demand: 'Our young medicinae alumni jump when they hear Your letters, they cry for me and shout: Help us out [on a journey] so we can cut our laurels [i.e. material for laurel wreaths]', Linnaeus wrote, in 1750, to his 'disciple' Frederic Hasselquist, who was travelling in the Middle East at the time.[19] It is, however, worth noting that the prospect of going on a journey exploring nature lost some of its appeal following the spread of rumours about the hard conditions aboard long-distance vessels. Out of Linnaeus's students, how many people's careers could possibly have benefited from a journey and how many took the opportunity? It is, of course, hard to give exact figures, but we can try to estimate. Next to the twenty or so 'disciples' (those famous for their long-distance travels) we also have a number of students, generally much less well known, who travelled and conducted research within Sweden's borders. Another group (including more than sixty students) travelled to continental Europe, and although many of these journeys constituted the finishing phase of a long medical education, they offered the students the opportunity to explore the Continental landscape too. How many of these travellers aimed to win new status (that of a member of a community of naturalists) on their return and how many actually benefited in status from their journeys is hard to determine exactly. It is, of course, even harder to estimate how many contemplated the option before dismissing it – there are a handful of known examples of Linnaeus's students declining offers to venture on longer journeys (much to the latter's frustration). However, the numbers above suggest that 'the option to go travelling' was a serious one (whether taken or not) for as many as a hundred of Linnaeus's students, possibly more.[20]

17 On the number of Swedish (including Finnish) students Linnaeus had, compare Sven-Erik Sandermann Olsen, *Bibliographia discipuli Linnaei: Bibliographies of the 331 Pupils of Linnaeus*, Copenhagen: Bibliotheca Linnaeana Danica, 1997; with Birger Strandell, 'Linnés lärjungar. Varifrån kom de och vart tog de vägen?', *SLÅ* (1979–1981), pp. 105–143.

18 Lindroth, op. cit. (16), p. 145.

19 Linnaeus to Hasselquist, 22 December 1750, in Carl von Linné, *Bref och skrifvelser af och till Carl von Linné* (ed. Theodor Magnus Fries, Johan Markus Hulth and Arvid Hjalmar Uggla), Stockholm: Akademiska boktryckeriet, Edv. Berling, Series I, 8 vols., 1907–1922, vol. 7, p. 35. The different motives for travelling have also been explored by Nyberg, op. cit. (2), Chapter 6, using Pehr Löfling as an example.

20 On the changing attitudes to long-distance travelling see Lindroth, op. cit. (6), p. 640. The number of Linnaeus's students who travelled in Sweden has never been systematically investigated but see, for example,

The rather large number of individuals who ventured abroad and influenced how natural history was done outside and on the move (for example Solander) form the basis for another argument in favour of studying the journeys of Linnaeus's students. Such a study can not only help explain social mobility and the formation of scientific communities in Sweden, it can also contribute to our understanding of broader changes within the history of science in the second half of the eighteenth century. As several historians of science have emphasized, while local circumstances of knowledge production and consumption remain important objects of study, it is also essential to acknowledge that scientific knowledge travels, sometimes with surprising ease, and that scholars relate to the world outside their immediate surroundings. This raises a series of questions about how and why knowledge, and those carrying that knowledge, travelled. These questions have been addressed in a series of studies of centres, peripheries, networks and corporations, and of the collection, diffusion and reception of seeds, specimens, books, letters, instruments and so on.[21] This article, focusing on how botanical knowledge was reproduced and extended 'on the move', and on what got senior and junior students moving, can be read as a contribution to this discussion. In the last section of the article I shall return to these issues. First, however, we should look more closely at the journeys that will form the main focus of attention in this article.

Introducing the travellers

At the centre of this article is Carl Bäck (1760–1776), a boy of just thirteen when he ventured on the first of three longer journeys in 1773.[22] Carl came from a wealthy family. He was the only son of Abraham Bäck (1713–1795), one of the most influential medical doctors in eighteenth-century Sweden and a central figure in the development of Swedish science.[23] Bäck senior was also closely connected to Linnaeus in several respects. Bäck was in charge of the Swedish College of Physicians (Collegium medicum) and employed many of Linnaeus's students during a period in which the Swedish medical services expanded greatly.[24] Bäck and Linnaeus shared an interest in science,

the journeys of Lars Montin (1723–1785), Johan Otto Hagström (1716–1792) and Peter Jonas Bergius (1730–1790). For a discussion of reluctant travelers see Hodacs, op. cit. (2), Chapter 3. A close reading of Sandermann Olsen, op. cit. (17), reveals that at least sixty out of 273 (Swedish) students of Linnaeus (not including any 'disciples') travelled in continental Europe. The true figure is probably higher since this information was not systematically collected by Sanderman Olsen.

21 See, for example, Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society*, Milton Keynes: Open University Press, 1987, esp. Chapter 6; Steven Shapin, 'Here and everywhere: sociology of scientific knowledge', *Annual Review of Sociology* (1995) 21, pp. 289–321; Steven J. Harris, 'Long-distance corporation, Big Science, and the geography of knowledge', *Configurations* (1998) 6, pp. 269–304; Bourguet, Licoppe and Sibum, op. cit. (10); and James A. Secord, 'Knowledge in transit', *Isis* (2004) 95, pp. 654–672.

22 Only Anders Grape has previously discussed Carl Bäck's journeys. Anders Grape, *Ihreska handskriftssamlingen i Uppsala Universitet*, 2 vols., vol. 1: *Samlingens tillkomst och öden*, Uppsala: Almqvist & Wiksells, 1949, pp. 716–746.

23 On Abraham Bäck see Bertil Boëthius, 'Bäck, Abraham', bd. 7, *Svenskt Biografiskt Lexikon*, 1927, pp. 71–85; and Grape, op. cit. (22), pp. 446–784.

24 Otto Edvard August Hjelt, *Svenska och finska medicinalverkets historia 1663–1812*, 3 vols., Helsingfors: Central-tryckeri, 1891–1893.

particularly natural history. Both played active and prominent roles in the Royal Swedish Academy of Science (Kungliga Vetenskapsakademien). Furthermore, Bäck was involved with many of Linnaeus's students (including several 'disciples') whose careers and scientific activities he supported and encouraged. Linnaeus and Bäck were also intimate personal acquaintances: Bäck was Linnaeus's 'beloved brother' and 'best friend'.[25] No one who reads their extensive correspondence could doubt that the scientific inquires, joint excursions and hours spent studying each other's collections mediated a deep and long-lasting friendship.[26]

The importance of Linnaeus to Abraham Bäck is further evidenced by the fact that it was Linnaeus who took charge of Bäck junior's education, and provided him with his two travel companions.[27] Johan Lindwall (1743–1796) and Sven Anders Hedin (1750–1821) belonged to Linnaeus's last generation of students. Both had modest backgrounds, and the opportunity to travel with the young Bäck came at a time when they were at a transient stage in their careers, their medical studies more or less complete. Lindwall, who came on the first journey to the south of Sweden (in the summer of 1774), was months away from securing his first permanent position as a district physician, while Hedin graduated as a medical doctor between the two journeys he made with Bäck, the first one to the north of Sweden (in the summer of 1775) and the second to western Sweden (in the autumn of 1776).[28]

How, then, do the journeys made between 1774 and 1776 by Bäck, Lindwall and Hedin fit into the tradition of eighteenth-century travelling? Given the close connections between Abraham Bäck and Linnaeus, as well as between the former and several of Linnaeus's 'disciples', it is perhaps no surprise that Bäck junior got to study natural

25 The development of Bäck and Linnaeus's friendship and professional relationship can be studied in their extensive correspondence (more than five hundred letters exist, though unfortunately most of Bäck's letter to Linnaeus were destroyed, by Bäck, after Linnaeus's death). The letters are published in Linné, op. cit. (19), vols. 4–5. The quotations above are from Linnaeus to Abraham Bäck, 10 September 1751, ibid., vol. 4, pp. 156–157; and Linnaeus to Abraham Bäck, 14 September 1753, ibid., vol. 4, p. 227. These letters and much more of Linnaeus's correspondence can also be accessed online at http://linnaeus.c18.net/letters. On the relationship between Linnaeus and Abraham Bäck see also Theodor Magnus Fries, *Lefnadsteckning*, 2 vols., Stockholm: Fahlcrantz & Co., 1903; and Grape, op. cit. (22).

26 See, for example, Linnaeus to Abraham Bäck, 1 May 1750, in Linné, op. cit. (19), vol. 4, p. 122; Linnaeus to Abraham Bäck, undated but probably from May or June 1750, ibid., vol. 4, p. 124; Linnaeus to Abraham Bäck, 18 June 1751, ibid., vol. 4, p. 151; Linnaeus to Abraham Bäck, undated but probably from July 1753, ibid., vol. 4, pp. 220–221; and Linnaeus to Abraham Bäck, 14 September 1753, ibid., vol. 4, p. 227.

27 On Linnaeus's involvement in Carl Bäck's early education see, for example, Linnaeus to Abraham Bäck, 11 February 1766, in Linné, op. cit. (19), vol. 5, p. 139; Linnaeus to Abraham Bäck, undated but probably from 1766, ibid., vol. 5, p. 144; and Linnaeus to Abraham Bäck, 6 July 1771, ibid., vol. 5, p. 184. See also Grape, op. cit. (22), p. 717. See also Linnaeus's discussion about suitable private tutors for Carl Bäck in Linnaeus to Abraham Bäck, 13 September 1771, Linné, op. cit. (19), vol. 5, p. 200; Linnaeus to Abraham Bäck, undated probably from December 1773, ibid., p. 212; Linnaeus to Abraham Bäck, 24 October 1774, ibid., vol. 5, p. 220; and Linnaeus to Abraham Bäck, undated but probably from April 1775, ibid., vol. 5, p. 231.

28 Lindwall's father was a superintendent at Bergkvara Castle and Hedin's was an inspector at an iron foundry in Skatelöv. On Hedin and Lindwall see also Olle Franzén, 'Hedin, Sven Anders', *Svenskt Biografiskt Lexikon*, vol. 18, Stockholm 1969–1971, pp. 460–463; and Paul Wilstadius, *Smolandi upsalienses. Smålandsstudenter i Uppsala. Biografier med genealogiska notiser*, 7 vols., vol. 6, 1745–1800, edited by Sten Carlsson, Uppsala: Smålands nation, Uppsala universitet, 1986, pp. 141–145.

history outdoors and on the move. However, Carl Bäck and his companions' excursions seem prima facie different from the more spectacular longer journeys traditionally associated with the Linnaean tradition. First, they were limited to better-trodden parts of Scandinavia, mainly Sweden: they did not travel beyond the town of Härnösand in the north and Copenhagen and Gothenburg formed the southern and western extremities of their itineraries. Second, Carl Bäck was between thirteen and sixteen years old when he undertook the journeys; his youth and inexperience suggest that the only reasons Lindwall, in his mid-thirties, and Hedin, in his mid-twenties, came along was to care for and instruct him. In sum, one could be excused for thinking that the objectives of these trips were solely educational, and that they had little to do with uncovering new facets of the natural world, with research.

As I indicated above, in this article I am going to illustrate that a bifurcation between education and research can distort our understanding of the historical context in which natural history, and in particular botany, evolved. Bäck, Lindwall and Hedin's journeys clearly illustrate ways in which education and research were combined 'on the move'. They also illustrate how travelling functioned as a way to turn a student into a researcher, someone who learns pre-established facts about nature into someone who uncovers new facts. In order to understand the multitude of functions of travelling and its transformative role, it is, I claim, necessary to focus simultaneously on two kinds of relations, one between the travellers and the landscape and the other between the different members of the travelling party. As I shall demonstrate below, a journey could traverse landscapes containing spaces for exploration and for teaching, and different members of a travelling party could use different spaces differently. On the one hand the landscape could be used as a classroom, a place where a senior member educated a junior. On the other it could be used as an arena of exploration, a space where the senior party could assemble novel observations and collections and thereby lay the foundations of a career as a naturalist. In the latter case the younger member could also learn research methods, such as conserving and recording.

This understanding has shaped the layout of the following analysis, which is based mainly on a reading of the diaries written by Lindwall and Hedin on their journeys with the young Bäck.[29]

Teaching and learning the foundations outdoors – the landscape as a classroom

Given Hedin and Lindwall's backgrounds as students of Linnaeus, and Abraham Bäck's relationship with the latter, it is not surprising that Lindwall and Hedin's educational quest was guided by Linnaeus's systematic principles. One of Linnaeus's most significant contributions to botany was the sexual system, with its twenty-four classes. Here, the number, size and position of the stamens on a flower were the most important

29 The diaries from the three journeys are bound together into one volume (Ihre 187) and are kept in Uppsala University Library (UUL). The first section (Ihre 187:1), written by Lindwall, is the most extensive. The other two diaries (Ihre 187:2–3), written by Hedin, are briefer. The volume also contains a diary written partially by Carl Bäck and partially by Lindwall (Ihre 187:4). It covers the month Bäck stayed with Carolus Linnaeus in Uppsala in the summer of 1771.

factors in deciding which class a species belonged to, each class then being further divided into a series of orders on the basis of the number of pistils on the flower. Further characteristics guided the reader to the right genus and species.[30] Linnaeus famously organized his botanical garden in Uppsala in accordance with the system, growing species belonging to the same class in the same beds. The outdoors on Bäck's journeys provided Hedin and Lindwall with a pedagogical environment similar to Linnaeus's garden in Uppsala – a space which could be used to impress Linnaean taxonomy upon Bäck. According to the documentation from the first journey – the most extensive – Lindwall and Bäck studied as many as 390 species in the wild.[31] Comments in the diaries suggest how important it was to find examples of these species at their flowering stage, to enable their proper examination.[32]

In contrast to Linnaeus's garden, of course, the landscape traversed by the travellers was not organized into helpful flowerbeds. Instead it was the teacher's role to create an overview and to help Bäck to read the plants they encountered along the way. The importance of the role of supervision while learning the sexual system in the field should not be underestimated. Although the sexual system offered a fairly successful method of plant identification for unguided students with only basic botanical knowledge, there were many anomalies; for example, Linnaeus's general ambition to keep genera intact (reflecting his desire to keep at least part of his system in step with a natural order) led him to group some species which did not share the same sexual characteristics (such as size and position and number of stamens and pistils) in the same order. Also, over time, the increasing frequency with which new species were discovered amplified the anomalies, and the system became gradually more complicated to use.[33] A teacher familiar with the irregularities of the sexual system, as well as of nature, was therefore of great help. The diaries also reveal the relative modesties of Hedin's and Lindwall's ambitions. There is, for example, no mention of species belonging to the twenty-fourth class of the sexual system, *Cryptogamia*. It included plants whose reproductive parts were not readily visible to the naked eye, such as the ferns, mosses, algae and fungi species which even Linnaeus found hard to classify, owing to the 'secrecy' of their sexual lives.[34] The teachers seem also to have avoided discussing distinctions between different members of the genus *Epilobium* (which, indeed, modern botanists continue to find difficult).[35] Generally, though, the diaries suggest that Bäck was introduced to a wide variety of different species: he received an all-round botanical education which should have familiarized him with his natural environment and sharpened his eyes to the detection of new species.

30 On Linnaean taxonomy see Blunt, op. cit. (5); Larson, op. cit. (5); Farber, op. cit. (5).

31 This number is based on an analysis of plants mentioned in Lindwall's 1774 journal (Ihre 187:1, UUL), and the list of plants collected by the travellers which Lindwall compiled (Ihre 238, UUL).

32 Ihre 187:1, *passim*; see, for example, 21 May and 6 and 15 June 1774 (UUL). See also comments relating to outdoor taxonomy lessons in Hedin's diary, Ihre 187:2, 18 June 1775, UUL.

33 For a recent history of this development see Sara Tovah Scharf, 'Identification keys and the natural method: the development of text-based information management tools in botany in the long eighteenth century', Ph.D. dissertation, no. 9780494279823, University of Toronto, 2007.

34 Carl von Linné, *Flora Svecica*, Stockholm och Uppsala, 1986 (first published 1755), p. xi.

35 Ihre 187:1, 29 July 1774.

The binary nomenclature is one of Linnaeus's most significant contributions to biology (and was recognized as such at the time). A binary name consists of two parts. The first part is a generic name indicating the species' genus. The second part is a specific epithet, which is unique within the genus. Linnaeus launched the binary system in full dress in *Species plantarum*, first published 1753. Binary names were also used almost exclusively in the material produced by Lindwall and Hedin in connection with Bäck's journey, illustrating the degree to which it had become canonical. We can assume that Bäck learned the scientific names of plants; in fact we know that before undertaking the journeys he was already familiar with Linnaean nomenclature. A diary which he kept on his journeys to and around Uppsala in 1771 contains a list of binary names of plants he encountered, correctly spelled and carefully inscribed in the characteristic rounded handwriting of a ten-year-old.[36]

The use of Linnaean nomenclature on the journeys is not surprising, but it is remarkable nonetheless that more attention was not paid to alternative Swedish names. Although Linnaeus obviously advocated his own system, he also took a great interest in popular and colloquial names. This interest stemmed from the importance Linnaeus attached to the potential utility of the subject of natural history. Botanical knowledge, including familiarity with Linnaeus's nomenclature, played a role in the identification of domestic alternatives to expensive imported plants used, for example, in drug production and colouring processes. And familiarity with the popular names of species was important to facilitate communication about such matters with people who lacked formal botanical education.[37]

Protocols from Linnaeus's excursions with students around Uppsala in the mid-eighteenth century – his so-called *Herbationes Upsalienses* – reveal the attention paid to popular names of species, as well as to many of their traditional uses. Collectively, they give the impression that Linnaeus's students were taught to read the landscape as a practical manual, the different species representing different and potentially useful applications.[38] However, there is scant evidence that Bäck was taught to view the landscape in this way; with a few exceptions, popular names and customs do not feature in the travel journals.[39]

Obviously, Lindwall and Hedin might have taught Bäck such material without recording it in their diaries, but that would not explain the absence of remarks on local names and customs altogether: Lindwall and Hedin encountered many local people and one would expect them to have encountered information that was 'new' to them – information they would have noted in their journals. I suggest that the most

36 Ihre 187:4 (undated but probably from the 5 June 1771), UUL.

37 Lisbet Koerner, 'Women and utility in Enlightenment science', *Configurations* (1995) 3, pp. 233–255.

38 Åke Berg (ed.), with an introduction by Arvid Hjalmar Uggla, *Herbationes Upsalienses. Protokoll över Linnés exkursioner i Uppsalatrakten. 1, Herbationerna 1747*, Uppsala: Almqvist and Wiksells, 1952; and Carl von Linné, *Botaniska Exkursioner i trakten av Uppsala* (*Herbationens Upsalienses*), thesis presented in Uppsala 1753, defended by A.N. Fornander. Valda avhandlingar av Carl von Linné i översättning utgivna av Svenska Linnésällskapet, Nr. 1, Uppsala, 1998 (1753).

39 For the only examples (of popular names) see Ihre 187:1, 25 and 27 June 1774, UUL; and Ihre 187:2, 9 June 1775, UUL. For references to popular medicine see Ihre 187:1, 27 June and 8 August 1774, UUL; and Ihre 187:2, 19 and 20 June 1775, UUL.

plausible explanation for this 'silence' involves the shifting outlook during the 1760s on the utility and economic benefits of natural history in general, and (arguably) botany in particular. During this decade, the political conception of the subject as inspirational and conducive of economic prosperity diminished in Sweden.[40] If the lack of confidence in the popular and practical applications of botany explains Lindwall and Hedin's silence in this regard, then it also illustrates how approaches to the landscape as a pedagogic space were sensitive to rather sudden changes. For Bäck, it could have meant that his outdoor classroom was devoted to material internal to the subject of botany: how to identify, delineate and name plants, and little else.

The diaries of Hedin and Lindwall also reveal the degree to which the landscape was used to discipline Bäck, and to keep his focus on the task of learning this 'formal' botany. The relationship between Carl Bäck and his teachers was complex: although senior and more knowledgeable, Lindwall and Hedin were socially subordinate to the young Bäck. Further, as will be discussed in more detail below, their future career prospects depended on consolidating their relationship with their student's father. One way of achieving this was by successfully teaching Carl Bäck as much botany as possible. Although we cannot examine the knowledge Bäck gained, the travel diaries of Lindwall and Hedin reveal some of the extent to which Bäck was encouraged, not to say pressurized, to learn botany. Lessons took place virtually every day: in fact the teachers expected daily lessons, and grumbled on the few occasions on which the landscape afforded little teaching material. In a diary entry from the middle of August 1774 Lindwall complained about how little 'useful' could be 'done' on the road between Gothenburg and Alingsås, as the landscape was dominated by heather.[41] The diaries of Lindwall and Hedin carefully list which plants they observed and examined; however, while searching for new species to study the travellers naturally also came across species 'that they had already seen'.[42] Lessons on taxonomy and nomenclature were thus very likely repeated, and we can therefore assume that the 390 different plant species Bäck and Lindwall encountered in the wild on their first trip were the result of many thousands of individual observations. In other words, Lindwall and Hedin had ample opportunity to instil botanical knowledge in their student.

The chance to use the surrounding landscape as a classroom, with built-in opportunities for revision, was further enhanced by the travellers' mode of transport. Travelling in eighteenth-century Sweden was a slow business: farmers along the road were obliged to provide travellers with horses, and this arrangement could further delay a journey which by its very nature was already time-consuming. It is possible that this characteristic conceals an important reason why natural history and, perhaps particularly, botany so effortlessly seem to have become subjects on the curriculum for those who could afford to travel. It meant that for the students on a Grand Tour or educational journey, the road itself – something which previously had represented no more than an

40 Karin Johannisson, 'Naturvetenskap på reträtt. En diskussion om naturvetenskapens status under svenskt 1700–tal', *Lychnos* (1979–1980), pp. 109–154.

41 Ihre 187:1, 16 August 1774, UUL. For similar comments see also Ihre 187:1, 26 June, 27 July and 17 August 1774, UUL.

42 Ihre 187:2, 24 July 1775, UUL.

interval between centres for culture and education, was suddenly endowed with an intrinsic value of its own. In this way, Bäck's journeys (and others I have studied – see the discussion in the final section of this article) suggest that outdoor lessons in botany could be integrated into an already extant form of education.

The sluggish movement through different climate zones and past specific biotopes also rendered the landscape predictable, which may have made it easier to instil a structure and an order into the lessons. If that was the case, then the use of the landscape as a classroom on Bäck's journeys was similar to Linnaeus's use of the surroundings of Uppsala for teaching botany. *Herbationes Upsalienses* refers to eight walks on which Linnaeus regularly brought his students at the end of spring terms. One advantage of repeating the same routes was, according to Linnaeus, that the teacher would know what grew in the area, and so could anticipate which plants he would encounter.[43]

The ability to anticipate helped Linnaeus (and probably also Lindwall and Hedin) to structure their lessons, and possibly also to maintain some sort of control and authority. However, it is important to acknowledge that teaching botany outdoors in eighteenth-century Sweden had relatively little to do with imposing control. On the contrary, it could have a destabilizing effect on traditional educational institutions. Linnaeus's excursions, for example, initially caused upheavals in and around Uppsala, as hundreds of students marched together accompanied by drums and trumpets. Linnaeus's colleagues resented the fact that he attracted as many as half the student population to his outdoor lessons, and after a few years complaints from other professors forced Linnaeus to take action and change the character of the excursions.[44]

Nevertheless, the free-spirited attitudes of the first generation of Linnaeus's students reflect in a sense how they were taught: the freedom of movement associated with the educational landscape, the fact that classrooms in the form of ditches, meadows, forests and shorelines could be found almost everywhere, promised an (albeit limited) democratization of knowledge consumption that seems to have been echoed in their behaviour.[45] In the case of Lindwall, Hedin and Bäck it also is worth highlighting that the landscape furnished few other distractions – including social ones – that might have reinforced the social differences between teachers and student. One can find examples in which the occasional company of more prominent persons forced Lindwall and Hedin to put aside their educational ambitions, but these situations were rare: usually the travellers were left to themselves, to study nature outdoors alone.[46] In other words, there is reason to believe that the field as an outdoor classroom provided the Linnaean

43 Linné, op. cit. (38), p. 6.

44 Fries, op. cit. (25), vol. 2, pp. 8–10; and Carl Hårleman to Linnaeus, 8 August 1748, Linné, op. cit. (19), vol. 7, pp. 138–140. See also introduction to *Herbationes Upsalienses*, op. cit. (38) and Hanna Hodacs, 'In the field: exploring Nature with Carolus Linnaeus', *Endeavour*, forthcoming.

45 I am not implying that this attitude was associated with ideological ideas threatening the social order in a more traditional political sense; after all, the ruling regime was highly supportive of natural history, particularly during all but the last decade of the Age of Liberty (1718–1772). For further discussions of student politics in Uppsala in the late eighteenth and early nineteenth centuries see Sjöberg, op. cit. (16).

46 See, for example, the occasion on which Lindwall and Bäck had to interrupt a closer examination of the harvest of some fishermen because of an invitation to a dinner party (Ihre 187, 26 July 1774, UUL).

student with a space in which – at least partially – to reform social relationships, and possibly even to introduce new social ideals such as meritocracy.

Exploring the outdoors – researching the landscape

As the previous section demonstrated, educational spaces could be found almost everywhere in the landscape. In contrast, a closer examination of the spaces used for research reveals that they were fewer and further between. More importantly, they were accessed mainly with the help of other natural historians – either in person or by way of written instructions.

Consider, for example, Lindwall's contribution to the correct classification of *Thesium linophyllon*, today referred to as *Thesium alpinum*, in the sexual system. In the second edition of *Flora Svecica* – that from 1755, which was the most recent edition available to our travellers – Linnaeus had positioned this species in the first order, Monogynia, of the fifth class, Pentandria – a classification that implies five stamens and one pistil. However, Linnaeus's comments in *Flora Svecica* suggest that this classification was problematic. Linnaeus's own specimen was different from examples that had been found in Sweden, and he mentions samples gathered by his student Daniel Rolander in the county of Småland which had four stamens.[47] Lindwall undertook to study this discrepancy in more detail. In a letter to Linnaeus, he claimed to have studied more than a thousand samples of the plant on his trip through Småland with Bäck, and that his observations coincided with Rolander's. Lindwall's diary also illustrates the extent of his research: observations of *Thesium alpinum* were made on three separate occasions over a period of six days.[48]

Meticulous though it no doubt was, this research was not the result of random ramblings. On the contrary, in *Flora Svecica* Linnaeus explicitly specified that *Thesium alpinum* – a rare plant today and very likely also to have been so in the eighteenth century – grew in the surroundings of the parish churches of Alsheda and Nottebäck, and this is where Lindwall and Bäck headed to study examples of the plant. The diary also suggests that Lindwall followed Rolander's instructions to find other samples, close to the church of Golberga. It is also worth mentioning that Lindwall had spent time in and around this part of Småland working as a temporary physician prior to the summer of 1774. That is probably why the clergymen in the parishes mentioned above hosted Lindwall and Bäck while they conducted their extensive research in the area. In fact, we know that Lindwall was quite familiar with the clergymen since they had provided him with letters of recommendation when, a few weeks earlier, he had applied to become district physician in the county of Blekinge.[49] In other words, perhaps the most significant research Lindwall undertook was conducted in a landscape with which

47 Linné, op. cit. (34), p. 68.

48 Linnaeus correspondence, vol. 9, fols. 200–203, Lindwall to Linnaeus, 9 July 1774, Linnaean Society, London; and Ihre 187:1, 2, 7 and 8 June 1774, UUL.

49 *Collegii Medici Acter* 1774, Johan Lindwall's autobiography and letters to *Collegium medicum*, Riksarkivet (RA), Stockholm.

he was already familiar, and was guided by descriptions of other natural historians' experiences.

Building up collections such as herbaria was central in the world of eighteenth-century natural history, and as Kenneth Nyberg has discussed in respect of Linnaeus's 'disciples', travelling offered great opportunities to gather material which these 'naturalists-in-the-making' could use, both to build up their own collections and to give away to central figures in the scientific networks to which they aspired to belong.[50] Lindwall and Hedin pursued rare plants, presumably with the same intention – however, here again they were to a large extent guided by other natural historians.

Consider, for example, Lindwall's finds of *Potentilla rupestris*, one of 'the rarest plants in Sweden' according to Linnaeus. Linnaeus also specified where examples of it grew: 'by Holsby in the parish of Alseda', and sure enough it was here Lindwall and Bäck went to gather samples.[51] Lindwall was also frequently guided by local natural historians who brought him and Bäck on long excursions that often involved collecting rare plants. The assistance provided by a couple of Linnaeus's former students is perhaps the best example; Lars Montin (1723–1785) was the district physician in Halmstad and Pehr Osbeck (1723–1805) the rural dean in nearby Hasslöf. Both were prominent naturalists and experienced travellers: Montin had journeyed to Lapland in his youth to study the natural history of the region, and Osbeck was one of Linnaeus's 'disciples', famous for his trip to China in the early 1750s. After settling close to one another in the county of Halland, the dean and the doctor started to explore the natural history of their surrounding and by the time of Lindwall and Bäck's visit they had found several species previously unrecorded in Sweden, such as *Geranium phaeum*, *Genista germanica* and *Ranunculus hederaceus*. When the guests arrived they were taken on several long excursions to collect examples of these rarities.[52]

On his first journey, Hedin passed through parts of Sweden that, from the point of view of natural history and botany, were far less explored than the areas traversed by Lindwall. Expectations were high that Hedin and Bäck would find valuable and rare material. In a letter to Abraham Bäck, Johan Jacob Ferber – a former student of Linnaeus who had played host to Carl Bäck and Lindwall in Karlskrona in 1774 (before Ferber's international career took off) – begged for any spare rare plants that might be yielded by the journey northward.[53] The botanical aspirations associated with the 1775 trip were also born of a belief that the journey would be quite extensive. Letters to

50 Nyberg, op. cit. (2), Chapter 6. On the collection and exchange of specimens in early modern and Enlightenment Europe more generally see, for example, Goldgar, op. cit. (15); Anke te Heesen and Emma C. Spary (eds.), *Sammeln als Wissen. Das Sammeln und seine wissenschaftliche Bedeutung*, Göttingen: Wallstein, 2001; and Florike Egmond, 'Correspondence and natural history in the sixteenth century: cultures of exchange in the circle of Carolus Clusius', in Francisco Bethencourt and Florike Egmond (eds.), *Cultural Exchange in Early Modern Europe*, 4 vols., vol. 3: *Correspondence and Cultural Exchange in Europe, 1400–1700*, Cambridge: Cambridge University Press, 2007, pp. 104–143.

51 Linné, op. cit. (34), p. 156; and Ihre 187:1, 2 June 1774, UUL, see also Ihre 238, UUL.

52 On Lindwall and Hedin's visits to Montin and Osbeck, see Ihre 187:1, 30 July to 6 August 1774, UUL. These were just some of many excursions Lindwall and Bäck were taken on; see, for example, ibid., 28 May, 22 June, 3 and 8 July, 1774, UUL.

53 Johan Jacob Ferber to Abraham Bäck, 14 April 1776, MS 26:84–90, Hagströmerbiblioteket (HB), Karolinska Institutet, Sweden.

Abraham Bäck and notes in Hedin's diary suggest that Hedin and Carl Bäck originally intended to travel much further then they ended up doing: a visit to Åreskutan (the mountains west of Åre in the county of Jämtland) and a trip into Norway were suggested detours, and their aspiration was to reach 'at least' as far north as Umeå, on the east shore of the Gulf of Botnia.[54]

In the event, Bäck and Hedin turned around in Härnösand (more than two hundred kilometres south of Umeå) and, instead of venturing westwards and inland, they stuck mainly to the eastern coastline. Their reasons had largely to do with Bäck's health: all the riding and discomfort took its toll, and Bäck's already poor physical condition deteriorated even further. As well as worrying about his student's fevers, Hedin felt increasingly aggravated by the lack of progress and the number of missed opportunities for research. A diary entry from 26 June 1775, when Hedin and Bäck had to traverse rough terrain on their way to a Sami village, is instructive. Bäck had been too tired to walk and Hedin felt obliged to keep him company on horseback, which prevented him from making any significant observations. In the diary he noted, 'now as well as almost always I had no chance to investigate any plants except those which were visible in passing'.[55]

Hedin's disappointment apart, it is worth asking whether he would have managed to find much more of botanical value if the young Bäck had been in better physical shape. The minor excursions Hedin managed to do – some on his own, and some in the company of the local chemist in Hudiksvall (who seems to have taken the opportunity to learn from Hedin) – produced only meagre results: 'I must admit the scarcity of plants here is striking', Hedin noted laconically in his diary after one such outing.[56] There is reason to believe that what made the landscape so attractive to Hedin – its remoteness and unexplored status – also rendered it unsuitable for Hedin's research and collection ambitions, thanks to the scarcity of resident natural historians or published floras to guide the travellers to suitable spaces and plant material. Hedin's mocking description of a young man who accompanied the travellers to Alnön, a botanically very interesting area outside Sundsvall, is telling: according to Hedin he was ignorant and so full of 'tiresome' talk Hedin's ears almost came off.[57]

One of the few active and competent natural historians that the travellers did encounter was the district physician in Hedemora, Carl Magnus Blom, a friend of Abraham Bäck, a former student of Linnaeus and a keen entomologist. As far as I can ascertain, Blom did not bring his visitors on any outdoor excursions (though they did study his collections). However, he tried to help them in another way, by bringing them to a local well to sample and test the water. Unfortunately this well had dried up; but in all, Hedin and Bäck managed to test eight different wells on their journey in

54 Peter Hernquist to Abraham Bäck, 17 August 1775, *Peter Hernquists brev till Abraham Bäck 1763–1792. Tolkade och kommenterade av Ivar Dyrendahl*, Stockholm: Skogs- och lantbruksakademin, 1992; Linnaeus to Abraham Bäck, 5 July 1775, Linné, op. cit. (19), vol. 5, p. 233; and Ihre 187:2, 24 and 27 June 1775, UUL. Quote from ibid., 24 June 1775.

55 Ihre 187:2, 26 June 1775, UUL. For other comments relating to Carl Bäck's inability to travel further see ibid., 24 and 27 June 1775.

56 Ihre 187:2, 12 July 1775.

57 Ihre 187:2, 29 June 1775.

1775.[58] The interest in water flowed from contemporary use of mineral water in various different medical therapies. At the time some of the mineral water was imported, but ambitions existed to locate more alternative domestic sources, and this explains Hedin's interest. The water he tested came from spas (such as Sätrabrunn), and – more interestingly in this context – lesser-known wells he and Bäck came across serendipitously. In the village of Delsbo, the local dean – an eighty-seven-year-old who was, by his own account, in excellent health – told Hedin and Bäck about the water he had been drinking for more than thirty years, and this immediately prompted them to test samples of it, adding different substances and studying the reactions.[59]

The focus on water also reflects Hedin's adaptability. The lack of knowledgeable natural historians to guide him and Bäck to botanically interesting places led him to focus on water and wells, since these could be accessed more easily. Specialist knowledge, such as that provided by the *in situ* naturalists, was not required; the vernacular knowledge of locals such as the old dean in Delsbo would suffice to locate interesting water sources. Furthermore, the medical benefits of mineral water would have been of great interest to Abraham Bäck, who, as we know, was responsible for medical provision throughout Sweden. In sum, Hedin's experiments with water could have been a way for him to secure the admiration of his student's father, even though the trip was unsuccessful from a botanical point of view. Moreover, the sampling and testing of water – adding substances, studying the reactions and residues, and so on – could be undertaken in a comfortable, controlled environment, more congenial to the ailing Carl Bäck.

It is also worth highlighting that Hedin's experiments were very characteristic of a Linnaean approach to natural history, with its emphasis on the potential utility and practical application of the subject. This approach had long helped to legitimize natural history in Sweden; however, as mentioned above, when in the 1760s it became obvious that the promised economic benefits of the subject had failed to materialize, the political support for natural history rapidly diminished – indeed, this process had already begun at the time of Bäck's journeys.[60] The general decline in confidence in the economic benefits of natural history, and particularly of botany, may have left Hedin and Lindwall somewhat uncertain what to focus on, what to research. This would scarcely have been helped by the fact that the botanical inventory of the Swedish landscapes had reached a relatively advanced level. Consider, for example, the second edition of Linnaeus's *Flora Svecica* published in 1755. As the historian Gunnar Eriksson has pointed out, this contained an impressive number of plant species – 1,296 to be exact. This is around half of the vascular plants domestic in Sweden today, and many of those not included were only introduced after its publication. Most of the other omissions occur so sporadically that Linnaeus was never likely to encounter them, unless by 'coincidence'.[61]

58 On the visit to the well with Blom see Ihre 187:2, 28 July 1775, UUL. On visits to other wells see ibid., 10 and 24 June, 6, 10, 16 and 17 July, 3 and 7 August 1775, UUL.

59 Ihre 187:2, 17 July, 1775, UUL.

60 Johannisson, op. cit. (40), p. 114.

61 Gunnar Eriksson, 'Efterskrift', in Linné, op. cit. (34), pp. 473–482, quotation from p. 479. Eriksson also points out that Linnaeus had a tendency to conflate two or three of what contemporary botanists regard as

Furthermore, Lindwall and Hedin's potential to relate to the landscape and the nature that enclosed them in any innovative or 'post-Linnaean' ways were probably compromised by the fact that they were surrounded, not to say embedded, in a social and scientific context that was dominated by Linnaeus, even while travelling. As we have seen, Lindwall and Hedin's access to spaces for research and exploration was constrained by information and guidance they received from Linnaeus and their hosts around Sweden. Most of those whom they met who had knowledge in natural history had studied in Uppsala under Linnaeus. Many of them were medical doctors and as such they were also connected to Abraham Bäck. A closer reading of these people's correspondence with Linnaeus and the older Bäck illuminates the strong Linnaean tradition that guided their scientific activities and interests.[62] As students of Linnaeus, Lindwall and Hedin were obviously steeped in this themselves: indeed, their diaries reveal the extent to which Linnaean botany was the norm. On the few occasions when they encountered someone whose approach to the study of nature differed from Linnaeus's their criticism was rather severe. The visitors were particularly agitated by the perceived lack of 'order' in the display and storage of specimens.[63]

In other words, a set of social and scientific circumstances, some of them very specific to the late Linnaean period (1760s and onwards), dictated how Lindwall and Hedin related to the landscape around them as a space for research and exploration. In the final section below I shall discuss how their journeys might be best understood as marking not a zenith, but the beginning of the end of a tradition of combining research and education 'on the move' in Sweden.

The transformative power of travelling

To what degree did the journeys discussed above change Lindwall's and Hedin's status as natural historians and to what degree did it help them advance professionally? It is, of course, impossible to determine exactly what impact on Lindwall and Hedin's careers their journeys with Carl Bäck had. What we do know is that they were in transient phases of their lives at the time of the travels: both of them had more or less finished their medical studies and were ready to move on. How did they do after arriving back home?

Let us begin with Lindwall. On the very day in May 1774 when he and Carl Bäck embarked on their first journey, Lindwall posted an application for the position of district physician in the county of Blekinge, the position for which he asked the clergymen in Småland to recommend him. Lindwall won the appointment in the end, and since the Swedish College of Physicians and Abraham Bäck were in charge of the appointments procedure it is highly unlikely that he was chosen without the approval, or indeed assistance, of Abraham Bäck. It seems, however, that in Blekinge, Lindwall gradually lost his taste for natural history. The only mention of botany he made in

separate species. Linnaeus's familiarity with the Swedish flora was hence probably even greater than the number of species listed in *Flora Svecica* suggests; ibid., p. 479.

62 Hodacs, op. cit. (2), Chapter 5.

63 Ihre 187:1, 8 and 16 August 1774, UUL; and Ihre 187:3, 19 September 1776, UUL.

correspondence with Abraham Bäck appears in a letter written soon after his appointment in which he promised Carl some plants he had collected. Later letters indicate that Lindwall became embroiled in a number of local conflicts, and that poverty, mental illness and difficulties with his in-laws embittered his life. He died 1796, forty-six years old.[64]

In contrast, Hedin's life developed much more prosperously, but not because of his contributions to botany. His career was built on his achievements as a medical doctor: between and after his travels, he worked for Abraham Bäck, as his medical assistant, providing care for the social elite in and around Stockholm. Bäck also helped Hedin set up his own clinic in Stockholm. He became doctor to cabinet ministers and later royal physician-in-ordinary. He also held a number of important positions in the College of Physicians (Sundhetskollegiet) and in its successor. Hedin applied for Linnaeus's old chair in medicine, vacant after the death of Linnaeus's son in 1783 (who in turn had taken over from his father). He did not secure the position – it went to Carl Peter Thunberg, perhaps the most successful of Linnaeus's 'disciples'. However, Hedin did receive a number of other distinctions; for example, in 1804 he was made a Fellow of the Royal Swedish Academy of Science. He died in 1821, aged seventy-one. Today he is best known for his contribution to the earliest romantic celebrations of Linnaeus, dating back to the centenary of Linnaeus's birth in 1807. His surname, however, is mainly associated with his great-grandson, the most famous Swedish twentieth-century explorer, Sven Hedin.[65]

In other words, the journeys I have described seem not significantly to have motivated Hedin and Lindwall to pursue further research in natural history. In terms of influencing their professional lives, however, the outcome is obvious: the journeys allowed them to consolidate their relationships with Abraham Bäck, and this had a profound effect on their careers, especially Hedin's. Natural history was of fundamental importance in this context. A shared interest in botany cemented the older Bäck's relationship with his son's teachers, and functioned as a stepping stone for the latter two; that is, as a way to gain Abraham Bäck's confidence and goodwill. Bäck also supported the scientific activity of his son's teachers. Lindwall mentioned that he was given access to Abraham Bäck's extensive library and collection and Bäck also made his son's teachers interns (*ämnesvenner*) at the Royal Swedish Academy of Science. Correspondence with Linnaeus also reveals that Bäck strived to consolidate his son's teachers' loyalty to him, hoping to gain from it in the future.[66] In other words, natural history seems to have been more a means to an end than an end in itself in the history of Lindwall and Hedin's relationship with Abraham Bäck.

64 *Collegii Medici Acter* 1774, Johan Lindwall's autobiography and letters to *Collegium medicum* (RA); for Lindwall's correspondence with Abraham Bäck (after he settled in Blekinge) see MS 36:20:2–7 and MS 26 145–150 (HB). The only reference to natural history is in Lindwall to Abraham Bäck, 14 December 1775, MS 26:145 (HB). Note, though, that Lindwall published a few papers on economic aspects of natural history in *Kungliga Patriotiska Sällskapet's handlingar*. Wilstadius, op. cit. (28), p. 142.

65 Franzén, op. cit. (28).

66 Linnaeus to Abraham Bäck, 9 March, 2 April and 1 July 1769 and 9 December 1774, Linné, op. cit. (19), vol. 5, pp. 164–165, 226.

It is, of course, hard to know why neither Hedin nor Lindwall continued exploring issues to do with natural history while pursuing their medical careers. Hedin's frustration with the lack of progress and the restrictions imposed by Carl Bäck's declining health suggests that he had botanical ambitions. So did Lindwall; for example, in his CV, written at the beginning 1774 (a few months before he set out), he wrote that he had 'the honour to make public' that he was soon to 'embark on a journey to the southern provinces and for a short period also to go abroad, partly to do observations in natural history, mineralogy, economy and medicine, [and] partly, on returning from the trip, to serve the public with something useful'.[67] Of course, ambitions are one thing and reality quite another, as Lindwall learned all too well as his life became overshadowed by ill-health and misfortune. However, another, more general, cause of Lindwall's and Hedin's failing interest in natural history is probably the changing status of the subject. I have already mentioned one reason for this – the failure to fulfil promises of material rewards – and this was soon followed by a withdrawal of political support. There was also a general change of direction of Enlightenment thinking in Sweden: the focus came to be on moral rather than practical usefulness. Instead of being celebrated, natural history began to be mocked. The prestige of the Royal Swedish Academy of Science also diminished as the aristocratic audience moved to other academies and learned societies centred around art and history.[68] Hedin's future career, particularly the literary interests he developed, reflects how he adjusted to the new trends that took hold over Stockholm's fashionable elite.

It is also possible that Lindwall sensed that the status of natural history was diminishing. Prior to his trip with Bäck, Lindwall declined an opportunity to travel to North Africa to study the natural history of the region. He had been recommend for this by Linnaeus, but when his application for additional economic support was unsuccessful, Lindwall withdrew. Perhaps he sensed that the potential reward was too small, while the financial (and possibly also physical) risks were too great. In contrast, the Swedish journey offered few risks and a huge bonus: the opportunity to consolidate a close relationship with Abraham Bäck, the single most important person for anyone contemplating a medical career in Sweden at the time. With hindsight we can see that Lindwall probably picked the right journey. Göran Rothman, the person who ended up going to North Africa in his place, struggled during his years abroad – in large measure because of shortcomings in the financial support he received from from the Royal Swedish Academy of Science. The journey ruined his health and within two years of his return he was dead.[69]

When it comes to Lindwall's future career, we need also to consider the changing status of local knowledge in Europe, recently explored by Alix Cooper. Cooper's argument is that Linnaeus's systematic innovations brought about a fundamental change in attitudes towards locally produced natural history. The new tools for categorizing and

67 *Collegii Medici Acter* 1774, J. Lindwall's autobiography and letters to *Collegium medicum* (RA).

68 Lindroth, op. cit. (14); Johannisson, op. cit. (40); and Tore Frängsmyr, *Svensk idéhistoria. Bildning och vetenskap under tusen år*, 2 vols., vol. 1, *1000–1809*, Stockholm: Natur och Kultur, 2000, pp. 342–357.

69 Wilstadius, op. cit. (28), pp. 141–142; and Emil Hedlund, 'Assessor Göran Rothman: levnadsteckning', *SLÅ* (1937), pp. 4–46.

naming species produced a new system of knowledge where those at the centre – those with access to large collections of species from around the world – became increasingly important. Meanwhile the local, resident experts on flora, fauna and mineralogy who had previously played such an important role in mapping the natural history of Europe were increasingly marginalized.[70] It is not unlikely that these developments also deterred Lindwall from continuing to work on the natural history of his immediate surroundings, in the province of Blekinge.

The changing status of natural history on national and local levels also raises the question of what career would have awaited Carl Bäck, had he survived the tuberculosis that killed him just a few months after his final journey. On the one hand there are reasons to believe that Bäck junior, with his education, contacts and resources (rumour had it that his father's collections were second in size only to those of Linnaeus himself[71]), was well positioned to become a future central figure in Swedish natural history. On the other hand, though, Carl Bäck's proximity to the Linnaean circle might have made it difficult for him to embrace new approaches to natural history. In any case, it is clear that great expectations were attached to the young Bäck. The letters of condolence which Abraham Bäck received from those who had played host to his son and his teachers reveal huge sorrow at his death. It is obvious that their authors had hoped and expected that Carl would come to inherit his father's mantle, becoming not only a naturalist but also a great patron of natural history.[72]

Spatial proximity, the inclusiveness of natural history and the changing motives of the traveller

To what degree is the analysis above relevant beyond a study of Bäck, Lindwall and Hedin's journeys? The specific circumstances brought about by the close friendship between Abraham Bäck and Linnaeus and their joint interest and central positions within Swedish natural history might suggest that these journeys were somewhat peculiar, and, in consequence, of little relevance to our wider understanding of eighteenth-century research outdoors and travelling in Sweden and elsewhere.

I begin with the concern that the journeys were peculiar and hence unrepresentative. I have three responses to this. First, there is good reason, to do with how education was organized in Sweden, to believe that the phenomenon at issue here was fairly widespread. To begin with, public education (primary and secondary), as provided by the Church of Sweden, was at the time receiving severe criticism. One reason for this had to do with its traditional focus on classical subjects (e.g. Latin), while new and fashionable subjects such as French and – more importantly here – natural history were often neglected. As a result, the wealthier classes tended to turn to private education, where they could set the curriculum themselves. Travelling was a common and

70 Cooper, op. cit. (11).

71 Grape, op. cit. (22), p. 656.

72 Montin to A. Bäck, 27 December 1776, MS 36: 28:1–17 (HB); and Hagström to Bäck, 12 December 1776, in Johan Otto Hagström, '*Wälborne Herr Archiatern...*' *Johan Otto Hagströms brev till Abraham Bäck 1747–1791*, Linköping: Östergötlands Medicinhistoriska Sällskap, 1997, p. 202.

well-established pedagogical practice within the sphere of private education. And it was not only those who could afford to travel that the system benefited. As Magnus von Platen has discussed in relation to the Swedish case (and as the journeys discussed above exemplify), the teachers or tutors who traditionally came on these trips were often students themselves – frequently less wealthy students who could not have afforded to travel without the support of the neophyte's family.[73] Also, as suggested above, there is reason to believe that natural history was apt to become an integral part of this form of education since, inevitably, travel in the eighteenth century required spending long hours by the roadside. In other words, a wide range of circumstances, to do with modes of transport, social structures, changing ideals and pedagogical traditions, helped to promote the study of natural history on the move within certain groups in society.

Second, there are other examples of journeys which combined research and teaching, although the privacy and modest scale of ventures of these types, and the need to employ a wide range of source material to chart them, make it hard to quantify the phenomenon. One example I have had the opportunity to investigate further is the journey undertaken by the young aristocrat Carl Johan Gyllenborg (1741–1811) in the mid-1750s. His father was Count Henning Adolf Gyllenborg (1713–1775), a leading politician of the day, who had a keen interest in natural history, which he obviously wanted to pass on to his son.[74] At the same age as Bäck, the young Gyllenborg undertook a long journey which incorporated the study of nature on the move and along the way. Gyllenborg was accompanied by two older students, Pehr Zetzell (1724–1802), one of Linnaeus's students, and Jonas Apelblad (1718–1786), a disciple of Johan Ihre (1707–1780), professor in rhetoric and politics (moral philosophy) in Uppsala. Apelblad had catered for Gyllenborg's educational needs in Uppsala (where Gyllenborg had matriculated at just seven years of age).[75] Zetzell was on his way to study medicine on the Continent, and seems to have returned the favour of a free journey south by teaching natural history to Gyllenborg.[76] Apelblad, who accompanied his student for the whole journey, seems to have provided lessons on the applied, (o)economic side of natural history (which in the 1750s was still a highly respected branch). On his return, Apelblad quickly published two longer accounts of his experiences in different German

73 David Löfberg, *Det nationalekonomiska motivet i svensk pedagogik*, Uppsala: Diss. Uppsala University, 1949; Yngve Löwegren, *Naturaliesamlingar och naturhistorisk undervisning vid läroverken*, Årsböcker i svensk undervisningshistoria, Stockholm, 1974, vol. 132, Chapter 2; von Platen, op. cit. (16); *idem*, 'Informatorn', in *Utbildningshistoria*, Årsböcker i svensk undervisningshistoria, Stockholm, 1994, vol. 176.

74 Olof Jägerskiöld, 'Gyllenborg, Henning Adolf', bd. 17, *Svenskt Biografiskt Lexikon*, 1967–1969, pp. 542–546.

75 On the relations between Apelblad, Ihre and Carl Johan Gyllenborg and his father see Grape, op. cit. (22), pp. 144–145, 236–237, 246.

76 Letters which the young Gyllenborg posted to his father while abroad suggest that the subjects mainly studied on the first part of the journey (through Sweden), when Zetzell was accompanying Apelblad and Gyllenborg, were species identification, geology and chemistry. See Carl Johan Gyllenborg to Henning Adolf Gyllenborg (F 380), 4, 23 and 28 June 1755 (UUL). See also Pehr Zetzell to Henning Adolf Gyllenborg (F 381), 9 September 1755 (UUL), in which the former describes the chemical experiments on water that he had conducted along the way, before parting with the company on 4 September 1755.

states, focusing largely on trade and domestic economy. The same focus dominates Gyllenborg's unpublished observations from the first part of the journey.[77]

As it happened, Apelblad's future assignments – he was appointed tutor to the royal family in 1761 – diverted him from his academic career. Nonetheless, this case is another example of how research and education were combined on the road.[78] To Gyllenborg the trip also offered opportunities to learn the skills needed in order to move effortlessly within higher circles of society – skills such as gambling and sartorial style (much to the despair of his tutor, whose concern about the travel budget seems to have caused tension between the co-travellers).[79] In this respect Gyllenborg's journey is also a classic example of an aristocrat's Grand Tour. Although the study of antiquity (rather than natural history) might have been a more common focal point within the Grand Tour tradition, such journeys also offered the opportunity to combine research and education on the move. Take the famous example of the antiquary and mineralogist Edward Clarke. Between 1799 and 1802 he and his student John Cripps travelled the fringes of Europe and North Africa. Their collections pay witness to their extensive field studies: they needed 183 cases to bring home the minerals and antiques they gathered. The collection (one of several Clarke assembled while accompanied by students) also provided a foundation for Clarke's academic career.[80] The Grand Tour tradition and its ability to accommodate not only a wide range of topics, but also a wide range of activities, including teaching and 'research', underlines further that the case I have treated in this article was not unique.

Second, returning to natural history and Sweden, there are in fact several better-known examples involving the combination of teaching and research 'on the move'. I am referring to the journeys Linnaeus himself undertook with groups of students before he was made professor in Uppsala, the first within the province of Dalarna in 1734 and the second to the Baltic islands of Öland and Gotland in 1741. The latter journey was sponsored by a government department (Manufakturkontoret) in Stockholm: Linnaeus was to research the natural history of the areas he traversed, with a particular focus on how they could be put to better use. The journey to Öland and Gotland may have failed in the latter respect but it seems to have been successful in providing training in how to conduct research outdoors to a group of six students. In one (draft) version of the preface to his travel journal from 1741 Linnaeus wrote, 'It was a pleasure to see what diligence these youngsters applied, and the progress they made by the end, those who in the beginning were altogether untrained, finally so ready that

77 Jonas Apelblad, *Rese-beskrifning öfwer Pomern och Brandenburg*, Stockholm: Lor. Ludw. Grefing, 1757; *idem*, *Rese-beskrifning öfwer Saxen*, Stockholm: Lars Salvii 1759; Carl Johan Gyllenborg (S 31), 'En resa öfver Södermanland, Nerike, Vestergötland and Bohus, anställd år 1755' (UUL).

78 Alfred Bernard Carlsson, 'Apelblad, Jonas', bd. 2, *Svenskt Biografiskt Lexikon*, 1920, pp. 81–85.

79 Carl Johan Gyllenborg to Henning Adolf Gyllenborg (F 380), 19 September and 23 December 1755, 26 January 1756 (UUL).

80 Clark published an extensive account of his journey: Edward Daniel Clarke, *Travels in Various Countries of Europe, Asia and Africa*, 6 vols., London: printed by R. Watts for T. Cadell and W. Davies, 1810–23. Clarke and Cripp's journey has been discussed in various contexts; the most comprehensive analysis is perhaps Brian Dolan, *Exploring European Frontiers: British Travellers in the Age of the Enlightenment*, London: Palgrave Macmillan, 2000.

I rarely had to remind them when we came across something peculiar.'[81] A close reading of the travel accounts from the trips to Öland, Gotland and Dalarna also reveals that the students learned how to conduct a number of exercises intrinsic to natural history, such as how to conserve specimens and report their finds.[82] In other words, Bäck and Gyllenborg's journeys were not unique, they were part of the existing Linnaean tradition of studying nature outdoors.

Third, Linnaeus actively promoted the combination of research and education on the move and he had the opportunity to influence many. In his inaugural lecture, 'On the utility of scientific journeys within the fatherland' (which he delivered in the autumn of 1741, soon after his journey to Gotland and Öland), Linnaeus elaborated on how travelling helped to 'sharpen and train' the attention of a natural-historian-in-the-making.[83] Even his *Herbationes Upsalienses* was organized in such a way as to encourage the students to participate actively and to make their own observations: the student who found the rarest plant on the excursion was offered a place next to Linnaeus at lunch. In the heyday of these trips, the competition for that place would have been between several hundred students.[84] He also assigned his students more specific outdoor tasks. Assembling information for his *Pan Svecicus* (about cattle feed), he gave his students the job of following specific animals (a cow, a goat and a sheep) to observe which plant species they ate.[85] Thus Linnaeus's multifunctional use of the landscape potentially influenced a rather large group of people – including not only the many hundreds of Uppsala students whose relationship with the landscape was directly shaped by Linnaeus himself, but also those like Carl Bäck and Carl Johan Gyllenborg whose teachers had been taught by Linnaeus.

How, then, can this multifunctional use of the outdoors in the Linnaean tradition help us to understand the role of natural history in Sweden, and how can it further our understanding of how nature was studied outdoors, and of scientific travelling in the Enlightenment era more generally? First of all, the discussion above suggests that the proximity of educational spaces and spaces in which to conduct research meant that the step from being a student to becoming a 'researcher' must have been, or must at

81 Carl von Linné, *Linné på Öland. Utdrag ur Carl Linnaeus' dagboksmanuskript från öländska resan 1741, ur den publicerade reseberättelsen, andra tryckta arbeten, avhandlingar, brev m.m.* (ed. Bertil Gullander), Stockholm: Norstedts, 1970 (first published 1745), p. 158.

82 Carl von Linné, *Iter Dalekarlicum jämte Utlandsresan Iter ad exteros och Bergslagsresan Iter ad fodinas* (ed. Arvid Hjalmar Uggla), Stockholm: Svenska Linnésällskapet och Nordiska museét, 1953, p. 3; *idem*, op. cit. (81), pp. 32, 47, 75; *idem*, *Linné på Gotland. Utdrag ur Carl Linnaeus' dagboksmanuskript från gotländska resan 1741, ur den publicerade reseberättelsen, samt ur andra arbeten* (ed. Bertil Gullander), Stockholm: Norstedts, 1971 (first published 1745), p. 13; and *idem*, *Linné i Dalarna. Carl Linnaeus dagbok från resan i Dalarna 1734 med åtskilliga stycken ur hans dalska och lapska floror, ur hans Diaeta naturalis, Flora oeconomica, ur brev m.m.* (ed. Bertil Gullander), Stockholm: Forum, 1980, p. 130.

83 Carl von Linné, 'Om nödvändigheten av forskningsresor inom fäderneslandet', inaugural lecture, Uppsala 1741 (tr. Annika Ström, original title: 'Oratio qua peregrinationum intra patriam asseritur necessitas'), published in Hodacs and Nyberg, op. cit. (2), Chapter 8, 'Om nödvändigheten av forskningsresor …', pp. 183–198, p. 189.

84 *Herbationes Upsalienses*, op. cit. (38).

85 William Thomas Stearn, 'The background of Linnaeus's contributions to the nomenclature and methods of systematic biology', *Systematic Zoology* (1959) 8, pp. 4–22.

least have seemed to be, quite short and easy to take. The integration of research and teaching promoted inclusiveness, something which encouraged a wider and more active participation in the exploration of nature, although of course mainly within a group whose age, gender and education (young, male university students) separated them from the great majority in society. Moreover, nature was accessible: the outdoors provided classrooms in which to study natural history, and to learn material techniques – almost everywhere. The open character of the field as well as the integration of research and teaching activities that took place here promoted, I argue, a democratization of the consumption of scientific knowledge, and also, to some degree, of its production, in mid-eighteenth-century Sweden. More people than ever before had the opportunity to learn and explore aspects of natural history. This growing interest was perhaps further advanced by a joint experience that social rules for human interaction could at least partially be reconfigured outdoors. The spatial context contained relatively few distractions of kinds apt to reinforce social differences, making it possible, perhaps, to reform existing relationships more in line with meritocratic ideals. In other words, various features of the field and of field-based activities engendered a social dynamic which explains not only the actions of individual students of nature, but also the status of natural history in eighteenth-century Sweden more generally.

Second, if the above conclusion is correct, it will also have consequences for how we describe the differences between the field and the laboratory as sites for knowledge production and consumption. Taking into account the Swedish developments, the following adjustment of Kuklick and Kohler's thesis discussed earlier seems necessary: while the exclusiveness of the laboratory environment gave (and probably still gives) the laboratory scientist high status, it should also be acknowledged that the inclusive character of the type of outdoors studies Linnaeus promoted helped to increase the popularity of natural history in mid-eighteenth-century Sweden – a popularity which, in turn, furnished Linnaeus and many of his students with high(er) social status. However, this state of affairs was not to be sustained, and by the time of Bäck, Lindwall and Hedin's trips the multifunctional use of the landscape on journeys had already started to lose its appeal. The economic application of natural history had failed to work; meanwhile the development of Swedish botany (the advancement of the inventory of the Swedish flora) meant that there remained fewer spaces for exploration and research, at least within Swedish landscapes. And journeys further afield were more complicated, expensive and dangerous, which made them less attractive for novices in natural history (or, perhaps more precisely, for their parents). From that point of view, Bäck, Lindwall and Hedin's journeys mark the closing chapter of the Linnaean tradition of more or less successful integration of education and research in the field and on the move.

The final conclusion relates to the general discussion of how and why knowledge and those carrying knowledge travel and why travellers sometimes stay at home. The experience of outdoor research and the education in taxonomy and nomenclature received by Linnaeus's students allowed them to move around, perhaps more freely than members of any previous generation of naturalists. The world should have been their oyster; however, a series of different circumstances conspired against them. At

home, natural history was becoming increasingly marginalized and politically irrelevant. In consequence, journeys undertaken to study nature lost their role as routes to more prestigious positions. The chances of winning an academic position (one of the few remaining rewards) were also slim. The most prestigious position in Sweden, Linnaeus's old chair, had in 1781 been passed to Carl Peter Thunberg, arguably Linnaeus's most successful 'disciple' (he had spent seven years travelling outside Europe before he settled in Uppsala again). However, appointments were rare in Sweden (particularly as Thunberg survived until 1828). Meanwhile, revolutions and the rise of nationalism began to undermine the transnational character of the Republic of Letters in Europe. Linnaeus's reputation also began to decline in the wake of a critique of the artificial character of the sexual system, particularly in France.[86] The extent to which these developments deterred the final generation of Linnaeus's students is difficult to measure, but it seems unlikely that it encouraged them to travel.

In other words, in order to understand how and why scholars (and knowledge) travel we need to take into account not only intellectual developments but also the complex social settings that regulated opportunities and needs for distinction among individuals and how these social settings (and with them the rewards system) changed. Mid-eighteenth-century Sweden offered conditions that promoted outdoor studies and scientific travelling on a perhaps unprecedented scale, but by the end of the century things had changed both at home and abroad. With too few factors 'pushing' students of nature away from home (or, for that matter, 'pulling' them back), the number of Swedish students of natural history who made journeys declined.[87] Of course, the decline was not permanent – indeed the tradition can be seen as an embryonic version of twentieth-century science, where adherence to universal methodological standards and the existence of global networks of research institutions helped scientists move around freely, bringing the results of their journeys and field studies with them.

86 Recent research has, however, illustrated that Linnaeus's understanding of his own system and the critique of Linnaeus has been misrepresented. Mary P. Winsor, 'Cain on Linnaeus: the scientist–historian as unanalysed entity', *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* (2001) 2, pp. 239–254; *idem*, 'Non-essentialist methods in pre-Darwinian taxonomy', *Biology and Philosophy* (2003) 3, pp. 387–400; Staffan Müller-Wille, 'Collection and collation: theory and practice of Linnaean botany', *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences* (2007) 3, pp. 541–562; and Scharf, op. cit. (33).

87 Of course, this is not to say that Swedish naturalists ceased to journey altogether. See Eliasson, op. cit. (10), for a discussion of the changing approaches to natural history in late eighteenth- and early nineteenth-century Sweden, with particular focus on the incorporation of plant geography.