

# The Role of Skis and Skiing in the Settlement of Early Scandinavia

JOHN WEINSTOCK

---

The Northern Review #25/26 (Summer 2005): 172-196.

---

## Introduction

Skiing as a modern sport spread from Norway in the late nineteenth and early twentieth centuries to other countries where there was snow during some portion of the year. Many people had read Fridtjof Nansen's account of his 1888-89 trek on skis over the inland ice of Greenland in his book *Paa ski over Grønland*, which appeared in Norwegian and other languages in 1890.<sup>1</sup> The book helped make skiing a household word. Not so well known is the role of the Sámi (formerly Lapps) in the evolution of skiing. This article aims to sketch the early history of skiing from its birth in the Stone Age to a period only some centuries ago. I suggest that Finno-Ugrian cultural complexes moved into Fennoscandia (the Scandinavian peninsula) from the east and south in the late Stone Age, bringing skis with them as one aspect of their material culture. Germanic groups migrated northward into Scandinavia much later on. They too may have brought skis with them, but their skis were not nearly as technologically advanced as the Sámi skis. When Germanic groups came in contact with the Sámi, they profited from the latter group's mastery of skis and skiing.<sup>2</sup>

## Origins of Skiing

The roots of skiing go back much further than a century or two. Written sources as early as 211 BC mention skis and skiing. There are rock carvings in northwest Russia and northern Norway depicting skiers that are upwards of four thousand years old. More than three hundred skis and ski fragments have been found in peat bogs in Scandinavia and Russia: several fragments found in north-central Russia have been carbon dated to circa (c.) 6700 BC.<sup>3</sup> And there is comparative linguistic evidence suggesting that skiing is very old. According to Hartvig Birkely, several scholars have claimed that the Sámi word *čuoigat*, meaning "to ski," is from six to eight thousand years old.<sup>4</sup>

When Stone Age people migrated northward in search of prey, they

encountered terrain covered with snow during much of the year. Moving about on the snow was difficult without an efficient means of transportation. They had brought with them foot coverings that protected them from the cold. They soon noticed that if they extended the sole of the early boot it would support them on a snow surface. The sole extension became primitive snowshoes, devices that could be attached to moccasins or boots and used to pursue animals in deep snow. One form of snowshoe was made of wood in an oblong shape. It worked quite well, although certain types of snow tended to stick to the bottom. A remedy for this was to attach a fur covering to the bottom of the snowshoe with the hairs pointing backward. The earliest forms of clothing, including foot coverings, were made from the hides of herbivorous animals and a very early form of foot covering was the leg hide of an animal including the outside fur or hair. Walking around on fur-clad foot coverings with the hairs pointing backwards, Stone Age humans would have discovered that they could slide forward with ease, but not backward against the direction of the hairs. When someone familiar with this "gliding principle" put fur on the bottom of a wooden snowshoe he would have noticed that it neither stuck to the snow nor slid backwards. This union of a snowshoe—possibly covered by fur—and the gliding motion produced the ski.

The ski was invented at least eight thousand years ago in an area around Lake Baikal in southern Siberia, north of Mongolia. At that time ancestors of speakers of the Ural-Altaic language family were in the area including the forebears of the Sámi. Following the reindeer and other prey, Finno-Ugric peoples expanded their areas of habitation and the forebears of the Sámi eventually migrated west and north into Scandinavia and brought their skis with them.<sup>5</sup> Then, over many centuries, they developed and perfected skis for different types of terrain and snow conditions.

In his book, Nansen had posited central Asia as the area of origin of the ski. Daniel Davidson, in a comprehensive study of snowshoes (1937), suggested that wooden snowshoes and primitive bearpaw snowshoes originated in this same area and spread east over the Bering Strait to the Americas and west, eventually reaching Fennoscandia.<sup>6</sup> Gudmund Hatt pointed out that moccasins and snowshoes go hand-in-hand and saw their point of origin near the northern boundary of Mongolia in the area south of Lake Baikal.<sup>7</sup> In other words, it seems that moccasins, snowshoes and skis evolved in the same Central Asia area. Skis, though, never made it across the Bering Strait. In North America, where there were no skis, snowshoes became so perfected that hunters could attain considerable speed on them. One result, throughout the snowy areas of the northern hemisphere, was the decimation of the wild animal populations, the reindeer and elk in Eurasia, the bison and caribou in North America.

Skis, then, should be seen as having originated as an accessory to the northern hunter, an accessory that soon became indispensable. They were also superior for long-distance communication between villages, and vital for the domestication of the reindeer herds of Eurasia. In fact, skis were so effective that, as early as the thirteenth century, laws had to be created to prohibit or limit hunting during the winter. In 1274, the Norwegian Gulathing law states with reference to elk hunting: "All elks shall be protected within the domain of the property owner from men on skis."<sup>8</sup> The elk cows were pregnant during the winter, and especially easy to overtake on crusty snow through which they sank.

### Early Evidence I: Literary References

In this section I list a few of the many references to skis and skiing throughout Eurasia over more than two millennia. Interestingly, none of the accounts are by skiers; rather they are by writers who may simply have heard about skiing but never witnessed it.

#### Han Dynasty

The Hai Nei Jing, the eighteenth volume of the Shan Hai Jing, a book on various schools of thought during the West Han period of China (206–25 BC), says:

The people of the Dingling Nationality living in the Aletai mountains of Northwest China sped like goats in the valleys and on the flatlands, wearing the "horns of a goat"—a kind of knee-high fur boot under which is a wooden board with a hoof-shaped front tip.<sup>9</sup>

Liu Qilu and Liu Yueye infer from this that skiing activities existed in the mountain range of Aletai [Altai] "between 211 BC and 206 BC, as a popular means for hunting, transportation and war."

#### Tacitus

Cornelius Tacitus (c. AD 55 to c. 117) was a Roman historian whose most celebrated work was the *Germania*,<sup>10</sup> which provides the earliest written material on the Germanic tribes. In describing the Fenni (Finns) he is not sure whether they are Germans or Sarmatians. He goes on to say:

The Fenni live in astonishing barbarism and disgusting misery: no arms, no horses, no household; wild plants for their food, skins for their clothing, the ground for their beds; arrows are all their hopes; for want of iron they tip them with sharp bone. This Lapps hunting is the support of the women as well as of the men, for they accompany the men freely and claim a share of the spoil; nor have their infants any shelter against wild beasts and rain, except the covering afforded by a few intertwined branches. To these the young men return: these are the asylum of age; and yet they think it happier so than to

groan over field labour, be cumbered with building houses, and be for ever involving their own and their neighbours' fortunes in alternate hopes and fears. Unconcerned towards men, unconcerned towards Heaven, they have achieved a consummation very difficult: they have nothing even to ask for.<sup>11</sup>

There is no mention of skiing but, when this description is compared with the following description, it will be seen that the Fenni are in fact the Sámi who were semi-nomadic reindeer hunters at the time. The scant shelter referred to is either the Sámi lavvu, a transportable, tepee-like structure, or the goáhti, a turf hut.

#### Procopius

The Byzantine historian Procopius of Caesarea (AD 490?–562?) accompanied Belisarius on military campaigns. Highly educated and a distinguished public servant, he wrote histories that are well respected because they are in many cases first-hand accounts of the events described. In his *History of the Wars*, VI. xv. 16-23, he writes:

But among the barbarians who are settled in Thule, one nation only, who are called the Scythiphini, live a kind of life akin to that of the beasts. For they neither wear garments of cloth nor do they walk with shoes on their feet, nor do they drink wine nor derive anything edible from the earth. For they neither till the land themselves, nor do their women work it for them, but the women regularly join the men in hunting, which is their only pursuit. For the forests, which are exceedingly large, produce for them a great abundance of wild beasts and other animals, as do also the mountains, which rise there. And they feed exclusively upon the flesh of the wild beasts slain by them, and clothe themselves in their skins, and since they have neither flax nor any implement with which to sew, they fasten these skins together by the sinews of the animals, and in this way manage to cover the whole body.<sup>12</sup>

Skis are not directly mentioned in the above passage, but the name of the people described—the Scythiphini—consists of two parts: scythi, which in Old Icelandic is skriða “to ski,” and phini, which is the modern word Finns, i.e., the “skiing Finns.” The Scythiphini are actually the Sámi of northern Scandinavia who had been skiing for many centuries before this.

#### Paulus Diaconus

Paul the Deacon (c. 725–799?) was a Lombard historian who spent some time at the court of Charlemagne. His main work was his *History of the Langobards*, covering the two centuries from the middle of the sixth to the middle of the eighth century. It is one of the earliest histories of a Germanic nation written by a German. In Book I, Chapter V, he says:

The Scythobini, for thus that nation is called, are neighbors to this place. They

are not without snow even in the summer time, and since they do not differ in nature from wild beasts themselves, they feed only upon the raw flesh of wild animals from whose shaggy skins also they fit garments for themselves. They deduce the etymology of their name according to their barbarous language from jumping. For by making use of leaps and bounds they pursue wild beasts very skillfully with a piece of wood bent in the likeness of a bow. Among them there is an animal not very unlike a stag, from whose hide, while it was rough with hairs, I saw a coat fitted in the manner of a tunic down to the knees, such as the aforesaid Scritobini use, as has been related. In these places about the summer solstice, a very bright light is seen for some days, even in the night time, and the days are much longer there than elsewhere.<sup>13</sup>

Again the people referred to are the “skiing Finns,” but Paul gives a description of skiing, “leaps and bounds with a piece of wood bent in the likeness of a bow.” The animal they hunt that is “not very unlike a stag” is undoubtedly the reindeer.

#### Huan-jù kî

Writing around 976–984, Huan-jù kî has a “description of earth” in which he tells of a people spread out in mountains southeast of the Kirghiz called Pasi-mi, that is, the Baschmil who are related to the Turks. It reads as follows:

In hunting they make use of a foot covering called wooden horse. It is similar to a sled, but the head (the forward end) is high (curved upward). The bottom surface is covered with horsehide so that the tips of the hairs run backwards. When the hunter has tied such boards on his feet and runs down a slope, then he overtakes the fleeing deer. If he runs over a plain covered with snow, he sticks a pole into the ground (the snow) and runs like a ship; in this manner he also overtakes the fleeing deer. The same pole serves him as support when slopes are to be climbed.<sup>14</sup>

These “wooden horses” are nothing other than skis. And it is clear that skis provided hunters with a great advantage over the animals in winter snows. In the fourth century BC Shan-hai-ching (Shan Hai Jing) described Turkish people of the Ting-Ling as having horsehair and hooves from the knee down, i.e., horse feet or wooden horses.<sup>15</sup>

#### Alfred the Great

Alfred (849–899) was king of the West Saxons from 871 until his death. He fought long and hard against the Danes and, after capturing London in 886, concluded a treaty with Guthrum that set up the Danelaw to the north and east, an area where Danish law would be in effect. His greatest achievement came in his reviving Old English literary prose by translating Latin works into Old English, among them Orosius’ universal history that contains an account of the Norse explorer Ottar’s (sometimes written Ohthere) voyages. In Bosworth’s edition (1858) there is the following passage:

... to the north, over the wastes, is Cwénland, and to the north-west are the Scride-Finns, and to the west the Northmen. Ohthere told his lord, King Alfred, that he dwelt northmost of all Northmen. He said that he dwelt northward, on the land by the west sea. He said, however, that the land is very long thence to the north; but it is all waste [desert], save that in a few places, here and there, Finns reside,—for hunting in winter, and in summer for fishing in the sea.<sup>16</sup>

Ottar goes on to tell about his voyage further north and east where he runs into more Finns and then the Biarmians (Karelians). Cwénland is the area around the Gulf of Bothnia that is inhabited by Finns. People of Finnish stock in northern Norway are today called kvensk “Kvens.” Above the Finns are the Scride-Finns, or, as explained earlier, the Sámi.

#### Adam of Bremen

Adam, the historian and archbishop of Hamburg-Bremen, lived in the eleventh century (dates of birth and death unknown). He reports in 1066 that:

Between Norway and Sweden dwell the Wärmilani and Finns and others; who are now all Christians and belong to the Church at Skara. On the confines of the Swedes and Norwegians toward the north live the Skritefingi, who, they say, outstrip wild beasts at running.<sup>17</sup>

This is yet again a reference to the “skiing Finns,” and here Adam mentions only one characteristic of these people, their skiing prowess.

#### Saxo Grammaticus

Saxo (c. 1150 to c. 1220) was Denmark’s first important historian. His *Gesta Danorum* (Danish History) consisted of sixteen books and covered the period from legendary history to his own time. In one place he has a description of skiing by the Skrit-Finns as he calls them:

Within the eastern area of these countries live the Skrit-Finns. In their passion for hunting, these people habitually transport themselves in an unusual manner, having to trace slippery roundabout routes to reach the desired haunts in remote parts of the mountains. No cliff stands too high for them to surmount by some skillfully twisting run.<sup>18</sup>

Saxo did not actually witness what he was describing and later writes:

They devote themselves to magical skills and are expert hunters. Their homes are impermanent, for they pursue a nomadic existence, pitching their dwelling wherever they have caught game. They travel on curved boards and race on them across the snowfields between mountain ridges.<sup>19</sup>

And later:

The Finns have always travelled by gliding swiftly on smooth boards and have complete control of their speed as they race along, so that men say they can be there and gone in a flash, just as they please. The nimbleness of their bodies

and skis combined gives them a practised ease in attacking and retreating.<sup>20</sup>

#### Raschîd ud-dîn

The Persian Raschîd ud-dîn, writing around 1322–25, has the following remarkable description of a Mongolian reindeer-hunting people; probably the Yakut:

Since there are many mountains and forests in their country and since it snows so much, they hunt in the winter a lot on the snow, and, indeed, in the way that they make wooden boards, which they call tschana, get on them, make a rein out of a strap and take a stick in hand. On the snow they then push the stick into the earth, as one propels a boat over water, and then go so fast over steppes and plains, up and downhill, that they overtake "mountain oxen" (reindeer) and other animals. They pull a second tschana as a "hand horse" (substitute horse) to the tschana on which they are mounted (standing), tied to it. They load the slain prey on it, and even if they load up to two or three thousand "mann" (a weight), they glide with the slightest force, that touches them, easily over the snow.... If you haven't seen it, you don't think it possible.<sup>21</sup>

#### Early Evidence II: The Ski in Rock Carvings

There is evidence for the use of skis in the distant past much earlier than the literary evidence, namely, rock carvings depicting skiers that go back as far as the Neolithic or even Mesolithic periods of the Stone Age. The oldest rock pictures are located in northwest Russia near the White Sea; the other, possibly younger, carvings are in Nordland and Finnmark counties, Norway.

Near the mouth of the White Sea, two groups of rock carvings on Bessovy Slédki Island<sup>22</sup> were discovered in 1926, three at Zalavruga<sup>23</sup> in the 1930s and two others at lérpine-Ostrov.<sup>24</sup> The carvings are numerous: Zalavruga has 326 individual pictures, lérpine-Ostrov 31, and Bessovy Slédki 368. They are of Stone Age human figures in action, depicting some of their material possessions and the animals that were important for their subsistence, all treated in a fairly realistic style. It has been suggested that the carvings are 4,000 to 4,500 years old or from the latter part of the Neolithic Age. All of the carvings known up to the mid-1930s were published in a monumental two-volume edition by W. J. Raudonikas: *Les Gravures Rupestres des Bords du lac Onéga et de la mer Blanche* (1936-38). The work is in Russian with a French summary and contains many helpful illustrations and photographs.<sup>25</sup>

Figure 1, which magnificently depicts an entire hunting scene, is from Zalavruga but not in the Raudonikas edition.<sup>26</sup> One can see the tracks of three hunters on skis as well as the tracks of the three elk they are following. In places it appears that the hunters are walking on their skis, perhaps

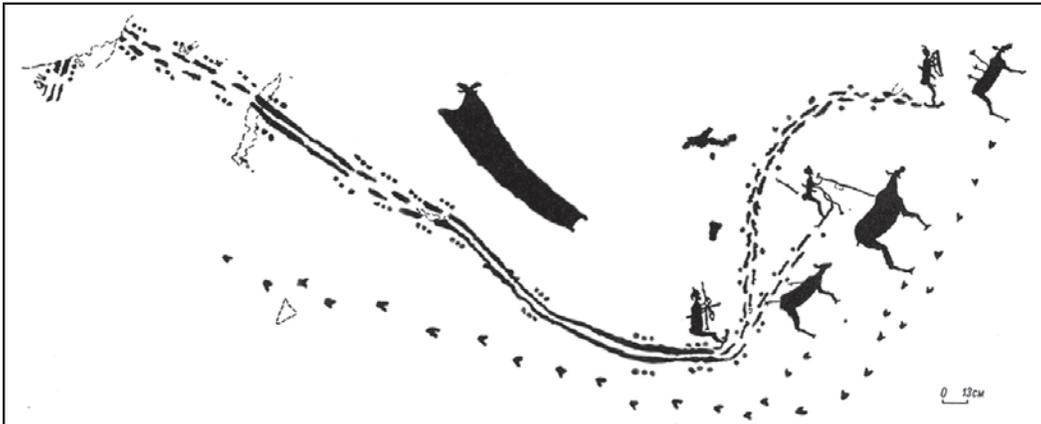


Figure 1. Zalavrouga hunting scene.

going up hill, and in other places there are long tracks, which may indicate that they are going downhill. The hunters are on equal length skis and are using two poles each as can be seen from the dots on either side of the ski tracks. The poles are actually a bow and a spear. Birkely pointed out that the dots, or pole marks, are placed at the front part of the skis, which suggests that the hunters were using the diagonal technique, or double poling, the normal technique used by cross-country skiers today.<sup>27</sup> When the hunters reached their prey, each one attacked an elk. Two of the elk have arrows in them and one seems to have a spear in it.

Figure 2 shows a hunter on skis in action.<sup>28</sup> The human figure has a tail—it was not uncommon for hunters to dress up as animals in order to better commune with nature and facilitate their hunting. The hunter is on skis and has a bow in hand. The line going toward the male reindeer may be a lasso. Birkely mentioned the Sámi word *dolkadit*, which is the equivalent of the Norwegian word *snørekjøre* meaning “to be pulled on skis by a reindeer.”<sup>29</sup> In earlier times a hunter may have caught up with a reindeer or elk in deep snow and thrown a lasso around the animal’s neck. If he were unable to tie the other end of the lasso to a tree, the hunter

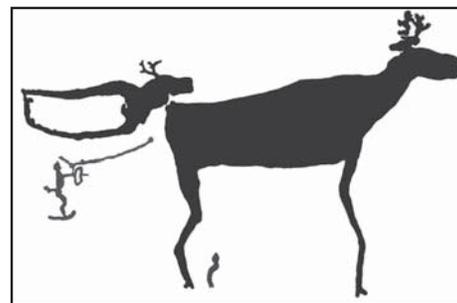


Figure 2. Zalavrouga hunter.

may just have hung on and been pulled by the reindeer until it became tired. This would have been a way to capture a reindeer or elk and tame it so that it could later be used as a decoy animal.

The first of the Norwegian rock carvings were discovered in 1929 during peat cutting at Rødøy in Helgeland (see Figure 3).<sup>30</sup> In 1933 the Norwegian archaeologist Guttorm Gjessing found part of the rock bared; figures of elk, seals and a boat could be seen. The carvings were done by a hunting society similar to the one that produced the Russian carvings.

The skier in Figure 3 has on an animal cap that looks something like a rabbit's head.<sup>31</sup> He is holding some sort of implement with both hands, probably an ax. His knees are bent in good skiing style, though Birkely suggested this might be another example of *dolkadit* with the knees bent to make it easier to be pulled by a reindeer. Note that the two skis are of equal length. These rock carvings are about the same age as the White Sea and Lake Onega carvings or slightly younger. They have been dated at about 4,000 years old.

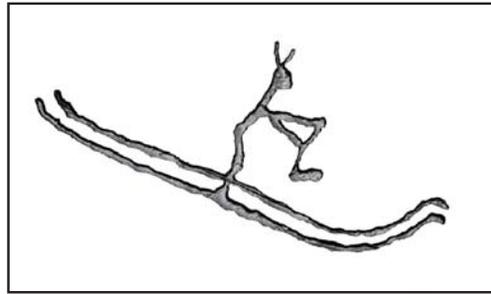


Figure 3. Rødøy rock carving.

There is also a skier in a rock carving field in Alta in Finnmark county in Norway (Figure 4).<sup>32</sup> The skier would seem to be in the process of shooting with a bow and arrow with his right arm pulling the bow. He has his skis at an angle to provide good support for shooting. This rock carving has been dated at somewhere between 1000 and 500 BC.



Figure 4. Rock carving of a skier from Alta in Finnmark county, Norway.

### Early Evidence III: Skis Found in Peat Bogs

Skis found in peat bogs in Finland, Norway, Sweden and Russia provide evidence for skiing even older than the rock carvings. Wood normally deteriorates rapidly over time when exposed to air; however, it can be preserved for thousands of years if it is buried in the acidic environment that wet peat provides. To the present, more than three hundred skis, ski pairs and fragments of skis have been discovered since the first ski was found in Finland in 1897 and brought to the attention of ethnologists.<sup>33</sup>

A number of scholars from these countries attempted to date the finds and to classify them as to type. However, it was not until 1933 that pollen analysis methods developed in Sweden were used in an effort to obtain more precise dates of when the skis had been buried in the bogs. According to this method, geologists arrive at an approximate date for a given find by determining the amount of different kinds of flower dust, pollen, etc., of the coniferous and deciduous trees found in the particular layer where the ski was found. Several decades later, a much more precise meth-

od of dating organic materials became available, the so-called  $^{14}\text{C}$  method. After the organism dies the amount of  $^{14}\text{C}$  absorbed during its life from the air around it is lost (decays) with a half-life of 5,568 years.<sup>34</sup> In other words, by measuring the amount of  $^{14}\text{C}$  in an organic artifact of unknown age, it is possible to determine the number of radiocarbon years since the organic material was alive. Then, the radiocarbon years are matched, or calibrated (cal.), to calendar years using a long-lived organism such as the bristlecone pine. The result is a very accurate estimate of age.

Of the forty Swedish finds that Gösta Berg discussed in his 1950 book, twenty-one could be dated through pollen analysis.<sup>35</sup> They varied in age from the Hoting ski that was estimated to be 4,500 years old to others that could be as recent as our own era. The number of Swedish finds neared a hundred by 1995. The Finnish finds (more than 125) include the Riihimäki ski originally thought to date from the final phase of the Stone Age, about 1500 BC. There were about twenty-five finds in Norway including several grave- and glacier-finds. These dates, though, have changed considerably now that more precise  $^{14}\text{C}$  results have become available. One caution with the  $^{14}\text{C}$  method must be kept in mind: though it yields a very accurate estimate of the age of the wood, the skis actually produced from that wood might be considerably younger.<sup>36</sup>

What is most remarkable about these bog skis is the extreme variation in form and features they display. First of all, it must be stressed that many of the ski types existed alongside one another over thousands of years; therefore, any evolutionary typology will be problematic. Ørnulv Vorren compared five bog skis found in different parts of Sápmi (the Sámi area of northern Fennoscandinavia and the Kola Peninsula) and varying in age from about 250 BC to AD 1435. He found a close correlation between the features of the individual skis and the types of terrains where the skis were used.<sup>37</sup> Second, some of the bog finds cannot be classified because they are fragments; they may lack the footrest upon which the classification below is based. Often they are just the front tips of skis. We will see below that the oldest bog skis are actually very advanced in some of their features. Over the years, the Swedes Wiklund, Berg and Manker and more recently the Finn Naskali and the Norwegian Sørensen have suggested several typological classifications or refined earlier groupings.<sup>38</sup> The typology presented here is based on Manker's three categories; it varies from Naskali's in that it does not have a separate category for prehistoric skis.<sup>39</sup>

#### Type A

This type has a low footstep with vertical pairs of holes for the binding strap, a flat bottom and no grooves. Consider the Kalvträsk find from Västerbotten, Sweden (Figure 5) consisting of a ski, a fragment of another ski, and a

pole with one end shaped like a shovel, all made of pine.<sup>40</sup> Pollen analysis yielded an age of just under 4,000 years, but radiocarbon (<sup>14</sup>C) results indicated that these items were much older; they date from cal. 3623–3110 BC and are among the oldest bog skis.<sup>41</sup> The whole ski is flat on the bottom and has a flat foot space on top with four vertical holes going through the ski in pairs.

On top of the ski there is a ridge in front of and behind the foot space that makes the ski stiffer. There are narrow grooves on the bottom of the ski running lengthwise between the pairs of holes. In this way a thong passing through the holes and grooves functions both as toe strap and heel strap. The ski is cut straight across at the back.

Parallels to this ski existed until fairly recently among a number of Siberian peoples, though

many of their skis come to a point in the rear, undoubtedly to facilitate attaching a fur covering on the underside with hairs pointing backward. Wiklund called this the Arctic ski type because of its Eurasian distribution. The Kalvträsk ski is one of only two Arctic skis among the bog finds.<sup>42</sup> The Arctic ski is Type A in Ernst Manker's typology: low footrest with vertical binding hole pairs, flat bottom and no grooves.

### Type B

This type has a lowered footstep—either hollowed out of the ski itself or with lists nailed onto the sides (list, a narrow strip of wood). Each side has a horizontal hole so that a binding strap can pass through the holes and over the foot. The Riihimäki ski, found some 70 km. north of Helsinki, Finland, is younger than the Kalvträsk ski with a <sup>14</sup>C date of cal. 3 BC–AD 257 and of a very different design.<sup>43</sup> The ski has a flat bottom and is cut straight across at the back. The foot space has been lowered so that a thong could pass through holes in the outside edges or lists to secure the foot. In a later

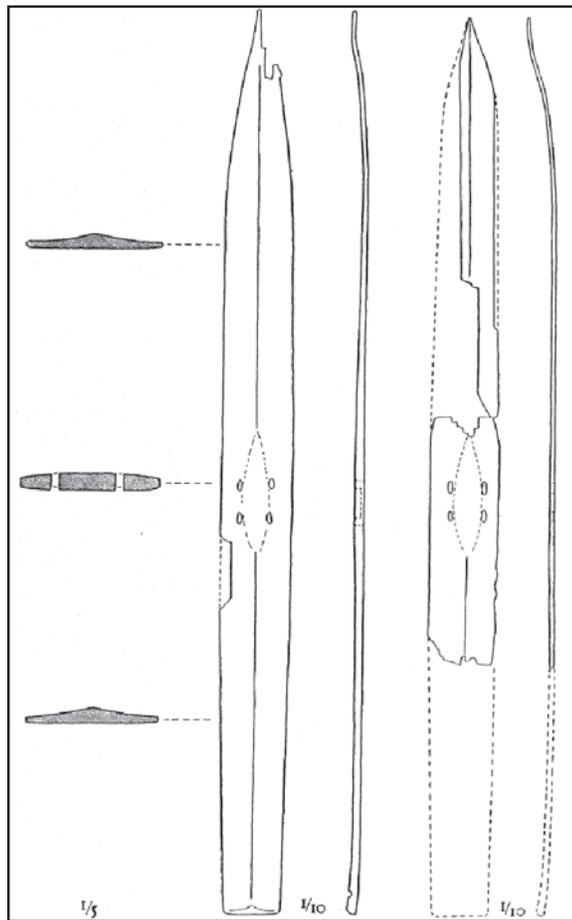


Figure 5. The Kalvträsk find, Västerbotten, Sweden.

development of this binding method the lists are nailed to the ski rather than being part of the original ski material. This ski is an example of what is called the Southern<sup>44</sup> ski type, first of all, because in Fennoscandia this sort of ski is found toward the south, and, second, because similar skis are found in the Baltic countries, Poland, Russia and possibly Yugoslavia.<sup>45</sup> This Southern type may have been brought north during the Indo-European expansion into Fennoscandia from 4,000–3,000 BC. The Southern ski was more common in areas where it was not so vital to subsistence patterns and where there was not as much snow. A common feature of the Southern ski is a hole at the tip through which a steering rope can be attached. In Manker's typology, the Southern ski is Type B: low footrest between side lists with horizontal binding holes through them, flat bottom and no grooves. Not many examples of this type are found in the bogs in the south of Scandinavia; the reason for this may be that the kinds of wood found in the south, birch, for example, were not as resistant to rotting as the coniferous woods further north. However, this type of ski was in use in southern Sweden and western Norway into the current century. It is interesting to note that the Komi, a Finnic people of the northeastern part of European Russia formerly called the Zyrians, use the Arctic ski type with a fur covering for hunting on the tundra where the snow is often crusty. However, in the forest where the snow is loose, they use the Southern type with a dugout foot place. The wide southerly distribution of the ski type suggests that it is very old.

### Type C

This type of ski has a raised and indented footstep with a horizontal hole through which a binding strap goes below the foot. The bottom may be without grooves (C 1) or with grooves (C 2). Type C 1 is further divided according to whether the bottom of the ski is flat or slightly convex. Type C 2 is subdivided according to whether the bottom has a wide groove or side lists (C 2 a) or narrow grooves (C 2 b).

Type C 1 a: This ski has a flat bottom, no grooves and lacks ornamentation. One example is the Liperi 1 ski.<sup>46</sup> It has a rounded back end and dates from cal 450 BC.

Type C 1 b: Gösta Berg termed this ski type the Bothnic ski in 1933.<sup>47</sup> It is relatively short in length and slightly convex on the underside; it gradually comes to a point at both ends. The footrest is raised and inset from the side edges and it is slightly concave so that footwear such as the moccasin would fit in it. There is a horizontal hole beneath the footrest for the toe strap. Most of the Swedish bog skis are of this type; they date from after cal. AD 1, and they are the only Swedish bog skis with a pointed back end. An example is the Arvträsk ski (Figure 6) from Swedish Lappland, which is

about a thousand years old or somewhat younger.<sup>48</sup> It was found together with a fragment of a ski that probably made up a pair with it.

Many of these Bothnic skis are decorated, some with rather intricate braided patterns. A fine example of the decoration is the Kinnula 1968 ski from Central Finland radio-carbon dated at cal. AD 650.<sup>49</sup> Berg pointed out that this sort of braided pattern is found on other objects of wood and horn that are common in the area around Birka. It was a popular form of ornamentation in central and south Sweden during the Viking period. Wilhelm Holmqvist, a Swedish archaeologist who examined the ornamentation on Swedish skis, dated them to between AD 1000 and 1200.<sup>50</sup> If this is so, then the AD 650 date of the Kinnula ski would suggest either that the wood is older than the ski or that the decoration

was added later. The Sámi who traded in skins with the Swedes may well have borrowed the braiding idea from them and gone on to develop it to perfection. Berg concludes that the Bothnic ski type represents the final stage of development with most of the influences coming from the south. If this is correct, the Bothnic ski did not come with the Sámi when they migrated into Fennoscandia but evolved there.

Type C 2 a: This type is represented by the Furnes ski found in Hedmark, some sixty-five miles north of Oslo, Norway; it was first dated to AD 150 using an earlier <sup>14</sup>C half-life, determined with less accurate equipment; this date has been revised to cal. AD 70–200.<sup>51</sup> The Furnes ski, constructed of pine, has a raised and indented footrest. The side lists on this wider ski are not at the outside edge of the ski but moved inward so as to provide support on either side of the foot, and there is a horizontal hole running across and through the entire ski below the footrest. This binding arrangement provides much more stability than the Southern type discussed above. Moreover, the Furnes ski has steering rims running lengthwise along the bottom of the ski at the outside edges that help the ski move in a straight line. They are important for long skis, and the Furnes ski may have been

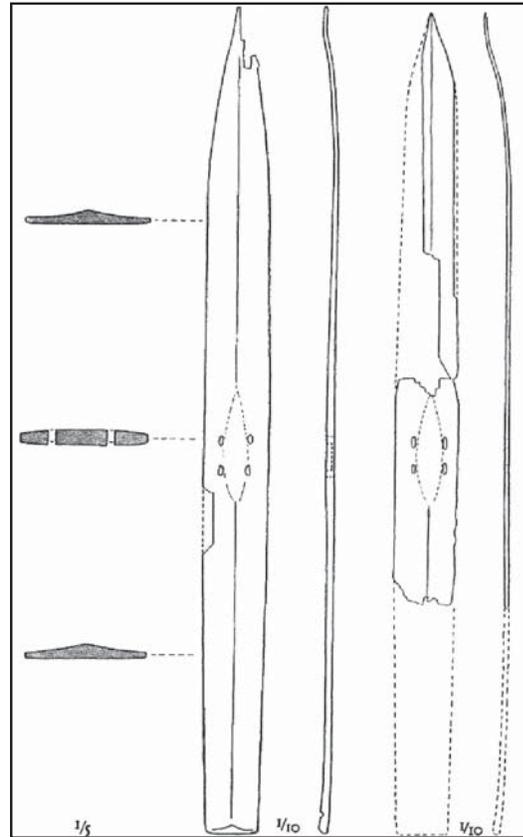


Figure 6. The Arvträsk ski, from Swedish Lapland, is about a thousand years old.

eight feet (2.44 m) long. These steering rims may have been the forerunners of grooves.

There is a similar ski—also of pine—found at Färnäs in Dalarna, Sweden and carbon dated at cal. 360 BC.<sup>52</sup> It has the inset footrest with a horizontal hole across the ski below it. These skis are all representatives of what Gösta Berg calls the Scandic type whose main feature is the raised, indented footrest with horizontal binding hole.<sup>53</sup> This is Manker's Type

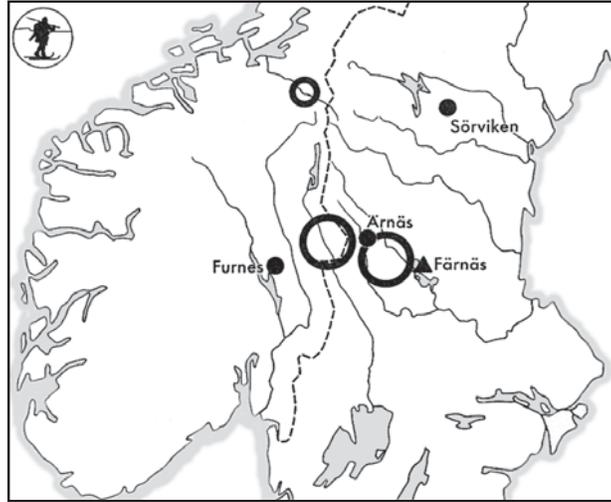


Figure 7. Map showing the areas in Sweden and Norway where Scandic skis have been found (small circles and triangles).

C4. They are all quite wide. The Scandic type represents an advance over the Southern and Arctic skis: in areas of heavier snow cover a stronger and more durable binding was needed. Since the ski became wider the footrest was raised and indented to accommodate a horizontal binding hole running across the entire width of the ski. Figure 7 shows the areas in Sweden and Norway where Scandic skis have been found.<sup>54</sup> Generally, C 2 a skis are not ornamented.<sup>55</sup>

Type C 2 b: This final group of narrow skis—with narrow grooves—includes one of the older bog skis. The Salla ski from the Särkila area of Finland is <sup>14</sup>C dated at cal. 3345–3145 BC and has five parallel grooves on the bottom.<sup>56</sup>

Inger Zachrisson, et al., have recently demonstrated convincingly that, from about 1000–800 BC to AD 1000–1200, the Sámi were settled in all of central and north Sweden and Norway and did not migrate south from northern Scandinavia as scholars had previously thought.<sup>57</sup> Hence, almost all of the Scandinavian bog skis have been found in areas where the Sámi had lived for thousands of years.

### Grooves

With regard to the origin of the ski groove on the bottom of the ski that helped the ski steer straight, one first of all has to distinguish between grooves that developed naturally and those that were cut into the skis.<sup>58</sup> Natural grooves came about through wear and tear on skis made from certain types of wood, especially fir. If the wood was cut with the rings vertical, the skis would tend to develop natural grooves on the bottom as the softer wood wore away. The latter, man-made groove seems to have de-

veloped out of the older skis with steering rims (C 2 a). Steering rims must be very old: they are clearly seen on the Vis I fragment that is more than 8,000 years old—see the discussion below. The first stage was a relatively broad, flat-bottomed groove taking up about one third of the ski's width. The oldest example is the Ikaalis ski from southwestern Finland dated at cal. AD 290–550. The groove gradually spread northward and eastward, ultimately turning into the narrow groove (C 2 b).<sup>59</sup>

### Bindings

Though the classification of bog skis above is based on binding type, very few bog skis have been found with bindings or binding fragments. However, in 1991 a ski was found in Mänttä, Finland with the remains of a bast front binding and leather strap rear binding dating from the fifth century AD.<sup>60</sup> This type of binding, the so-called Selbu binding—a withe toe loop plus a leather thong at the rear—was still used at the end of the last century in Norway.<sup>61</sup> From this Vilkuuna concludes that a binding developed during the Iron Age stood the test of time and lasted for centuries.

### Early Bog Ski Fragments

Among the oldest bog skis is the back end of a ski from Drevja in Vefsn, Nordland, Norway<sup>62</sup> with a <sup>14</sup>C date of cal. BC 3343–2939. Sørensen points out that the wood is so knotty and the annual rings so crooked that it could not have been used to glide on; rather it must have been fur-covered. The tips from Vis I in the Vychegda basin near the Vis River, excavated by Grigoriy Burov, have been carbon dated to between cal. 6709–5763 BC. Due to the absence of holes toward the front, the symmetry of the artifacts, and the flat bottom surface, Burov interprets them as skis rather than sledge runners.<sup>63</sup> Figure 8, a ski tip that Burov calls the Vis-type, is the older variety from the site and is thus probably more than 8,500 years old. It is made of hardwood. Note the steering rims at the outer edges.

The ski fragment in Figure 9, though not as old as the Vis-type, is even more remarkable. Burov calls it the Veretye-type. On the lower surface there is a carved projection—an elk's head—pointing backwards. It could have served as a brake to prevent reverse movement over packed snow and to prevent lateral displacement of the ski tip. This somewhat younger fragment, made of softwood, does not have the rims of the Vis type.<sup>64</sup>

### The Sámi and the Evolution of Skiing

The references to skiing and skis presented in the first section involve a wide range of groups from the Turkic people of eastern Asia northwest to the Sámi of northern Scandinavia. The Sámi were mentioned often, and I have suggested that Norwegians and Swedes learned much about skis

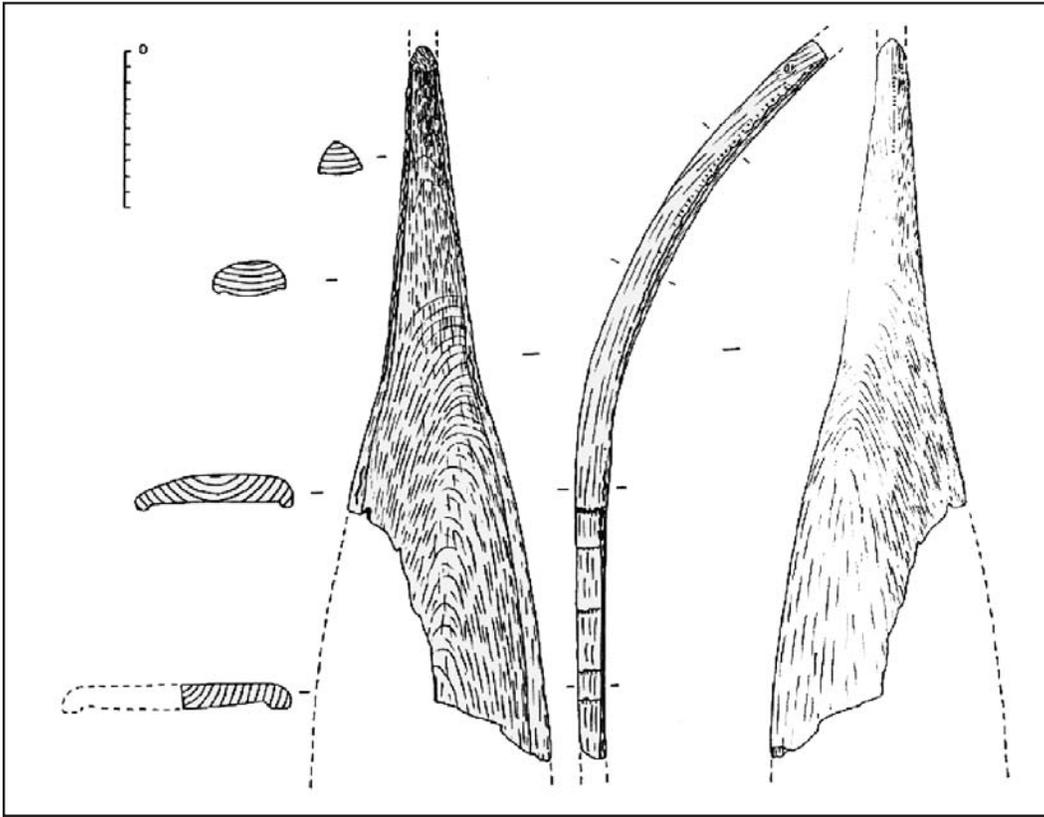


Figure 8. Vis-type (after Burov) ski tip found in the Vycheгда basin near the Vis River.

from the Sámi. Who are the Sámi? What do we know of their history? And what did skiing mean to them? A detailed look at the Sámi will provide clues to the evolution of the ski.

The Sámi are an Indigenous people inhabiting the northern portions of Norway, Sweden, Finland and Russia, numbering up to 60,000 today depending on what definition one uses.<sup>65</sup> Roughly seventy percent of the Sámi live in Norway in Finnmark and Troms counties, around 17,000 in Sweden as far south as Härjedalen and Jämtland, some 7,000 in northern Finland and about 2,000 in Russia in the Petsamo and Kola Peninsula areas.

Sápmi today covers a large area from the White Sea (Russia) in the northeast to Lake Femund south of Røros in Norway. Along the extensive coastline, which is cut by numerous fjords, there is a relatively moderate climate, thanks to the Gulf Stream. Mountains run right down to the sea-coasts, and forests cover much of the area with deciduous trees such as birch, willow and alder and coniferous trees such as fir in the North and spruce in the South. Forest vegetation consists mainly of heather and reindeer lichen as well as other types of lichen. Heather and grass are found in the treeless mountain and coastal areas.

Speculations about the origins of the Sámi began in earnest in the

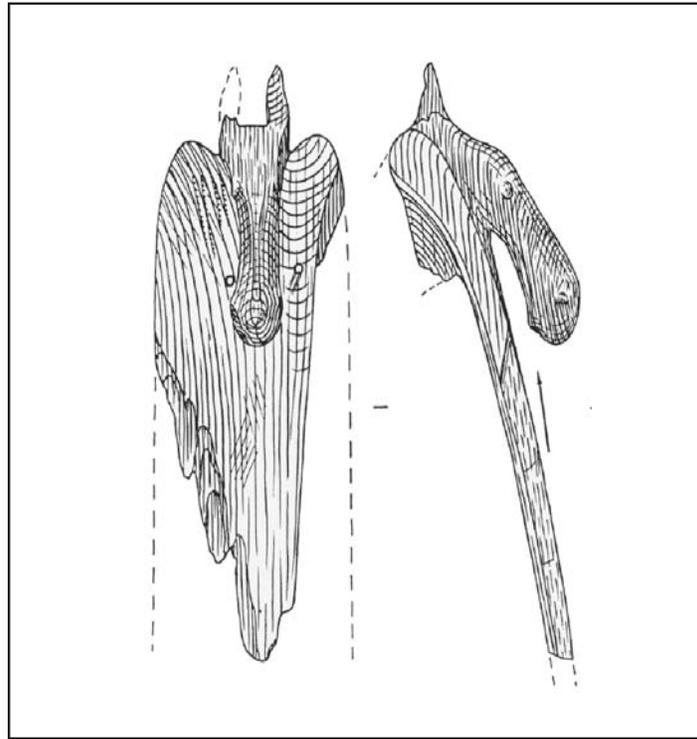


Figure 9. Veretye-type (after Burov) ski fragment, with a projection, carved as an elk's head, on the lower surface pointing backwards. The projection might have served as a brake.

seventeenth century when Johannes Schefferus<sup>66</sup> reiterated the widespread assumption that the Sámi had originated as far east as Asia and had migrated through the inner part of the continent to Finland and on into the coastal districts of Fennoscandia. If the Sámi had migrated into Fennoscandia so early—while the ice sheet covered most of the Scandinavian peninsula—they would have had to follow the ice-free coast. Stone Age tools found at the Komsa sites in northern Norway provide evidence that there were people living along the coast of the Varanger Peninsula as far back as the glacial period more than 10,000 years ago. We do not know who the people of the Komsa culture were, dwelling in the North that long ago. Refuse heaps suggest that these people ate a wide range of animals, fish and birds. The weapons and tools are excellently shaped out of stone, horn and bone. There are somewhat younger artifacts about 4,000 years old found at sites where earth houses or turf huts stood—the so-called Fosna culture—in present-day southern Norway between Oslo and Bergen.<sup>67</sup> And in central Finland the Suomusjärvi culture was found with affinities to the Komsa culture and going back as far as 7000 BC. Since similar artifacts are found at dwelling places throughout the area where the Sámi now live, there would seem to be a connection between them. More recent

gravesites and dwelling sites contain objects even more typically Sámi.<sup>68</sup> The extent of the archaeological finds suggests that most of Fennoscandia was occupied by the late Stone Age, albeit sparsely.

Rather than speaking of a people such as the Sámi migrating into Fennoscandia from the south or east we should speak of “spreading cultural complexes with central traits that were shaped by influences from both west and east” as Lehtola puts it.<sup>69</sup> The western, Indo-European, influence began during the period 4000–3000 BC when the agrarian, Battle Axe culture began to enter Fennoscandia, after which a distinct Sámi cultural identity gradually began to develop. By 1000 BC there was a hunter-gatherer culture throughout most of Fennoscandia and an expanding agrarian culture along the coasts to the south in Finland, Sweden and Norway. Linguistic history affirms the developments taking place on the Fennoscandian peninsula.

Sámi is a member of the Finno-Ugric language group, which includes Sámi, Finnish and Hungarian among others. The Finno-Ugric group together with the Samoyed language makes up the Uralic sub-group of the Ural-Altai language family. Sámi and Finnish are not mutually intelligible, but they are quite close because they have the same basic structure and have borrowed many words from one another.<sup>70</sup> Sámi has also borrowed many words from Norwegian and Swedish, some of them so old that they have preserved their Old Norse forms. Pekka Sammallahti published a detailed study of the Sámi language and its history in 1998. He reconstructed a Finno-Saamic protolanguage that did not begin to split until “after the introduction of the Indo-European Battle Axe culture to the coasts of Finland about 3200 BC.”<sup>71</sup>

One of the enigmas about Sámi origins has always been that Sámi and Samoyed share quite a few vocabulary items and morphological features not found in the other Finno-Ugric languages. Roughly one hundred stems that Sámi and Samoyed share go back to Proto-Uralic, an earlier stage of the language spoken about 4500 BC.<sup>72</sup> This would suggest contact between the Sámi and Samoyed around 4500 BC or earlier, after which ancestors of the Sámi emigrated from their previous home, located in the region of the Urals Mountains, to follow the reindeer herds northward as the ice sheet continued to retreat from Fennoscandia. Sammallahti demonstrated a long history of contact between Sámi and neighboring languages. Thousands of words were borrowed from the Indo-European language family, some of them from as early as seven thousand years ago. Once the forebears of the Sámi reached Fennoscandia they came in contact with and were influenced by Neolithic groups living south of them near the Baltic and in northern Scandinavia. Judging from the language contact evidence and the long practice of intermarriage between the Sámi and their neighbors, it is most likely that the Sámi gradually merged with descendants of

the Komsa, Suomusjärvi and Fosna cultures.<sup>73</sup>

If we look at linguistic evidence presented in Nansen's Paa ski over Grønland the origins of the Sámi become somewhat clearer. He had librarian Andr M. Hansen investigate the words for ski in the languages of northern Eurasia, the area where skis are likely to have been used for thousands of years. Hansen then produced a map of these words (see Figure 10).<sup>74</sup> It turned out that none of the main Indo-European words for ski was original. For example, the word ski itself is cognate with English skid "piece of wood or to slide." Skid is derived from the Indo-European root \*skhait, skhit "split" so its original meaning had nothing to do with skis. Hansen was able to reduce a myriad of names for ski to three main families of names, all of which led back to the Lake Baikal area.

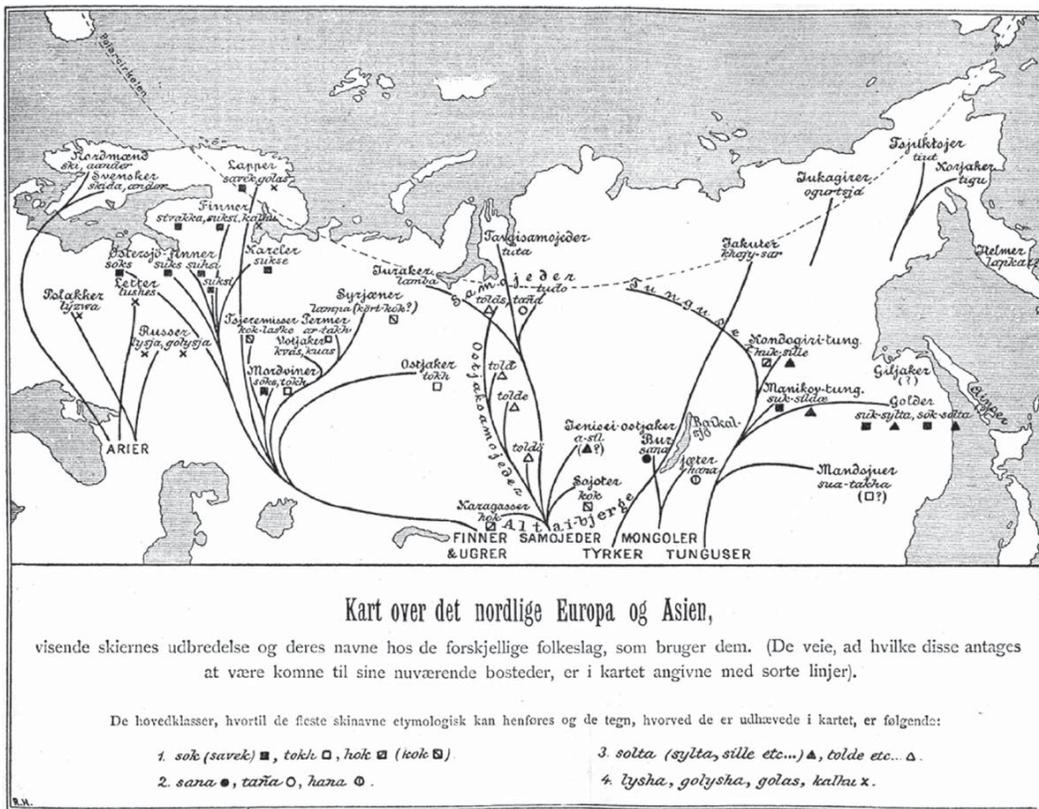


Figure 10. Andr M. Hansen's map of the words for ski in the languages of northern Eurasia.

The most important family is the suks group. One of the Sámi words for ski is sâbek. Finnish has the word suksi; Finno-Ugrian peoples between Lake Ladoga and Lithuania have suhsi, suksi, suks and soks; far to the east the Tungus have the word suksylta, the first part of which is related to the above words; and the Golds have soksolta. All the words of this first group are original words for ski. The second family is the solta group. This appears

as the second member of the compounds mentioned above; the Samoyeds have tolds, which is related to solt. It should be pointed out that there are errors of detail in Hansen's map.<sup>75</sup> Problems notwithstanding, the map strongly suggests that the forebears of Ural-Altai peoples invented the ski in the area of Lake Baikal not far from the Altai Mountains. So it is likely that the ancestors of the Sámi migrated many millennia ago from central Asia to their present home bringing skis with them. The migration was undoubtedly a lengthy process induced by the warming of the climate and the movement of reindeer and other prey further north. There were stopping points along the way, some during periods of time before the Sámi split off from most closely related Finno-Ugric tribes—for example, in the Urals.

One can almost read Sámi subsistence patterns in their language, which has evolved and been honed over thousands of years to describe Arctic nature. The language is rife with words and phrases for the concepts that were essential for exploiting natural resources and for their very survival as hunter-gatherers. It is not surprising, then, that the areas of the vocabulary having to do with reindeer, grazing conditions, snow conditions and skiing are extensive.<sup>76</sup> Nils Jernsletten lists 49 words used to distinguish between reindeer by age, sex, hair color and antler type. There are 108 words for different types of snow and ice conditions. "Sami descriptions of landscape can function as maps, in which are incorporated topography, geography and information as to which routes are best to take."<sup>77</sup> Yngve Ryd, with the Sámi Johan Rassa as his informant, lists over 320 South Sámi words for snow.<sup>78</sup>

By the early seventeenth century, heavy taxes, paid by the Sámi in reindeer hides and meat, had depleted the wild reindeer in Fennoscandia. Those Sámi who had lived primarily from wild reindeer were forced to alter their subsistence patterns. The answer was a move toward reindeer pastoralism on a large scale.<sup>79</sup> This was not an entirely new subsistence strategy. The Sámi had always kept a few tame reindeer that were used as decoy or draft animals. Indeed, there are reports of tame reindeer as far back as the fifth century AD.<sup>80</sup> In the ninth century, Ottar reported having a herd of 600 reindeer including six prized decoy animals, though the animals may have belonged to Sámi who paid taxes to Ottar. It seems likely that from Ottar's time on reindeer nomadism developed gradually.

The nomadic lifestyle required a material culture that was not overly burdensome. Traditionally, everything that was to be transported during periods of migration was loaded onto sleds pulled by reindeer or put on the backs of the reindeer themselves. Adults were usually on skis for these seasonal movements. Skis had always been essential to Sámi reindeer hunters, but once nomadism was established skis became even more vital. Now the herders had to protect the herds from predators such as wolves and bears.

Skis were an extremely important part of Sámi material culture, es-

pecially that of the reindeer nomads. Skis were used to follow the reindeer herds and were used to hunt wild reindeer and other prey in ancient times. Snowshoes are not found among the Sámi. If they existed at one time, they were completely replaced by skis.

### Conclusion

When the ancestors of the Sámi arrived in Fennoscandia, they were no doubt using skis similar to the Kalvträsk ski, that is, like skis found among the Zyr-ian (Komi), Samoyed, Chukchi, Lamut and even the Ainu. Then, over the succeeding millennia they altered and perfected their skis—probably under influences from the south—so that they became more efficient as accessories to the hunt and in different terrain. The fact that most of the rock carvings and the over 300 bog skis have been found in areas that were occupied almost exclusively by the Sámi 3,000 or more years ago strongly supports the conclusion that the Sámi played a vital role in bringing skis to Scandinavia, in perfecting them there, and in teaching others how to use them.

### About the Author

John Weinstock is a professor at the University of Texas. He is the author of *Skis and Skiing From the Stone Age to the Birth of the Sport* (Lewiston, NY: The Edwin Mellen Press, 2003).

### Endnotes

1. Nansen 1890.
2. For more of the early history of skiing, see Weinstock, *Skis and Skiing From the Stone Age to the Birth of the Sport* (Lewiston, NY: The Edwin Mellen Press, 2003).
3. Burov 1985: 392.
4. Birkely 1994: 12.
5. Dresbeck 1967: 469 sees the ski emerging in northern Scandinavia. Then it would be difficult to account for skis found throughout Eurasia unless one could show that they arose independently in various places.
6. Davidson 1937: 49.
7. Hatt 1916: 247-48.
8. Vaage 1969: 10.
9. Goksøyr 1994: 70.
10. Tacitus 1970: 213, 215.
11. The Sarmatians were closely related to the Scythians and may have spoken Proto-Slavonic.
12. Procopius 1919: 419, 421.
13. Paulus Diaconus 1906-07: 7-8.
14. Schott 1864: 448.
15. Luther 1962: 8.
16. Alfred 1858: 38-39.
17. Adam 1959: 205-06.
18. Saxo 1999: 9.
19. *Ibid.*: 153.
20. *Ibid.*: 287.
21. Schott 1864: 448; Luther 1926: 502; Meuli 1975: 787.
22. Raudonikas 1938: 59-90.
23. *Ibid.*: 25-52.
24. *Ibid.*: 53-58.
25. *Ibid.*: 19-38.
26. Åström 1984: 86.
27. Birkely 1994: 35-36, 81-82.
28. Raudonikas 1938, Planche 2.
29. Birkely 1994: 81.

30. Gjessing 1936: 185.
31. Bø 1992: 18.
32. Helskog 1988: 59-60; Bø 1992: 18.
33. Appelgren-Kivalo 1911; Sørensen 1996: 7.
34. The program CALIB, at <<http://radiocarbon.pa.qub.ac.uk/calib/index.html>> was used to convert radiocarbon age to calibrated calendar years. All of the 14C dates presented here are at the (1-sigma) confidence level, or 68.3%. "Cal." means "calibrated" rather than "calendar."
35. Berg 1950.
36. Sørensen 1996: 44-47.
37. Vorren 1998: 19.
38. Wiklund 1931, 1933; Berg 1950, 1951; Manker 1971; Naskali in Vorren 1995; Sørensen 1993, 1995, 1996.
39. Vorren 1995: 13.
40. Berg 1950: 114-20.
41. Åström 1993.
42. Wiklund 1931: 5-50; Berg 1933: 143-46; Zettersten 1934: 7-10.
43. Itkonen 1937: 72-73; Berg 1950: 24.
44. Wiklund 1931; Berg 1933: 149-58; Zettersten 1934, 1938, 1939.
45. Wiklund 1931: 28; Zettersten 1939: 402; På skidor 1936: 351; Wiklund 1928: 13.
46. På skidor 1937: 75; Naskali in Vorren 1995: 74.
47. Berg 1933: 158-63; Berg 1950: 23, 25.
48. Berg 1950: 90-93; Åström 1984: 85.
49. Itkonen 1937: 83; Vilkuina in Vorren 1995: 67-68.
50. Holmqvist 1934: 273.
51. Zettersten 1932: 24; Bø 1966: 14; Sørensen 1993: 97.
52. Berg 1950: 153-57.
53. Ibid.: 146-49.
54. Zettersten 1942: 14.
55. Berg 1950: 127-31.
56. Naskali in Vorren 1995: 72.
57. Zachrisson 1997: 240-49.
59. Tomasson 1928: 24.
59. Valonen 1980: 222; Sørensen 1996: 14 and 11-18.
60. Vilkuina 1998: 70-75.
61. Bø 1968: 41.
62. Sørensen 1993: 107.
63. Burov 1985: 393.
64. Ibid.: 394.
65. If a person considers him- or herself to be a Sámi and either speaks a Sámi dialect or had a Sámi parent or grandparent who spoke Sámi at home, then he or she is counted as a Sámi.
66. Schefferus 1673. See Lindkjølen 1994 for a nice discussion of Schefferus.
67. Wiklund (1948: 6-7) theorized that the Proto-Sámi would winter along the ice-free coasts of northern Norway and spend the summer in the Møre and Romsdal area where Fosna culture artifacts were found.
68. Schanche in Vorren 1994.
69. Lehtola 2002: 19.
70. Sørensen 1996: 53.
71. Sammallahti 1998: 2.
72. Ibid.: 118.
73. Möten i gränsland.
74. Nansen 1890: between 96-97; Wiklund (1926: 2) found the map dilettantish and worthless but did not go into detail.
75. Valonen (1980: 104) says that the Sámi term for ski, *savek*, lacks parallels in the other Finno-Ugric languages.
76. Jernsletten 1997: 86.
77. Gaski 1997a: 13.
78. Ryd 2001.
79. Laufer 1917; Vajda 1968.
80. Sarauw 1913; Laufer 1917: 93.

## Bibliography

- Adam of Bremen. History of the Archbishops of Hamburg-Bremen. New York: Columbia University Press, 1959.
- Alfred. The Whole Works of King Alfred the Great. London: Bosworth & Harrison, 1858.
- Appelgren-Kivalo, Hjalmar. "Muinaisajan suksista." Suomen museo 18, 1911: 7-16.

- Association for the Promotion of Skiing. History of skiing conference: Holmenkollen, Oslo, 16.-18.9.1998. Oslo, NO: Foreningen til ski-idrettens fremme, 1998.
- Berg, Gösta. "Förhistoriska skidor i Sverige." På skidor, 1933: 142-169.
- . Finds of Skis From Prehistoric Time in Swedish Bogs and Marshes. Stockholm, SE: Generalstabens litografiska anstalts förlag, 1950.
- . "Nya fynd av förhistoriska skidor i Sverige." På skidor 1951: 181-186.
- . "Skidor." In Kulturhistorisk leksikon for nordisk middelalder fra vikingetid til reformasjonstid, Vol. 15. Stockholm, SE: Gyldendal, 1970: 496-500.
- Birkely, Hartvig. "I Norge har lapperne først indført skierne." Iðut, 1994.
- Burov, Grigoriy M. "Some Mesolithic Wooden Artifacts from the Site of Vis I in the European North East of the U.S.S.R." In The Mesolithic in Europe: papers presented at the third International Symposium, Edinburgh, 1985. Edited by Clive Bonsall. Edinburgh, UK: J. Donald, 1990: 391-401.
- Bø, Olav. Norsk skitradisjon. Oslo, NO: Samlaget, 1966.
- . Skiing Traditions in Norway. Oslo, NO: Samlaget, 1968.
- . På ski gjennom historia. Oslo, NO: Samlaget, 1992.
- Davidson, Daniel S. Snowshoes. Vol. VI of Memoirs of the American Philosophical Society. Philadelphia: The American Philosophical Society, 1937.
- Dresbeck, LeRoy J. "The Ski: Its History and Historiography." Technology and Culture 8, October, 1967: 467-79.
- Gaski, Harald. Sami Culture in a New Era: The Norwegian Sami Experience. Karasjok, NO: Davvi Girji OS, 1997a.
- . In the Shadow of the Midnight Sun: Contemporary Sami Prose and Poetry. Karasjok, NO: Davvi Girji OS, 1997b.
- Gjessing, Gutorm. Nordenfjelske ristninger og malinger av den arktiske gruppe. Oslo, NO: Aschehoug, 1936.
- Goksøyr, Matti, et al. Winter Games, Warm Tradition: Selected Papers from the Second International ISHPES Seminar, Lillehammer, 1994. Oslo, NO: The Norwegian Society of Sports History/The International Society for the History of Physical Education and Sport, 1996.
- Hatt, Gudmund. "Moccasins and Their Relation to Arctic Footwear." Memoirs of the American Anthropological Association, Vol. III, 1916: 149-250.
- Helskog, Knut. Helleristningene i Alta. Spor etter ritualer og dagligliv i Finnmarks forhistorie. Alta, The Author and Alta Museum, 1988.
- Holmqvist, Wilhelm. "On the origin of the Lapp ribbon ornament." Acta archaeologica 5. 1934.
- Itkonen, T. I. "Finlands fornskidor." På skidor. 1937: 71-89.
- Jernsletten, Nils. "Sami Traditional Terminology: Professional Terms Concerning Salmon, Reindeer and Snow." In Gaski 1997a: 86-108.
- Jirlow, R. "Gamla dagars vinteridrott i Transtrand." På skidor 1935: 27-46.
- Kunicke, H. "Sibirische Märchen." Märchen der Weltliteratur. 1940.
- Laufer, Berthold. "The Reindeer and Its Domestication." Memoirs of the American Anthropological Association. Lancaster, PA: American Anthropological Association, 1916.

- tion, 1917.
- Lehtola, Veli-Pekka. *The Sámi People – Traditions in Transition*. Inari, FI: Kustannus-Puntsi, 2002.
- Luther, Carl J. "Geschichte des Schnee- und Eis-sports." in *Geschichte des Sports aller Völker und Zeiten*. Ed. G. A. E. Bogeng. Leipzig, DE: E. A. Seemann, 1926.
- Manker, Ernst. "Fennoskandiens fornskidor." *Fornvännen* Vol. 2. 1971
- Mark, Karin. "Zur Herkunft der Finnisch-Ugrischen Völker vom Standpunkt der Anthropologie." *Soviet Fenno-Ugric Studies* VI. Tallin, 1970: 211-20.
- Meuli, Karl. *Scythica Vergiliana: Ethnographisches, Archäologisches und Mythologisches zu Vergils Georgica 3, 367ff*. In *Gesammelte Schriften, Zweiter Band*. Basel-Stuttgart: Schwabe, 1975: 757-813.
- Möten i gränsland. *Samer och germaner i Mellanskandinavien*. Stockholm, SE: Statens Historiska Museum, 1997.
- Nansen, Fridtjof. *Paa Ski over Grønland*. Kristiania, NO: Aschehoug, 1890.
- Naskali, Eero. "Ski i lyset av gamle funn." In *Vorren* 1995: 71-80.
- Niemi, Einar. "Sami History and the Frontier Myth: A Perspective on the Northern Sami Spatial and Rights History." In *Gaski* 1997a: 62-85.
- Paulus Diaconus. *History of the Langobards*. Philadelphia, PA: Department of History, University of Pennsylvania, 1907.
- Procopius. *History of the Wars III, Book VI*. Translated by H. B. Dewing. London, UK: Loeb Classical Library, 1919.
- Raudonikas, W. J. *Les Gravures Rupestres des Bords du lac Onéga et de la mer Blanche*. Moscow, RU: Akademii Nauk, 1936, 1938.
- Ryd, Yngve. *Snö – en renskötare berättar*. Stockholm, SE: Ordfront, 2001.
- Sammallahti, Pekka. *The Saami Languages: An Introduction*. Karasjok, FI: Davvi Girji, 1998.
- Sarauw, Georg. "Das Rentier in Europa zu den Zeiten Alexanders und Cæsars." *Mindeskript for Japetus Steenstrup*. [København], 1913.
- Saxo Grammaticus. *The History of the Danes, Books I-IX*. Woodbridge, Suffolk, UK: Boydell & Brewer Ltd., 1999.
- Schefferus, Johannes. *Lapponia*. Frankfurt, DE: Ex officina Christiani Wolffii, 1673.
- Schott, W. *Über Die Ächten Kirgisen*. Berlin, DE: Dümmler, 1865.
- Sørensen, Steinar. "Skifunnet fra Steinhaugmo og de skinnkledde skiene i Fennoskandias fortid." *Viking tidsskrift for norrøn arkeologi*, Bind LVI, 1993: 87-111.
- , "Skihistorie i tusen år. Fortalt gjennom syv funn i Skimuseet." *Snø & ski*, 1995: 46-64, 102-03.
- , "Daterte skifunn fra middelalderen: Et omriss av middelalderens skihistorie." *Collegium Medievale*, 9(1-2). 1996: 7-55.
- Tacitus. *Germania*. Cambridge, MA: Harvard University Press, 1970.
- Tomasson, Torkel. "Ur skidans historia." *Samefolkets Egen Tidning*, June, 1928a: 15-16.
- , "Några tankar om skidrännans och de oliklånga skidornas uppkomst." *Samefolkets Egen Tidning*, September, 1928b: 21-24.

- Vaage, Jacob, *Norskeskiløpere: skihistorisk oppslagsverki 5 bind. Bind 6: Supplementsbind (Ungdomsbind)*. Oslo, NO: Skiforlage, 1969.
- ."Skimakerkunsten i det 19 århundre." *Norveg: Folkelivsgransking* 15, 1972.
- ."Våre eldste ski datert etter C<sup>14</sup>-klokken." *Snø og Ski* 5, 1981: 53-56.
- Vajda, László. *Untersuchungen zur Geschichte der Hirtenkulturen*. Wiesbaden, DE: Harrassowitz, 1968.
- Valonen, Niilo. "Den finska folkulturen i Nordskandinavien, särskilt skidans historia." *Umeå Studies in the Humanities* 24, 1980: 207-33.
- Valvasor, Johann Weichard Freiherr. *Die Ehre des Herzogthums Krain [The Honor of the Duchy of Krain]*. Nürnberg, DE: Laibach-Nürnberg, 1689.
- Vilkuna, Janne. "Kinnulan pienareunainen muinaissuksi." *Studia Historica Jyväskyläenna*. [Jyväskylä] 1990: 25-34.
- ."Oldtidsski fra Kinnula sogn." *In Vorren* 1995: 64-70.
- ."The binding of the prehistoric ski from Mänttä, Finland." *In Association for the Promotion of Skiing*, 1998.
- Vorren, Ørnulv and Ernst Manker. *Samekulturen: En historisk oversikt*. Oslo, NO: Universitetsforlag, 1988.
- Vorren, Ørnulv. "Ski og skiløping hos samene." *In Norske Skiløpere*, V, 1960: 159-65.
- ."Lapp skis and skiing. I: Land transport in Europe." *Folkelivsstudier fra Nationalmuseet* 4 [København], 1973: 470-87.
- ."Festskrift til Ørnulv Vorren. Tromsø Museums Skrifter XXV. Tromsø, NO: Tromsø Museum, 1994.
- ."Samiske oldski. Funn i Nord-Norge fra 300 f.Kr. til 1500 e.Kr. Stonglandseidet, NO: Nordkalott-forlag, 1995.
- ."Ancient Saami ski finds from the northern-most part of Northern Norway." *In Association for the Promotion of Skiing*, 1998: 16-20.
- Wiklund, K. B. "Några tankar om snöskors och skidors upprinnelse." *På skidor* 1926: 1-18.
- ."Ur skidans och snöskors historia." *På skidor* 1928: 5-56.
- ."Den nordiska skidan, den södra och den arktiska." *På skidor* 1931: 5-50.
- ."Den södra skidtypens källa." *På skidor* 1933: 20-26.
- Zachrisson, Inger, ed. *Möten i gränsland: Samer och germaner i Mellanskandinavien*. Statens Historiska Museum Monographs 4. Stockholm, SE: Statens historiska museum, 1997.
- Zettersten, Artur. "Den södra skitypen." *På skidor* 1932: 7-27.
- ."Svenska skidtyper." *På skidor* 1934: 5-31.
- ."Den södra skidtypens urform." *På skidor* 1938: 375-377.
- ."Den södra skidtypens utbredning." *På skidor* 1939: 401-403.
- ."Den skandiska skidtypens ursprung." *På skidor* 1942: 13-22.
- Åström, Kenneth and Ove Norberg. "Förhistoriska och medeltida skidor." *Västerbotten* 2 84 [Umeå, SE], 1984: 82-88.
- ."Skidan från Kalvträsk." *Västerbotten* 3 93 [Umeå, SE], 1993: 129-31.