Norw. Arch. Rev., Vol. 23, Nos. 1–2, 1990

Dating Problems in Icelandic Archaeology

VILHJÁLMUR ÖRN VILHJÁLMSSON

Department of Prehistoric Archaeology, University of Aarhus, Denmark

For many decades tephrochronology has been used as a scientific method for dating archaeological as well as geological remains in Iceland. Recently, parts of the tephrochronology for the eruptions of the famous volcano Hekla have been questioned by the author. This is due to obvious differences in dating results of archaeological artefacts from the valley of Thjórsárdalur in southern Iceland and the current tephrochronological dating of its devastation. While the devastation of the valley has been dated to AD 1104 and is thought to have been caused by a huge eruption of mount Hekla in that year, the artefacts from excavations and stray finds, as well as new ^{14}C results, show somewhat later 12th–13th century dates. The paper deals with this obvious discrepancy, which has hitherto been ignored, together with the results of archaeological excavations in 1983–86 at Stöng in Thjórsárdalur; it also gives a critical analysis of the historical methodology of the tephrochronologists.

INTRODUCTION

In Iceland archaeology is a relatively new science compared to other European and Nordic countries, although there has been interest in it since the 19th century.

The Icelandic population is small, so there are not many fully qualified archaeologists, and excavations on the island were, until recent years, very few, and unsystematic. There are many reasons for this, the main ones being the well known lack of financial support, an insufficiently staffed archaeological museum, as well as the lack of an archaeological institute.

Until recently, Icelandic archaeology has often been looked upon, and used as, a tool to verify or disprove what the Icelandic Sagas and other written sources have told us about the settlement of Iceland and the later history of the country.

Despite relatively few excavations, their results have often been used quite uncritically by historians as well as archaeologists to prove or disprove information in written records. This kind of archaeology could be defined as a natural continuation of the very strong, national literary tradition in Iceland.

As for archaeological theory and artefact studies, very little has been done or published, except for Kristján Eldjárn's work on the Viking graves in Iceland (Eldjárn 1956). In recent years excellent work has been in progress in the field of zooarchaeology by the American scientists Thomas McGovern and Thomas Amorosi, and palaeoecological studies by Gudrún Sveinbjarnardóttir and P. C. Buckland (Sveinbjarnardóttir 1983, Buckland & Perry 1989).

Archaeological dating in Iceland has, in recent years, in most cases been solved by a method called *Tephrochronology*. Since this method was introduced, it has very often been preferred to conventional archaeological dating by means of a well-known comparative method or scientific methods.

Because of lack of necessary tree growth, the use of dendrochronology has never been

possible in Iceland. Radiocarbon dating has been applied to some extent in quaternary geology, but limited in archaeology. This rare use of the radiocarbon method might be caused to some degree by there being no possibility of producing radiocarbon analysis in Iceland. Another and undoubtedly the main explanation for the relatively infrequent use of radiocarbon dating in connection with Icelandic archaeology is the greater use of tephrochronology.

TEPHROCHRONOLOGY

Tephrochronology was introduced in Iceland in the thirties by the late Sigurdur Thórarinsson (1944), one of Iceland's leading geologists in recent times.

Volcanic ash and pumice (also called the tephra), which are deposited in the soil, are dated by a method based on written sources dating from various times after the settlement of Iceland, e.g. by annalistic records from the middle ages. Some tephra layers have also been dated roughly by radiocarbon dates and by estimation on soil increase.

The deposited tephra layers have been produced by the numerous volcanoes in Iceland. By spectrum analysis and later by chemical analysis Dr Thórarinsson and his successors were often able to determine the source of the tephra in order to make sure that a layer from the right volcano was connected to written information on the year of an eruption in that particular volcano.

The best known of the tephrochronologies is the one developed on the eruptions of the well-known volcano Hekla in southern Iceland (Thórarinsson 1944, 1967). Thórarinsson began developing the tephrochronology of Hekla in the late thirties and until today it is presumed to be the most reliable of all the tephrochronologies.

Hekla has had numerous eruptions in historical times, and written sources from medieval and later periods have informed us of at least 21 eruptions. Meanwhile the geologists have only located approximately 16 layers which can be determined as Hekla tephra. This means that there exist more records of Hekla eruptions in written sources than there are detected distinct volcanic tephra layers which can be determined as Hekla tephra (Thórarinsson 1953:65–79, Vilhjálmsson 1985:70–72).

Through this tephrochronology the devastation of the settlement of Thjórsárdalur in S. Iceland, 15 km from Hekla (Fig. 1), has been dated. It is presumed that this settlement was destroyed in a Hekla eruption or became depopulated just after one. This devastation has been dated twice, but differently, by Hekla tephrochronology: first to AD 1300, and later to AD 1104 (Thórarinsson 1944:67, 1967:30).

In a written record dating from 1605 (S.S.Í. 1856:15, 38), mention is made of a devastation of the Thjórsárdalur settlement, possibly in the period 1216–1348, as a consequence of an eruption of a mountain other than Hekla, i.e. the Raudukambar mountain in the valley of Thjórsárdalur. Whilst the Raudukambar mountain has never erupted in historical times, Thórarinsson turned a white, rhyolithic tephra layer from Hekla into the product of this presumed destructive eruption. The layer was dated to the year AD 1300 and later to AD 1104 and is now normally called H 1 (Thórarinsson 1967:30–38).

The dates 1300 and 1104 used by Thórarinsson are provided by medieval annalistic records, and in these years the annals mention the Hekla eruptions. Quite a large eruption is described in the year 1300, but no detailed mention is made of the eruption in 1104 (Storm 1888:19, 52, 59, 72, 111, 146, 199, 251, 261, 319, 339, 382, 473, 486). Likewise, no mention is made of severe consequences, nor of a destruction of the settlement of Thjórsárdalur or any other settlement. In fact there is no written source older than that of 1605 which tells us about a destruction and depopulation of the Thjórsárdalur settlement in earlier times.

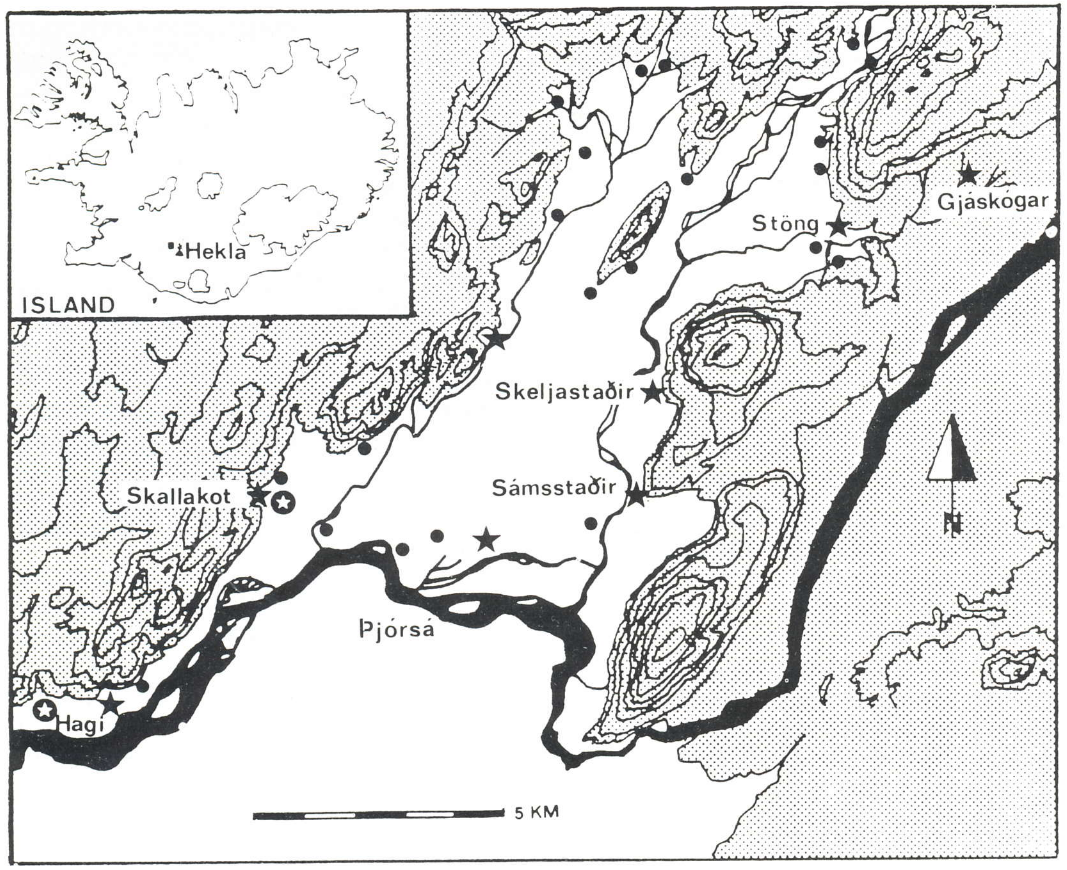

Fig. 1. *Map of Thjórsárdalur.*

STÖNG IN THJÓRSÁRDALUR

New archaeological excavations at the farm site of Stöng in Thjórsárdalur (Fig. 2) in 1983–86 have shown that the valley was most likely depopulated at the beginning of the 13th century, or more than 100 years later than its presumed volcanic destruction as dated by tephrochronology (Vilhjálmsson 1985:243–246, Vilhjálmsson 1989).

Some factors which give rise to this new date are artefacts which were found at Stöng and other ruins in Thjórsárdalur. Among them is a characteristic comb-type, a variation of the hog-backed comb (Fig. 3), which dates from the latter half of the 12th century into the first half of the 13th. There is a ceramic sherd of English origin found at Stöng. The fabric of the sherd strongly indicates that it is a piece of so-called Grimston-ware from the kilns in East Anglia. The sherd can be dated to the beginning of the 13th century at the earliest (pers. comm. John Cherry, British Museum, Vilhjálmsson 1989:91–92).

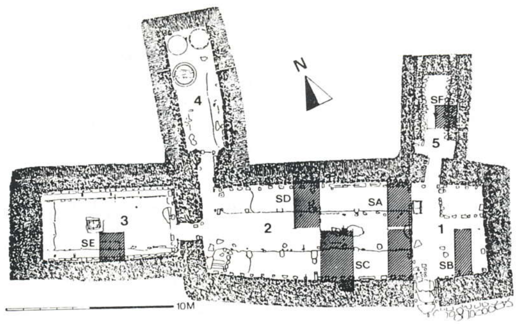

Fig. 2. *The plan of the younger dwelling-house at Stöng, which was partly excavated in 1939. Locations of the excavation units of 1983–84 are shown. After Stenberger (1943) with additions by V.Ö.V.*

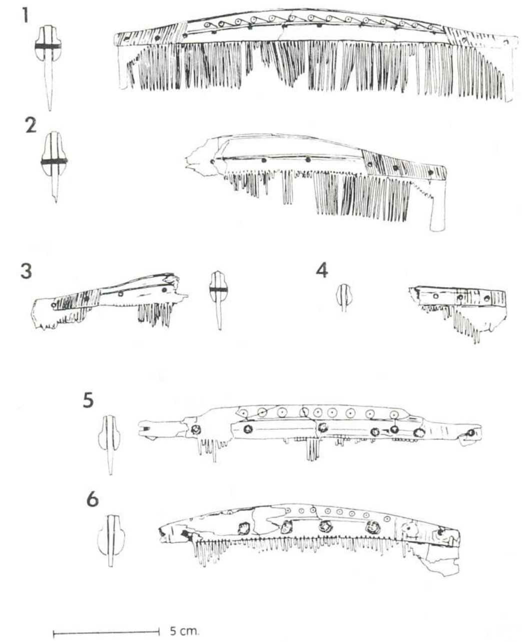

Fig. 3. *Combs made of antler found at Stöng (1–4), and of bone from Sámsstadir (5–6). The combs date from the later half of the 12th century to the first half of the 13th. Drawing V.Ö.V.*

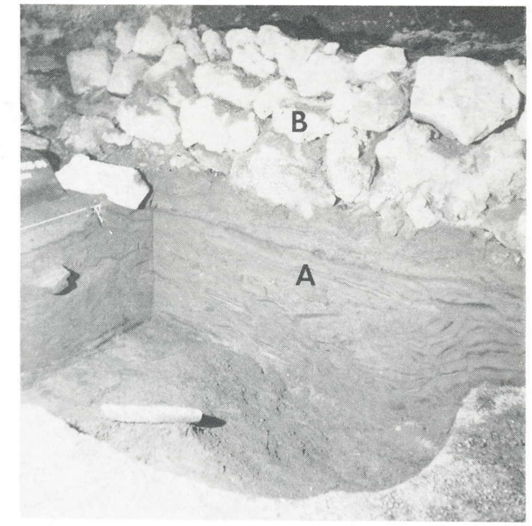

Fig. 4. *The walls of two farmhouses at Stöng. The older one (A), made of turf, belongs to a building which was used in the 11th century. The younger ruin (B), with walls of stone and turf, dates to the 12–13th centuries. The stripes in the turf of the older wall are tephra layers of the Katla eruption K~1000, which according to tephrochronological estimations took place around the year AD 1000. Photograph V.Ö.V. 1984.*

Other features, such as the existence of more than one phase of the farmhouse structure, and a dwelling-house built from turf which contains tephra layers like H 1, also show a habitation later than 1104, if the dating of the H 1 layer is correct.

One of the main arguments for the reliability of the tephrochronological dating of the settlement of Thjórsárdalur was the apparent presence of just one phase and one dwelling-house at Stöng (Lárusson 1944:79–111, Steffensen 1946:151–162, 1950:68), the one that was partly excavated in 1939 (Stenberger 1943:72–97). In fact there are two phases, as an older ruin was found directly underlying the one excavated in 1939 (Fig. 4). People at Stöng even built houses after the eruption which produced the H 1 tephra and tried to mitigate the effects of the H 1 tephra near the farmhouse by filling some of it into a large pit which they had dug (Fig. 5).

The causes of the decline and depopulation of Thjórsárdalur were probably many. Factors like heavy erosion, the consequences of which can be clearly seen today, combined with climatic changes for the worse as well as the continuous eruptions of Hekla, as mentioned in the annals from 1158, 1206 and 1222, all made life rather hard and forced the inhabitants from the valley toward the beginning of the 13th century. Absolutely no

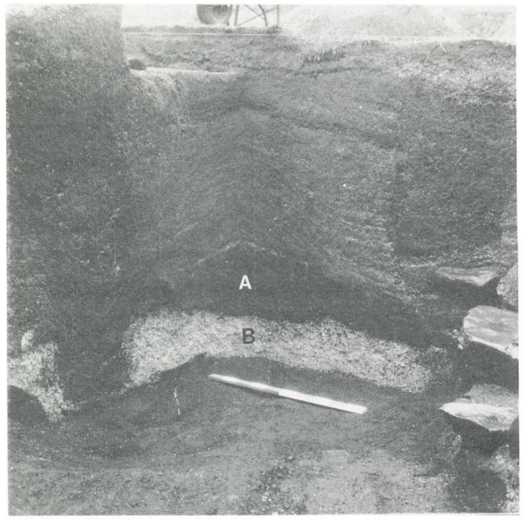

Fig. 5. *The white H 1 layer, which should possibly be dated to the year 1104. The H 1 pumice was filled into a pit just outside a building, possibly to prevent the tephra from drifting. The trenches, which can be seen as darker features in the sections, were dug in 1939. (A) spread occupation layer, (B) the H 1 tephra. Photograph V.Ö.V. 1986.*

indications of an abrupt destruction followed by death or the sudden exodus of the people from the valley can be detected. The Thjórsárdalur settlement has therefore been mistakenly called the Pompeii of Iceland.

Radiocarbon dates made of local charred birch, as well as birch bark, and on bones of sheep and cattle, also indicate a later time for the depopulation than 1104. (The samples K-4488–K-4492 were dated in 1985.) Three samples (Table 1) taken from the youngest dwelling-house produced dates that strongly indicate that the house was used in the 12th and 13th centuries, and two samples from the older ruin indicate that the older building was used in the 11th and 12th centuries. Archaeologically dated artefacts from these two features match these radiocarbon dates. Among them is a needlecase of bronze (Fig. 6) with a 10th–11th century date and which was found in the oldest phase of the occupation layers of the older ruin.

The youngest farmhouse ruin at Stöng, which for many years has been interpreted as a prototype for Icelandic farmhouses of the 10th and 11th centuries, should therefore be dated to the 12th and early 13th centuries.

The reasons for the incorrect dating of the termination of the Thjósárdalur settlement can be ascribed to the excavation method employed in 1939 as well as to a somewhat uncritical use of written sources and oral tradition when the tephrochronology was being developed. Archaeological datings of the 1939 excavations in Thjórsárdalur were obviously of no concern to the geologists and were not mentioned when the 1104 date was presented.

TEPHROCHRONOLOGY AND WRITTEN SOURCES

During the development of the historical tephrochronology of Hekla, the character and the background of the written sources upon which it is based would not have been studied in detail. Concepts which are relevant in all forms of historical and archaeological methodology, such as primary and secondary sources, as well as the time, the place and the reasons for their being written, would not have been discussed when the tephrochronology was being developed. Tephra layers from known volcanoes were often dated with years from annals which were written 200–300 years after the occurrence of the eruptions, which produced the dated layers. The information from the annals was used, as were they scientifically measured and verified data.

The early Icelandic annals were, of course, not written exclusively to describe or date volcanic eruptions. It is also a known fact that more eruptions have occurred than those mentioned in the written records. The volcano Katla in S. Iceland, for instance, has had at least 17 eruptions in historical times which can be identified as tephra layers in the ground, but only 14 eruptions of Katla are known from written records (Vilhjálmsson 1985:90–92, Thórarinsson 1957:125–150).

Table 1. *Radiocarbon analyses (K-4988–K-4992) on material from Stöng.*

Material	*K-4488* *Bones of sheep and cattle*	*K-4489* *Bones of sheep and cattle*	*K-4490* *Charred, local birch*	*K-4491* *Birchbark*	*K-4492* *Charred, local birch*
Weight	69.0 gr	148.0 gr	27.0 gr	10.5 gr	8.6 gr
Phase 2 = younger 1 = older	2	2	2	1	1
^{14}C age, BP before 1950	840 ± 50 BP	890 ± 65 BP	860 ± 50 BP	950 ± 65 BP	930 ± 65 BP
Date	AD 1110	AD 1060	AD 1090	AD 1000	AD 1020
Calibrated mean date according to Stuiver & Pearson	AD 1215	AD 1165	AD 1180	AD 1030	AD 1040
Probability range of calibrated date, within one standard deviation	AD 1126–1260	AD 1042–1212	AD 1050–1236	AD 1018–1158	AD 1026–1162

Fig. 6. *A needle case of bronze dated to the 11th century. It was found in the occupation layers of the ruin of the oldest dwelling house at Stöng. 1:1. Photograph V.Ö.V. 1983.*

Although the method of tephrochronology is basically a relative method, its absolute character has often been stressed in Iceland, based on the solid belief in the reliability of Icelandic written sources. It has even been maintained that the tephrochronology is more reliable as a dating method in archaeology than radiocarbon dating (Thórarinsson 1981:112).

No one has yet been able to tell if the tephrochronology of Hekla is complete and reliable enough for archaeological purposes. No other dating methods, whether dating by artefacts or by scientific methods, can verify the dates attributed to many of the Hekla layers from early times, nor do they tell us if the right layer has received a correct date from the written records. So far, no archaeological remains have been dated reliably through the tephrochronology of Hekla, and it is not certain that there occurred any huge eruption of Hekla in 1104 which produced white tephra. Just one radiocarbon analysis, made on peat, stratified beneath the H 1 layer in NE Iceland, shows a late 12th century date (Thórarinsson 1967:33–34, Vilhjálmsson 1985:189).

The method of tephrochronology has, until recently, been widely accepted by Icelandic archaeologists and historians, who have not questioned its reliability. Not even the 1104 dating of the destruction of the Thjórsárdalur settlement has been doubted, although the archaeologists, who excavated in the valley in 1939, found artefacts which could also at that time have had possible 12th–13th century dates (Stenberger 1943:94–97).

The great impact of tephrochronology can also be detected where archaeologists have excluded a series of radiocarbon dates from publications because their results did not match a tephrochronological date (*Radiocarbon*, Vol. 10, no. 1, 1968:321, Vilhjálmsson 1985:177–178).

TEPHROCHRONOLOGY AND OTHER SCIENCES

Tephrochronology has also had a great impact on other sciences. Among these are history, the method of ice-core dating and Icelandic pollen analysis, which, until recently, depended totally on tephrochronology as a dating method.

It has been suggested, for example, that the date of the writing of the Icelandic Book of Settlements (*Landnámabók*) should be changed to the latter half of the 11th century since the tephrochronologically dated devastation of Thjórsárdalur is not mentioned in the book (Rafnsson 1974:121). The new archaeological results from Thjórsárdalur actually verify the traditional date of the Book of Settlements, for it would not have been worth mentioning the devastation of a settlement which existed until the 13th century.

Thórarinsson wrote the following: 'Tephrochronological connections have through the work on the Greenland ice cores become global, and enable absolute and exact dating, reaching back in time far beyond written records for many volcanic

countries' (Thórarinsson 1981:133).

Here he is referring to the work of Dr C. U. Hammer on the chronology of the Greenland ice cores. Through a series of letters between Hammer and Thórarinsson (Hammer 1984:59), many of the high acidity peaks of the ice-core diagrams were given names of Icelandic volcanoes. Immediately one could see the acidity impact from eruptions in Iceland revealed in these diagrams. Among the high acidity peaks that were given the same names as volcanoes in Iceland are some which most probably do show the impact of eruptions which really took place in Iceland, and therefore deserve their names.

But the name, Eldgjá, has been given to a peak in the year 934 ± 2 (Hammer et al. 1980:230), after a volcanic ridge in SE Iceland. Most probably an eruption did occur in that particular year, but whether it was in Iceland, in the Eldgjá area, or somewhere else, is not possible to tell. This date from the Crête core of S. Greenland has now been published as the date for various lava flows in SE Iceland (Larsen & Thórarinsson 1984:33–34), and among them the lava flow Landbrotshraun, although other scientists have shown very convincingly, with the help of radiocarbon dates, that the lava was produced 5000 years ago at the earliest (Jónsson 1987:17).

Likewise, a tephra layer thought to originate from Eldgjá (E1) has received the same date by the ice-core method, although this date and the eruption cannot be verified by written records or radiocarbon dates. The E1 layer with the 934 ± 2 date has now been used to date archaeological finds (Larsen & Thórarinsson 1984:33–34).

Besides this, Icelandic geologists have used the ice-core chronology as evidence for the correctness of the tephrochronology (Thórarinsson 1981:133), and published ice-core diagrams have been used to verify the dates of other volcanic eruptions, e.g. the eruption which produced the settlement layer (Landnámslag, VIIa + b). This tephra layer has had a series of estimated dates, e.g. AD 800, 850, and 850–930, but by using information from ice-core diagrams Icelandic geologists have determined its age as AD 898 (Larsen 1982:63).

The peak of 898 could, in fact, have been caused by eruptions in more than one country other than Iceland. The eruption which produced the settlement layer is not mentioned in written sources, and its new date cannot be verified by other means. Even radiocarbon dates, derived from material in connection with the layer (*Radiocarbon*, Vol. 19, no. 1:432), gave much earlier dates. Despite all this, the new date of the settlement layer has been used to date archaeological remains.

The use of the ice-core chronology has caused a great deal of misunderstanding, and it is even believed by some scientists that tephra layers from Iceland can actually be located in the ice sheet of Greenland (Thorsteinsson 1985:15), although possible, electronically measured impacts of acidity from eruptions in the northern hemisphere are the only elements to be detected.

From an archaeological point of view, early acidity peaks on the ice-core diagrams should be given the names of Icelandic volcanoes along with an interrogative mark, similar to the ice-core date which the great eruption of the Aegean island of Thera (1645 BC?) recently received (Hammer et al. 1987:517–519). It is even questionable whether to exclude the possibility that it was an eruption in Iceland which caused the acidity increase in the stratosphere and in the Greenland ice sheet in 1645 BC. If so, there was, unfortunately, no one there to write about it.

Unfortunately, there is no other volcanic country in the northern hemisphere that has the same literary tradition as Iceland, and eruptions in these countries are not connected with tephrochronological studies. This explains, to some extent, why many large acidity peaks of the ice-core diagrams are given names of Icelandic volcanoes.

It is certain that dates in old written sources cannot always be used as scientifically produced facts. When Icelandic eruptions in medieval times are conected with the ice-core chronology, this method becomes a relative one, demanding that the scientist working on the ice-core chronology is well acquainted with all aspects of the tephrochronology, especially its relative structure. The scientist should also be able to explain why eruptions like Hekla in 1104 and the presumed eruption of Katla in AD 1179, whose tephra product has not been detected in Iceland, can be located as impacts of acidity in Greenland, when the greatest Icelandic explosive eruption in historical times, as far as tephra is concerned, the eruption of Öræfajökull in 1362 (Thórarinsson 1958:25–27), can not. The ice-core chronology has not by any means verified the method of tephrochronology.

EARLY SETTLEMENT IN ICELAND AND RADIOCARBON DATING

In Iceland, it has often been argued that results of radiocarbon dates of Icelandic material could be misleading and give much too early dates (Thórarinsson 1977:35, Ólafsson 1980:66, Hermannsdóttir 1982:99, Jónsson 1982:196). It has been proposed that a possible regional, low level of radiocarbon in samples could be the result of volcanic activity, or of the small size of land areas in the Arctic regions (Olsson 1983:393).

This hypothesis has unfortunately been used as the main argument whenever radiocarbon dating did not match with tephrochronological dates. This hypothesis has not been studied closely or systematically in Iceland, but elsewhere a volcanic effect on radiocarbon has been detected in samples taken in the vicinity of thermal areas as well as volcanic areas (Bruns et al. 1980:532–536).

Another problem is dating the time of the earliest settlement in Iceland. In the literary tradition, it is dated to the latter half of the 9th century, and, frequently to the year 874, which has become a kind of official date for this event.

Geologists have tried to confirm this date by the so-called settlement layer. But the different dates of that layer are produced as a result of the solid belief in the correctness of the historical date 874, rather than the other way around.

In a recent paper, Hermannsdóttir presents a Merovingian partly 7th–8th century farm site in Herjólfsdalur on Heimaey, an island south of Iceland (1986:135–145). The early date of the farm is the result of nine radiocarbon analyses, which indicate the possibility of a much earlier date than the usual one for the first settlement of Iceland.

Studies of artefacts in connection with the excavation in Herjólfsdalur have not been published, but the artefacts which have been presented (Hermannsdóttir 1982:112–115, 1986:144) do not indicate an earlier date than the 9th–10th centuries. The house structures on the site in Herjólfsdalur bear no characteristics that can justify the early age given by the radiocarbon dates.

Apart from two of the samples from Herjólfsdalur being dated without a wood analysis, and the fact that Icelandic birch can sometimes reach an age of 100 years, the dates from Herjólfsdalur could certainly indicate a possible effect on the level of radiocarbon in the samples. The site is situated on an island in the vicinity of a volcano which became active during the excavation period causing a temporary depopulation of the township of Heimaey island. A certain selective use of the calibrated results of the dates from Herjólfsdalur could also be the cause of this high age. There is a possibility of a great range in the calibrated results of all the dates, both within one and two standard deviations. These give a probability range from the 6th century to the 12th century, when calibrated according to Stuiver & Pearson (1986:805–838).

CONCLUSION

The possible volcanic and geographical impacts on ^{14}C dating should be studied more closely before they are used for determining whether seemingly old dates are right or wrong. A closer co-operation between archaeologists, geologists and radiocarbon scientists is necessary, and a systematic revision of the tephrochronology by radiocarbon dates, as well as of its methodology, is needed before the method can be used sensibly in Icelandic archaeology. If tephra layers, dated by annals, are used in connection with archaeology, then these layers should also be studied systematically through archaeological research.

Tandem accelerator datings (AMS), as well as TL dating of tephra by the so-called fine-grain method, might also prove relevant. (In connection with the Stöng excavations, two scannings were made of the H1 tephra to see if it could be dated by TL, but the tephra showed scatter signals which were unsuitable for TL dating.)

Neither radiocarbon dating nor tephrochronology can be considered to be exact, but, if sensibly combined, their usefulness could prove advantageous to Icelandic archaeology in the future. But most of all, written sources, such as the sagas and other such material, should be handled with the greatest care when combined with the natural sciences.

REFERENCES

Amorosi, T. 1986. *Icelandic Zoarchaeology Project, Initial 1985 Field Report.* New York.

Benediktsson, J. 1969. Landnámabók: some remarks on its value as a historical source. *Saga-Book, Vol. XVII, Part 4.*

Bruns, M. et al. 1980. Regional sources of volcanic carbon dioxide and their influence on ^{14}C content of present-day material. *Radiocarbon 22(2).*

Buckland, P. & Perry, D. W. 1989. Ectoparasites of sheep from Stóraborg, Iceland and their interpretation. *Hikuin 15.*

Eldjárn, K. 1956. *Kuml og Haugfé i heidnum sid á Íslandi.* Akureyri.

Hammer, C. U. 1984. Traces of Icelandic eruptions in the Greenland ice sheet. *Jökull, 34.*

Hammer, C. U. et al. 1980. Greenland ice sheet: evidence of postglacial volcanism and its climatic impact. *Nature 288.*

Hammer, C. U. et al. 1987. The Minoan eruption of Santorini in Greece dated to 1645 BC? *Nature 328.*

Hermannsdóttir, M. 1982. Fornleifarannsóknir í Herjólfsdal, Vestmannaeyjum 1971–1981. *Eyjaskinna, 1. rit.*

Hermannsdóttir, M. 1986. Merovingertida bosätning på Island. *Viking XLIX.*

Jónsson, J. 1982. Um Ögmundarhraun og aldur thess. In Thórarinsdóttir, H. (ed.), *Eldur í Nordri, afmælisrit helgad Sigurdi Thórarinssyni sjötugum.* Reykjavík.

Jónsson, J. 1987. Eldgjárgos og Landbrotshraun. *Náttúrufrædingurinn, 57,* 1–2.

Larsen, G. 1982. Gjóskutímatal Jökuldals og nágrennis. In Thórarinsdóttir (ed.), *Eldur er í Nordri, afmælisrit helgad Sigurdi Thórarinssyni sjötugum.* Reykjavik.

Larsen, G. & Thórarinsson, S. 1984. Kumlateigur í Hrífunesi í Skaftártungu IV. *Árbók hins íslenzka fornleifafélags 1983.*

Lárusson, O. 1940. Eyding Thjórsárdals. *Skírnir CXIV.*

Ólafsson, G. 1980. Grelutóttir landnámsbær á Eyri vid Arnarfjörd. *Arbók hins íslenzka fornleifafélags 1979.*

Olsson, I. U. 1983. Radiocarbon dating in the Arctic region. *Radiocarbon* 25(2).

Radiocarbon. *Radiocarbon.* Published by the American Journal of Science, Yale University.

Rafnsson, S. 1974. *Studier i Landnamabok, kritiska bidrag til den isländska fristatstidens historia.* Bibliotheca Historica Lundensis XXXI) Lund.

S.S.Í. 1856. *Safn til sögu Íslands og íslenzkra bókmennta.* In Sigurdsson, J. (ed.) København.

Steffensen, J. 1946. Rannsóknir á kirkjugardinum í Haffjardarey, sumarid 1945. *Skírnir CXX.*

Steffensen, J. 1950. Enn um eydingu Thjórsárdals. *Árbók hins íslenzka fornleifafélags 1949–1950.*

Stenberger, M. 1943. (ed.) *Forntida Gårdar i Island.* København.

Storm, G. 1888. *Islandske Annaler indtil 1578.* Christiania.

Stuiver, M. & Pearson, G. W. 1986. High-precision calibration of the radiocarbon time scale AD 1950–500 BC. *Radiocarbon 28(2B)*.
Sveinbjarnardóttir, G. 1983. Palæoekologiske undersøgelser på Holt i Eyjafjallasveit, Sydisland. In Ólafsson, G. (ed.) *Hus, Gård och bebyggelse, föredrag från det XVI nordiska arkeologmödet, Island 1982*. Reykjavík.
Thórarinsson, S. 1944. *Tefrokronologiska Studier på Island*. København.
Thórarinsson, S. 1953. Hversu mörg voru Heklugosin? *Náttúrufrædingurinn 22. ár*.
Thórarinsson, S. 1958. The Öræfajökull Eruption of 1362. *Acta Naturalia Islandica II*.
Thórarinsson, S. 1967. *The Eruption of Hekla in Historical Times, a Tephrochronological Study*. Reykjavík.
Thórarinsson, S. 1975. Katla og annáll Kötlugosa. *Árbók Ferdafélags Íslands 1975*.
Thórarinsson, S. 1977. Gjóskulög og gamlar rústir, brot úr íslenskri byggdarsögu. *Arbók hins íslenzka fornleifafélags 1976*.
Thórarinsson, S. 1981. The application of tephrochronology in Iceland. In Self, S. & Sparks R. S. J. (eds.), *Tephra Studies as a Tool in Quaternary Geology*. Dordrecht.
Thorsteinsson, B. 1985. *Island*. Politikens Danmarkshistorie. Århus.
Vilhjálmsson, V. Ö. 1985. *Thjórsárdalur-bygdens ødelæggelse*. Specialeopgave og prisopgave i Middelalder-arkæologi, Aarhus Universitet. Unpublished cand. phil. thesis. Århus.
Vilhjálmsson, V. Ö. 1989. Stöng og Thjórsárdalur-bosættelsens ophør. *Hikuin 15*.