

The Norse in Newfoundland: L'Anse aux Meadows and Vinland

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ONE THOUSAND YEARS AGO, the Old World and the New stood face to face in the Strait of Belle Isle. The landing of the Norse on the shores of North America was not the result of a sudden journey but the endpoint of a step-by-step expansion stretching over two centuries. This expansion began in southwestern Norway, where chieftains and minor kings jostled for power over a growing population. In such a competitive context, migration across the North Sea to the Scottish Isles and the Faeroes was an attractive alternative to staying home. The contemporary development of seaworthy ships, capable of safely crossing open oceans and transporting people, their worldly belongings and livestock, made emigration possible. Note that the term "Norse" refers to all inhabitants of Viking Age and medieval Scandinavia, not just those of Norway (Webster 1988). Danes and Swedes were part of the migrations of this period, aptly named the Viking Age (c. 750-1050). Although they drastically affected the map of Europe, their role in the Norse ventures to North America was minor, and is therefore not discussed here. The term "Norse" is preferred here to the more popular "Viking", which really refers to pirates or raiders. Although many men of the Viking Period would have been vikings at some time in their lives, women and children were not.

The existence of Iceland may have been known in England and Ireland, and the Norse probably learned about this land from tales of Irish hermits, who were supposed to have made their way there in the eighth century.¹ The Norse colonization of Iceland began shortly after 870, according to the *Book of Settlement*. This date has recently been confirmed by the date AD 871 $\pm$ 2 for volcanic ash (*tephra*) from the Landnam layer, also found in the Greenland ice cap.² The new settlers came from Norway and Norse Scotland, where the Norse were mixed with Celts and Picts through intermarriage and slavery.³ The distinctive genetic makeup of Ice-

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land's settler population is still traceable today in A-B-O system blood groups, in occurrence of the recessive disease phenylketonuria (PKU) (Donegani et al. 1950: 47-52, Fegersten 1977) and in DNA markers, each of which differ from mainland Scandinavian populations.

The old romantic view of Norse history, inspired by nationalism, coupled all too easily with the spirit of nineteenth-century emigration to America and the overly positive view of Nordic peoples common in Germany in the 1930s saw the migration to Iceland as a democratic venture, pioneers leaving their homelands in search of freedom and a better life (Iversen 1996). Modern research gives another picture. Migration was initiated and led by disgruntled chieftains and well-to-do farmers who sought to maintain the comfortable lifestyle they had enjoyed, before competition created difficulties. To this end, they needed a labour force of tenant farmers, domestic workers and slaves, as well as supporters among the free farmers a rank or two below themselves. The leaders claimed large and choice tracts of land, establishing their new estates in the best places, granting select locations to supporters of rank, and parcelling out peripheral lands to their tenants (Orri Vésteinsson 2000). The early magnates, about 430 of them according to the *Book of Settlement*, were thus in a favourable position over their poorer subordinates, a situation that was perpetuated and maintained for centuries (Orri Vésteinsson 1997, 1998, 2000).

According to *Erik's Saga* and *The Greenlanders' Saga*, Erik Thorvaldsson, nick-named Erik the Red, and his father Thorvald Asvaldsson were among the later emigrants from southwestern Norway, settling at Drangar in northwestern Iceland, one of the poorer spots in the land.⁴ That late immigrants to Iceland could not challenge a system in which choice of settlement depended on the favours of powerful magnates, soon became obvious to the headstrong young man. Neither his status, nor his land-holdings, placed him among the elite. His marriage to Thjodhild, step-daughter of the chieftain Thorbjorn of Haukadal, was a first step up.⁵ Thorbjorn granted Erik land on the outskirts of his estate on Hvammsfjord, about 100 kilometers north of present-day Reykjavik. The Icelandic archaeologist who excavated what is believed to be Erik's house has pointed out that Erik's farm was the least productive on the estate (Guðmundur Ólafsson 1998, 2001).

When Erik was banished from Iceland for three years, following a blood feud, he spent his time exploring Greenland "bestowing place-names far and wide", as *Greenlanders' Saga* tells us, and naming the country itself.⁶ (Greenland had been known to exist for at least 50 years, at that point.⁷) When his banishment was over, Erik chose to move his household to Greenland. Again, this emigration involved a structured group of people rather than unassociated individuals. Erik convinced a number of free farmers and chieftains from his area in Iceland to move with him, and they in turn brought their labourers and tenants. Archaeologists have shown that the Icelandic settlement pattern was repeated in Greenland (Keller 1991). Erik and his most favoured supporters kept the choice areas for themselves; the working



Figure 1. Greenland, Helluland, Markland and Vinland. B. Wallace, for Parks Canada.

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poor got the marginal lands. At the time, there were no Aboriginal people in the areas settled by the Norse. The Dorset had retreated to the high Arctic, and the Thule, ancestors of the Inuit, did not arrive in southern Greenland until the late thirteenth century or later (McCullough 1989, Schledermann 1996: 113). Demographers have suggested that it requires at least 400 to 500 people to successfully establish a settlement in a previously unoccupied area, or one populated by people with a radically different lifestyle (Dyke 1984). Erik seems to have had about that number of people with him.⁸ Within a couple centuries these immigrants had multiplied to at least 2000 and the colony survived until about 1450 (Lynnerup 1998: 113, 116-118).⁹

The Norse settled the west coast of Greenland. During the nearly five centuries they were there, they inevitably came into contact with North America. This happened, apparently, the very year the Greenland settlement was founded. To reach the western settlements, ships had to round Cape Farewell, the southern tip of Greenland (Figure 1). Here, the cold Greenland Current meets the warm Gulf Stream. As a result, fogs and unruly weather are common, easily blowing even the most experienced sailor off course. According to *Greenlanders' Saga*, this is precisely what happened to Bjarni Herjolfsson. Arriving in Iceland from Norway and finding that his father had emigrated to Greenland with Erik, he set sail from Iceland, late in the sailing season of 985 or 986.¹⁰ After three days of sail, Bjarni and his crew met with inclement weather and were storm-tossed for many days. When the sky cleared, they found themselves within sight of land. Realizing that this land was too far south to be Greenland and anxious to reach the Norse settlements there before more storms descended upon them, Bjarni turned north along the coast, observing changes in the landscape, until he reached the right latitude, then turned east to his father's new home. The experiences of Bjarni and his crew caused a stir in Greenland, but it was another 15 years before the Norse colony there was sufficiently established to support exploration of new areas. Predictably, this expansion was led by Leif, one of Erik's three sons, for this was the family with the means and authority to launch such an expedition.¹¹ It was in Erik's interest to have Leif as leader, as the first explorer would be entitled to claim any new lands discovered, just as Erik himself had claimed Greenland. According to the sagas this took place shortly after the year 1000, although one saga scholar maintains that it could not have happened much before 1020 (Ólafur Halldórsson 1978: 382).

THE WRITTEN EVIDENCE: THE SAGAS

The Norse in North America have attracted an inordinate amount of popular attention; "Vikings" enjoy a romantic appeal in North America and their landfalls have been the subject of hundreds, possibly thousands, of lay and scholarly studies.¹² Such speculation has been based on documentary evidence, the so-called Vinland

sagas. These consist primarily of *The Greenlanders' Saga* and *Erik's Saga*, complemented by smaller passages in Adam of Bremen's *Gesta Hammaburgensis* (c. 1075), *Olaf Tryggvason's Saga* in *Heimskringla* and *Kristni Saga*, as well as *Gripla*, a fourteenth-century geographical treatise preserved in the *Greenland Annals*.¹³ Like all medieval Icelandic family sagas, the Vinland sagas are written in deceptively direct and clear terms, with lucid observations of nature and people. In the nineteenth century the sagas were viewed as accurate, objective, historical accounts, but recent research has shown that they are far from it (Úlfar Bragason 2000, Helgi Þórláksson 2001, Adolf Friðriksson and Orri Vésteinsson 2003). The writing of history normally has a purpose, and the Vinland sagas were no exception. Even though based on actual episodes of the early eleventh century, they were written to serve thirteenth- and fourteenth-century political ends. Anthropological findings provide a context in which one can begin to sort fiction from fact.¹⁴ Archaeological research has likewise vastly added to our knowledge of the situation in Greenland.¹⁵ By the same token, the archaeological data from L'Anse aux Meadows in Newfoundland can assist in interpreting the Vinland sagas.

There are two major versions of the Vinland sagas, *Greenlanders' Saga* and *Erik's Saga*. Both were based on oral traditions and written in Iceland, *Erik's Saga* in the thirteenth century and *Greenlanders' Saga* some time after 1310 and before 1387 (Ólafur Halldórsson 1978: 398-400, 452; Helgi Þórláksson 2001: 66). *Erik's Saga* is known in two adaptations, *Skalholt Book* and the somewhat later *Hauk's Book*.¹⁶ These are copies of the same original, but *Hauk's Book* was heavily edited by Hauk Erlendsson, an Icelandic law speaker, using a now lost original, c. 1306-1308 (Karlsson 1964: 114-121). In spite of this editing, or rather because of it, *Hauk's Book* is considered the more accurate version (Jansson 1945: 82, Helgi Þórláksson 2001: 73-74).

Greenlanders' Saga describes the accidental discovery of the North American Atlantic coast by Bjarni Herjólfsson and five subsequent expeditions launched 15 years later, first by Leif Eriksson, then by his siblings or, in the case of Gudrid Thorbjarnardóttir, by a sister-in-law and her new husband, Thorfinn Karlsefni. One of these expeditions, led by Leif's brother Thorstein, never reached its goal: Thorstein's ship was storm-tossed on the Atlantic the entire summer, finding its return to Greenland only in October.¹⁷ In *Greenlanders' Saga* Leif Eriksson is the main explorer who establishes his base, *Leifsbúðir*, "Leif's Booths", from which further explorations take place. The base also serves as a transshipment station where resources, especially lumber and grapes, are assembled to make up the cargo destined for Greenland. All expeditions use Leifsbúðir as their base, but Leif maintains control over it: "He would lend the houses," he is reported as saying, "but not give them" (*Greenlanders' Saga*, in Jones 1986: 200, 202).

In *Erik's Saga*, Leif's role has been reduced to that of the accidental discoverer of Vinland. All subsequent successful expeditions are combined into one mega-expedition, led by the Iclander Thorfinn Karlsefni and his wife Gudrid

Thorbjarnardóttir, widow of Leif's brother Thorstein (he of the abortive voyage). The name Leifsbúðir is erased, and instead of one, two bases are established, *Straumfjord*, "Fjord of Currents", in the north, and *Hóp*, "Tidal Lagoon", in the south. *Straumfjord* is the main base where everyone gathers for the winter. *Hóp* is a summer camp, occupied for only two months, where lumber is cut and dressed and grapes collected for shipment to *Straumfjord* and thence to Greenland.

Traditionally, Leifsbúðir, *Straumfjord* and *Hóp* have been regarded as three separate locations. I would argue that they are not three but two, and that Leifsbúðir is simply a combination of *Straumfjord* and *Hóp*. The signs of this are clear. Physically, Leifsbúðir has many of the same attributes as *Hóp*: a shallow tidal bay, a river issuing into it, woods and grapes in abundance. Functionally, though, Leifsbúðir resembles *Straumfjord*, as a base from which explorations take place in different directions and where harvested resources are gathered.¹⁸ The events of the various voyages in *Greenlanders' Saga* and of Thorfinn Karlsefni's and Gudrid's voyage in *Erik's Saga* parallel each other. Clearly, the two sagas describe the same events, not separate occurrences.

The reasons for the discrepancies between *Greenlanders' Saga* and *Erik's Saga* are now apparent. Scholars have shown that *Erik's Saga* was written to support the canonization of Bishop Björn Gíllsson, who died in 1162 (Jón Jóhannesson 1962, Wahlgren 1969, Ólafur Halldórsson 1978: 392-395, 1992). An account of illustrious and exceptional ancestors was expected to accompany any petition for beatification and Bishop Björn was a direct descendant of Thorfinn Karlsefni and Gudrid Thorbjarnardóttir. Furthermore, Law Speaker Hauk Erlendsson, who edited the *Hauk's Book* version of *Erik's Saga*, was himself also a direct descendant of Thorfinn and Gudrid, removed from them by nine generations. Hence, the roles of Thorfinn Karlsefni and Gudrid were greatly magnified and embellished, while those of Leif Eriksson and his family almost vanished altogether.

The Greenlanders' Saga, although also written in Iceland, is less tendentious and probably more objective in its view of the events (Ólafur Halldórsson 1992). The author of *Erik's Saga*, on the other hand, has more detailed information on the events associated with Karlsefni and Gudrid, perhaps the result of traditions preserved within the family. Even *Greenlanders' Saga* states in its epilogue that the most complete account of the voyages stems from Thorfinn Karlsefni (*Greenlanders' Saga*, in Jones 1986: 206).

THE ARCHAEOLOGICAL EVIDENCE:

THE L'ANSE AUX MEADOWS SETTLEMENT

The archaeology of the L'Anse aux Meadows site shows that many elements of the Vinland sagas are factual, in particular *Erik's Saga's* version of the settlement. The Norse did indeed have a northern base camp. This, in turn, lends plausibility to the

claim in the sagas that they had some sort of summer/early fall camp farther south. There is little doubt that L'Anse aux Meadows was Straumfjord. I will argue here that Hóp was in the Miramichi area of New Brunswick.

In most aspects, L'Anse aux Meadows resembles other early eleventh-century Norse sites in Iceland or Greenland; but its location and layout differ from all other such sites. Its situation on the most exposed bay in the area contrasts with the sheltered areas favoured for West Norse livestock farming. The usual large West Norse barns and byres are missing. Specific archaeological testing showed no sign of enclosures or shelters for livestock of any kind, or of disturbances in the flora caused by grazing and cultivation. Nor were remains of domestic animals found: all the identifiable bones being seal and whale. (A small scapula originally identified as domestic pig has now been identified as seal: A.S. Ingstad 1977: 45, 179, 266; Rick 1977; Spiess 1990.)

The layout of L'Anse aux Meadows is also unusual. Its eight buildings cluster into four complexes (Figure 2). Three are dwelling compounds, each with a large hall and a small hut. One also includes a small house. The dwellings are all lined up, evenly spaced, on a narrow, curving terrace, bordered on the east side by a raised sphagnum bog and on its western seaward side by a funnel-shaped sedge peat bog.¹⁹ A small brook winds its way through the bog to the sea from a small lake about one kilometer inland, breaking through the terrace just south of the dwellings. The fourth complex, for iron production, is away from the other buildings, on the far side of the brook, on the arm of the terrace closest to the sea. It consists of a hut sheltering a small furnace of stone and clay, in which iron was manufactured, and a kiln for making charcoal, as fuel for the furnace. The buildings were all occupied at the same time. With the exception of the iron production complex, all appear to have been dwellings, although various forms of specialized crafts took place within them. At least two of the halls also included large storage rooms. Storage rooms for dairy and other food products are well known from Iceland and Greenland and take a characteristic form in the archaeological record. Whatever was stored at L'Anse aux Meadows left no such trace.

A settlement consisting almost exclusively of dwellings is unknown in any other Norse area. It might be argued that during an incursion into virgin territory, usual settlement patterns might have been modified, for a few years at least. In the initial settlement of Iceland, for example, farmers may sometimes have settled together in pairs, building their halls next to each other — at least there is evidence of this at Hófstaðir in northern Iceland (Orri Vésteinsson 1998). At L'Anse aux Meadows, however, there was no attempt to establish a self-supporting colony, capable of producing its own sustenance. Instead, both the architectural layout and artifact distribution suggest that this was a highly specialized, non-farming settlement.

The Buildings All the buildings were Icelandic in style, an architecture rooted in the traditions of western and northern Norway — but which developed its

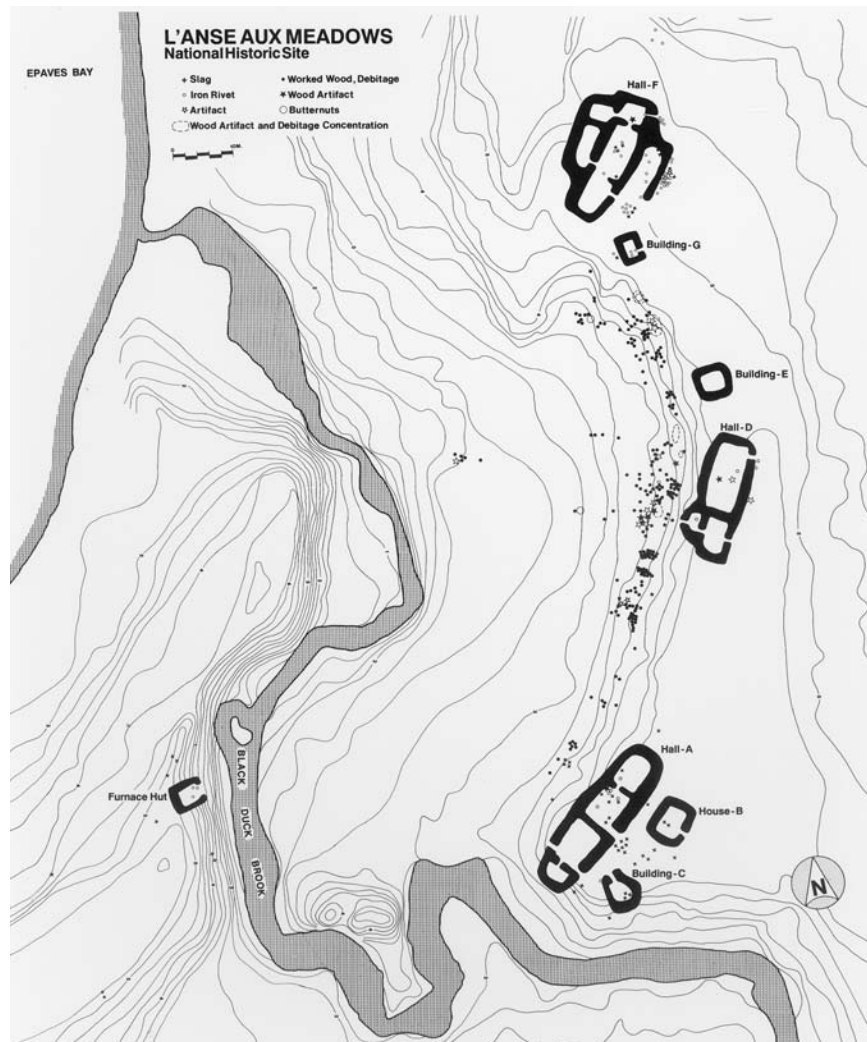


Figure 2. Plan of the L'Anse aux Meadows archaeological site. B. Gallant and B. Wallace, for Parks Canada.

own characteristics, as the tenth century progressed. This Icelandic style was transferred to Greenland, as is evident from the first generation of buildings there (Albrethsen 1982, Arneborg 2001, Guldager, Stumman Hansen and Gleie 2002). The chief building material was sod over a timber frame (Figure 3). Even the roofs were sod, though some roofs may have been wood, in the ninth century (Orri Vésteinsson 1998).



Figure 3. Parks Canada's reconstruction of the forge hut at L'Anse aux Meadows. Photo by R. Harrison.

The Halls The two largest halls, A and F, were large, multi-roomed structures. Hall A had four rooms, all in a row (Figure 4). One small and two large rooms were sleeping and sitting rooms, characterized by wooden platforms along the walls and a simple hearth, either in the center of the floor or off to one side. While the two large rooms were for communal living, the small rooms were a type of private quarters enjoyed only by a lord. The fourth room, located in the middle, was used as a smithy, at least at one point, for it contains a forge pit in its northwestern corner.

Hall F was the largest and most complex building on the site (Figure 5). It had six rooms plus a lean-to shed. Three living-sleeping rooms formed a row running through the center of the house. On the western side of them were three more rooms, also in a line: a kitchen with a stone oven, and two large storage rooms.²⁰ At-

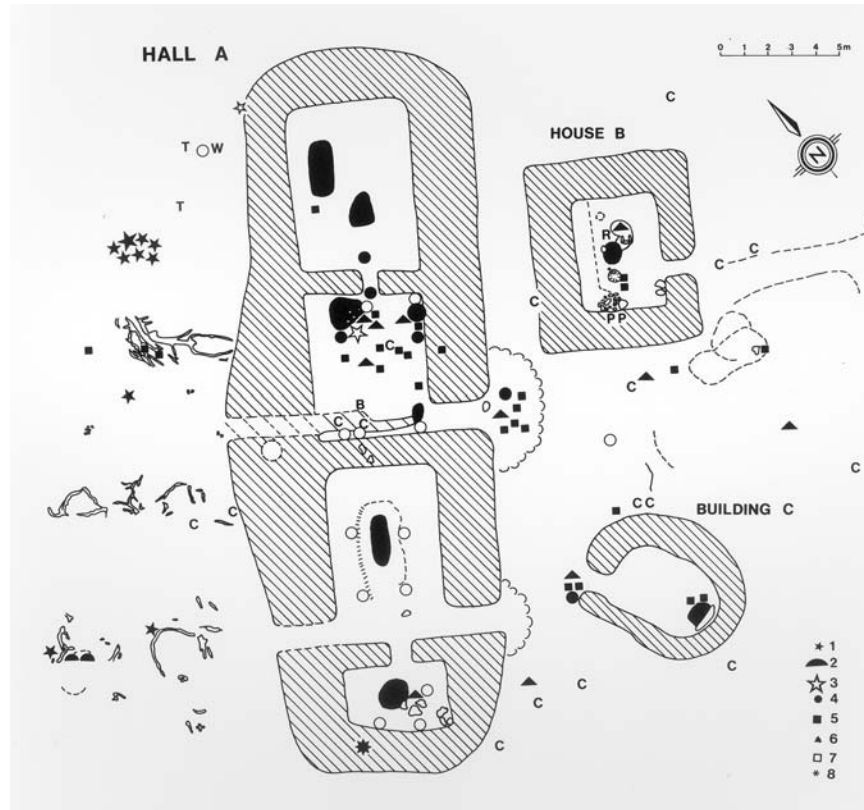


Figure 4. Plan of the A-B-C building complex, L'Anse aux Meadows. J. Gaspereau and B. Wallace, for Parks Canada. Key: 1. Cut wood, 2. Heat-altered stone, 3. Ringed pin, 4. Iron nail, 5. Smithing slag, 6. Bone, 7. Birch bark, 8. Point Revenge/Little Passage point.

tached to the eastern side of the building was a lean-to shed, also of wood-and-sod construction, where boat repair and/or boat building took place. Of the living-sleeping rooms, one was a small private one like the one in hall A, with a fireplace. Next to it was a large communal room with a classic Norse long fire, consisting of a stone hearth, a cooking pit, and a pit for keeping embers overnight. This long fire was in the center of the floor, while sleeping platforms ran lengthwise along the walls, which may have been wood-panelled. The third living and sleeping room had a rectangular fire pit in the center of the floor and, probably, sleeping-sitting benches along the walls, as well as a large pit in its northeast corner, either for food storage or perhaps to serve as a latrine.²¹



Figure 5. Restored turf outlines of Hall F, one of the major structures at L'Anse aux Meadows. Photo by R. Ferguson, for Parks Canada.

The third hall, D, was a more modest structure. It lacked the private quarters of the other two halls and had only one communal living and sleeping room. It had a long fire, slightly off-center, with a square, slate-lined, ember box at one end. Along the same axis was a large storage room and, on the western seaward side, a small carpentry shop. The carpentry shop was set into the edge of the terrace, almost touching the sedge peat bog.

The Small House House B stood next to hall A in the southernmost complex. It was rectangular with a fireplace by the southern wall, backed by a large slab of slate. The house was probably a dwelling and workshop combined. A wide bench for sleeping and sitting ran along the western wall. In the middle of the floor was a small rounded pit, lined with slate. To the north, but still within the house, lay a 20-centimeter-deep deposit of ashes and large chunks of charcoal, containing roasted bog ore lumps. Similar ash and charcoal deposits at Erlendsgard (Møsstrand), in Telemark, Norway, and in Dalecarlia, Sweden, have been identified as the remains of roasting fires for the preparation of bog ore for smelting (Martens 1972: 106; Serning 1973: 46). At the edge of this deposit, excavators found a square, slate-lined, ember pit. In its overall form, house B is the kind of small one-roomed, multi-functional house lived in by people of modest means, such as tenant farmers and independent farm workers (Myhre 1980: 392, 473).

The Huts Two huts, E and G, were square pit buildings, dug into the ground. Hut C, on the other hand, was irregularly rounded and not dug into the ground. All were dwellings, huts E and G possibly also workshops. Hut E flanked hall D, a short distance north of it. This hut was set about 50 centimeters deep into the terrace, with

slender posts in the corners and along the walls, holding up the roof. Excavation, in one corner, uncovered a stone oven consisting of slate slabs set on edge. In the northwest corner was a pile of 19 stones, the size of a clenched fist, mostly limestone (A.S. Ingstad 1977: 65). Hut G was next to hall F. It was set into the very edge of the terrace and cut more into it than hut E, undoubtedly because it is farther from the bog and therefore has drier ground. The function of the hut is uncertain. It had a fireplace by a wall, the latter protected by a stone slab, so it probably functioned, at least in part, as a dwelling. In front of the fireplace was a large egg-shaped stone, resembling features in Iceland and Greenland that have been interpreted as anvils (Kristján Eldjárn 1961: 38, Roussell 1943: 93-94).²² Open huts like hut G occur on iron production sites in Norway (Martens 1972: 106).

Pit buildings are an old tradition in Scandinavian prehistory from at least the fifth century.²³ They are extremely common in Viking Age Sweden and Denmark, where they usually exist side-by-side with halls (Hinz 1989; Randsborg 1980: 61-62, 66). They are common in ports-of-trade and early towns such as Århus and Haithabu (Roesdahl 1980: 87). They were often used as workshops, for the manufacture of amber beads, bronze jewelry, iron working, bone industry, carpentry, and weaving, but they were also used as dwellings (Randsborg 1980: 89, Nancke-Krogh 1978, Bjarni Einarsson 1992). Such pit buildings probably served different functions, as was required. They were simple to build and maintain. Many were equipped either with a fireplace or a stone oven; stone ovens were present in the pit buildings both at Grelutóttir and Hvítarholt in western and southern Iceland (Guðmundur Ólafsson 1980, Þór Magnússon 1972). Pit buildings with ovens have been interpreted as weaving huts, as loom weights are commonly found in them (Bjarni Einarsson 1992). The stones in the pile in the corner of hut E at L'Anse aux Meadows had undoubtedly been used as weights, but whether for a fishing net or a loom is difficult to say. A number of birch bark rolls and waste from wood working, found in the bog outside the hut, may clarify this issue. Birch bark rolls were frequently used as net sinker wraps for stones like those in the corner of the hut (a practice persisting into the nineteenth century), so hut E could be a workshop and storage place for a fish net (Martens 1972: 94, Myrdal 1984).

Hut C differed from all other buildings on the site in that it was rounded, with a narrow entrance protected by walls projecting towards hall A. No traces of posts were found. The roof must have been created by corbelling sods in a more or less circular pattern, each row extending beyond the previous one so that a domed roof was formed. Only outbuildings and small huts were built this way in Iceland (Hörður Ágústsson 1982: 173-174). The only feature inside was a fireplace by the wall, which makes it likely that this was a dwelling, for a person of low rank.

The Furnace Hut The furnace hut was set into the edge of terrace, its front open and facing the brook, its floor a little over one meter below the ground (Figure 3). In this case, the function of the hut is clear. In the middle of the floor stood a small furnace for the manufacture of iron. The furnace consisted of a small shaft of

tabular stones set on edge, the spaces between them chinked with small stones and a thick layer of clay. This shaft was set over a shallow pit and filled with alternate layers of bog ore iron and charcoal. The ore had been collected along the brook bank where it is formed, continually, by natural processes. Bog iron ore is iron that has been leached out of igneous rock and dissolved in the ground water. Under the right chemical conditions, in the presence of certain bacteria, the iron becomes moderately solid and, adhering to organic materials, such as roots, and inorganic materials, such as sand, is precipitated into crusty lumps.

ARTIFACTS

Most of the artifacts consisted of waste from iron manufacture, wood working, and boat repair or construction. A handful of small personal items had probably been lost by their owners. One artifact, a socket or pivot stone for a door post, was likely discarded because it was a heavy object of little value.

Iron Working Waste Iron was both made and worked on the site. The waste from these activities consisted primarily of slag. A metallurgical analysis helped distinguish smelting slag, produced in iron making, from smithy slag (Unglik and Stewart 1979, 1999). Smelting slag was concentrated around the small furnace inside the furnace hut and on the upper part of the slope to the brook in front of the hut. The raw material for the iron was local bog ore. In order to obtain iron from the bog ore, it had to be heated to a temperature of at least 1100°C to 1250°C. This was done inside the small stone furnace by layering the ore with charcoal and adding oxygen to the fire via a double-chambered bellows inserted into the front of the furnace.²⁴ Charcoal was produced in a nearby pit, filled with softwood set alight to smoulder for a couple of days. Identical charcoal kilns are well known from Norway, Sweden and Iceland, where this type of kiln existed into our days (Johansen 1973: 88, Serning 1974: 16, Einar Friðgeirsson 1969).

Only a few kilograms of iron were produced, in a single smelting event, which may have been an unplanned necessity. The iron produced filled an immediate need, for it was worked into objects, as can be seen from the presence of smithing slag. The Norse must have brought smith's tools on the voyage, perhaps as a precaution.²⁵ The smithing slag was concentrated to room III in hall A, where the smith worked. This was also a one-time activity of limited duration, probably to work the iron into nails. These were essential for the boat repair (or perhaps boat building), that took place on the site.

Carpentry Waste Carpentry, obviously, was required to prepare the bearing elements and much of the interior of the large halls. Part of the waste from this work fell into the peat bog skirting the halls. Thanks to the tannic acid in the bog, and the fact that the bog must have had standing water on the surface at the time, carpentry debris has survived in excellent condition.²⁶ The waste was concentrated outside

the D-E complex, although the conditions for preservation were equally good outside the A-B-C and F-G complexes. Thus the D-E complex must be where most of the wood working took place. Most of the waste consisted of post and plank ends, shavings, and chips. Excavators also found birch bark rolls and fragments of rope made from twisted spruce roots. With one exception, the waste consisted of local woods: balsam fir and northern pine, with some larch (tamarack), birch, and alder. The exception was a butternut burl, cut with a sharp knife. A few broken objects lay within the wood waste: a barrel lid, the floor plank for a small boat, an auger bow, a birch bark cup, treenails, and a few objects whose function has not been determined (A.E. Christensen, pers. comm.). Unlike the waste chips, some of these were European wood. A carved triangular finial is of Scots pine, a European species introduced into North America only after 1500. The small peg hammered into the head of a treenail in the boat floor plank is also Scots pine. These objects must have been made in Europe, presumably in Norway, where Scots pine was readily available.

Boat Repair/Building Waste Ninety-nine nail fragments and one whole nail were found on the site — practically all the iron found (Figure 6). Yet this is an unusually high concentration for a West Norse site, for nails were not used in building construction, except in very expensive structures. On 65 farm sites in Norway excavators recovered a total of only 15 whole or fragmentary nails (Rolfesen 1974: 92). When iron nails occur in double digit quantities on a West Norse site, they always signal boat repair. Iron nails rust with time, and boat nails have to be replaced. They are removed by inserting a chisel between the planks, and cutting the nails with a hammer blow (Lundström 1981: 75-79). X-ray photos of the L'Anse aux Meadows nails show that they have been cut in this way. There are also nail tips which were snapped off as the new nail was being clenched over the rove (a small metal plate over which the boat rivet or nail is clenched). About 66 percent of the nail fragments were found in the F-G complex, with a special concentration in room VI, a lean-to shed on the inland side of the hall. Obviously this is where the boat work took place. Replacement of rusted nails and, perhaps, cracked planks had always seemed plausible to me, until a Norwegian marine historian pointed out that in Norse clinker construction, building a new boat is easier than replacing individual strakes (Olaf Engvig, pers. comm.). The break up of the old hull could have been simply to salvage as much as possible. At least a few boat strakes were used as firewood, because a few nail fragments turned up in the fireplaces. The idea that the Norse built boats at L'Anse aux Meadows merits consideration: the room VI shed, where the work took place, contains irregular post moulds and impressions of some kind of irregular framing structure, which was not part of the walls. These could be the remnants of a *båds-kott*, a kind of boat-building form used in Norway and Shetland, well into modern times (Andersen and Andersen 1989: 21). These structures are common in western Norway, where boats were always constructed in a shed in which the strakes of the boat are shaped and supported by shores from a strong-back under the building's tie-beams (Christensen 1984: 93). The traces in the L'Anse aux



Figure 6. X-ray image of an iron nail, cut during boat repair, from L'Anse aux Meadows. Photo by Conservation Division, Parks Canada.

Meadows boat shed do look as if they could be the vestiges of such a wooden structure. The boat itself would have been small, no longer than eight meters, comparable to some of the boats found with the Gokstad ship, which were used as landing and scouting craft. The number of people present at L'Anse aux Meadows make it virtually certain that big ships were used to get there from Greenland, probably at least three of them, one for each of the three dwelling complexes — but as the sagas tell us, smaller boats were used for local travel.

Besides the 99 nail fragments, excavators recovered a single whole nail, unused, from carpentry waste in the bog. The iron from which it was made differed from the other nails, with a much higher phosphor content. Since both the ore and the slag on the site were relatively high in phosphor, this nail may have been made on site, as part of the boat work (Unglik and Stewart 1999: 105-106, 305, 390).

Small Personal Items A few small items were lost by their owners: a small bronze pin, a glass bead, a minute fragment of a gilded bronze ornament, a spindle whorl, a small whetstone for the sharpening of needles, and a bone needle. The bronze pin, which measured only 10 centimeters in length when new, had been dropped into the forge pit in the smithy in hall D. It was a simple “Hiberno-Norse” type of clothing fastener, worn by either a man or a woman, common in the entire West Norse area (Fanning 1994: 30-36). The glass bead was a common, almost globular, clear glass type, just over one centimeter in diameter. It was originally lost outside hall D, on the terrace side of the house. Unfortunately it has since been lost once more, while being prepared for conservation in a Parks Canada laboratory, and photographs and descriptions are all that are left. The minute bronze fragment, found within the living-room of hall D, is of interest primarily because it was gilded

(Unglik and Stewart 1979: 9). It had been part of a ring with a striated decoration, but whether finger ring or suspension loop is impossible to tell.

Excavators recovered two objects definitely associated with women's work, in the lean-to shed of hall F. One was a spindle whorl, the other a small whetstone for the sharpening of needles and small sewing scissors (Figure 7). A spindle whorl is the small flywheel of a hand-held spindle, used to make yarn or thread for weaving



Figure 7. The needle whetstone and soapstone spindle whorl, diagnostic Norse artifacts, associated with women's work, from L'Anse aux Meadows. Photo by R. Chan, for Parks Canada.

and knitting. The weight of the whorl, at 16.9 grams, is indicative of the spinning of a light thread (Hofseth Høigård 1985). The whorl consists of soapstone and was made from a sherd of a broken cook pot, for the slightly concave bottom side of the whorl has been blackened by soot.²⁷

The small needle whetstone is of a fine-grained sandstone or quartzite and is shaped like a slender rod with square cross-section and tapering ends (Pride 1978: 4). This is a typical Viking Age form, often kept in small sewing boxes (Roesdahl 1977: 60, 133). The bone needle had been dropped in the long fire in the living-room of hall D. It is simple in form, with an expanding inverse triangular head, through which a hole has been drilled. Its tip is broken off. Such needles were used for single-needle knitting, *nålbinding*, something between crocheting and knitting, primarily for small clothing items such as hats, socks, and mitts (Danielsson 1973: 45-46, Haltiner 1990: 117). There were also nine fire strikers of jasper, worn and discarded.

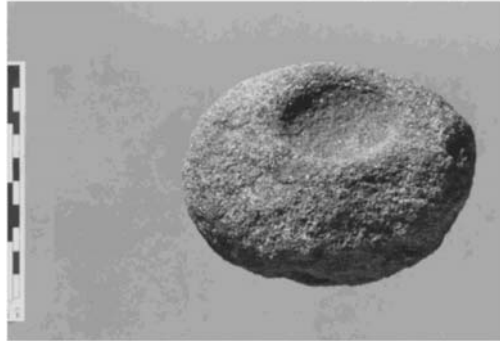


Figure 8. Stone door pivot, from L'Anse aux Meadows. Photo by G. Vandervloegt, for Parks Canada.

The only finished Norse object deliberately left on the site was a small beach boulder of igneous rock with a shallow depression pecked out of its center (Figure 8). Similar objects found in Iceland have been interpreted as oil lamps (Roussell 1943: 97; Kristján Eldjárn 1949: 38-39; Gísli Gestsson 1959: 75-76; Nordahl 1988: figs. 89a,b). This was formerly believed to be the function of the L'Anse aux Meadows specimen (A.S. Ingstad 1977: 82, 92, 202-204). They are a common object in Scotland and the Shetland Islands, where the Norse had learned to use them from the local people. Their use as lamps has been deduced from the presence of charred organic substances in the cavity (Hamilton 1956: 52, 70, 168; 1964: 83). But such forms, without evidence of burning, also appear to have been socket pivots for door posts (Batey et al. 1995: 127-129). The L'Anse aux Meadows specimen, which has no charred substance or evidence of burning, was probably used for a door. It was found at the edge of a doorway between the kitchen and a large storage room in hall F.

DATE AND FUNCTION OF THE SETTLEMENT

Dating The site can be dated by its style of architecture and artifacts, and by radiocarbon dates. The architecture is distinctly Icelandic, in the style evolving towards the end of the tenth century and remaining in vogue into the thirteenth century. The number of rooms varies according to need, as does their alignment. While the first Icelandic buildings seldom had more than three rooms, separated by wooden partitions, buildings of the late ninth to eleventh century had rooms added wherever needed, whether along the lengthwise axis of the building or to its sides. Interior walls of sod and the lack of stone foundations are further typical characteristics of this early Icelandic style. Entrances are in the middle of the side walls. Fireplaces are by the walls, and posts set along the walls can occur, which was the case in one room of hall A. The central long fires, consisting of a stone hearth, the cooking pit, and an ember pit are other typical features. The interior walls are of sod. The

side walls of the halls are often bowed, but may be straight. The end walls are always straight.

Only a few of the artifacts are chronologically diagnostic. The bronze pin is of a kind developed from Irish models in Norse Ireland and Scotland, between 920 and 1050 being especially common around 950, and used primarily for fastening clothing (Fanning 1994: 28-29). The spindle whorl, shaped like a flattened sphere, with no decoration, is of a type particularly common in the Viking Age throughout Scandinavia, but it does exist in later periods as well (Hofseth Høigård 1985: 54-60). The same is true for the bone needle. The small, carefully shaped needle hone with a square cross-section and tapering ends is characteristic of the Viking and early Middle Ages. The socket door-pivot base occurred in the Viking Age but continued in use for centuries.

In total there are 148 radiocarbon dates for the L'Anse aux Meadows site. About 50 of these pertain to the Norse occupation. The great range in the dates show that caution must be used with radiocarbon dating. The sheer number of dates for L'Anse aux Meadows permits one to see how the nature of the samples submitted for dating influences the results. Eighteen samples consist of charcoal from hearths, 14 of worked wood, two of building posts, seven of small twigs and branches, six of wall sod or other peat, and one of whale bone. They gave very different results.

The peat/sod dates range from 680 to 1150.²⁸ Since most were processed before the development of Accelerated Mass Spectrometry (AMS) dating, the samples submitted were large. They cannot be precise because centuries of plant material have been compressed into a thin band. Peat/sod samples are also easily contaminated by later roots, especially in areas like Newfoundland where grass development is very slow.

One sample of whale bone could be dated, most likely, to either 1060 or 1080.²⁹ The dates were not, however, corrected for the reservoir effect of marine carbon. Ignoring this effect means that the radiocarbon ages of sea mammal remains appear older than they really are, in calendar years. The marine reservoir age for Newfoundland waters is between 500 and 600 radiocarbon years (Dyke et al. 2003). The whale does not, therefore, likely belong to the Norse phase.

As far as wood is concerned, only the outer rings are contemporary with the cutting date. If the sample consists of the heart wood of a long-lived wood species, such as spruce, it can yield a radiocarbon date centuries older than when the artifact was made and used. The 14 dates on the worked wood from the Norse deposits yielded probable dates ranging from AD 640 to AD 980 (Figure 9). Yet from the stratification it is clear that we are dealing with a single occupation and a short one at that. So what has happened? The oldest date was from a plank of spruce, shaped with a metal broad axe, which lay in close association with a slim stake of Balsam fir. The spruce plank gave the date AD 640, the stake AD 980, yet the two were clearly discarded at the same time.³⁰ The discrepancy is due to the effect of wood age at the time of artifact use. Live spruce can be up to 1000 years old in northern

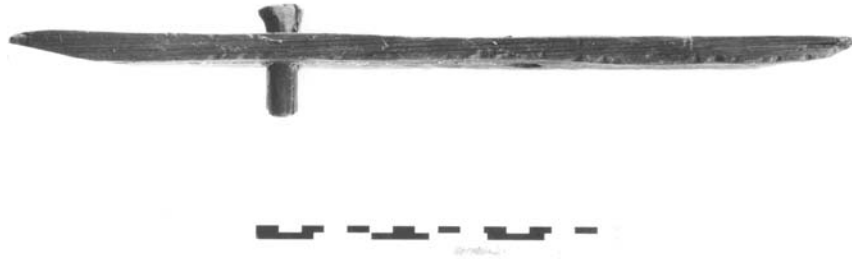


Figure 9. A boat plank, with trenail, from L'Anse aux Meadows. Photo by G. Vandervloegt, for Parks Canada.

Sweden, and ages of 600 or more years have been demonstrated in Labrador spruce (Jacoby and Ulan 1981: App. 1-11). The plank had been cut from the very center of the tree, and the sample sent for dating was cut from the center of the plank. It is only natural that this plank may have been cut from a tree several hundred years older than the slim Balsam fir branch, which would have been young when it was cut and put to use.

Charcoal dates had a similar span, ranging from AD 670 to 990. This is what one would expect in an area where the wood used as fuel was primarily dead wood, which had accumulated over several centuries, when the site was only intermittently and sparsely occupied by the Middle Dorset and Recent Indians. By contrast, the dates on short-lived wood samples, such as twigs and branches ranged between 990 and 1050, with a mean date of 1014.³¹ Two dates on wooden posts were slightly older: 900, for a post about 15 centimeters wide, in one of the big houses; and 980 for a small post in the hut where the iron-making furnace was located.³² There is little doubt that the twig dates, clustered in the early eleventh century, come closest to the actual date of the Norse occupation.

SIZE OF THE SETTLEMENT AND SOCIAL ORGANIZATION

The settlement was large. Thanks to the fact that the halls follow known Icelandic room layouts, for which sleeping space requirements are known, we can determine the number of people the L'Anse aux Meadows buildings could accommodate. People generally slept in pairs, on platforms on each side of the halls, lying along the main axis of the building. The halls had sleeping space for 60 to 78 individuals,

house B for two to three and the huts C, E, and G for an additional five to 11, meaning that something like 70 to 90 people inhabited the settlement.

The major activities on the site — carpentry, iron manufacture and smithing — lay within the male realm. On the other hand, the textile working implements — the spindle whorl, needle hone, and bone pin — indicate the presence of women.³³ The pile of stones in the corner of hut E is ambiguous. If the stones were loom weights, they would have been used by women, but if they were net sinkers, their users would have been men. Beads were worn by both men and women, so are not indicators of gender. Throughout, there is little evidence of normal household activities, in the form of broken soapstone vessels and dairy pantries, small household knives, and looms. The general impression is that most but not all of the people in the Norse camp at L'Anse aux Meadows were men.

A house reflects the social unit for which it was built, announcing the status of its owner (Stoklund 1982: 22-24). In a chiefdom society, like that of the Norse, this expression of status is especially important, particularly in a period of social mobility. The buildings at L'Anse aux Meadows clearly belonged to inhabitants of unequal social standing. The large halls A and F were the type of dwellings enjoyed by the elite of chieftains or their near-equals. Both were imposing buildings. Hall A, with an exterior length of 29 meters and a floor space of about 102 square meters, was more than double the size of Erik the Red's last home in Iceland, which was only about 16 meters long and had a floor space of about 50 square meters (Guðmundur Ólafsson 1998, 2000). Hall F, with a floor space of about 160 square meters, of which 80 were for accommodations, was almost ten times as large. The living space in hall F is, in fact, comparable to the large hall at Sandnes, the chief estate in West Greenland and likewise compares in size with the hall at Hófstadir in Iceland, a venue which has been interpreted as a status symbol, intended "for large gatherings and feasts" (McGovern 1992: Table 6, Orri Vésteinsson 2001: 339). Hall D, at 20.2 meters in exterior length, with a floor space of about 88 square meters, was more modest than the other two, but still very large. It had only one communal sleeping and living room, which, however, with its 62 square meters was larger than any of the others. House B, with a floor space of only about 15 square meters, is the type of multi-functional dwelling used by tenant farmers who rented land on larger estates in return for their labour (Myhre 1982: 473). Finally, the small hut C, as well as huts E and G, were the kind of dwellings relegated to those lowest on the social scale, for example, slaves.

The artifacts are less explicit with regard to the status of their owners. Glass beads and bronze adornments were both relatively common. Only the gilded small brass fragment represents real wealth. The buildings and artifacts together suggest that the occupants represented the whole spectrum of West Norse society — precisely the situation portrayed in the Vinland sagas.

The jasper fire strikers give an indication of the national origin of the occupants. Four of the nine pieces were of jasper from western Greenland, three pieces

from western or southwestern Iceland, and two from southern Borgarfjord in western Iceland (Smith 2000). All the Greenland pieces were found in the hall F middens. Both of the pieces from southern Borgarfjord came from hall D.³⁴ Of the pieces from western and southern Iceland, two were from the A-B-C complex and one from the long fire in the communal living and sleeping room in hall F. This could be seen as a corroboration of the Vinland sagas, which suggest that on some voyages as much as two-thirds of the Vinland exploration parties might have come from Iceland, even though the Greenlanders retained leadership and control. The F-G complex was, without doubt, the most important complex on the site, and the communal living space in this hall the chief gathering place. Pushing the evidence to its limits, but not beyond reason, one might conclude that hall F at L'Anse aux Meadows was the hall built by Leif Eriksson.

LENGTH OF OCCUPATION AND ABANDONMENT

The archaeological indicators show that the Norse occupation was short, probably a matter of years rather than decades. The middens are minute. They consist primarily of ashes and burnt food bone. The total count of bone amounts to 125 fragmentary pieces unburnt and 315 fragments burnt.³⁵ Chemical and phosphate analyses of the peat in the bog immediately outside the buildings were performed to see if bone and ash had been discarded here, since both would have been dissolved by the tannic acid. The results were negative (Robertson 1978, McCauley 1973, 1975). Likewise, the scatters of carpentry waste in the bog immediately west of the D-E complex were so small as to indicate a one-time event. There may originally have been additional waste on the terrace on the other side of the complex, but it could not have been significant, as there were no strong phosphate concentrations there either (McCauley 1975). Within the buildings, the cultural deposits were insignificant, with almost non-existing floor deposits.³⁶ Neither did the buildings reveal any traces of repair or rebuilding. Wear and tear on the full-scale replica Norse buildings at L'Anse aux Meadows suggests that extensive renovations of the original halls would probably have been necessary after about 15 years.

Although the archaeological evidence does not reveal why the settlement was abandoned after only a short time, it does suggest that the Norse departure was not the result of disaster. Abandonment was voluntary and orderly, as indicated by the removal of all household inventory, including tools and substantial belongings.

Aboriginal Presence Aboriginal fireplaces, artifacts, and tent floors are scattered throughout the site. A concentration of such sites, on the southern shore of Epaves Bay, close to the waterline, includes traces of Maritime Archaic, Groswater Palaeoeskimo, Middle Dorset Palaeoeskimo, and two Indian occupations, one before the Norse, and one after. The former has affinities to the Cow Head complex, the latter to Point Revenge and Little Passage complex, which in turn is undoubt-

edly proto-Beothuk (Pastore 1989, 1998: 272). There were, however, no Aboriginal groups on the site at the time of the Norse.

One stray artifact deserves special mention. This is a late Dorset soapstone lamp, the only late Dorset artifact on the site. Such a find was unexpected here, as late Dorset are known only in northern Labrador (Maxwell 1985: 238). The lamp was found in a post-Norse context, in surface sod above the collapsed Norse furnace hut. Radiocarbon analysis on charcoal inside it gave a twentieth-century date (A.S. Ingstad 1977: 97, 217). As a single artifact, with no associated features, the lamp probably arrived on the site from northern Labrador. Inuit traders from Labrador were present in nearby Quirpon and Noddy Bay in the eighteenth century and Innu (Montagnais) Indians from Labrador used to camp among the Norse ruins in the eighteenth and nineteenth centuries (Auger 1984, 1991, 1993; Mowat 1965: 452, confirmed by L. Decker, pers. comm.). However the bowl arrived at the site, it happened long after the departure of the Norse.

Function of the Settlement All the buildings at L'Anse aux Meadows were permanent, year-round buildings, constructed to withstand a northern winter. One is reminded of a point made explicit in the *Greenlanders' Saga*: "Leif and his crew carried their skin sleeping bags off board, and built themselves booths. Later they decided to winter there and built big houses" (Jones 1986: 198). In Iceland and Greenland, quickly-constructed dwellings were customarily *búðir*, or booths, the type of structure used for recurring seasonal occupations, for instance at the *things* or at Norðsetr, the "Northern *Shielings*", a base camp for walrus hunting located a good distance north of the Greenland settlements. A *búð* was a cross between a house and a tent, consisting of permanent sod walls, with a portable roof structure of poles and tent cloth. The name *Leifsbúðir* probably retains the memory of such structures. No evidence was found of booths at L'Anse aux Meadows, but if they were remodeled into proper houses only a month or so after they were built, this would not likely leave traces in the archaeological record.

The artifacts at the Newfoundland site are more specialized than those typical of family farm sites in Greenland or Iceland; the buildings have relatively large living areas, plenty of space for storage and specific work areas. The extensive living space would have served an unusually large concentration of people. The exposed location of the settlement, on the open sea of the Strait of Belle Isle, suggests that seafaring was the most important function of the settlement. The burl of butternut wood (cut with a sharp metal knife and then discarded) and three butternuts, recovered from the carpentry waste, prove that some of the Norse who over-wintered at L'Anse aux Meadows had been farther south. Butternut or white walnut, *Juglans cinerea*, is a North American species of wood but is not indigenous to Newfoundland. Its northern limit lies about latitude 47° north, in the inner Miramichi region of northeastern New Brunswick, along the Saint John River and in the St. Lawrence River valley, west of Baie St. Paul, Quebec (Adams 2000). Finds of butternuts at L'Anse aux Meadows are significant because the most accessible sources, at least

for Norse coming from Newfoundland, are also the northernmost areas in North America where wild grapes grow. For centuries, scholars debated whether the name *Vinland* stemmed from first-hand experience of grapes or if it simply symbolized paradisaical qualities perceived in a country previously unknown to the Norse (Rafn 1837, Storm 1889, Hovgaard 1914, Magnusson and Pálsson 1965, Larsson 1999, Nansen 1911, Wahlgren 1956, Keller 2001).³⁷ This debate can now be closed: the presence of butternut wood and nuts at L'Anse aux Meadows proves that the Norse did, in fact, visit areas where grapes grew wild.

The sagas also speak of *vinvið*, or “grape trees”, which were felled and shipped back to Greenland as a prime cargo. This has puzzled many scholars, who have even pictured grapes on vines in vineyards and attempted to explain why the Norse would bring vines back to Greenland (Hovgaard 1914: 159, Pohl 1972: 112-113). The answer is simpler. In their wild state, grapes grow among deciduous trees and the vines wind themselves up tree trunks, climbing all the way to the top of the trees. A sixteenth-century account reported that “in Canada in several of the coastal regions you see beautiful grapevines ... These vines grow a lot with poplars and elms, which having climbed over they are so abundant in foliage and branches that they can only be separated from them without breaking with great difficulty” (Thevet 1575: 49). Such trees were the *vinvið*, the “grape trees” of the sagas. The grapes were collected, and the trees felled and dressed to be shipped back to Greenland.

Wine had great significance in Norse society. In chiefdoms, power and political authority are intricately tied to the ability of leaders to mount ostentatious displays of wealth, including bestowal of luxury gifts and the hosting of lavish feasts featuring exotic foods and quantities of alcohol. Wine was an expensive and rare commodity for the Norse, imported in small quantities into Scandinavia from the Rhineland and France by chieftains and kings. For someone from an upstart family, like Leif Eriksson, his own supply of wine would mean a great deal for maintaining his position and that of his family as chiefs of the new Greenland colony. No wonder he named his new territory *Vinland*, Land of Wine.

L'ANSE AUX MEADOWS AND VINLAND

L'Anse aux Meadows was a base for exploration and a transshipment station for resources collected farther afield. The archaeology of the site tells us that its occupants were mostly men, who spent considerable time away but who periodically returned, and that some of the exploration was in a southerly direction. The only comparable Norse settlement either in the sagas or in the archaeological record is the Vinland settlement of Straumfjord.

The archaeological evidence from L'Anse aux Meadows supports the description in *Erik's Saga* of two Norse camps in the New World: Straumfjord, a year-round base camp in the north of Vinland; and Hóp, a summer camp in the

south, where lumber and grapes were collected. The parallels between Straumfjord and L'Anse aux Meadows are striking. The former is described as a large year-round base, functioning much like Viking winter camps in Ireland and France, except that summer activities consisted of exploration rather than raids. Even the physical description of Straumfjord is applicable to L'Anse aux Meadows, with its location on a fjord (the Strait of Belle Isle), near an island (Belle Isle) at its northern mouth, surrounded by strong currents. Surface currents can reach 0.4 meters per second and are especially complex in the Strait, because it acts as a funnel in and out of the Gulf of St. Lawrence, the water flow changing constantly, in different directions, on either side of the Strait (Farmer 1981: 63, Farquarsson 1966). The sagas describe smaller islands lying off the coast, promising masses of eider ducks and eggs, and winters sufficiently mild for cattle to graze out of doors on the abundant tall grass surrounding the settlement.³⁸ Interpreters of the sagas have often portrayed Straumfjord as a harsh place, far from Leif's promised Land of Wine (Páll Bergþórsson 2000: 73, Larsson 1999: 20, 45, 69). On the contrary, *Erik's Saga* says that "the situation of the land was beautiful, and they did nothing but explore the country". When the Norse visitors encountered winter hardship, it was because they had been so busy exploring that they had neglected to lay up adequate provisions and were therefore in a difficult position when both hunting and fishing failed (until they came across a stranded whale). Many writers have considered the climate and environment of L'Anse aux Meadows too harsh to have been Straumfjord, preferring to place it farther south, in southern New Brunswick or eastern Nova Scotia, for instance (Páll Bergþórsson 2000: 41, Larsson 1999: 45, 68-72). Yet the environment of L'Anse aux Meadows is more varied in resources than much of southern Iceland, and the climate is about the same as that of Iceland's north. Recent climate studies have shown a warming peak around the year 1000, with temperatures several degrees warmer than present (Ogilvie et al. 2000). Thus the climate in L'Anse aux Meadows would have been significantly better in the eleventh century than it is now, when snow cover is heavy in most years. In the winter of 1998, however, when the average winter temperature was only 2° Celsius warmer than normal, there was hardly any snow; and very little again in 1999, when it was less than 2° warmer. The observed effect of these recent fluctuations suggests that winters at L'Anse aux Meadows in the eleventh century were likely snowless and that cattle could indeed have grazed out of doors all winter. As for locations farther south, winters in New Brunswick or Maine are colder than those in northern Newfoundland, and Massachusetts winters are only slightly warmer.

If Straumfjord was L'Anse aux Meadows, Hóp was almost certainly on the southern shores of the Gulf of St. Lawrence, most likely in northeastern New Brunswick. The location of L'Anse aux Meadows, facing west to the Strait of Belle Isle rather than being on the Atlantic coast facing east, indicates that the main Norse route south lay in the Gulf of St. Lawrence, along the coasts of eastern Quebec or western Newfoundland. Once in the southern part of the Gulf, travelers from the

north would enter a new ecological zone, distinguished by warm waters and, in the past, vast hardwood forests with richly diversified fauna and flora. For a number of reasons, Hóp is most plausibly understood as a camp on the New Brunswick shore of the Gulf. The *Hauk's Book* version of Erik's Saga says that "they reached a river which flowed down from the land into a lake and so to the sea. There were such extensive bars [*Skalholt Book*: islands] off the mouth of the estuary that they were unable to get into the river except at full flood. Karlsefni and his men sailed into the estuary, and called the place Hop, Landlock Bay" (Jones 1986: 226). Note, however, that *hóp* can also mean inlet. *Hóp* is a shallow lagoon, salt at flood tide and fresh at ebb, hidden behind sandbars. The New Brunswick northeast coast is known for its extensive offshore sandbars, today known as *barachoix*, which shelter warm, shallow, tidal lagoons from the cold waters of the Gulf of St. Lawrence (Figure 10). Great rivers lead inland, among them the Miramichi, along which butternuts and wild grapes, *Vitis riparia*, grew in pre-contact times, in deciduous forests dominated by oak and maple. (Following European settlement and industrial development, most of this habitat has been replaced by pine forest.) The original hardwood forest of New Brunswick contrasts with the dominant softwoods of Newfoundland,



Figure 10. Coastal barachoix and lagoon in the Miramichi region of northern New Brunswick, a plausible match for the sagas' *Hóp*. Photo by A. Dufresne, for Parks Canada.

Labrador, and eastern Quebec. Nova Scotia's Atlantic coast resembles Newfoundland, with stunted softwood and birch forests, rocks and cold inlets.

The Atlantic coast of Nova Scotia would not have been particularly enticing to anyone searching for supplies beyond what was available in Greenland and Newfoundland. While the Norse were technically capable of reaching eastern Nova Scotia, either around Cape Breton or through the Strait of Canso, and might have explored this coast, I have serious doubt that it became a regular itinerary, for neither butternut trees nor wild grapes are found there. These species are not native to Nova Scotia but are introductions from France and New Brunswick (Champlain 1922, I: 365, n.1; Roland and Smith 1969: 509; Zinck 1999, I: 576).³⁹ To find either butternuts or wild grapes on the Atlantic coast, the northern mariners would have had to reach the bottom of Penobscot Bay in central Maine or even farther south. Modern sailors, aware of their destination, may consider this a feasible voyage but, when the Norse reached southwestern Nova Scotia, the only land in sight lay to the northwest. Even if they eventually reached the coast of Maine, there they would have entered into a vast and intricate archipelago. While Norse ships could, winds permitting, easily make three to six knots or even more in well-known areas where hidden reefs were known, travel in unknown waters was probably no faster than one to two knots (Þorsteinn Vilhjálmsson 2000: 366-371). Given these constraints, it is unrealistic to suppose that grapes and butternuts were harvested as far south as Maine or New England, since the Norse sailors would then have had to return to their northern establishment, where food and supplies were available to see them through the winter.

Hóp was, more likely, somewhere in northeastern New Brunswick. The sagas speak of salmon in the rivers and large groups of Aboriginal people in skin boats. Atlantic salmon were not present in New England before the seventeenth century but, until recently, the Miramichi and other New Brunswick rivers had the biggest salmon populations in eastern Canada (Carlson 1996, Russell 1970: 96). It is highly probable that salmon were already there, in the eleventh century (although this assumption remains to be demonstrated archaeologically). The Mi'kmaq on Chaleur Bay had a salmon as their totem in the seventeenth century — a choice of symbolism that certainly speaks for a long tradition of salmon fishing (LeClerq 1677, in Whitehead 1991: 64, 66). Furthermore, the Natives encountered at Hóp had canoes. These were rare among Indian groups south of central Maine and did not exist at all south of Boston (Salwen 1978, Snow 1978). The Mi'kmaq, on the other hand, used canoes and, before the seventeenth century some, at least, were skin canoes (Wallis and Wallis 1955: 50-51, Whitehead 1991: 20).

With Straumfjord in northern Newfoundland and Hóp in northeastern New Brunswick, Vinland can be defined. Vinland comprised the coastal region around the Gulf of St. Lawrence, from the Strait of Belle Isle in the north, to the Northumberland Strait in the south. L'Anse aux Meadows-Straumfjord was part of Vinland and was the gateway to its rare and valuable resources (Figure 1).

Some interpret L'Anse aux Meadows as an anonymous settlement, unmentioned in the sagas (Larsson 1999: 48, Barnes 2001: xvii). I used to think along those lines myself but simple calculations have forced me to reconsider. The amount of sod used in the L'Anse aux Meadows buildings can be determined from the archaeological remains. A total of 1100 cubic meters would have been required to construct the three halls, with additional amounts for the huts. The number of posts used in the construction can also be calculated from the remaining post moulds, combined with knowledge of bearing capacity, gained from the reconstruction of building replicas on the site. At least 86 trees with diameters varying between ten and 50 centimeters had to be felled for roof support posts. In addition, wood for framing the huge roofs of the halls and the smaller roofs of the huts had to be cut and shaped with axes — not to mention planks for doors and platforms, and possibly even panelling, for several rooms. The work required for the building of the replica buildings provides the basis for a rough calculation of the labour needed to complete the entire settlement. (The Norse were more familiar with sod construction, but the modern worker has sharper tools, trucks for transport, and mechanical cutters for sod.) All in all, it must have taken 60 people two months or 90 people a month and a half (cf. Orri Vésteinsson 2000: 170). Even at its thirteenth-century peak, the Norse population of Greenland was no more than 2000 to 3000 people and the budding colony comprised no more than 400 to 500 in the early eleventh century (Lynnerup 1998: 113, 116-118). Our construction calculations suggest that it took anywhere between 60 and 90 people to set up L'Anse aux Meadows, assuming these men and women were in their best working age. Even if we allow, generously, that two-thirds of the crews might have been Icelanders, at least 20 to 30 people must have come from Greenland. This was between 5 and 7 percent of its entire population, including the young and elderly. Greenland simply could not supply sufficient labour to establish another settlement in Vinland or to even to maintain a permanent settlement there. The logic of these calculations suggests that L'Anse aux Meadows must be the *Straumfjord* of the sagas.

Present-day North Americans have a hard time grappling with the thought that the Norse gave up on Vinland almost as soon as they found it. Surely they must have wanted to stay forever! In the eyes of the Greenlanders, however, the incentive for a permanent colony was simply not there. At the time, the Greenland Norse clustered in two or three small communities, far from each other, with no more than 400 people in the East and Middle Settlements and perhaps 100 in the West Settlement.⁴⁰ They were not yet solidly established, land remained to be cleared and they were already far from relatives and friends in Iceland and Norway. The areas settled were lush in the summer, with plenty of fodder for still-growing herds, more than they could use. There was no shortage of game: walrus, whale, seal, birds, arctic fox, polar bear and, notably, caribou (which was not available in Iceland). Soapstone for household items, likewise unavailable in Iceland, was plentiful. The only crucial missing commodities were staples such as flour and salt and good lumber for build-

ings and boats.⁴¹ Lumber was no doubt part of the prime cargo brought back from Vinland, but good lumber was also available in Markland, and Labrador is much closer to Greenland than the Gulf of St. Lawrence. Vinland had diversified resources, including luxuries such as walnuts and grapes, necessary for any magnate who wished to display and thereby maintain his authority. Vinland lacked, however, other equally important wares, which were available in Europe: flour, salt, spices, sword blades, bronze, copper, brass, silver, gold, fine textiles, glass, artwork, and precious stones. Hence, regular voyages to Norway were a necessity; voyages to Vinland were not. Ships were rare, owned only by a few members of the elite. The sagas give ample evidence that Atlantic voyages were fraught with danger and that safe arrival was never assured. Vinland was as far away as Norway and the voyage even more dangerous, as it required an assessment of longitude, for which no accurate method then existed. Maintaining traffic in both directions would have strained the small Greenland colony beyond its capacity. In the eleventh century, the colony was too small to splinter off a daughter colony in Vinland and, in the centuries that followed, it never reached sufficient size to afford this form of expansion. Besides, the Norse were outnumbered by thousands of Native people already in Vinland, people with whom they had already fallen into conflict.

In order to obtain wares from Europe, the Norse needed goods to offer in exchange. Walnuts, grapes, and lumber from Vinland would not have been very useful, since these were available in Europe as well. Only walrus and narwhal tusks, and products from seals and other sea mammals fit the bill. For these, the Norse had to go north, to *Norðsetr*, the Northern Shielings, in a direction opposite to Vinland. Under these circumstances it is not difficult to understand why Vinland was not colonized, or why L'Anse aux Meadows-Straumfjord was soon abandoned. Sporadic voyages to relatively nearby Markland continued, and there is some evidence for forages, both planned and unplanned, into the Arctic (Gad 1971: 123, Schledermann 1996, Sutherland 2000).

Yet Vinland was never completely forgotten. At the turn of the seventeenth century, the Danish king, then ruler of Iceland and, nominally, of Greenland, used the memory of Norse explorations to boost his claim for North American territory. This effort came to naught, but it did have the effect of renewing interest in the Vinland sagas. They were discussed in a publication of 1705, *Historia Vinlandiae Antiquae, se Partis Americas Septentrionalis* ("History of Ancient Vinland, or Rather, a Portion of North America"), by Þormóður Torfason (Thormodus Torfaeus). Per Kalm brought up the topic with Benjamin Franklin, in the 1740s, during his travels in North America, and one of Kalm's disciples, George Westman, wrote a dissertation in 1757 at the University of Turku, *Itinerera Priscorum Scandianarum in Americum* ("The Travels of the Ancient Scandinavians in America") (Lyle 1968: 176). The first speculation on the location of Vinland came in 1777, in Gerald Schöning's appendix to Snorri Sturluson's *Heimskringla* ("The Globe") (Schöning 1777). The real breakthrough in Vinland

research came with the publication in 1837 of all the Vinland documents in *Antiquitates Americanæ* by Carl Christian Rafn (1837). A widely-read English edition followed in 1838 (Rafn 1838). These works started the search for Vinland in earnest. We have finally found it in Atlantic Canada, where the remains of Leif's exploration base in Straumfjord survive as the L'Anse aux Meadows site in northern Newfoundland.

Notes

¹*Thule*, mentioned by the Greek Pytheas c. 330-300 BC and later Roman geographers, was probably northern Norway rather than Iceland (Bugge 1923). Bugge pointed out that the text says that Thule was inhabited by "barbarians", the common Roman term for the various Germanic tribes, and that the barbarians told the Greek sailors that the constant daylight of the summer was replaced by constant darkness in winter. There was no one in Iceland to tell explorers of these conditions.

²The earliest settlement took place just about the same time as an eruption of Hekla, producing the so-called Landnam volcanic ash layer (Orri Vésteinsson 1998: 152). Claims for settlement in the seventh century (Margaret Hermanns-Auðardóttir 1989, 1991) have been refuted (*Norwegian Archaeological Review* 1991, Orri Vésteinsson 1997).

³A few Danes and Swedes (East Norse) would have been among them, but Icelandic language and culture show strong West Norwegian patterns.

⁴In the oldest redaction of the *Book of Settlements*, Thorvald is mentioned as coming from Norway and Erik is described as a native of Breidafjord in western Iceland (Ólafur Halldórsson 1978: 319). According to Ólafur, the term used, *Breidafjörðing*, indicates that Erik must also have been born there.

⁵In both the *Hauk's Book* and *Skalholt Book* versions of *Erik's Saga* Thjodhild's name is given as Thorhild, but in one place in *Hauk's Book* Thorhild is crossed out and replaced with Thjodhild (Jansson 1945: 86 n.14).

⁶We can assume that Erik was not alone but accompanied by a select trustworthy crew.

⁷Gunnbjörn Ulfkrakuson is said to be the first European to sight Greenland, or rather, islands off Greenland's east coast (*Greenlanders' Saga, Eric's Saga*, Jón Guðmundarson the Learned c. 1637; in Jones 1986: 74-75, 209).

⁸This number is based on studies of the Greenland burials by Niels Lynnerup (1998). It supports the saga figure of 25 or 35 ship loads of emigrants, only 14 of which reached their destination on their first attempt (*Greenlanders' Saga*, in Jones 1986: 86).

⁹Recent radiocarbon dates and documentary research on clothing found in Greenland graves show that items once believed to postdate 1450 are no later than the period 1280-1395 (Arneborg et al. 1999: 161).

¹⁰Ólafur Halldórsson believes that the date lay closer to 1000 (2001: 46). We have no proof that Bjarni Herjólfsson was an historical person (Helge Þórlaksson 2001: 64, 72).

¹¹One of these sons, Thorvald, appears to have been illegitimate, as was Erik's daughter Freydis (Jansson 1945: 128, *Greenland Annals* AM 115, Ólafur Halldórsson 1978: 23).

¹²For a more or less complete bibliography, see Bergersen 1997.

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¹³All have been published, in Icelandic and Latin in Rafn 1837, and, in Icelandic, in Ólaf Halldórsson 1978. Unless otherwise noted, translations in the present article are the author's.

¹⁴Such as archaeologists Orri Vésteinsson, Adolf Fríðriksson, and anthropologists Jón Haukur Ingimundarson, Gísli Pálsson, and Kirsten Hastrup.

¹⁵By Jette Arneborg, Joel Berglund, Christian Keller, Niels Lynnerup, and Thomas McGovern.

¹⁶There are also five seventeenth-century copies (Jones 1986: 306-308).

¹⁷The calendar in Iceland and Greenland had only two seasons, summer and winter, summer beginning in mid-April, and winter beginning about October 15 (Hastrup in *Medieval Scandinavia* 1993: 65).

¹⁸One argument for the locations in *Greenlanders' Saga* and *Erik's Saga* being three separate spots has been that in the latter, Thorfinn Karlsefni spends much of his time searching for Vinland, without stating that he ever found it. The *Hauk's Book* version of *Erik's Saga* says clearly, however, that Straumfjord was located in Vinland: "They ... spent that third winter in Straumfjord.... When they sailed from Vinland [they got a south wind and reached Markland ...]" (*Erik's Saga*, in Jones 1986: 230). What Karlsefni's group at first had difficulty in locating was the wild grapes, and these he later found at Hóp.

¹⁹The terrace is a former beach, on which several sea transgressions ranging between 4000 and 1400 BC can be traced, following carbon dates (Qu-365, S-1103, S-1105, S-1107).

²⁰The existence of one of these rooms was not documented until the 1980s.

²¹Such latrine pits were found in the corners of buildings in Viking Dublin (P. Wallace 1988: 12).

²²The building was originally believed to have been a steambath (A.S. Ingstad 1977: 218-220). However, the fireplace by the wall is not the type of fireplace used in a steambath, and steambaths may not have come into use in Iceland or Greenland until the twelfth century (Nanna Ólafsdóttir 1973, Gísli Gestsson 1976, Stoklund 1984: 110). A feature interpreted as associated with the steambath and consisting of a large slate slab topped by a block of sandstone in the centre of the hut postdates the Norse occupation. The intercept point of a radio-carbon date (T-327) on associated charcoal is AD 1170 $\pm$ 70.

²³A pit building at Oddernes Church, West Agder, Norway, has been dated to the fourth century (Rolfen 1976).

²⁴No bellows from this period have survived, but depictions in the Sigurd carving in Sweden and the Hyltestad church in Norway show double-chambered construction.

²⁵The iron manufacture and subsequent smithing could not have taken place without tools essentially similar to a modern smith's.

²⁶Much of the building sod was sedge peat, so the bog is likely to have been stripped of its sod cover by the builders, bringing the surface closer to the water level.

²⁷A trace element study concluding that the whorl had been made from local soapstone from an outcrop at Straitsview, three kilometers south of L'Anse aux Meadows, has since proved invalid, given the variability of soapstone within a single outcrop (Allen et al. 1978, 1984). The spindle whorl sherd had no similarity whatever to another sample taken only a few meters from the first. It is more likely that the whorl was made from a Greenland Norse soapstone cooking pot.

²⁸All dates cited are intercept values, Stuiver corrected, with two standard deviations.

²⁹St-2665. The date was obtained in the Stockholm radiocarbon lab, which was one of the first labs to correct for isotopic fractionation.

³⁰Plank (S-1092), stake (S-1093).

³¹Three of these samples had AMS-dating performed in Toronto. Calendar dates AD were: 990 (S-1340), two at 1000 (TO-119 and S-1113), 1010 (TO-117), 1020 (TO-118), 1030 (S-1111), 1050 (S-1355).

³²Radiocarbon dating references: for AD 900 (S-1102), for AD 980 (S-1101).

³³The majority of textile-working implements have been found in female burials (Dommasnes 1978: 107, Løken 1987: 58, Roesdahl 1977: 29, 31).

³⁴A ninth piece, a broken flake found in association with Aboriginal fireplaces east of hall D, was of jasper from Notre Dame Bay, in Newfoundland itself (Smith 2000). Whether or not this artifact was Aboriginal, Norse explorations in Notre Dame Bay are entirely plausible.

³⁵Not all burnt bone was collected by the Ingstad expedition as shown by its presence in the backfill from the early excavations. Although this bone was retrieved during the Parks Canada excavations, it was by then out of context making it impossible to tell whether it was derived from the Norse or the many Aboriginal features on the site.

³⁶Wherever they were recorded as having depths of as much as ten centimeters or more, the deposits included burnt and collapsed building debris (e.g., A.S. Ingstad 1977: 68).

³⁷The claim by Helge Ingstad (1986), Magnús Stefánsson (1997, 2004), and Erik Lönnroth (1996) that the name was *Vin-land*, with a short *i* in *vin*, meaning “pasture”, has never been accepted by Norse philologists (Crozier 1999, 2004, Holm 1997, cf. Wallace 2001: 142).

³⁸*Skalholt Book* also says “mountains”, but this has been edited out of *Hauk’s Book*.

³⁹There may have been some wild grapes near Pictou on the Northumberland side of Nova Scotia, but when Champlain and Denys speak of grapes and butternuts around Port Royal, both are clearly confusing Nova Scotia with other parts of Acadia (Denys 1672, I: 164-168 and II: 19-20 in 1982: 113-112 and 147-148; Champlain 1613 in 1922: 368). Lescarbot speaks of the lack of wild grapes at Port Royal as opposed to New Brunswick (1609, in 1928: 104).

⁴⁰For research on the Middle Settlement, situated just north of the East Settlement, see Arneborg 1994.

⁴¹Some salt was produced locally by burning seaweed and some from boiling sea water, but the former was of inferior quality and the latter required great amounts of fuel (Perkins 1976: 72, Hellerup Madsen 1977: 288).

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