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Casting Identities in Central Seclusion

Aspects of non-ferrous metalworking and society on Gotland in the Early Medieval Period

Ny Björn Gustafsson

Doctoral Thesis in Archaeological Science at Stockholm University, Sweden 2013

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Abstract

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The aim of this thesis has been to investigate and interpret late Iron Age and Early Medieval traces of non-ferrous metalworking on the island Gotland, Sweden. Gotland was not, based on the archaeological record, an integrated part of the common Scandinavian culture. Instead a local, endemic cultural expression had developed; a seclusion which lasted for centuries despite the islands central position in the Baltic Sea. In the past, key elements for the understanding of local settlement- and burial practices as well as the local material culture were mainly recovered and reported by local farmers. A specific category of such finds – so-called 'bronze slag' is discussed and partly reinterpreted in the first study of this thesis. Two further studies treat different aspects of metalworking and metalworkers – one discusses common archaeological notions of Scandinavian workshops, production sites and metalworkers from a critical perspective while the other mainly focuses on the Gotlandic finds from metal-detector surveys carried out over the last 35 years. Based on where and to which extent, both from a quantitative and a qualitative point of view, these finds occur a hierarchical classification into four sub groups is presented – ordinary farm sites with traces of non-ferrous metalworking, workshop sites, potential workshop sites and last, extrovert harbour settlements. A fourth study presents an attempt to evaluate the usefulness of magnetometry in delimiting extant traces of high-temperature crafts, such as metalworking. The last study of the thesis presents an attempt to use trace elements analysis of skeletal lead in human bone to identify potential non-ferrous metalworkers.

As the wearing of endemic Gotlandic jewellery appears to have been central in the manifestation of the local identity it is argued that the metalworking artisans played a crucial role in defining how this identity was signalled and displayed via the jewellery and dress-related metal objects. It is further suggested that these artisans might have played an important role in upholding the local economy before the advent of local minting.

Keywords: Archaeometallurgy, Non-ferrous, Archaeological prospection, Metal detection, Geophysical survey, Sweden, Magnetometry, Gotland, Iron Age, Viking Period, Silver economy, Identity.

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To Valdar, Helmi and Erika

Acknowledgements

In the autumn of 1997 I was fresh back in Sweden and stood by a crossroad in life. Up until then I had tried my luck in a broad range of careers. I had been a desperately ill-suited petty officer and an almost as meritless farm hand and I had worked as a keeper in various zoological gardens. This had been supplemented by halfhearted studies in marine biology on a basic level. All this was nice, but not spot-on. Then my mother told me about a course in archaeology and heritage management at Biskops-Arnö folk college west of Stockholm. I went ahead and spent a semester there, a decision I have never regretted. A dynamic troika consisting of Anders Carlsson, Niklas Stenbäck and Martina Franke taught us about past eras in a manner which was personal, professional and refreshingly subjective. I had by then been partaking in various Medieval and Viking Period re-enactments and living history events for almost a decade, but it was my time at Biskops-Arnö that got me irreversibly hooked on archaeology, or rather opened up my eyes to the fact that archaeology can include so much. I had found a discipline in which all aspects of life could be reflected upon and considered. Some might see me as a possessed workaholic, but I don't mind in particular. From my horizon most things can simply be dealt with archaeologically!

This thesis comprices seven years of thoughts and observations; it focuses on Gotland and I have tried to include as many aspects as possible. This is hard, not to say impossible to do on one's own, and for the last five years I have been blessed with the opportunity to study and work at one of the finest interdisciplinary archaeological research facilities in Scandinavia, the Archaeological Research Laboratory, which is also the base for a number brilliant researchers like my supervisor Lena Holmquist as well as Sven Isaksson, Gunilla Eriksson, Anders Götherström, Birgit Arrhenius and the head of Department, Kerstin Lidén. Further, my fellow PhD-students of past and present – Hans Ahlgren, Christos Economou, Rachel Howcraft, Joakim Schultzén and my desk-neighbour for four years Elin Fornander as well as the non-magnetic Andreas Viberg, to mention just a few.

The Lab would most certainly grind to a halt if it was not for the technical staff: Mikael Lundin and Malgorzata Wojnar-Johansson, the nave around which the Lab revolves. And last, but not least the formidable Margaretha Klockhoff, metal conservator Emerita Absoluta – a true finds enthusiast!

As the Lab is a division of the Department of Archaeology and Classical Studies I also would like to direct a wave of gratitude towards the staffs and students at the sections of Archaeology, Classical Archaeology and Ancient History, the Osteoarchaeological Research Laboratory and the Stockholm Numismatic Institute; you are all crucial parts in what makes Archaeology at Stockholm University interesting and dynamic, year after year. Special and heartfelt thanks is directed at Kenneth Jonsson of the Numismatic Institute (for providing an endless supply of reports and thoughts on the relation between ancient Gotlanders and their silver) and towards Jan Storå and Anna Kjellström of the Osteoarchaeological lab (for many good discussions on bones and their original owners).

Gotlandic finds are mainly kept at the Swedish History Museum in Stockholm and Gotland County Museum in Visby. I have had the opportunity to work for them both over the years, but besides that I have also been granted more or less unlimited access to the finds of my choice. I would thus like to express my gratitude towards the staffs of both museums. In Stockholm, Eva Vedin and Jessica Hedenskog have been ever-patient despite my often quite unspecific desire to trace obscure finds and Charlotte Hedenstierna Jonson has been my enthusiastic companion for many planned and unplanned sessions in the finds storages as well as contributing many wisdoms on The Art of Writing a Doctoral Thesis. In Visby, Jenny Örjestad has been a rock-solid support and an infallible provider of accommodation in Visby. The latter also applies for Laila Kitzler-Åfeldt who, besides that, has been a true resource in my attempts to harness the wonders of 3-D scanning. Another person of great importance is Anders Söderberg, probably the most knowledgeable traditional caster in Sweden and a true expert on technical ceramics. Sven Kalmring and Antje Wendt have never failed to offer good and vital points on most things Viking. Further, Gustaf Trotzig has been a perennial support over the years, as has my excellent technical supervisor Justine Bayley. Additionally, working with finds from Gotlandic sites would have been impossible without the aid and knowledge of Majvor Östergren, Dan Carlsson and Lena Thunmark-Nylén, who have all generously shared observations and experiences from deacades of Gotlandic archaeology. Another importat part of the Gotlandic heritage management, but of more recent years is Jonas Paulsson, wizard of metal-detecting and an ever resourceful force of nature on tiled ground.

As an archaeologist it is also crucial to be granted access to sites for surveys and excavation and for this I direct a special thought to the landowners and locals I have had the pleasure to interact with over the years. The same goes for those, like Tove Swenson, who have actively aided me in these ramblings through the Gotlandic underbrush.

Even though this thesis is mainly about finds and contexts it would have been very thin if it had not been for the Antiquarian Topographical Archives in Stockholm and its exelent staff, notably Catrin Rigefalk, Ylva Larsson and

Karin Larsson who have quite literally provided me with tonnes of archival material on Gotlandic heritage management.

Alas, it is an indisputable fact that a human life is short. Hence some of the people who actively inspired me over the years are no longer with us – Inger and Sven Österholm, Tomas Johansson, to mention three. Without you my life would most probably have taken a different and less interesting course. This also applies to Torgny O. Andersson, a man I only met on a couple of occasions but whose legacy as a surveyor of over-ploughed heritage sites is most probably unrivalled in Sweden.

Over the years I have been lucky to received financial support from a number of trusts and research foundations, a fact for which I am truly grateful – these are the Helge Ax:son Johnson Foundation, the Berit Wallenberg Foundation, the Royal Academy of Letters, History and Antiquities, Jernkontoret, the Längmanska Culture Foundation, the Greta Arwidsson Foundation and the Swedish Antiquarian Society. Means for printing this thesis was provided by Wilhelmina von Hallwyl's Foundation for Gotlandic research and the DBW Foundation.

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List of papers

I. Gustafsson, N. B. 2013. Scrutinizing copper and bronze slag on Gotland - On the making and dismantling of a category of archaeometallurgical finds. *Journal of Nordic Archaeological Science* 18: 49-53.

II. Gustafsson, N. B. 2013. In the Wake of the Hoards – Glimpses of Non-ferrous Metalworking Through the Finds of the Gotland Hoard Projects. *Fornvännen* 108: 1-11.

III. Gustafsson, N. B. 2012. Beyond Wayland – thoughts on early medieval metal workshops in Scandinavia. *Historical Metallurgy,* 45(2): 90-101.

IV. Gustafsson, N. B. & Viberg, A. 2012. Tracing High-temperature Crafts. Magnetometry on the island of Gotland, Sweden. *Archaeological Prospection*, 19(3): 201-208.

V. Gustafsson, N. B. Evaluating Trace Elements Analysis as a Means to Identify Early Metalworkers. Manuscript submitted to *International Journal of Osteoarchaeology*.

Contents

1 Introduction

> '*In most respects it is unlike Sweden, and its inhabitants always call Sweden 'the Continent' and speak of Swedes as a separate people*.'
> Selina Bunbury 1856, p. 209

A modern traveller to Gotland is often confronted with the concept of Gotland as another country far away. For a time, this was even a commercially broadcasted slogan. As the quote by Victorian travelleress Selina Bunbury suggests, this view is far from new. Gotland has, officially speaking, been a Swedish province since the 17th century, but in reality the relationship is far more complex. A strong Gotlandic identity manifests throughout most aspects of the local society, from the marketing of local agricultural produce to endorsement of the local dialect and a sundry of traditional customs. Even though Gotland is not the only insular Swedish province, its location – 90 km off the Swedish mainland (Fig. 1) – has always served to isolate it from the rest of the country. Thus, Gotland is still a rural province which has survived untouched by most of the demographical and infrastructural developments that have reshaped much of the southern parts of the Swedish mainland over the centuries.

Simultaneously, Gotland has held a special position for researchers since the dawn of Scandinavian archaeology. This is due to the general changes in local farming practices during the 19th century; as a result, many meadows and pastures were put under the plough and brought into crop rotation for the first time. Simultaneously, a large portion of the island's wetlands were drained and transformed into farmland. As these new fields were cleared and tiled, a wealth of artefacts started to appear; many of these found their way into various collections and helped to form the modern understanding of the island's pre-historic periods. From early on it became evident that the uncovered physical remains were in part different from those east and west of the Baltic Sea. Today, this is mainly visible through the introduction and evolution of certain types of insular dress accessories and jewellery, in particular those worn by women (cf. Fig. 3). These brooches and pendants are largely endemic to Gotland and few have been found outside the island. As with mainland Scandinavian jewellery, which was dominated by oval brooches and various types of round-, equal-armed- and trefoil-brooches, the Gotlandic types often offers good clues to the understanding of the society that produced them. While objects of more easily perishable materials like

wood and fabric have normally disintegrated, metal objects are often quite well preserved on Gotland. As a result, these have regularly been used to interpret a number of cultural features such as dress customs, migration and production strategies (e.g. A. Carlsson 1983a & b; Thunmark-Nylén 1983).

This thesis mainly focuses on the latter of these features – the production of metal objects on Gotland. More specifically, I aim to identify, evaluate and interpret the production of non-ferrous objects. But as with all socially integrated phenomena, it is impossible not to simultaneously discuss the

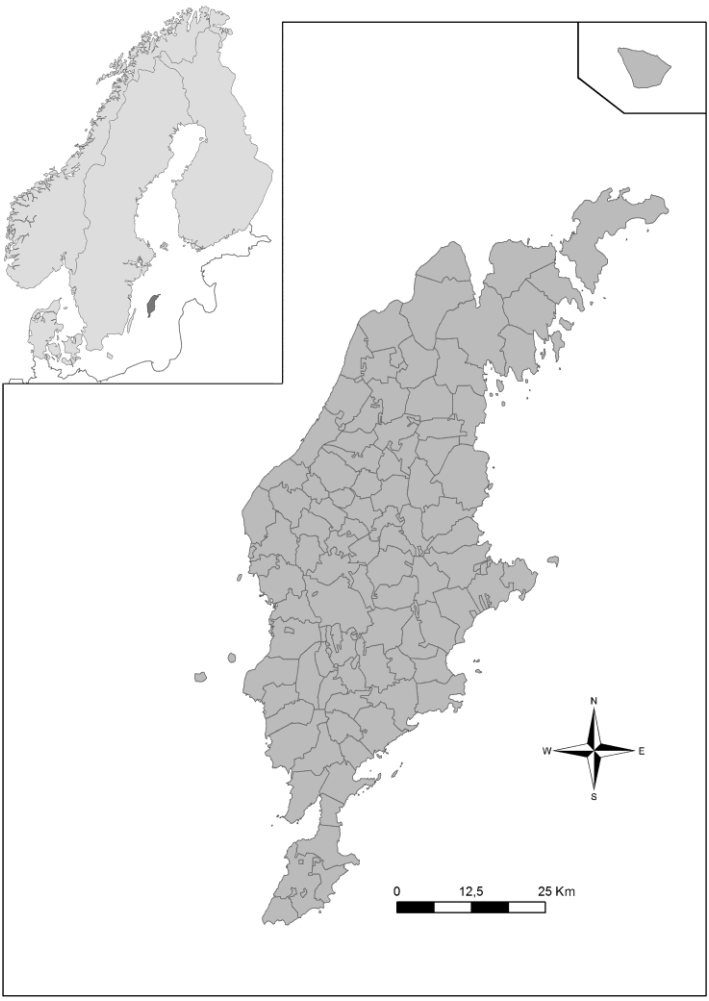

Figure 1. Gotland with modern parish borders

society behind the production as it, judging from its scale and profound impact throughout the full extent of the late Iron Age, fulfilled a central role in forming and sustaining the insular Gotlandic identity.

1.1 Social concepts in archaeology

The concept of *culture* is central to archaeology, in particular where pre-historic periods are concerned. The archaeological use of the term is wide and has been re-defined over time, but an oft-referred-to starting point is the definition suggested by Edward B. Tylor in 1871, in which culture is said to be '*that complex whole which includes knowledge, belief, art, moral, law, custom, and any other capabilities and habits acquired by man as a member of society*' (Tylor 1958 [1871]:1). In the 19th and early 20th centuries, the pre-historic periods were seen as populated by larger and smaller groups of individuals who shared these stipulated traits, demarking them as '*peoples*' separated from other groups who had different sets of defining traits, which in effect made them into *other peoples*. In early pre-historic archaeology, much effort was invested in identifying and geographically delimiting such cultural groups, often on racial grounds, i.e. the 'peoples' were seen as synonomous with certain imagined 'races' of humans. In early archaeology, this line of thought became particularly developed in Germany via the school of thought established by Gustaf Kossinna (e.g. 1911) who argued for a connection between the distribution of key artefacts and that of distinct races via the notion that a culture which produced and used a particular set of artefacts equalled an ethnic group, which, in turn, could be regarded as a race (Jones 1997:2). Later, the conceptual connection between key artefacts and social groups was further developed and spread by Vere Gordon Childe (1925; 1929). Since the archaeologically defined cultures were so closely connected to presumed ethnic groups, ethnicity, as a field of study, has prevailed over the decades, regardless of paradigmatic dynamics in theories and methods. This is especially true for the earlier pre-historic periods (in particular the Neolithic) but also for the later Scandinavian Iron Age, even though the discussion on ethnic affiliation in that period is often shaped by early-modern chauvinism relating to the Scandinavian National States, in particular Denmark, Norway and Sweden (cf. Svanberg 2003:102p). By and large, ethnicity is normally included in the more general term *identity,* which is the term mainly used throughout this thesis. Mats Roslund (2001:75p) has, via studies of the production and use of certain types of pottery, argued that the concept of *ethnic identity* ought to be separated from the concept of *cultural identity*. According to Roslund, these two concepts are aimed towards different audiences – the former is outward bound and the latter is primarily aimed to express and communicate affinity within groups. This line of thought is interesting, but from a general Gotlandic point of view, I

regard it as less usefull to discuss ethnic and cultural identity as entities separated from eachother. Identity, as a single term, is, on the other hand, rather unprecice as it can comprice so much and be so divers; an identity is normally built of several sub-identities which are activated when called on. Thus, when I speak of identity in the following, I refere to expressions of material and non-material character that serves to unite certain individuals and groups of individuals and to set them apart from other individuals or groups of individuals. Given the aim of this thesis, most of the defining expressions discussed here are of the material kind in the shape of objects of non-ferrous metal.

1.2 Identity and social distinction

For many reasons, discussions of identity form a cornerstone in archaeology; how individuals and groups manifested themselves in the interplay with other individuals and groups pervades the extant material cultures of past societies. In retrospect, this has been dealt with in different ways throughout the history of archaeological interpretation – from racial views to post-processual stances on extrovert and introvert communication via symbols. The archaeological concept of social manifestation through material culture is largely inspired by Social Anthropology, in particular the theories of Frederik Barth. In 1969, he presented a (at that time) new take on interaction between socially defined groups. One of the key observations was that dissimilarities in material culture between such groups must not necessarily equal a lower frequency of interaction. In many cases, it might instead signal the opposite and should then be understood as a means of strengthening group identities among populations subjected to outside influences.

In Viking Studies, these concepts have recently formed the backdrop for a study of social distinction among Scandinavian settlers in the English Danelaw (Kershaw 2013). Via the distribution of Scandinavian, Anglo-Scandinavian and Anglo-Saxon dress jewellery, mainly but not exclusively recovered via metal-detection, Jane Kershaw has shown that there is a significant tendency to preserve certain Scandinavian elements in the designs of brooches throughout the 8th, 9th and 10th Centuries in parts of the Danelaw (embracing a large portion of eastern and north-eastern England from Essex in the south to North Yorkshire in the north). Strikingly, this tendency seems to have been strongest in Northern East Anglia, a region not previously seen as an Anglo-Scandinavian heartland (Kershaw 2013:213). Kershaw's general conclusion is, based on the jewellery and accordingly the dress-fashion it belonged to, that the Scandinavian identity among the population of the Danelaw was more expressed than earlier assumed. She suggests that this could be the result of a profound Scandinavian (or rather, Danish) influence over the region, an influence that did not markedly lose its foothold over the centuries, despite the political loss of independence when

the Danelaw was successively captured and finally re-annexed under Anglo-Saxon rule after 954 AD. The Scandinavian cultural inclination thus suggests that it was favourable to signal 'Scandinavianness' – possibly for political and social gain. This implies the presence of a Scandinavian cultural elite whose standards were followed by the population as a demonstration against the display of the Anglo-Saxon cultural norm among the people of surrounding areas. (Kershaw 2013:248p). The example from the Danelaw implies that culturally 'charged' symbols played an important role in the day-to-day interaction between people in culturally mixed areas of the Scandinavian Cultural Sphere, a phenomena far from uncommon also in more modern social contexts, for example in 20th Century diasporas and immigrant communities (e.g. Gradén 2003).

The social aspects and impacts of dress, in both historic and contemporary contexts, is a broad and classic field of study (cf. Harlow 2012 for a summary). By and large I concur with the definition of dress suggested by Mary Ellen Roach-Higgins and Joanne B. Eicher (1992) as '*an assemblage of modifications of the body and/or supplements to the body*'. This view, based in symbolic interactionism – i.e. that individuals acquire identities through social interaction – presupposes that not only garments, but also jewellery, fittings, tattoos, hairstyles etc. form elements of dress. The study of ethnic dress which can be said to form a sub-branch in this field of study is of major interest for this thesis. Ethnic dress have been defined as '*those items, ensembles and modifications of the body that capture the past of the members of a group, the items of tradition that are worn and displayed to signify cultural heritage*' (Eicher & Sumberg 1995:299).
In the following, I argue, in accordance with this citation, that the dress jewellery and related items produced and worn on Gotland offer vital clues to the understanding of how a local Gotlandic identity was expressed, communicated and developed. I will further try to establish which role the non-ferrous metalworkers played in this development.

1.3 Some central questions

In 1985, Lena Thunmark-Nylén discussed what she came to call '*The Gotland Paradox*', i.e. the fact that Gotlanders evidently interacted with contemporary, non-Gotlandic societies without being particularly affected by the overall cultural and political trends that dominated the rest of Scandinavia. She concluded that much of the development occurred as a result of the Gotlandic social structure without larger settlements or permanent emporia – in short, the paradox could be explained by the fact that Gotlanders had good reasons to leave the island while foreigners had little reason to visit it (cf. Thunmark-Nylén 1985). While I agree with some of the conclusions behind the Paradox – Gotland is, after all, a rather remote island, particularly so in a time when most of the seaborne travel followed

the coasts of the Baltic Sea, I dispute the main conclusion; i.e. that the Gotlandic subdivision of the Viking Period cultural expression developed in *absence* of other influences. Instead, I rather regard the Gotlandic situation, which at first might appear paradoxical, as a quite intentional reaction to the development outside Gotland.

As jewellery and similar ornamental accessories apparently fulfilled such a profound role in articulating Gotlandic identity, a fundamental hypothesis throughout this thesis will be that the production of the jewellery was just as central for Gotlandic society as the wearing and display of it. That assumption places the producers, the metalworkers, right in the centre of the society; from that point of view, they were not only skilled artisans who possessed specialist knowledge, but also a driving force behind the social dynamics on the island in the late Iron Age. Drawing on this, I will try to answer a number of central overarching questions:

- *Where* did non-ferrous metalworking occur and *what* was being produced by *which* techniques?

- *Who* were the metalworkers and within *which* social framework did they live and work, both *within* and *outside* Gotland?

It should be noted that it might not be possible to thoroughly answer these questions all together, but the process *itself* will most certainly highlight issues of value for the overall work. Furthermore, it should also be remembered that these questions are formulated to fit any cultural entity; if Gotland strived to uphold a cultural seclusion from the neighbouring areas, that ought to be reflected in the answers to the questions above.

1.4 Terminology

The general timeframe of this thesis is c. 750-1140 A.D. – a period often referred to as the 'Viking Period' or '- Age' on Gotland. According to mainland Scandinavian chronology, the Viking Period lasted between the late 8th and the mid 11th centuries. The concept of a more long-lasting Viking Period cultural expression on Gotland compared to the mainland is based on the material culture; on Gotland, specific Viking Period key artefacts, for example paired brooches, occurred frequently into the 12th Century (cf. Thunmark-Nylén 2007). The end of the Gotlandic Viking Period is normally dated via the start of local minting c. 1140-1150 A.D. (Myrberg 2008). Within Sweden, the Viking Period is normally regarded as the last part of the Iron Age (c. 500 BC-1070 AD), but from a European perspective, it falls within the Early Medieval Period. For the sake of continuity, the terms **Iron Age** and **Viking Period** will be used when discussing Scandinavian and

Gotlandic finds and contexts and **Early Medieval** when discussing contemporary European features. The term 'Viking' is used widely within scholarly literature. Often these 'Vikings' are presented as one ethnic group among many in the period, a usage I find imprecise for Scandinavia proper. Instead, I will use the term **Norse** to describe Early Medieval Scandinavians in general. The traditional name of the native Gotlanders is *Gutar*, but for the sake of consistency, I have chosen to speak of **Gotlanders** throughout this thesis. Specific geographical areas in the Nordic and Baltic regions, which today are delimited by modern national borders, will be referred to by their modern English names, i.e. Sweden, Finland, Estonia etc. The term 'smith' is avoided throughout the thesis as it is so tightly connected with ironworking in contemporary discourses. Instead, the more neutral **metalworker/-ers** is used. The **non-ferrous metalworking** treated in the thesis mainly comprises working of copper-alloys, but also of silver, gold, lead, tin and mercury.

A short note on a crucial abbreviation is also called for: No one dealing with Late Iron-age Gotland can ignore Lena Thunmark-Nylén's fundamental work *Die Wikingerzeit Gotlands*, published between 1995 and 2006. It is referred to repeatedly throughout this thesis as **WKG** in accordance with the established abbreviations of earlier standard works on Gotland.

1.5 Applied analythical techniques

In the preparation of this thesis a wide range of methods have been utilized. Beyond archival studies of published and unpublished accounts, primarily in the Antiquarian Topographical Archives in Stockholm, I have undertaken a physical examination and ocular characterisation of artefacts, including analyses of surfaces and ornaments with 3D white light scanning. Elemental analyses of metal objects have been carried out by means of Energy-dispersive X-ray spectroscopy (SEM-EDS) and Micro X-ray fluorescence (μXRF). Further analyses – of trace elements in human bone – have been carried out by means of Flame atomic absorption spectroscopy (FAAS).

Geophysical surveys form an essential base for much of the thesis, primarily metal-detections carried out from the 1970's up until 2010 by Majvor Östergren, Torgny Andersson, Jonas Ström and Jonas Paulsson to mention a few. Magnetic surveys in close co-operation with Andreas Viberg have also been utilized along with limited metal-detection of my own.

1.6 Somewhat on theories

In many archaeological works, it is customary to declare the authors theoretical point of departure. While I agree that theory forms a crucial part of most archaeological works beyond sheer presentation of the physical

capacities of artefacts and contexts, I have always felt a certain hesitation when confronted with various theoretical trends and paradigms. All too often they tend to focus on one or a number of aspects within the studied area or material culture and ignore others, and, at least in retrospect, to have been both communicated and received as universal remedies and salvation doctrines. This is of course not confined to theories – a great many methods have been appointed with similar qualities, just to later be found wanting in one way or another. Thus, I have always refrained from declaring an explicit theoretical 'creed', rather the opposite. However, there is no way around the fact that the subjects treated in this thesis cannot be discussed without considering social aspects that cannot be satisfyingly covered via available empirical sources. Conceptual subjects such as ethnicity and identity are of vital importance for this thesis. Hence, the interpretative models presented, for example by Fredrik Barth (1969) and Ian Hodder (1982), are of great interest to the understanding of the interplay between early Gotland and its neighbours.

The more practical aspects of this thesis, such as the production of metal objects, might not at first seem to be a primary target of a theoretical discussion. However, André Leroi-Gourhan's (Audouze 2002) ideas vis-à-vis technology, in particular the concept of *Chaîne opératoire*, are often more suited for lithic studies as they have been shown to have some interpretive potential with respect to metalworking (Apel 2009). Similarly, the thoughts on technology and the social foundations of production by Leroi-Gourhan's scholarly heirs within French archaeology and anthropology, for example Pierre Lemonnier (1992), are also of interest to the discussion of Gotlandic metalworking from a social point of view.
These theoretical potentials will be further discussed and developed in Chapter 6.

1.7 Structure of the thesis

The Gotlandic society in the centuries before and during the Viking Period appears to have been secluded, but to paraphrase John Donne *not even an insular man is an island entire unto himself*; Gotlanders have at all times been forced to interact with the surrounding areas to attain necessary goods – in particular non-ferrous metals. That this interaction has left so few traces within the contemporary Gotlandic material culture is in itself an interesting phenomenon, well worth studying. The Viking Period Gotlandic society will be the focus of Chapter 2, which presents a thorough account of the known and presumed conditions on the island before, during and after the Viking Period. In Chapter 3, I will discuss techniques, raw material and trends in non-ferrous metalworking, again with the focus set on Gotland. Chapter 4 will cover the actual traces of metalworking, i.e. the find sites, and the

individuals behind the craft, both in retrospect as they are presented in previous research and as they appear in light of new finds and theories. This will be followed by a discussion of trade, harbours and interaction with the outside world in Chapter 5. Finally, in Chapter 6, conclusions will be drawn from the previous chapters and the Gotlandic material culture's part in defining a local identity will be discussed at length. The finds and sites that constitute the empirical base for this work are presented in a numbered catalogue at the end of the thesis.

The thesis includes 5 papers. As mentioned above, they discuss widely separate features through a range of archaeometric methods, but are all focused on highlighting aspects of non-ferrous metalworking. Even though the thesis aims to examine Gotlandic finds and contexts, a number of non-Gotlandic sites and objects are presented and analysed, both for the sake of representativity and the simple fact that Gotland is an island.

1.8 Papers

Paper I is a re-examination of a previously reported group of Gotlandic finds labelled as 'copper –' or 'bronze slag'. Fragments of such slag have been reported and collected at least since the 1920's and they have been used in discussions on the occurrence of early copper extraction on Gotland in the Iron Age. A renewed study of the nowadays quite substantial number of such finds showed that the fragments were not slag but hearth lining. By way of Energy-dispersive X-ray spectroscopy (SEM-EDS), it was possible to establish that the green patches of verdigris, which were found on most fragments, are inclusions of copper-alloy spillages rather than pure copper. These are most likely the result of casting; accordingly the 'slag' should not be seen as an indication of copper extraction, but of bronze casting at these sites.

Paper II is central to this thesis and presents a study aimed at compiling the finds and debris rendered by non-ferrous metalworking, which have been collected during metal detections on Gotland from the 1970's and onwards. Clear traces of such metalworking were found at 72 sites (sometimes divided into several find clusters) within 56 properties. 12 of these clusters might, judging from the finds, be interpreted as more permanent production sites or workshops; an additional 9 might also, based on the occurrence of certain diagnostic finds, have been production sites – these have been attributed as *potential workshop sites*. The majority – 51 – of the surveyed sites have only yielded a very limited number of finds of metalworking, though. One interpretation of this situation is that a number of professional or semi-professional metalworkers were based on specific *workshop farms* throughout Gotland and that the finds from the seemingly more ordinary

farm sites indicate casting, possibly of a less complex nature, by professional metalworkers as a way to display their skills and thus attain prestige in their contemporary society. The study also highlighted the fact that the workshops on the production sites seem to have followed the settlements when they were relocated, indirectly indicating an expected but otherwise less visual hereditarity among Gotlandic metalworkers.

Paper III discusses and problematizes the concept of Early-medieval Scandinavian workshops and metalworking based on a number of find sites in Denmark, Norway, Karelia, Estonia, mainland Sweden and Gotland. A central theme in the study is a critique of the common archaeological tendency to overemphasise the importance of written accounts when such are present; from a technical perspective the primary archaeological sources – finds and features from excavated workshop sites – often contradict the secondary sources offered by the few but frequently referred written accounts. Secondly, the paper includes a critique of the likewise common habit of over-interpreting archaeometallurgical finds; such debris is generally very resilient and survives well in settlement deposits, in contrast to the remains of many other human activities. Thus, debris from one single metalworking episode, for example in connection with construction, might disturb the entire interpretation of the utilization of a building. In short: The occurrence of slag in a house does not automatically make it into a forge.

Paper IV presents a pilot study carried out at three Gotlandic sites. These had previously been partly excavated or metal detected and then yielded clear evidence of high temperature crafts – evident non-ferrous metalworking in two cases and potential glass working in the third. In the study, magnetic survey was used to examine whether any traceable remains rendered by the craft activities could be observed. This was the case at two of the sites; the third had been submitted to deep ploughing, which had effectively altered the settlement deposit. It was also established that magnetic survey, regardless of metalworking, holds great potential for the location of subterranean stone structures, since they were often constructed by igneous rocks with a different magnetic susceptibility than the underlying Gotlandic sedimentary bedrock.

Paper V reports on a bone chemical study, which was carried out with the aim of investigating whether elevated levels of skeletal lead could be connected to exposure during metalworking. Through early-modern accounts and contemporary studies, it has been possible to establish that low-technical metalworking normally exposes participating individuals to high levels of metallic fumes, which are absorbed through the respiratory system and deposited in the skeletal tissue. 31 individual bone samples from as many inhumation graves from Gotland, mainland-Sweden, Denmark and

Iceland were submitted to trace element analysis. The results showed that two individuals from so-called 'smith's graves' displayed clearly elevated lead levels while a third individual without visual connections to metalworking and osteologically diagnosed with dwarfism featured elevated levels of both lead and zinc.

1.9 Delimitations

The traces of Gotlandic metalworking are rich and heterogeneous. Even though iron production through utilisation of local Gotlandic bog iron was disputed for a long time (cf. Serning 1979), it has been thoroughly established since the late 1970's that bog ore does exist on the island and that it was most likely collected and processed in furnaces, at least during the centuries around the BC/AD transition (Rydén 1979). Since all hitherto dated furnaces have yielded dates from that period, the local demand seems to have exceeded the supply. The initial extractive phase was followed by the import of iron blanks and possibly, as indicated by abundant finds of slag cakes, more or less unrefined blooms. Besides the ferrous bog ores, there are no naturally occurring metal sources on Gotland. This has not, however, limited the local use of non-ferrous metals.

As mentioned, above I have chosen to focus on non-ferrous metalworking in this thesis. This delimitation is artificial, but necessary, for a number of reasons: Debris from ironworking is very common on Gotland, but it is also highly uniform and often very hard to date, especially when it is recovered from ploughed-out contexts. Additionally, iron objects tend to require more effort and expense in conservation. This has led to a practice not to recover iron objects during metal detection. Thus, a chiefly economical consideration has rendered finds from the Hoard projects (cf. 1.11) less useful for studies of ironworking. Lastly, non-ferrous metalworking requires a wide range of specialist knowledge, not only of metals and alloys, but also of clays and their refractoriness. Many metalworkers, both on Gotland and beyond, probably mastered both ferrous and non-ferrous metalworking, but from a technical point of view, the latter must be considered the most demanding on a general level. Even though there are many technically advanced and demanding disciplines within ferrous metalworking, they are by far outnumbered by those involved in, for example, casting. Hence, it is probably possible to presume that even average random traces of non-ferrous metalworking normally reflect a higher level of specialisation than corresponding traces of ironworking.

1.10 Gotlandic geology and pre-Viking Period development

To understand Gotland's cultural development, it is important to know and understand its geological history. As on Öland, Sweden's second largest island closer to the mainland, the bedrock mainly consists of sedimentary deposits of lime- and sandstone, mainly from the Silurian era, but in addition, the latest glacial period left rich deposits of non-Gotlandic moraine sediments and igneous rocks all over the island. In c. 8700 BC, a fresh water transgression – the Ancylus Lake – formed in the Baltic Sea basin due to glacio-isostatic uplift in the south outlet areas. A significant gravel ridge was deposited along the lake's maximum landward shoreline. This so-called Ancylus ridge is presently, due to more rapid postglacial uplift on northern Gotland, found at a higher altitude in the north than in the south, ranging from 40 metres down to 18 metres above the current sea level. The ridge played a crucial part in the settlement pattern of the island from the Neolithic up through the early medieval period since it offered easily accessible and well-drained land. A later significant transgressive ridge utilised, in a similar fashion, the Litorina ridge, formed around 5000 BC. It is similarly located in the landscape, at altitudes between 27 and 13 metres above the current sea level (Munthe 1910).

From the centuries around the BC/AD transition, a local cultural expression developed on Gotland, at first with clear connections to eastern mid-Sweden and Öland, but from around 600 AD, a clearly defined insular Gotlandic culture can be seen to emerge. The people of this cultural subdivision seem to have interacted with those of the surrounding areas without being notably acculturated. This lasted up until around c. 1150 AD when Gotland seems to have chosen to be thoroughly annexed to the Continental High Medieval cultural sphere (D. Carlsson 1979; Myrberg 2008).

As mentioned above, the transgressive ridges of Gotland attracted settlements from an early stage, but over time less favourable areas were also utilised for this purpose, even though the shallow soils and large areas of bare rock effectively delimited farming in many parts of the island. At more favourable areas, large systems of Celtic fields developed in the centuries around the BC/AD transition, some of which are still discernible today (Arnberg 2007). Around the first centuries AD low, stone walls were laid out throughout the landscape and buildings were generally constructed with massive dry stone foundations. The stones used were not quarried to any great extent, but rather collected as the land was cleared. Accordingly, these walls and the foundations are, to a high degree, constructed by igneous rocks brought to the island by means of the ice sheet during the glaciations (Nihlén & Boëtius 1933; Nilsson 2011). Later, after around 500 AD, this practise seems to have been largely abandoned. Buildings erected during the

following centuries were of more Pan-Scandinavian types with earth-embedded frame- and roof posts (D. Carlsson 1983). These latter buildings have been shown to have a close connection to one of Gotland's most knowledgeable find categories – the silver hoards.

1.11 Silver hoards and metal detection

Occasionally, archaeological finds can take on a life of their own; they appeal to certain popular preferences and thus manage to draw interest far outside the narrow sphere of academic specialists. One such preference is without doubt shine and gloss – precious metal seldom fails to attract attention. Another appealing quality is general collectability. Certain artefacts and find types unfailingly attract more interest than others and, like most sought-after objects, they tend to be attributed to a value in accordance with economic logics concerning supply and demand. On Gotland, this became an established fact already in the 19th century and illegal trade in artefacts, looted from various contexts, became a way to increase the income for certain individuals (cf. Lindquist 1985; Kidd & Thunmark-Nylén 1990).

From early on, Gotland has been renowned for its rich and perennially occurring treasure hoards. The fashion to deposit hoards was widespread in the Early Medieval period, but on Gotland, this was done on a seemingly unrivalled level. To date, c. 800 silver hoards are known from the island (Östergren 2008), but an additional unknown number of hoards have most probably been recovered and dispersed by looters. In the 1970's, a new threat became imminent through widely available hand-held metal detectors and thusly equipped looters began a systematic plundering of sites known to have yielded hoards. As a measure to save what could be saved, the antiquarian authorities through the Swedish National Heritage Board's Gotlandic branch – *Riksantikvarieämbetets Gotlandsundersökningar* (commonly abbreviated *RAGU*) – launched a rescue project with the outspoken goal to beat the plunderers to their loot through proactive metal detection (Östergren 1989:15). Some of the surveyed sites were also excavated, but the vast majority were only metal detected. Since normal metal detectors seldom work satisfactory below a depth of 20-25 cm (Connor & Scott 1998), it has been common practice to metal detect potential find sites on more than one occasion, preferably after intermediate ploughing to allow objects from the lower plough zone to be tiled up to a more shallow and detectable depth. The first Hoard Project effectively lasted from 1977 to 1989, but it has been followed by a number of similar salvage projects, which altogether have helped to vastly increase the knowledge concerning hoards, their immediate contexts and the society that rendered them (Östergren 1989; 2004). *Paper II* in this thesis is entirely based on finds recovered and documented during the Hoard projects.

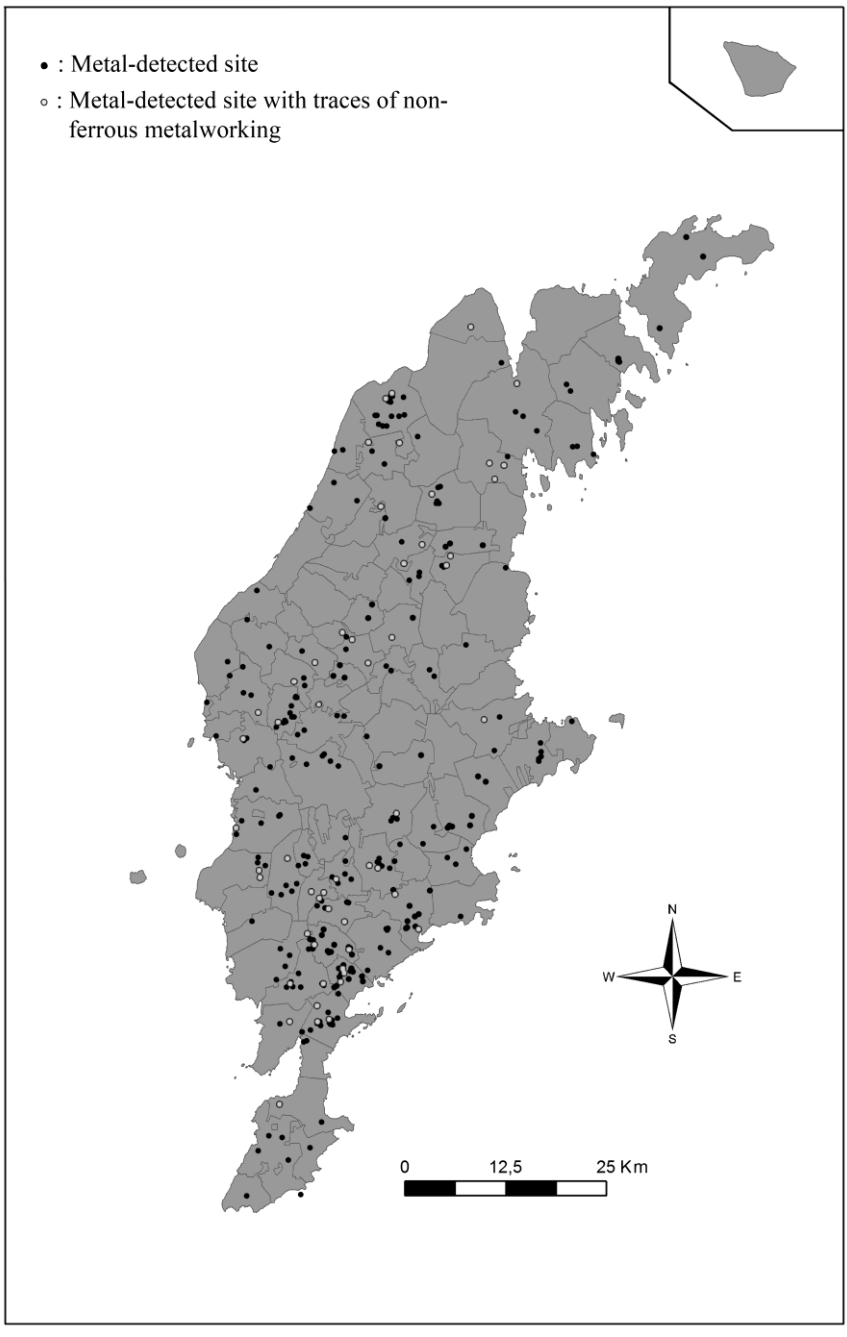

Figure 2. Geographical distribution of metal-detected Gotlandic sites surveyed between 1973 and 2010.

1.12 A note on sources

As Gotlandic archaeologists have, with few exceptions, largely been occupied with rescue excavations of burials, few extensive excavations of Iron Age and Early Medieval settlements have been carried out on the island. The settlement remains that nonetheless *have* been excavated are mainly in or close to Visby, the capital and seat of the island's modern municipality (Westholm 1989; Wickman-Nydolf 2011). The stone foundations of early Iron Age buildings locally known as *Kämpgravar* – giant's graves – were exceptions as they, through their often evident remains, were relatively easy to identify (Nilsson 2011). But while these were mapped and excavated, the settlements from the later Iron Age remained more enigmatic. When the Hoard Project began to survey ploughed-out hoard remains in fields all around the countryside this changed, as finds from a large number of sites were so clearly settlement-related. Among these settlement finds were a high number with clear connections to non-ferrous metalworking. Starting in 2006, I have had the opportunity to study and analyse these finds and as mentioned above, they form an essential part of the empirical base for the conclusions presented in this thesis and can be found in entirety in the second catalogue-section of this thesis (Section B). The geographical distribution of all metal-detected sites on the island is shown in Figure 2. Finds from a limited number of other sites are also included in the study and even though some of these sites have been surveyed by means of metal detecting, most of the finds have been recovered through field walking and traditional excavations. A limited number are stray finds from uncertain contexts. Sites of these later two categories are to be found in the first section of the catalogue (Section A).

Written accounts of early Gotlandic metalworking are few – as are written accounts of most other aspects of early Gotland. Written accounts before the 13th century are mainly confined to short runic inscriptions (Snædal-Brink & Jansson 1983) and even though some early events are accounted for in, for example *Gutasagan* – the Saga of the Gotlanders (cf. Chapter 2.1.2), they were all written down several centuries later. The 12th century treatise *De Diversis Artibus* (Hawthorne & Smith 1979) – Concerning the Various Arts – attributed to the pseudonym Theophilus and most probably composed in northern Germany, is invaluable when one attempts to understand early metalworking. Even though some of the content can be dismissed as nonsense, many of the techniques described in it have evidently been used on Gotland according to extant debris (cf. Chapter 3.3.5 & 7).

1.13 Statistical limitations

As most of the find sites treated here have primarily been surveyed for other reasons than to investigate non-ferrous metalworking, I will refrain from too

many statistical discussions. The random nature of the surveys simply does not allow for it from a metallurgical point of view. This applies, for example, to the number of metalworking sites per modern church parish. Only one of the parishes – Eke on the south-eastern coast – can be said to have been surveyed on a level that allows for more far-reaching conclusions but unfortunately the full extent of these surveys have never been published and cannot be assessed at the present. Another important issue is the fact that most of the sites have *only* been metal detected; hence, non-metallic finds, for instance technical ceramics, are generally absent. This underscores the fact that some uncertainty has to be accounted for in the discussion. Additionally, many find sites with few traces of non-ferrous metalworking might potentially hold other, similar finds in unaltered deposits below the plough depth. Thus, it is quite possible that a site that is presented as an ordinary farm in the catalogue might get 'upgraded' in the future as new finds surface.

2 Gotlandic society in retrospect

As mentioned in Chapter 1, a basic understanding of a society, on Gotland and elsewhere, is of vital importance for further studies of all activities that occurred within it and metalworking is not an exception. In this chapter, I will thus try to establish and, to some extent, comment upon the current position of the research on early Gotland.

Retrospective views often tend to try to fit the past into tidy segments, neatly sorted in chronologically defined order. Accordingly, prehistoric (i.e. pre c. 1050 AD) Scandinavia has since the 19th Century been divided into the Stone, Bronze and Iron Ages. In Sweden, the latter is rounded off by the Viking Period, which on Gotland, from an archaeological vantage point, is estimated to have ended a century later than in the rest of Scandinavia (cf. 1.4). This is a reminder that the chronological periods are later constructs, which at times can hinder broader interpretations by creating imaginary borders. The Viking Period is preceded by the Vendel Period (c. 550-750 AD) both on Gotland and in mainland-Scandinavia, but to find a more clearly defined break in the Gotlandic material culture, one has to move back to the late Migration Period – c. 500-550 AD – when the building customs shifted and the then typical Gotlandic buildings – long houses on massive stone foundations – fell out of use (D. Carlsson 1983; Nilsson 2011). This break has been connected to a climatic catastrophe which supposedly hit Scandinavia in the middle of the 530's AD (Gräslund & Price 2012), causing a profound cultural change throughout the society (Östergren 1989:32pp). The changes also seem to have affected the material culture by sparking a gradual evolution of the artefact types, which today is seen as diagnostic to the island – for example animal-head- and box brooches (A. Carlsson 1983a; Thunmark-Nylén 1983a). Other types, such as disc-on-bow brooches, which occurred both on Gotland and on the Swedish mainland, were preserved and developed further on Gotland, while they mainly fell out of use on the mainland during the Viking Period (Thunmark-Nylén 1995a). Yet other artefact types – like fish-head- and tongue-shaped pendants – seem to have been developed locally (Thunmark-Nylén 1995b).

Beside the artefactual evidence, there are a limited number of other sources that are useful for understanding Gotland in the Viking Period. These sources are both pictorial and written and well worth a more through presentation.

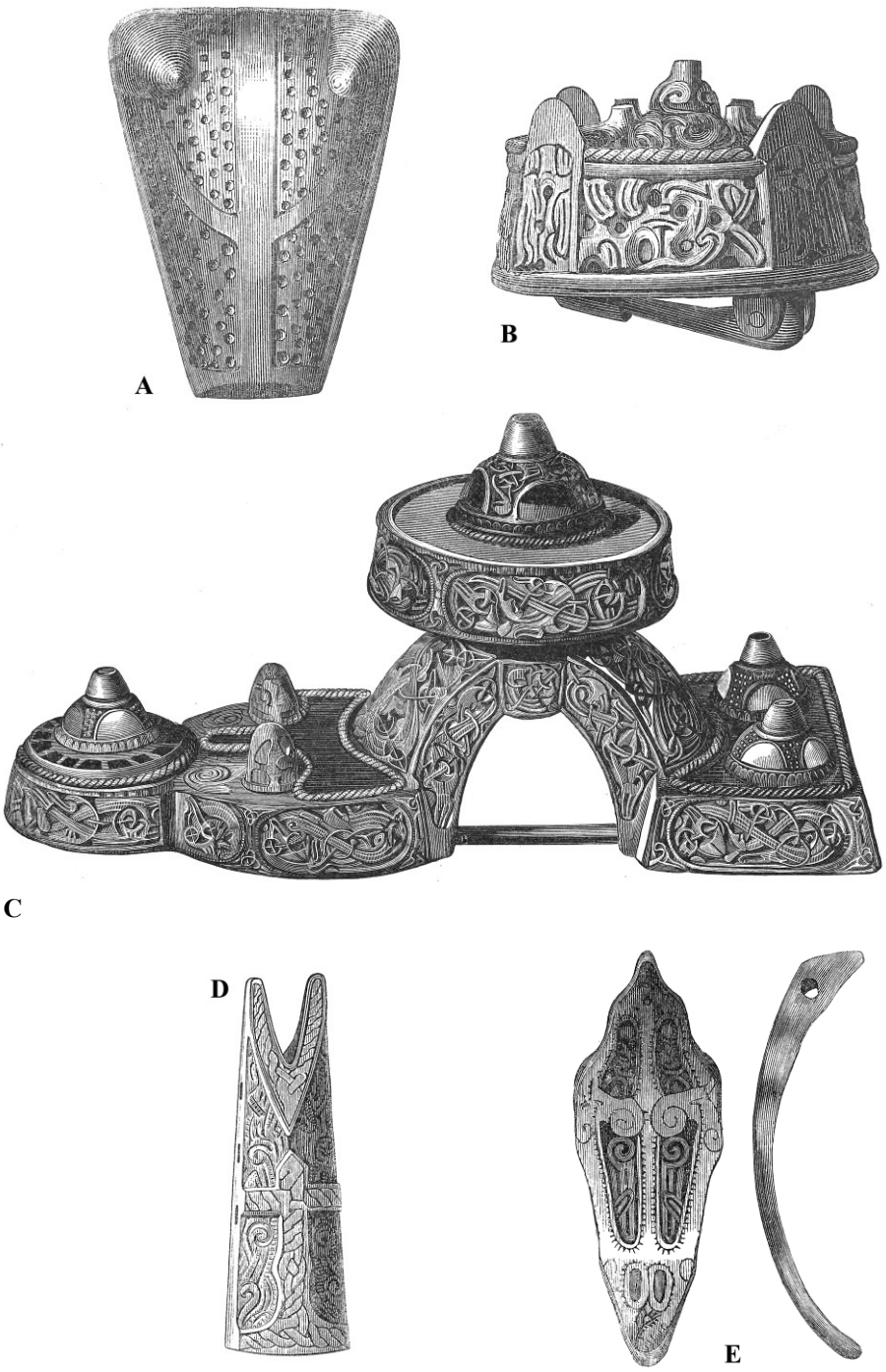

Figure 3. Gotlandic dress jewellery. A. Animal-head brooch, B. Box brooch, C. Disc-on-bow brooch, D. Fish-head pendant, E. Tongue-shaped pendant. Not to scale. After Montelius 1874

2.1 Complementary sources of a bygone society

2.1.1 Contemporary depictions – uses and pitfalls

Contemporary sources of early Viking Period Gotland are, as already noted, few. There is, however, one category of sources that is almost exclusive to the island: Picture stones. The first picture stones are dated to the Roman Period (c. 200-400 AD), but the production survived up into the late Viking Period. While the older types are rather simple with stylised motives, a new type was introduced in the 8th Century (Widerström 2012:10pp). The sizes of these stones varied, but the motives became more naturalistic with detailed depictions of humans, animals, buildings and ships. The motives on the stones are highly regulated and even though some individual differences can be observed, it is still quite apparent that they follow a schematic iconography, sometimes accomplished by means of templates (cf. Kitzler-Åhfeldt 2009). These younger stones are normally key-hole shaped and divided into ornamental panels or 'scenes' surrounded by a knotwork frame. The top panel normally shows a central horse and rider, which is often greeted by a female. Larger stones often have one or several middle panels showing various scenes, for example processions and fighting. The lowest panel on most stones displays a sailing ship. Later, the picture stones were increasingly influenced by the rune stone tradition on the Swedish mainland and much of the typical iconography eventually disappeared, leaving only the key-hole shaped outline and the raised ornamental relief as reminders of the original tradition (cf. Gustavson 2012).

Over the last century, many scholars have turned to picture stones to find clues to the culture of Iron-age Gotland. These attempts have often been dominated by interpretations that link the depicted scenes to myths and religious practises (e.g. Andrén 1993; Staecker 2004). In later years, the interpretational framework has been increased somewhat and allowed for more far-reaching theories as to the origins of the motives on the stones. Jörn Staecker for example, has suggested Christian influences for some scenes (Staecker 2004), but already in the first standard work on picture stones, *Gotlands Bildsteine,* the fact that many motives and even full scenes mimics depictions from late Roman and Persian cultural contexts is discussed (Lindqvist 1941:126pp). This practice of *Imitatio Imperii* has also been thoroughly discussed by Hayo Vierk (1981). A defence against such interpretations would of course be to claim that the similarities are coincidental, but if the view is broadened and other artefact types are brought into the comparison, it is clear that although picture stones were a specifically Gotlandic cultural feature, their motives were closely modelled on non-Scandinavian iconographies. This serves to stress something that is apparent when ornamented objects like Gotlandic dress jewellery are

Figure 4. Gotlandic (left – SHM 8315:2) and Achaemenid (right – BM 124029) arm rings, both with lion's heads terminals (left photo by the author, right photo: © Trustees of the British Museum). Not to scale.

studied: even though styles came and went the motives – *the scenes* – tended to be more conservatively persistent. Other similar examples of objects that follow the same trends are animal-headed arm rings and – outside Gotland – ornamental gold foils depicting single or paired humanoids, so called *guldgubbar*. The former category is almost exclusive to Gotland and comprises around 10 surviving and highly elaborate silver arm rings with cast-on terminals in the shape of dragon, or probably more correctly, lion heads (Gustafsson & Söderberg 2007). The *motive* can be backtracked down through Europe, both chronologically and geographically, towards the south-east (cf. Fodor & Révesz 1996:378) and further on towards Persia. There, animal-headed rings were being produced already during the Achaemenid period (c. 550-330 BC). They have survived in substantial numbers (Curtis 2005:139pp), which allows for a comparison with the Viking Period Gotlandic rings. This shows, as can be expected, a great difference in style but also a correspondence in featured details such as collars and complexional features (Fig. 4); hence, even though there are very few common denominations in terms of stylistic traits, there is a connection in motive. Yet it might have been possible to dismiss these as coincidal if it had not been for other Scandinavian artefact types featuring the same correspondence. The abovementioned pressblech guldgubbar is often brought forth as typically Scandinavian, yet a similar connection in motive and composition can be observed when extant Scandinavian guldgubbar are compared with Achaemenid gold plaques, for example from the Oxus Treasure (Razmjou 2005:162pp). But even if the most imaginative theories are stretched to their limits, there can hardly be said to exist a credible connection between Achaemenid Persia (c. 400 BC) and Scandinavia in the centuries around the turn of the first millennia AD; this correspondence must

instead be explained by a conservative consistency in the choice of motives regardless of the social changes or possibly by an influx of antiquated objects later in the Early Medieval Period.

This stresses the importance of thoroughly examining non-Scandinavian objects and features that can be assumed to have inspired local artisans; such an approach allows us to dismiss the details that were imported along with the motive scenes by rule of convention, in the same fashion as saints in modern Orthodox-Christian icons which are still depicted wearing Byzantine or even Roman lamellar- and scale armour. It is only when those features are acknowledged that we can start to use the depictions as a means of interpreting the material culture of the society that created them.

With this in mind, large portions of the motives on the picture stones must be discarded as sources to the Gotlandic Iron Age and the focus should instead be set on the defining details that were incorporated by the local artisans.

2.1.2 Written sources

Besides the runic inscriptions mentioned above, there are surprisingly few written sources for early Gotland. The Medieval law of Gotland – *Gutalagen* – which is dated to the 13th century (the oldest surviving copies were written in the 14th century), based on cameral and linguistic traits is considered to be the one of the earliest. It is accompanied by a document that is normally referred to as *Gutasagan* – the Saga of the Gotlanders (Holmbäck & Wessén 1979); a text which allegedly gives a background for several Medieval relations, for example between Gotland and mainland Sweden, such as under which terms the Gotlanders accepted Swedish superiority and how sacral issues were dealt with on the island. A few individuals are mentioned by name in the text and even though some of these, like the would-be pioneer on the island, Tjelvar, must most likely be ruled out as purely mythical, others may have actually existed. One of these was Avair Strabain from Alva parish who is described as the Gotlander's envoy to the Swedes (Holmbäck & Wessén 1979:292). There are also a number of written Late and Post-Medieval sources of a more or less cameral nature, dated to after c. 1485 (cf. Ersson 1974:18pp). These include names of farms and farmers and, together with recorded Roman Period buildings with stone foundations, they constitute the main base for most estimates of the number of active farms and their abiding population in the late Iron Age.

There are two late historical accounts of interest for the discussion on early Gotland, in particular for the introduction and spread of Christianity. The first is *Cronica Guthilandorum*, published in 1633 by the Gotlandic priest Hans Nielssön Strelow (Strelow 1978 [1633]) and the second, compiled in the 1680's, is *Rudera gothlandica* (Spegel 1901) by Haquin Spegel, who would later become Archbishop of Sweden. Both aimed to

describe the past Gotlandic culture; Strelow's *Cronica* is mainly – as the name implies – a chronological account of events, people and features up to his own time. It is generally believed to have been based on earlier historical accounts, some of which are now lost, and legends collected among Strelow's contemporary Gotlanders. These were then rounded off with a generous amount of additions, which were clearly of his own, nationalistically inclined making. Spegel's *Rudera,* on the other hand, is more thematically disposed, but just as Strelow, he had a clearly discernible nationalist agenda – but from a Swedish perspective, instead of Strelow's Danish. Spegel is believed to have based parts of his text on Strelow's, or at least on the same sources, but there are differences in some details. The credibility of Strelow's text has been discussed all since the 18th century. One central issue is the years of construction for a number of churches that are listed in the *Cronica*. A number of these dates are surprisingly old given the visible age of the present churches, a discrepancy dealt with in various ways by different scholars (c.f. Thunmark-Nylén 1980; Wase 1995). One explanation for the different dates, at least at some churches, might be that the present stone churches were preceded by smaller wooden stave churches at the same site, as in Silte and Sproge (Trotzig 1983), or close by, as in Fröjel (D. Carlsson 1999b).

2.2 Settlements

During the last 40 years, several works of Gotlandic archaeology and cultural geography have discussed the dynamic settlement pattern of the late Iron Age, based on metal detector finds, extant monuments and early maps (e.g. Ersson 1974; D. Carlsson 1979; Windelhed 1984a & b; Östergren 1989). Drawing on the earlier studies, Majvor Östergren presented a theory which suggested a general tendency of settlement mobility; this meant that many individual farms were repeatedly relocated within their nearby lands over time. Her interpretation of this was that new farming practices and technologies endowed the growing of crops with a greater importance over time and that this came to claim more land (Östergren 1989:225). Practically speaking, this custom has left traceable remains, which are chronologically and spatially separated from each other but still interpretable as remains of the same farming units. By the medieval period, this custom seems to have been laid off, possibly as a result of a greater social sedentarity brought on by new building practices; sacral buildings were built of stone on an increasing scale and this was to some extent mimicked by profane buildings. This also led to a fixation of the main roads and when the farms had reached these roads there were no incitements to move them any further (Östergren 1989:238). Additionally, it should be acknowledged that an archaeologically documented settlement site must not necessarily be connected with one that

is historically known; permanent abandonment of Gotlandic farms, resulting in *ödegårdar* – deserted farms – is a well established historical fact (cf. Ersson 1974). In most cases, these earlier settlement sites are only known via find clusters in the fields, found via metal detection and dated by means of coin-*t.p.q.* and chronologically diagnostic artefacts.

2.3 Population and social organisation

Besides osteoarchaeologic data, not much is known about early Gotlanders on an individual level. Via the archaeological record, it is possible to observe a general trend of increased withdrawal, culturally speaking, from the surrounding areas during the course of the Iron Age. The Gotlanders had thus, by the advent of the Viking Period, developed a defined insular culture; hence, while the other regions of the Scandinavian cultural sphere were connected through cardinal similarities in material culture, for example general costuming patterns, the Gotlanders evidently chose to develop a local, culture-specific dress which differed from the more pan-Scandinavian version (Gow Sjöblom 1989). Such an outspoken positioning by a society just 90 km east of the Swedish mainland speaks for itself – Gotland was not a part of the pan-Scandinavian culture and presumably it was not until the later part of the Viking Period that the Gotlanders, allegedly via the aforementioned Avair Strabain's mediation, formed an open alliance with the mainland Swedes, exchanging a yearly tax for protection and exemption from tolls in areas under Swedish rule. One of the theories concerning the Gotlandic negotiations with the Swedes stresses that they might have come about after repeated encounters with Norwegian plunderers like Olav Tryggvasson and Erik Hakonsson in the late 10th and early 11th centuries (Holmbäck & Wessén 1979:304pp). From an archaeological point of view, it seems as if this alliance was not very far-reaching; until the end of the Gotlandic Viking Period it left a very small impression in terms of non-Gotlandic objects on the island (not counting valuables such as coins and other objects of silver or, exceptionally, gold). But when such foreign objects do occur, they become all the more interesting – for example, equal-armed brooches, mainly of the types JP 58 and 71/72, which are commonly found both in Scandinavia and in the areas east of the Baltic Sea (cf. Aagård 1984:104p). On Gotland, a number of such brooches have been found both in graves and in unclear overploughed deposits (WKG III:91). Their cultural significance is uncertain, but since they do occur in graves together with Gotlandic brooches, it might be assumed that they were an accepted addition to the overall dress. Anders Carlsson (1993) has suggested that such non-Gotlandic brooches might have been used to signal foreign contacts (cf. 6.2 for a further discussion).

It is also important to remember that the Gotlandic material culture featured a large number of traits, which originated in, or were influenced by, the material cultures in the Baltic countries, chiefly Latvia. Judging from the finds, both along the eastern and southeastern Baltic rim as well as on Gotland, an intensive interaction and cultural exchange seems to have occurred in the Vendel Period or the earliest part of the Viking Period (Thunmark-Nylén 1983b). Early interpretations (e.g. Nerman 1942) regarded these finds as indications of Swedish military expansion followed by Gotlandic migration and colonization, but in later years the finds from, for example, Grobina in Latvia have been connected to the more peaceful immigration of Gotlanders around 700 AD (Gunnarsson 2012). The recent finds of two extraordinary boat burials at Salme on southern Saaremaa, Estonia, might re-vitalize the discussion on Scandinavian military activities along the eastern coasts since the finds indicate that the buried individuals came from Scandinavia and since many of them feature signs of severe trauma, no doubt inflicted by combat at close quarters (Konsa *et al.* 2009; Peets *et al.* 2011). Regardless, it is evident that the Gotlandic-Baltic contacts were upheld throughout the Viking Period, a fact that can be observed through male dress attires in both areas (Thunmark-Nylén 1983b).

2.3.1 Early Gotlandic society in sources and research

On a social level, Gotlandic society has by some scholars been interpreted as less hierarchic than its contemporary Scandinavian dittos (e.g. Yrwing 1978; Siltberg 2012): no kings and no outspoken nobility are accounted for in the surviving written sources, in particular the Gotlandic Law, and the graves are generally quite modest regarding demarking inventories like prestigious objects etc. But this picture of Gotland as a 'farmer's republic' without outspoken social stratification has not remained unchallenged over the years.

The general lack of early sources has brought that even surprisingly late accounts, from the 16th and 17th centuries, have been used in attempts to reconstruct and interpret earlier social conditions. These later sources describe a Gotland that had passed its economical zenith, where the trade on Visby had lost most of its importance and a number of appointed judges (see below) ruled the island in consensus with the royal representatives of Visborg castle, the stronghold immediately south of the town. Carl Johan Gardell (1986) treated this situation in a thesis where he suggested that the judges formed a ruling oligarchic nobility, at least from the 15th century on. The judges also apportionated taxation and to some extent collected tax and law-regulated dayworks among farms within their jurisdiction, while they themselves were exempted from parts of the taxation. Gardell suggested that this system in effect rendered Gotland quite autonomous from the Danish crown. He saw it as mainly caused by the crown's inability to enforce and manifest itself on the island and by the judges' self-interest in upholding

their privileged positions. Later, Jens Lerbom (2003) presented a new take on the Gotlandic judges, interpreting them not as nobility but as a cultural elite. He also discussed the potential evidence for heredity and demarking insignia for judges.

This has been fiercely challenged by Tryggve Siltberg (e.g. 1991 & 2012) who argued that Gardell overestimated the power of the judges, especially from a long-term perspective. Instead he insisted that the judges were more to be seen as *Primi inter pares*, i.e. that they, to some extent, were socially privileged, but that they as a group cannot be proven to have formed a distinctive nobility, different from other landowning farmers. Siltberg agreed that most judges were recruited from Gotlands larger farms in the 17th century, but he rather chose to compare them with civil servants. Lerboms efforts in finding dynasties and demarking insignia have also been disputed by Siltberg, who dismissed the arguments in favour of such an interpretation as based on a too narrow set of evidence (2012:216pp).

These discussions are all centred on conditions during the Late Medieval and Early Modern periods, and it ought to be kept in mind that much must have changed within the Gotlandic society over the centuries from the end of the Viking Period. To transfer the socio-political situation from the 17th century back to the 10-12th centuries must thus, at best, be seen as speculative.

Figure 5. Setting- and Thing borders. After Östergren 2004.

2.3.2 Social, legal and ecclesial organisation

Much of what is known about the political, religious and judicial organisation on Gotland has been pieced together by more or less inconclusive accounts in the Gotlandic Law and other, later sources. According to these, Gotland was divided into several hierarchically arranged geographically defined units (Fig. 5): First, three *Tredingar*

(thirds, first accounted for in 1213; Yrwing 1978:81), which were divided into two *Settingar* each (sixths – six in total – mentioned in the Gotlandic Law; Yrwing 1978:83). These Settingar were divided into two or in some cases three *Ting* each (Things, the lowest level of judicial authority– 20 in total – first accounted for in 1412; Yrwing 1978:86), and these were then divided further into *Fjärdingar* (fourths, first accounted for in the 1520's; Yrwing 1978:87) and parishes (cf. Ersson 1974, Chapter V). Hugo Yrwing (1978:83) has argued that the Setting organization was a late addition, which was introduced after the treaty with the mainland Swedes. The Tredingar and the local Things seems to have been older structural units with roots in the pre-Christian society since local sacrificial feasts – *Blot* – administered both by Settingar and Ting (as well as on a national level) are mentioned in the Saga of the Gotlanders (Yrwing 1978:82). The local Things had, as already mentioned above, appointed judges who might or might not have formed a socially elevated class, at least in the Late Medieval society. The three Tredingar also had a Thing each and, finally, the whole island had a Thing (usually referred to as the *Allthing* modelled on its Icelandic equivalent) with a *Landsdommare* – a High Judge – whom, together with other appointed judges and later a number of priests, formed the supreme legislative and political body of Gotland. It has been suggested that Gotland was a parliamentarian autocracy, ruled by the Allthing and its judges (cf. Andrén 2011:15; Siltberg 2012). The Gotlandic Allthing is by tradition assumed to have assembled near Roma in the central part of the island (Östergren 2004b; CAT no. 66). A Cistercian monastery which is referred to as *Sancta Maria de Guthnalia* in contemporary sources was founded there in the 12th century and it is still reflected in the area's current name: *Roma kloster* (Roma cloister). The name *de Guthnalia* has been interpreted as deriving from a Latinised form of '- by the *Guthnalthing'* (the Allthing of the Gotlanders) (Lindström 1895:170pp). In recent years, some doubts have been expressed concerning the identification of the area by Roma kloster as the original assembly point of the Allthing. This is instead suggested to have been located on a now disappeared island called *Björkö* (Birch Island) somewhat east of the monastery (Myrberg 2009). The area north of the monastery, which has yielded rich finds connected to trade and exchange (weights, silver, fragments of copper-alloy bars), would then have been close by the Thing area, yet not in the middle of it during the Viking Period (Myrberg 2009). Myrberg further connects to a much older hypothesis, which maintains that the place name *Gutnal* might denote some kind of assembly point, translating as the *Al* of the Gotlanders rather than the Allthing of the Gotlanders (Lindroth 1915). According to Stefan Brink (1992:116) the element *-al* or *-alh* in a place name might signify a protected, enclosed area or even a prominent building. Per Vikstrand (2001:191pp) maintains that –al/–alh might rather signify some sort of consecrated building i.e. a temple-like structure. Ola Nilsson (2011:41) has presented a

17th century source, which appears to support the interpretation of Gutnalia/Gutnal as' the Al of the Gotlanders'. In the account, a history of the Cistercian order published in 1640 by Caspar Jongelinus, it is stated that the local name of the monastery was *Gudholyn* (Jongelinus 1640:34) – most probably a phonetic spelling of *Gutalen.* The original – and single – account of the location of the Gotlandic Allthing is to be found in the German translation of the Gotlandic Law with the attached Saga of the Gotlanders, completed in 1401. It speaks of the '*gutnaldhing das ist czu Rume*' (Yrwing 1978:80). However, given the nature of pre-Christian Scandinavian society, there ought not to be a contradiction between the Allthing on one side and a possible cultic structure on the same site – rather, it should be the opposite as several assemblies, both in pre-Christian and Christian contexts, seems to have been interchangeably connected with the more religious aspects of the society (cf. Sanmark & Semple 2008).

The Gotlandic Things and their organization are mainly a Medieval and Post-Medieval field of study, at least as far as the main sources go, and the same applies for the discussion about the origin of Gotland's many church parishes. In the 1970's, chorological studies of the parish layouts in relation to the positioning of farms and churches led to the conclusion that parish borders seemed to predate the Medieval stone churches and that the parishes presumably were established within a short timeframe towards the end of the 11th century. Furthermore, it was suggested that most churches were constructed on sites that were consensually chosen by the farmers (Lindquist 1981). This swiftness in the establishment of parishes has been criticised and some scholars would rather see pre-conversion roots for the parishes (Siltberg 2011:130) – but the debate on how and by whom the parishes were established has by no means ended; new evidence for an against specific theories is published regularly (e.g. Andrén 2010 & 2011).

One way to broaden these rather narrow perspective is to compare the Gotlandic situation with that of other early Free States and would-be 'Farmers republics' – most notably that of Viking Period and Early Medieval Iceland.

2.4 Early North European Free States

A number of areas in Northwestern and Central Europe, beside Gotland, have at times been controlled by local assemblies that were more, or sometimes less,unaffected by interference from feudal power. A selection of these early 'Farmers republics', defined as *Landesherrschaft,* have been treated by Alexander Ganse in his doctoral dissertation from 1988. He drew examples from Frisia, Germany, Switzerland and Austria. These constituted a very heterogeneous group and the level of autonomy varied greatly. A common feature, at least for Friesland and Gotland, was that they mostly

represented a very basic concept of state with a limited number of institutions led by appointed judges (Ganse 1990).

From a Scandinavian perspective, the most prominent and well-known example of such a 'Farmers republic' is the Icelandic Free State. There, after the initial colonisation phase in the 870's AD, the urge for a judicial authority arose among the land-takers (*Landnámsmenn*) as more and more of the island was claimed by settlers. A general assembly, the *AllÞing*, was established around 930 AD and after a reformation in the 960's it formed the political heart of the Free State. Already from the start the system was based on local leaders, *Goðar* (sing. *Goði*), who initially acted interchangeably as cult leaders and representatives in the AllÞing. Originally there were 36 Goðorð, i.e. the political office of a Goði. These could be inherited, sold or passed on as a gift, but also shared between several individuals. As an effect, there could be more than 36 Goðar at any given time. After a reform of the judicial system, the number of Goðord was increased to 39. These were tied to a new regional division of Iceland in quarters, an additional 9 Goðar with limited authority were also appointed in three of the quarters to level off the internal power balance (Byock 1999:114). The Goðar acted by mandate of supporters who could freely chose which Goði they were to sign up for, so even though the Goðar acted within a system of regional division, their power bases were more individual than territorial. A follower of a specific Goði could also choose to change his allegiance to another Goði if he was not satisfied with the first one (Byock 1999:137). Up until the 12th century, the power of the Goðar mainly lay in their abilities as advocates and mediators in the perennial conflicts between farmers, mainly over land or other natural resources. The introduction of a tithe law in 1096 (Byock 2001:305) came to act as a watershed in the history of the Free State as the Goðord became exempt from tithes. The tithes themselves were also divided into parts that could partly be claimed by farmers with churches at their farms. This allowed for an accumulation of wealth among such farmers who also in many cases held Goðord – offices which, as stated above, could be bought. Eventually, this lead to the formation of a new social class – the so-called *Stórgoðar* (Byock 2001:328) – who came to control most of Iceland in the 13th century and whose internal feuding quite effectively brought about the decline and fall of the Free State in the course of the 1240- 60's.

It might be tempting to use the Icelandic Free State as a direct template to interpret the situation on early Gotland, prior to the earliest surviving written sources. That would hardly be fruitful, however, since a wealth of features, both climatic and socio-cultural, set them apart. Yet the Icelandic situation might be used as a sounding board in the attempts to discuss possible but hard-proven traits of the Gotlandic society. First, it might be of some use to compile a number of the more obvious similarities between the two islands: First, they were both, quite obviously, insular societies, i.e. their landed areas are easy to overview as they are defined by shorelines. Second, both

societies appear to have been formed in opposition to established societies of mainland Scandinavia. Finally, more defined social boundaries seems to have been absent in regard to the general – free – populations of both Iceland and Gotland.

Then again, there are a number of crucial features that serve to separate the two areas. Most important: their respective locations. Gotland, though admittedly on the eastern frontier of Scandinavia, was still surrounded by other inhabited areas while Iceland, up until the previously mentioned colonisation – the *Landnám*, was an uninhabited solitaire in the north Atlantic. Furthermore, even though both societies were formed in opposition to those on the Scandinavian mainland, the Icelandic Free State displayed a material culture that was clearly in line with that of western Scandinavia, most probably since it was detached so late from the Norwegian motherland.

The key to Iceland's usefulness as a sounding board is of course the rich range of written accounts from the 12th and 13th centuries, which mainly relate to alleged events in the centuries around the turn of the first Millennia AD. These accounts, together with the first preserved written code of law by tradition referred to as the *Grágás*, offer invaluable insight into Early Medieval society even though normal issues with biases and personal tendencies in the texts must of course be taken in to consideration, as well as the rather late date of the earliest surviving copies (normally dated to the later half of the 13th century, cf. Byock 2001:390, note 2). One of the more interesting aspects of the Icelandic political structure is doubtlessly the less territorially defined system of the allegiance between chieftains/ judges/Goðar and their supporters. No such system is known from Gotland where 20 more or less territorially defined local Things are mentioned in sources from the early 15th Century (Yrwing 1978:86). Furthermore, there are no known accounts of how the Thing judges were appointed. The Gotlandic Law gives no insight into how and on which merits the judges were appointed in the Early Medieval Period – their existence is evidently taken for granted. Neither is it possible to establish if the individual farmer, like his Icelandic counterparts, had the right to change his allegiance from one judge to another within, for example, his home Setting. That being said, it is evident that the Gotlandic division of local Things features a striking discrepancy when compared to the borders of church parishes. Tryggve Siltberg (1991:188) has argued that this might be explained by the local Thing's role in the tax collection at least from the 15th century on. To alter the borders of the Things might thus have been seen as less suitable as it would have changed the general basis for taxation. On the other hand it seems to have been much easier to change the parish affiliation of a farm, which, in single cases is known to have happened as late as the early 17th century (Siltberg 1990).

One feature in the Icelandic judicial system might lend itself to a comparison with Gotland though: When a foreign merchant landed on

Iceland he had to turn to a Goði who was to estimate the value of the imported goods in the local currency *Lögeyrir* before he could sell anything. The Lögeyri was not primarily based on silver but on the value of a specific quantity of woollen cloth, *vaðmál*. One Lögeyri equalled a piece of vaðmál 6 ells long and 2 ells wide (1 Icelandic ell measured between 0.49 and 0.5 m). The value of the Lögeyri was established each year by the local Thing (Byock 1999:131). This system meant that the Goðar could maintain control of both what was being brought into the country and by whom. The concept of controlling foreign elements and influences is very interesting, especially in a closed society such as Gotland, and I will discuss the possibilities for a similar system on Gotland below (cf. 6.4).

2.5 Mainland-based archaeological criticism

A number of archaeological studies published in the late 1980's and early 1990's expressed doubts as to the alleged social equality and autonomy of early Gotland (e.g. A. Carlsson 1990; Hyenstrand 1989; Broberg *et al.*1990). These mainly focused on similarities in finds, contexts and other features between Gotland and the Swedish mainland and they often utilized hypothesises based on mainland Scandinavian conditions in their interpretive models. One example is the possible occurrence of organisational units, which might be reflected in the use of certain place-names – for example *Stenstugu* and *Tuna* – that occur repeatedly on the island. Instead of a levelled society, this was said to imply that a number of contexts on Gotland were modelled on contemporary mainland-Swedish manorial structures. This would, according to the referred works, point to a higher degree of cultural similarity and exchange between Sweden and Gotland than is normally assumed. However, given the development in research and general find rate over the last 20 years, both on Gotland as well as mainland Sweden, such an approach must in part be regarded as questionable, given the apparent differences in the material cultures.

That being said, I personally find it hard to believe that late Iron Age Gotland harboured an entirely egalitarian society – even though the differences are many, the same can be said for the similarities. The Gotlanders lived and acted within a social framework that was profoundly Germanic/Norse even though they quite apparently had their own version. This framework featured a number of key elements, and one of the more central of these seems to have been the concept of patronhood where certain individuals for various reasons, such as economical resourcefulness or military capability, acted as leaders for others (Bazelmans 1999). The paramount issue in the discussion of alleged equality seems rather to be one of definition – every scholar that has treated the situation, even Siltberg (2012), admits that some differences must have existed between individuals,

but they all have a personal definition of exactly what it constitutes to be part of a nobility or gentry. Some, like Siltberg, speak of wealthy and less wealthy farmers while others, e.g. Anders Carlsson (1990; 1993), regard certain families as allied to and mimicking mainland-Swedish overlords.

One specific find site that is often referred to by scholars who maintain that Gotland had a social stratification is the Broa/Högbro cemetery in Halla parish on central Gotland. Originally, the cemetery comprised some 700 graves and among the many finds are fragments of four Vendel-period helmets and the so-called Broa grave, a horseman's grave with very rich grave goods – perhaps most notably the amber bridge of a lyre. These finds have been interpreted as implications of a high-status milieu, possibly connected to the farm Hallegårde (Broberg *et al.* 1990). This might well, at least in parts, be correct, but simultaneously it should be kept in mind that the Gotlandic Vendel Period, like its mainland counterpart, seems to have been a very dynamic period about which we know very little. Thus, Gotland might well have been controlled by a limited number of families in the Vendel Period but that does not necessarily mean that this was also the case in the Viking Period. Contrary to the Swedish mainland, Gotland, as stated above, seems to have had a very uniform burial practise in the Viking Period, without the more extravagant features in grave design, which, on the Swedish mainland, are generally assumed to have signalled social stratification and hierarchical superiority – for example large mounds and intricate stone settings or cairns. Neither do the few thoroughly excavated settlements on the island display any greater differences in presumed status even if it might be possible to identify and reconstruct some distinguishing patterns from these finds and contexts.

2.6 Social distinctions

The Gotlandic settlement pattern has already been partly covered above, but a couple of important features need to be highlighted further: First, while farms in other parts of Scandinavia tended to cluster together and form villages in the later Iron Age, their Gotlandic counterparts mainly stayed as single farms, sometimes divided into several parts, up until the Early Modern Period (e.g. Ersson 1974:1; Östergren 1989:217pp). Thus, on Gotland the organizational units above farms were not hamlets and villages, but rather neighbourhoods, i.e. a number of farms and farm parts in proximity of each other, generally with bordering lands. Previous studies have shown that the neighbourhoods that are visible on the first parish maps drawn around the late 17th and early 18th centuries appear to reflect the land use at least back to the Early Medieval Period (D. Carlsson 1979:146).

In a paper published in 2010, Nils Blomkvist challenged the 'normal' picture with a statistical estimate of approximately 1500-1800 farms on the

island from the Iron Age up through the Early Modern Period. Based on the fact that Gotland saw rapid economical growth from the Viking Period up until the 14th Century, Blomkvist maintained that the Gotlandic population must have been much larger than the usual estimates (Blomkvist 2010:72). There are a number of historic accounts, mainly taxation lists, but Blomkvist dispute them as being based on the demographic situation of a society which had been severely decimated by the Black Death in the mid 14th Century and the battles in connection with the Danish conquest in the summer of 1361. Other scholars have highlighted this issue in the past (e.g. A. Carlsson 1983a:31pp; Ersson 1974:56; Östergren 1989:117pp), but not sufficiently according to Blomkvist. Before the 1350's, he argues, the demography must have been much different due to the dynamics of the economical growth experienced on the island; one important source of error for the estimates can possibly be explained by immigration from surrounding areas. These foreign individuals would have interacted with the native, landowning population without leaving many traces behind to give them away in the records, which can be interpreted by archaeologists and geographers (Blomkvist 2010:82).

Majvor Östergrens and the Hoard Project's surveys and interpretations of settlements with silver hoards were epochal, but not unproblematic; at first, they might lead to the presumption that the inhabitants of most farms were able to hoard silver. Further studies have shown that this was not the case even though the concentration of silver at Gotlandic settlements by all standards must be regarded as high. Östergrens surveys at Mallgårds (currently Bondarve) in Levide parish gave indications of at least 16 individually defined settlement sites via find clusters (cf. CAT. nos. 54-57). Eight of these yielded finds of silver coins and two silver hoards have been located within another cluster; some of the coins might also have been the remains of ploughed-out hoards (Östergren 2004a:46). Thus, there are eight find clusters without silver finds. Torgny O. Andersson's surveys also yielded similar results from Eke parish; the large workshop site by Nygårds (CAT. no. 26), for example, has not yielded any finds which can be related to a hoard to date. This support Blomkvists hypothesis about a denser population prior to the mid 14th century, even though he primarily treated the situation in the Gotlandic Medieval Period (post 1140 AD). Unfortunately, the settlement sites found by means of metal detection are hard to arrange chronologically beyond the Iron Age and Early Medieval based on diagnostic artefacts. Nonetheless, it is quite apparent that the estimate of 1800 farms must be adjusted upwards. Blomkvist also, in passing (2010:109), pointed out an interesting passage in the Gotlandic Law which might help to increase the understanding of the vast number of settlement sites found at, for example, the abovementioned Mallgårds in Levide parish: In the code on land sale it is stated that a man could choose to apportion his moveable assets among his heirs while he was still alive but remain as sole

landowner until his death. Meanwhile, he could allot his son(s) plots of land to settle within the family unit (Holmbäck & Wessén 1979:280). By and large the Gotlandic legislation concerning land was quite complicated. According to the law, the land seems to have been closely tied to the settled Gotlandic families through a strict patrilineal clan system, which stipulated that, primarily, the land should *not* be sold but inherited. If land was to be sold, the family was granted preemptition and a man who sold his land seems to have rendered himself judicially non-Gotlandic, i.e. lost his citizenship since the law specifically states that men who sold their family land, if slain, where only granted the wergild stipulated for non-Gotlanders.

It has been suggested that the Gotlandic Law was composed rather late and that the reoccurring paragraphs on how Gotlandic land should be owned by Gotlanders was a reaction to an influx of, for example, Germans in the 13th and 14th centuries (Sjöholm 1976:152pp). To some extent this might be accurate, but even though a number of paragraphs in the law can be assumed to have been added later than the first half of the 13th century, it is obvious that protection of family land was as central to the early Gotlanders as it was on the Swedish mainland. This is generally connected to the widespread north-European concept of *Oðal* – the traditional entail-like relation between landowning families and their allodial land (T. Zachrisson 2011; in print).

The positioning of farms within the parishes might give some information about the social standing of the inhabitants – farms located on good soils most probably indicate a greater wealth. Another factor that might possibly have added to the prestige, and thus the social standing of an individual, was if he held a more important public office, for example as a judge in the local and regional Things (cf. the discussion during the early 17th Century in Siltberg 2012:216pp). I will now return to the Oðal and its possible manifestations and implications on the Gotlandic archaeological record.

2.7 Oðal, borders and silver hoards

An apprehension of Oðal rights is very important for the understanding of Scandinavia in the Iron Age and Early Medieval Period. Possession of allodial land earned individuals and families a position in the society, and much of what we today use as sources, for example the Icelandic Family Sagas, have clear ties to assertion of Oðal rights. In Norway, several early laws stipulate that landowners should be able to account for their ownership down through a long number of generations, to *haughs og till heiðni* according to Håkon V law of 1316 – back to pre-Christian ancestors buried in mounds by the farms (T. Zachrisson in print). Outside Gotland this system has been the subject for several studies – for east-central mainland Sweden most notably by Torun Zachrisson (1998). Zachrisson broadened the perspective on how Oðal rights were asserted beyond known written

accounts and investigated how rune stones and precious metal hoards could have been utilized in this respect. She maintained that both categories could have been used to demark allodial borders in the landscape – rune stones visibly and hoards metaphysically since they lay hidden. She also (1998:119pp) briefly discussed the depositional patterns on Gotland and presented a somewhat modified interpretation of a number of the hoards that formed the empirical base for Majvor Östergren's (1989) thesis. In contrast to Östergren, Zachrisson could not find clear settlement relations for 9 (11%) of the 82 hoards while Östergren only presented 1 out of these 82 as non-settlement related (Östergren 1989:49). Zachrisson also referred to an older compilation by Mårten Stenberger (1958:18pp) in which a number of Viking Period hoards were reported as found in older stone walls, house foundations and graves. These hoards might – according to Zachrisson – be connected to a practice of accentuating ancestral relations and demarcating borders of allodial lands (T. Zachrisson 1998:121). It should be pointed out, though, that while a majority of the Gotlandic hoards can be securely tied to buildings, only one single mainland hoard in Zachrisson's primary area of study was recovered from a building. Reversely, it can be established that hoards in graves and by known or assumed borders appears to be a much more common feature in mainland Sweden than on Gotland. Nonetheless, Zachrisson's comments are quite important since they establish a more non-monetary view of the hoards, an aspect worth considering given that most other studies have focused on the hoards as temporary deposits of precious objects, which – for some reason – were never recovered. The suggestions range from, at one extreme, the view that hoards were collections of loot taken by plundering Vikings who eventually fell in battle, and thus were unable to reclaim their silver (e.g. Sawyer 1982:125pp & 1983; A. Carlsson 1983:36 &120; 1990), to the other extreme, that the hoards mainly constituted an economic surplus created through trading enterprises (e.g. Hartz 1974; Jonsson 2004). Others, like Lena Thunmark-Nylén (1986:24) and Gun Westholm (1990:23pp) have stressed that a considerable number of the Gotlandic hoards might not actually have been intended to be recovered, i.e. they were permanent depositions. Both authors point to a passage in Snorri Sturluson's Heimskringla (Ynglinga Saga), which might shed some light on the problem. There it is stated that the so-called *Law of Oðin* stipulated that objects, which a man buried in the soil while alive, would accompany him in the after-life (Sturlusson 1991:30p). Thunmark-Nylén (1986) has further suggested that the silver coins in many of the younger hoards (with *t.p.q.* 1015 AD or later) might have reached the island in connection with the formation of a local Christian organization; the later *t.p.q.*'s largely correlate with the alleged years of construction of early churches in Strelow's Chronica. Thunmark-Nylén discussed whether the silver was simply used to buy necessities in connection with the founding of the churches. Mats Burström (1993) has suggested that some hoards might

represent accumulated but unused bridewealth, while I myself (*paper II*) have suggested that a number of the would-be hoards might not have been deposited at all, but rather they represented the scrap silver stocks of individual metalworkers (cf. Hyenstrand 1985:64) lost in workshop fires.

In the light of this small selection of theories, it is probably safe to say that there is not one conclusive explanation to cover all Gotlandic hoards. However, I do no think it would be prudent to dismiss metaphysical concepts when interpreting the great majority of them – even though many hoards might be explained by the death of the owner and the oblivion of his heirs (Östergren 1989:235), that argument becomes absurd when confronted by the sheer number of hoards on the island. That the hoards might not have been left untouched has been treated by Kenneth Jonsson (2004:30p) who, in a presentation of an almost in-situe coin hoard in a copper-alloy container recovered at Stumle in Alva parish in 1989, describes a clear partition of the coins in the hoard. The lower horizon of coins (c. 500 coins) is dated to c. 1053 AD via *t.p.q.* and the upper horizon (c. 800 coins) is dated to 1059 AD. Jonsson has interpreted the find as a result of two separate trading endeavours, six years apart. This might very well be a correct observation, but it still does not explain why the Stumle hoard, like so many others, was left in the ground when the location of the farm shifted some time in the late 11th century. The hoards seem to have been regarded as inseparable from the buildings they were deposited in. A strikingly large number of the known building-deposited hoards cannot even be said to have been hidden away in a fashion that would have counted as hard to uncover by chance (e.g. Thunmark-Nylén 1983:53). Majvor Östergren (1989:62) has argued that the term 'buried' is less suited in connection with many Gotlandic hoards; instead, she suggested that 'hidden' or 'tucked away' are better descriptions of how the hoards relate to their surrounding contexts in the settlement deposits. Based on these observations and Torun Zachrisson's theories on Oðal manifestation, it could probably be suggested that hoards, in some cases, were deposited *after* the removal of the building – as a metaphysical allodial statement to accentuate the connection between the depositors and their presumed ancestors who populated the old farm site. Unfortunately, such a discussion is far beyond the scope of this thesis, but nonetheless it should be stated with great certainty that there is not a single, standard explanation for the deposition of hoards in Iron Age Gotland, but rather several just as plausible reasons for why the silver ended up in the soil and stayed there (cf. Jonsson 1986).

2.8 Early Gotland – some concluding remarks

All in all, Gotland had, as has been shown in this chapter, developed into a distinctly insular society during the course of the Iron Age, a society which seems to have differed quite significantly from other local Scandinavian societies of the period. Alas, it may never be possible to fully understand the underlying and driving forces of this process: why the Gotlanders picked a different social path than their neighbours on the Swedish mainland. But the situation is far from hopeless though – even if the overall picture might be impossible to grasp, we are still left with some powerful clues that shed light on a number of important social features. One of these is metalworking and the traces it left behind during the production of indigenous pieces of importance for endorsing Gotlandic identity. Thus, in Chapter 3, I will focus mainly on Gotlandic non-ferrous metalworking. I will, however, also discuss the individuals behind these techniques – the artisan metalworkers who both designed and cast a vital portion of the Gotlandic identity.

3 The craft

Metalworking, like many other crafts, is often taken for granted in archaeological presentations. For decades and even centuries, it has been assumed to occur very much in the background, producing necessities, trading goods and jewellery alike. However, metalworking was always a complicated range of tasks with high demands concerning experience and proficiency. In this chapter, I will try to present the stages behind the production of non-ferrous metal objects, from raw materials to finishing touches. As my primary focus is on Gotland, the following will, when applicable, be presented from a Gotlandic perspective.

3.1 Raw materials

As pointed out in Chapter 1.9, Gotland lacks sources of non-ferrous metals; accordingly, these had to be imported, presumably via trade. Before the various techniques used within non-ferrous metalworking are presented, it is appropriate to present an overview of the raw materials. It should be stressed that this initial section is primarily meant as an orientation for the reader and it is by no means complete; there are several thorough studies on non-ferrous metals available that provide fuller accounts (e.g. Scott 1991; Bergen 2005).

3.1.1 Copper alloys

Alloys of copper (Cu) and additional metals are often indiscriminately described as *bronze*. In light of elemental analyses, which have been carried out on various archaeological 'bronze objects', it is clear that this is not very adequate; consequently, I use the more generally inclusive term *copper-alloy*. From an early medieval perspective, this means alloys leadoff copper with one or more of tin, zinc and lead. Already in a Swedish analytic study carried out in the 1930s, it was established that most of the sampled Scandinavian Viking Period 'bronzes' were in fact brasses, i.e. copper which was mainly alloyed with zinc instead of tin (e.g. Oldeberg 1942 & 1966; Kalmring 2010:438). Objects of copper alloy are common finds from Gotlandic metal detector surveys of ploughed-over settlements; although the majority of these are ambiguous bits and pieces of sheets and fragments of hack metal with no clear connection to metalworking.

3.1.2 Silver

Silver (Ag) is central from a Gotlandic perspective; it is found in abundance all over the island, as stray coins, collections of hack-silver and hoards. It can be assumed that most silver reached Scandinavia as coins, which were remelted and cast into ingots and local artefact types. Some theories on how the silver reached Gotland have been previously mentioned in Chapter 2.7, but a general trend can be observed in that the areas providing the coins changed over time. In the early Viking Period, it is probably safe to assume that Roman silver was a potential source, followed by Islamic dirhams in the 9th and 10th centuries (cf. Noonan 1990; Eniosova & Mitoyan 2011). In the late 10th century, the import pattern changed again and silver coins from England and Germany, as well as other parts of the Norse cultural sphere, succeeded the dirham (cf. Jonsson 2004). The coins offer the only means of dating most Gotlandic contexts by way of *t.p.q.* Apart from coins, silver objects were also imported, normally as scrap metal, but also as whole pieces like arm and neck rings and various smaller dress fittings and jewellery.

3.1.3 Gold

Unlike silver, gold (Au) is less common in Viking Period Scandinavia – at least in the form of solid objects. Presumably, the main source of gold for Norse metalworkers was the same as that of silver – coins. The lack of gold objects is quite well compensated for by the occurrence of gilded objects as certain artefact types like oval brooches seem to have been gilded as a rule. On Gotland, sheet gold occurs as pressblech decorations on certain types of indigenous jewellery (cf. 3.3.5). Gotlandic metal detections have recovered a few finds of unworked gold at Viking Period settlements (e.g. Carlsson 2011b), but compared to the large number of gilded objects, the figure is very low.

3.1.4 Lead, tin and zinc

Lumps of lead (Pb) are common finds from Gotlandic settlement sites. Tin (Sn) has also been documented but can hardly be said to occur commonly (though cf. Pettersson 2005). Since metallic zinc (Zn) was not available (as it was not produced in Europe at this time) to compensate for the zinc lost during remelting of brasses, lead seems to have fulfilled that purpose. Besides this, metallic lead had many other uses within early metalworking, for example in model making and cupellation (cf. 3.2). The origin of the lead found on Gotland is uncertain – but contemporary extraction occurred at many locations both in central Europe and the British Isles (Bergen 2005). Tin is more problematic as it does not survive very well in its metallic state

in Scandinavian contexts (cf. I. Zachrisson 1984:83). As with the lead, it is hard to determine the origin of the tin that does occur on Gotland, but one possible area of origin might be the southwest corner of England (Penhallurick 2008). Finally, since lead and tin are soft and malleable, they can easily be cast without specialist knowledge or equipment (cf. 3.1.7).

3.1.5 Mercury

Mercury (Hg) is the dark horse among the metals in Viking Period Scandinavia. Despite the fact that it was most likely used throughout the Norse cultural sphere, the only site that has actually yielded metallic mercury is Haithabu in Germany (Schietzel 2002). The primary use for mercury was in gilding-amalgams for jewellery and other decorative metal objects. Mercury-rich ores occur sparsely in southern Europe as well as the areas controlled by the Abbasid Caliphate during the Early Medieval Period. The import of mercury to Gotland has not yet been studied, but it is quite possible that indicative key finds, for example shards from import vessels, are waiting to be identified (cf. Steuer et al. 2002).

3.1.6 Beeswax

Due to its malleability and low melting point, it can be assumed that beeswax was important in the process of casting non-ferrous objects (cf. 3.3.1). The sheer wealth of such objects produced on Gotland implies that considerable amounts of beeswax were used on the island during the Late Iron Age and even though some of this could have been collected locally, it is probably safe to say most of it was imported. As with mercury, beeswax is hard to discuss from an archaeological point of view since it was obliterated in the line of production. Two Gotlandic finds of beeswax ought to be mentioned though – one is a broken up cake weighing roughly 0.5 kg recovered in 1900 by a farmer ploughing a field called Starrar in Halla parish (SHM 11120). Judging from the outline of the fragments, it was originally approximately 400 mm in diameter and at least 30 mm thick. The second find is considerably larger and consists of a cylindrical lump of wax weighing 9 kg, found in the large fen Mästermyr on southern Gotland in 1951 (GM GF C 9903). Since none of these finds have yet been dated it is not possible to specifically connect them to Viking Period metalworking.

3.1.7 Stone and clay

Lead and tin have low enough melting points to be handled and cast without the use of refractory clay vessels – an iron casting ladle would suffice (e.g. Lønborg 1998:30). Additionally, several moulds of antler and wood have been recovered at find sites within the Norse cultural sphere (Capelle

1970:18pp; Anspach 2010:22pp); it must be assumed that they were intended for lead and tin or alloys of the two metals. Gold, silver and copper-alloys, on the other hand, all have considerably higher melting points and require an entirely different set of tools and equipment if they are to be cast. Crucibles and moulds had to withstand and survive temperatures well above 1000° C and this demanded heat-resistant materials such as stone and clays with refractory capacities (cf. Bayley & Rehren 2007). Since the Gotlandic bedrock is mainly made up of limestone, much of the native post-glacial clays are lime-rich, an undesirable feature in clays used in metalworking. No studies have been performed to establish the origin of clays in Gotlandic crucibles and moulds, but it can be assumed that the local non-ferrous metalworkers had knowledge of where deposits of suitable clay could be found.

Stone moulds have been found at many Scandinavian sites; on Gotland, most of these are simple sandstone ingot moulds but a number of piece moulds have also been recovered on the island (e.g. Carlsson 1999:93p; v Friesen 1941). In other areas of Scandinavia, there is a clear tendency to use imported West Scandinavian steatite, for instance, in bellows shields and moulds (Gustafsson 2009; Gjøstein Resi & Augdahl 1979). Steatite has excellent refractory capacities, but on Gotland such objects are not common (cf. Brandt 1986:43).

3.2 Determination of properties and quality

For obvious reasons there were no declarations of content available to early metalworkers. The metal came in many shapes and one of the skills required of a metalworker was the ability to determine the nature of these alloys. One relatively simple method was test pecking and notching, i.e. to make tiny cuts on the objects to reveal the hardness of the metal (Rispling 2004) and the colour of the raw metal below the surface. This made it possible to separate debased silver objects from objects of purer silver. The craftsman's experience most certainly played a crucial part in this. Substantial amounts of the silver found on Gotland have been submitted to test pecking, particularly in later hoards. Another 'direct' method to evaluate noble metals was touching, i.e. to determine purity by looking at the colour of metal streaks that were produced on the surface of a touchstone. Such stones were generally of a dark, hard rock type like schist or diabase (Moore & Oddy 1985). Touching is often only discussed in connection with gold as it can often still be traced on the surfaces of the touchstones, but it ought to be noted that other metals are subjected to corrosion and would normally not be preserved on the stones (Rausing 1976:41). Many objects categorised as small whetstones might thus, in reality, be touchstones.

These more direct methods for assaying were not confined to metalworkers. They did not demand much more than personal experience and simple tools but, on the other hand, were not minutely accurate. This deficiency was bettered by fire assaying or cupellation which was used widely throughout Viking Period Scandinavia (Söderberg 2006; Bayley 2008). It was – and still is – very good for determining the actual silver and gold contents in an object of unknown composition. In short, it is carried out by mixing a weighed piece of metal with lead on a shallow plate of clay – a scorifier. The mixture was then melted and kept in an oxidising environment. The oxidising lead acts as an agent to draw base metals out of the melt and, ideally, when the process has finished, the noble metal remains intact (Gustafsson & Söderberg 2005; Söderberg 2006). This is then weighed and the weight is compared to that of the original piece – the less loss of weight, the purer the metal. Given the high-temperature stages involved in fire assaying, it must be assumed that this method was predominately utilised by people skilled in and equipped for non-ferrous metalworking.

Even though copper alloys were not subjected to fire assaying in the same way as silver and gold, it must still have been important for Norse metalworkers to establish the properties of their copper-alloy stock. Much can be told from the colour since the alloys feature different shades depending on the composition, ranging from distinctively yellow in brasses to more reddish in tin and lead-rich alloys. Another way to determine the physical properties of an alloy is to cold work it; depending on the composition, the hardness, ductility and malleability varies (Hedegaard 1992:84p). The analyses of copper-alloy artefacts referred to above have shown that many copper-alloy bars held a relatively even quality – the bar shape could thus have acted as a quality marker, assuring the quality even to individuals who were not primarily metalworkers (Sindbæk 2005:63p). Additionally, evaluative casting of unknown alloys probably occurred.

3.3 Non-ferrous metalworking techniques

A complete presentation of *all* techniques used by Norse metalworkers would fill a large volume, and since several such works are readily available, if somewhat outdated (e.g. Oldeberg 1942, 1943, 1966; Lønborg 1998), this section will focus on techniques which were used on Gotland in the Viking Period. These will be presented from a methodological perspective, roughly in the order that they were used.

3.3.1 Casting

To cast is, simply speaking, to insert or pour a solidifying substance into an empty space, often with an imprinted pattern, thus creating a positive

representation of the space and the pattern. It might sound simple – and it can be – but with the increased complexity of the imprinted pattern follows a similar increase in the skills demanded of the caster to achieve a good result. The simplest form of casting is probably the production of bars and ingots. This does not even necessarily demand moulds, as the casting of simple bars can be done by pouring molten metal into grooves in the ground. The bars thus produced leave a lot to be desired in terms of control of weight and shape. This was solved with solid, open ingot moulds of stone and clay with grooves. Fragments of such stone moulds have been recovered from a number of Gotlandic sites (cf. CAT nos. 1, 4, 6, 8, 11). Open stone moulds were also used to cast blanks in basic shapes that were then worked further by hammering – which of course can also be done with metal bars. A logical continuation of this was piece moulds, i.e. moulds with two or more valves with matching cavities and an ingate through which the metal was poured. Stone moulds had both advantages and disadvantages – they took some time to produce, but could also be used repeatedly for long series of casts. The major drawback is that the patterns in the casting cavities cannot be undercut, i.e. no part of a pattern can extend out over the other parts since that would wedge the finished casting in the mould. To solve this, casting by *lost wax* (*cire perdu*), was developed in the European Bronze Age (cf. Davey 2009). The method makes use of the malleability and low melting point of beeswax and it typically begins with the creation of a beeswax model of the intended object. The model is then encased in mould loam – a soft mixture of clay, sand and some kind of organic matter. The latter is added to create a porous structure in the mould and is often said to have been animal dung (Lønborg 1998:26; Hedegaard 1992:80). Such a mould would then have been left to dry out completely after which it would be fired. The heat caused the wax to melt and run out and the organic inclusions to burn away. Just how widespread the lost wax method was in Viking Period Scandinavia has been under discussion since very early in the history of archaeometallurgy (cf. Söderberg 2001 for a closer discussion) and yet it is hard to question that lost-wax casting is by far the best answer to how a large number of objects were produced throughout the Norse cultural sphere, most notably hollow objects.

Regardless of the information above, many objects were made by means of master models instead of lost-wax casting. This knowledge is far from new, but it is only in recent years that such master models have been more widely identified (cf. Anspach 2010; Pedersen 2010). A master model is – as the name implies – a model of the finished object, though some details may be missing. It was used to mass-produce moulds of tempered clay by acting as a cliché of the finished object. Both lead and copper-alloy master models have been identified; lead models have the advantage of being easy to retouch if needed, while copper-alloy models are tougher and could be handled with less care. In many ways, the use of master models is related to

the use of stone piece moulds – but in reverse. While a stone mould is effectively a negative of the intended object, a master model is a positive. Both suffer from the same problem: they cannot be used to produce objects with undercut details.However, the plasticity of soft mould loam around a master model might allow for some flexibility around protruding points, but not very much.

A number of master models have been recovered on Gotland (cf. CAT nos. 1, 5, 33, 34, 36, 37, 57, 59; I. Zachrisson 1962 – e.g. *paper III,* Fig. 2b-c & *paper II,* Fig. 3) and they point to an extensive use of this technique in local non-ferrous metalworking. Old objects could also serve as master models. This seems to have been particularly common in the production of brooches, but also for other, more complex objects. That this practice was common on Gotland is evident from a number of finds. One specific group, which will be discussed further in Chapter 5.2, is oval brooches of mainland types – brooches that had never been fitted with pins. One such brooch might have been dismissed as a coincidence, but there are a number of them found on Gotland (cf. CAT no. 5; SHM 7571:389 & 16815; I. Zachrisson 1962) and it is probably safe to interpret them as master models for local oval-brooch production.

Moulds for hollow objects were generally, as stated above, produced using the lost-wax method. However, in several cases a mixed technique, using both wax and master models, can be traced through the finds. This was used to produce multiple hollow objects such as fish-head pendants. A hypothetical sequence of production of such pendants, based on an ornamented master model for the front face of such pendants recovered at Klints in Othem (*Paper III,* Fig. 2b & c; CAT no. 62), might be as follows: first, a master model was used to create an imprint in soft clay; the imprint was then coated with beeswax, after which the clay was removed. As this specific type of pendant had one ornamented and one plain side, two master models were used to make front and rear halves. These were then fitted together and the central cavity was filled with mould loam, creating a core. The wax model and the core were then pierced by iron or copper alloy pins known as chaplets. These protruded somewhat outside the beeswax. The model was covered with mould loam, dried and fired; the inserted pins held the core in place when the beeswax melted out during the firing. After casting, the core was scraped out and the pins were normally removed, leaving distinctive holes in the sides and bottom of the pendant.

Mould-making was evidently an important and quite laborious stage in metal casting – if the mould was made incorrectly, it did not matter how skilled the metalworker was; a bad mould always spoiled the casting. As extant miscasts show, this did happen on a regular basis and sometimes the metalworkers made considerable efforts to mend miscast objects rather than going through all the stages of making a new mould (e.g. Gustafsson 2011).

Metal was melted in crucibles (cf. Bayley & Rehren 2007); in Viking Period Scandinavia these were mostly of a simple design with rounded bottom and straight sides. All Viking-period crucibles on Gotland known to date are of this type (cf. CAT nos. 1, 2, 6, 7, 8, 9, 12, 13, 16, 67). These were all made from highly tempered clay, but the design is somewhat variable. This should probably be seen as a representation of the individual metalworkers' preferences – the crucibles thus tend to tell somewhat about the artisan who created it. Crucibles are sometimes found with substantial amounts of metal still inside, a phenomenon which has been suggested as evidence for the occurrence of 'taboos' among metalworkers, e.g. that it might have been considered unlucky to re-use metal from damaged crucibles (Pedersen 1999:138p). The same reluctance might have been valid for miscasts, but this seems to be strongly contradicted by apparent and rather complicated mends of miscast objects (e.g. CAT 60 C).

3.3.2 Casting-on technique

One method of casting, sometimes called *casting-on*, or in German *Überfangguss* (Drescher 1958), needs to be treated separately. It was a widespread technique that fulfilled several purposes and, as the name implies, it was used to cast details *on to* objects of similar or different metal. On Gotland, this technique was quite common. Most of the extant objects with cast-on additions seem to have been produced by means of lost wax. To accomplish this, objects that were to be furnished with cast-on elements were fitted with beeswax representations of these, though probably not before the addition of a fluxing agent to lessen the risk that the elements would not adhere securely to the object. A common feature to cast-on was polyhedral knobs; such additions are found on several Gotlandic find types, for example bridle bits and dress pins. The technique also fulfilled an important role in the manufacture of composite objects by acting as an extended form of brazing – for example, on basket-handled keys and silver bracelets. The cast-on elements were generally placed on joints and points submitted to stress and wear. At least two master models intended for cast-on casting have been recovered on Gotland – one polyhedral element, possibly for keys (CAT no. 33) and one part of a master model for handles on padlock keys (Östergren 2013, F no. 58).

3.3.3 After-treatment and plating

A cast object could not just be lifted from its mould and used as it was, since its surface was normally covered by a raw oxide layer. A quite substantial after-treatment followed the opening of a mould; the casting jet and runners were cut off and the surface cleaned up and polished. How Gotlandic metalworkers accomplished this is not clear, but chisel marks on oval

brooches from Denmark have been interpreted as traces of retouch of the surface (Lønborg 1998:39). Additionally, *De Diversis Artibus* (cf. above in 1.12) recommends filing of the raw cast surfaces, followed by retouching with chisels and lastly polishing with sand and wooden sticks with shredded ends (Hawthorne & Smith 1979:138).

The surfaces of most cast copper-alloy objects were seemingly left in a polished but unplated state. Some artefact types, however, were tinned, encased in silver or gilded – or, often, both encased and gilded. All additions to the surface of a copper-alloy object require it to be thoroughly cleaned – fingerprints or oxides prevent the added metal layer from adhering properly. The main technique to encase objects in silver was to solder thin, pre-shaped sheets to the surface. This is particularly common with Gotlandic jewellery and the silver was often engraved and inlaid with niello – a black material made of silver and/or copper sulphides which served to accentuate the engraved patterns (cf. Stemann Petersen 1995). Early Medieval gilding seems mainly to have been carried out via fire gilding, i.e. the surfaces to be gilded were covered by a gold-mercury amalgam, which was heated to vaporize the mercury, leaving a coating of gold behind. The use of fire gilding in Scandinavia is supported by the occurrence of mercury in many objects that have been subjected to elemental analysis (e.g. Duczko 1985:29; Lønborg 1998:89).

3.3.4 Sheet metal

To date, no direct evidence for the making of sheet metal has been reported on Gotland, but since it is a basic requirement in non-ferrous metalworking, there can be no doubts concerning the fact that it was produced on the island. The method available was hammering accompanied by regular annealing, gradually stretching and spreading the metal to a suitable gauge.

3.3.5 Pressblech – manufacture and use

Ornaments made of metal foils – which I refer to by their German name *pressblech* – have a long tradition; in Scandinavia they are common at least from the middle part of the 1st millennium AD. They can occur as single objects, for example gold figure foils, or as integrated ornamental parts of other objects, in the latter form often as a base for filigree and granulation. On Gotland, a particular type of D-shaped gold pressblech has been found on several brooch-types, for example disc-on-bow brooches and box brooches (WKG III:1:54p & 78pp). The details vary somewhat between individual brooches, but all pressblech foils feature a similar motif – an embossed central gripping beast-styled anthropomorph with entwined legs. To date, two copper-alloy dies for making such foils have been identified and both are now in the National Historical Museum's collection in Stockholm. From

the ornaments it can, with some certainty, be established that one of these dies, found in 2002 at Klints farm in Othem parish (*paper III,* Fig. 2a; CAT no. 59), was used to produce pressblech foils for disc-on-bow brooches. The other die has no inventory number and is attributed to Gotland; it was most probably used to produce foils for box brooches.

A die for an entirely different type of brooch has also been found on Gotland in the Viking Period deposits in Visby. It was used to produce the upper embossed shell of round Hiddensee-styled brooches (Andersson 1976). The largest collection of Norse dies hitherto found was recovered during the excavations in Haithabu harbour. The collection included not only dies for Terslev and Hiddensee style brooches, but also for a number of pressblech pendants (Kleingärtner 2007). A bird-shaped variety, represented by two identical dies, has a match in a find tentatively attributed to Kattlunds in Grötlingbo parish (CAT no. 43). It is a piece of lead with the imprint of a die which, it must be assumed, was used to make the design on a metal sheet supported by the lead (*paper II,* Fig. 5). Alas, since the piece was recovered by looters and sold as a stray find at auction, it is hard to determine if it was actually found on Gotland. In the same lot was another, smaller piece of lead; it had the imprint of an ornamental pressblech boss (*paper II,* Fig. 4). Such bosses are normally found on mainland-Scandinavian oval brooches and not on Gotlandic jewellery. A similar piece of lead was recovered during metal detector surveys at Mallgårds farm in Levide parish in the 1980's (CAT no. 53; Östergren 2004a:85). It was also most likely used to produce a similar ornamental boss.

These three pieces of lead bring us to the question of how pressblech foils were produced. A simple instruction is included in *De Diversis Artibus*, mentioned above. It states that the die should be placed on an anvil; a sheet of metal is then placed on top of it and covered by large piece of lead. The lead is then hammered upon and as it deforms, it forces the sheet metal into the shape of the pattern on the die (Hawthorne & Smith 1979:153). Modern experimental research has showed that this is more complicated than the treatise implies, but still quite plausible (Armbruster 2002:238pp).

Another method to produce pressblech foils is by means of negative press models, matrixes. A matrix is the opposite of a die – all ornamental features are negatively represented in a concave depression. Matrices were used much like dies, but in reverse, i.e. instead of being shaped *over* a convex positive pattern, the metal sheet is forced *down* into the negative design. Matrices have been found at the Fröjel harbour site (CAT no. 6), in the Smiss tool find (I. Zachrisson 1962), at the workshop site by Nygårds in Eke (CAT no. 26) and at the potential workshop by Nygårds in Etelhem (*paper II,* Fig 2a; CAT no. 34).

3.3.6 Filigree and granulation

Many objects of gold or silver sheet – mainly pressblech foils, but also of heavier gauges – were decorated with filigree and granulation during the course of the Iron Age. Many such objects have been recovered all over the Norse cultural sphere and Gotland is richer than many areas as many silver hoards include silver filigree jewellery. Much of this was produced east and south of the Baltic Sea (Duczko 1983), but there are several good examples of locally produced filigree objects, for example the previously mentioned D-shaped pressblech on button-on-bow and box brooches. Both filigree and granulation techniques are based on the addition of fine elements to the surface of an object, thus creating intricate patterns. These elements were fixed to the metal surface by means of a hard solder.

3.3.7 Engraving and punching

Many Gotlandic objects, especially those covered with silver, have been further decorated by engraving the added sheets. The result is grooves that might have been filled with niello to accentuate the pattern (cf. 3.3.3). Punching of repeated patterns, most commonly variations of triangles and dots, appears to have been even more common as it occurs on thousands of objects, especially on penannular brooches and arm rings. The common procedure to accomplish such patterns would have been to use an iron punch repeatedly until the object's surface was suitably covered. Test-strikes captured on a lead sheet in the Mästermyr tool find (SHM 21592:85) give some insight into how the design was planned and evaluated before being applied to the silver. It should be remembered that not all objects necessarily needed to be decorated by means of punching – the same effect could be accomplished by stamping the patterns into the beeswax models from which the moulds were made. This is illustrated by two Gotlandic finds – a piece of a miscast silver arm ring from Häffinds in Burs (CAT no. 23) and a mould fragment from Bottarve in Fröjel (CAT no. 6B). The latter shows beyond all doubt that the object cast in the mould was decorated with small ornamental triangles (Gustafsson & Söderberg 2005, Fig. 4).

3.4 Workshops and metalworking sites

The generic view of early Scandinavian metalworking claims that it mainly took place in shadowy workshops and was carried out by cunning smiths who, based on myths, ethnographical parallels and written accounts, held a liminal status (cf. Hed Jakobsson 2003:270; Lund 2006:330pp). Such aspects will be discussed in Chapter 4.5, so in this section I will only briefly mention the more basic prerequisites for the craft.

Roughly speaking, non-ferrous metalworking – beside the expertise of the metalworker – mainly requires a working, sufficiently heat-resistant hearth with a supply of charcoal and a directed flow of air to increase the heat to necessary levels. Based on finds, contemporary accounts and depictions, the hearth was normally a pit structure, lined with stones and clay while the airflow was secured with a double bellows. At some sites, there are indications of elevated hearths of the type which later became the norm in metal workshops from the Medieval Period onwards (*paper III*:92). Besides this, and depending on what was produced, a wide range of tools were used (Armbruster 2010). Two large collections of tools have been recovered on Gotland – the Mästermyr tool chest (Arwidsson & Berg 1983) and the Smiss find (I. Zachrisson 1962). The former find mainly includes tools for woodworking, tinsmithing and iron forging. Many of the tools could have been used interchangeably between several metalworking disciplines, but a number of objects in the find are definitely connected to, or produced by, non-ferrous metalworking. The most obvious is a piece of lead with imprints of a decorative punch or stamp of the same basic design as those found on both Gotlandic arm rings and penannular brooches (Arwidsson & Berg 1983:16). The Smiss find is more specifically focused on non-ferrous metalworking; it includes half-finished objects, scrap metal and tools such as tongs, master models and a steelyard (I. Zachrisson 1962). In addition, other tools – mainly hammers – have been recovered at several Gotlandic sites. To equate these finds with workshops is not unproblematic – the tools were most probably *used* in workshops by metalworkers, but in several cases it has been possible to connect them to wetlands, i.e. they were intentionally deposited hoards.

Paper III discusses Norse workshops and metalworking from a somewhat critical point of view in an attempt to get beyond the prevailing conceptual world of archaeological interpretation. A survey of a number of excavated workshops and metalworking sites showed that the traces of metalworking often tended to be overemphasised in interpretations. Many of the Norse 'forges' and workshops reported and discussed by previous researchers can doubtlessly be explained by single or temporary metalworking episodes (*paper III*:93). Since debris from metalworking, as opposed to debris produced by many other Early Medieval crafts, survives exceptionally well in archaeological contexts. It is very easy to overinterpret the importance of such finds and for example interpret buildings, which might have seen many other different uses, as permanent workshops solely on the basis of the occurrence of metalworking debris. That said, there are a number of preserved Norse metal workshops that have been investigated and reported over the years. Many of these have been utilised for more than one craft – even though metalworking might have been predominating.

From a Gotlandic point of view, this is less obvious due to the generally bad state of preservation of early metalworking sites on the island; with very

few exceptions, these remains are to be found in ploughed fields. Despite this, these sites offer vital clues to the understanding of non-ferrous metalworking on Gotland.

3.5 Non-ferrous metals and metalworking – concluding remarks

In this chapter, my aim has been to present an overview of the non-ferrous metals and metalworking techniques used within the Norse cultural sphere during the Viking Period. Given the nature of this thesis, this has been done with a particular emphasis on the situation on Gotland. Before I move on, however, it should be noted that much of our current knowledge of the more practical aspects of early metalworking has been gained through extensive experiments by modern craftsmen such as Anders Söderberg in Sweden and Ken Ravn Hedegaard in Denmark. Both are skilled enthusiasts who combine archaeological training and excellent craftsmanship. Without such empirically substantiated experimental tests, other, less practically minded archaeologists are at risk of constructing theories that are both useless and tough to kill (cf. Gustafsson 2009:256pp). Less soundly-based experiments can, on the other hand, be just as dangerous as they might yield results that have very little bearing on early metalworking. A modern 'Iron Age' style metalworker with scientific pretentions ought, therefore, to consider whether the proposed experiment actually will answer his or her questions in a scientifically acceptable fashion. Furthermore, he or she ought to consider whether the proposed experiment meets the standards expected of an academically governed data collection, i.e. that the general approach, materials and techniques used are actually sufficiently similar to those used and experienced by an Iron Age metalworker. From my own personal experience, I know that bronze casting in a modern forge using a graphite crucible can be a very satisfying recreation, but it says very little about Viking Period casting undertaken in pit-hearths with hand-operated double bellows and clay crucibles. To get the most out of an experimental study, one must thus try to come as close as possible to such a contemporary casting session, or else there is an risk that the results only reflect the marvels that can be achieved through metal casting – in the 21st Century AD.

In the following chapter, I will present Gotlandic sites that have yielded finds that can be connected to non-ferrous metalworking. A great majority of these have been recovered by means of metal detection. I will also discuss those who participated in the production – the early metalworkers.

4 Sites and metalworkers

Above, in Chapter 3.4, I discussed some of the basic prerequisites for workshops and sites utilized in non-ferrous metalworking. In the following chapter, I will continue this discussion to evaluate just how these sites are reflected in the archaeological record and, when possible, I will examine if, when and how the metalworkers – individually and collectively – can be similarly discerned.

4.1 Metal-detector surveys in Swedish settlement archaeology– a short background

As mentioned above, most of the registered Viking Period and Early Medieval settlements on Gotland are ploughed-over and occur as find clusters in fields. Excavations of such sites can be highly rewarding, but it is generally a much better idea in terms of an economic use of resources, at least as a first stage, to delimit and survey the sites by means of metal detection.

Alas, metal detection has not yet come to be included as a natural part of the excavational process in Sweden, even though repeated observations have shown that a majority of the metal objects at ploughed-over sites are to be found in the plough soil (cf. Östergren 1989:182). Additionally, a recent comparative study of three Scanian sites has shown that all but three out of approximately 50 identifiable non-ferrous objects were found in plough soil that would normally not have been subjected to any closer examination (Svensson & Söderberg 2009). Accordingly – since the stripping of unsurveyed topsoil is common practise at the excavation of ploughed sites – a potential wealth of finds is rendered more or less useless for interpretive archaeology every year – if they are ever recovered. An even greater problem is connected to *how* the removed topsoil is treated. A Gotlandic case can serve as an example: In 1990, a number of silver coins and other small objects were found at a recently developed camping site at Åminne in Gothem on the island's east coast. The soil in which the finds were recovered had, however, been fetched from an inland site at Nygranne in Halla, 20 km to the south-west, before being spread over some 5000 m^2 at Åminne (Almqvist 1990; Pettersson 1998:8). If the objects had not been found in close connection with the development of the site, it might well have been, at a later point in time, erroneously interpreted as a primary find

site. Given that topsoil-removal has been widely utilised for decades in Swedish contract archaeology, one can only speculate as to how widespread this particular problem has been on a national level. However, thanks to the Hoard Projects, Gotland is one of the few places in Sweden that is reasonably well-detected in comparison (c.f. Fig. 2).

4.2 The seemingly elusive metalworking

Up until quite recently the understanding of Gotlandic non-ferrous metalworking was mainly built on its products – the extant insular objects. A number of studies of these artefacts have been carried out over the last century (e.g. Rydh 1919; A. Carlsson 1983 & 1988; Thunmark-Nylén 1983), presenting styles, trends, chronological features and manufacturing techniques. These studies mainly lacked one important aspect though: the production sites. While excavations on the Swedish mainland in the 19th century, for example at Björkö (Stolpe 1873) had presented clear evidence for Viking-period metalworking, such direct traces were almost unknown on Gotland prior to the latter part of the 20th century. Besides a number of sites that saw excavation rather early in the century – often under unsatisfactory conditions (CAT nos. 1, 8, 9, 11, 13, 14, 15) – objects and debris rendered by non-ferrous metalworking have normally been recovered as solitary stray finds in ploughed fields or from unknown contexts (CAT nos. 3, 4, 5, 7, 10, 12).

One of few excavated sites with indisputable traces of non-ferrous metalworking was found by chance in a small trench on the island Stora Karlsö, off the Gotlandic west coast. The area, by the mouth of the cave Stora Förvar, which was excavated already in the late 19th and early 20th centuries (Schnittger & Rydh 1940), was re-examined in 1973. Judging from observations made during the re-examination, the area was covered by re-deposited soil, presumably from the cave (Örjestad 2008, Appendix 2). A number of key finds, such as clay casting moulds, metal spillages, a crucible fragment and vitrified hearth debris (CAT no. 2), were recovered from this added layer east of the cave's mouth. The mould fragments included a number of specimens that have had a crucial impact on the understanding of Gotlandic non-ferrous metalworking. One of these fragments belongs to a mould for a box brooch. Despite its insignificant size, it is the only identifiable fragment of such a mould known and reported to date. Earlier, at a non-specified date but before 1908, two other mould fragments had been recovered in the same area and eventually added to the collections of the Swedish History Museum in Stockholm (SHM 13418:3). Both fragments displayed imprinted patterns, one of an unidentifiable object but the other – like the box brooch mould fragment – constitutes the only identified mould for a specific brooch-type ever found on Gotland. In this case, the mould was

used to cast the back of an ornamental crown of a disc-on-bow brooch. Despite being unique to date, these mould fragments do not stand out as out of place in a Gotlandic context – rather the opposite. But the culturally harmonic picture is shattered by two additional mould fragments which complicates the understanding of the site: these derived from a mould which was intended for an oval brooch of mainland-Scandinavian type – P 25. Such brooches were not in use on Gotland, yet the finds clearly imply that they were cast alongside more ordinary Gotlandic jewellery. This might, of course, be interpreted in various ways, but the most logical interpretation – based on empirical data – is that these oval brooches (they were, as a rule, produced in pairs) were intended for a non-Gotlandic user (Jansson 1981:7). This assumption is given yet another dimension by the distributional pattern of P 25-brooches, which are mainly found in present-day Norway (Jansson 1985:198p). Given this range of jewellery, it is hard to imagine that the metalworkers operating by Stora Förvar were temporarily visiting stormtossed sailors waiting for fair winds. Instead, it is probably safe to say that the cave or the area by its mouth was utilised for metalworking on a more permanent scale. Judging from the approximate dating of the jewellery, it was apparently produced on site this took place in the beginning of the Viking Period, during the first half of the 9th Century. Additionally, it should not come as a surprise that the workshop remains were not recognized as such by the excavators in the 19th century – even though they were directed by Hjalmar Stolpe and other similarly skilled archaeologists who lay the foundation of Swedish field archaeology. The methodology and excavational techniques simply were not developed enough to recognize such features; a similar observation was made in the 1990's when a trench from Hjalmar Stolpe's Björkö campaigns in the 1870's was located and re-excavated. The soil from the trench was found to contain a large amount of previously unrecognised mould fragments that had been re-deposited in the trench when it was backfilled by Stolpe's workers (Ambrosiani & Eriksson 1992:31 & 34pp). Nevertheless – the potential workshop on Stora Karlsö was dug away long ago and further excavations east of the cave mouth might quite possibly result in the recovery of other interesting mould fragments, but they would tell very little of the workshop's original layout.

The story of the Stora Karlsö finds is also largely the story of most other Gotlandic workshop remains – scattered clusters, often without a clearly defined context. In total, I have been able to identify 17 sites with traces of non-ferrous metalworking (CAT nos 1-17, section A – the defining criteria for this, mainly via the occurence of key artefact types is described below in 4.3, p. 62). Most of these sites were surveyed and excavated rather early – two sites were not even documented in a proper manner and only survive as archival records of patches of 'bronze slag' in farmland and some randomly collected specimens of such 'slag' (CAT nos. 3 & 10). On the other end of the spectrum, there are a number of quite well documented and properly

excavated sites with defined contexts (CAT nos. 1, 6, 7 & 14), but since these are so few, they cannot offer a representative picture of the non-ferrous metalworking on Gotland; at best they can serve as diagnostic checkpoints. Additionally, it was not until 2000 that the remains of a workshop building which had survived more or less unaltered was uncovered (CAT no. 6 B; *paper III,* Fig. 4). This, the so-called 'Fröjel workshop', is still the only Viking Period workshop excavated in accordance with modern standards (cf. Dahlström & Eriksson 2002) even though a recently excavated site on the eastern outskirts of Visby also yielded several interesting features (CAT no. 13; Wickman-Nydolf 2011). Sadly, this latter site has both been damaged by ploughing and submitted to stripping of unsurveyed topsoil, effectively eradicating all possibilities of connecting potential find clusters at shallow depths to surviving structures in lower strata.

Beside these sites, there are several others that are sometimes mentioned in connection with Gotlandic non-ferrous metalworking. Many of these – like the previously mentioned tool hoards (cf. 3.4) – are quite unsuitable as direct evidence though. One such problematic find category is the 'bronze bars' (though in reality rather brass-, cf. 3.1.1) recovered all over the island, often as small pieces severed from larger bars. An optimistic interpretation of these finds would be that they all indicate metalworking sites. However, given the high frequency of other arbitrary copper-alloy fragments recovered on Gotlandic settlements, I have chosen not to interpret singly found bars or bar fragments as indications of metalworking. This also includes a large depot of brass bars found during ploughing at Myrvälder farm on north Gotland in 1847 (SHM 1375; Sindbæk 2001). These bars might very well have formed part of a metalworkers stock, but they might just as well have been ritually deposited. Table 1 presents 33 find sites where bars and bar fragments have been recovered without further metalworking finds. For many of these sites, this might be a question of lacking representativity (cf. the discussion in *Paper II*:9p) as evidenced by a second collection of brass bars from Stora Enbjänne in Hogrän (CAT no. 51), where recent metal detections have yielded clear evidence for extensive metalworking over a long chronological sequence.

4.3 Metal detector finds and non-ferrous metal-working

Already in the 1970's and 80's, Majvor Östergren and other local archaeologists were able to show how useful metal-detector surveys were for the understanding of Gotlandic society during the Iron Age and Medieval Period, beside salvaging coins and other valuable objects ahead of looters (Östergren 1986a; 1989). The tug-of-war over artefacts did not by any means diminish over the decades; looters from Gotland and mainland Sweden, as

Table 1. Finds of copper-alloy bars from sites without other finds diagnostic of non-ferrous metalworking. (f)= fragment, SHM= Swedish History Museum, GM= Gotland Museum, ESP = Eke Settlement Project (largely unreported)

Find site	Inv no. or year of survey	No. of bars (fragm.)
Alskog, Bote 1:1	SHM 34561 & 2008	3 (f)
Alva, Lilla Kruse 1:22	2010	2 (f)
Boge, Mojner	SHM 5946	1 (f)
Burs, Ljugännes 2:1	1990	1 (f)
Burs, Vanges 1:3	SHM 31607	1 (f)
Dalhem, Hässelby	SHM 8212	1 (f)
Eke, Petsarve 1:2	ESP	1 (f)
Eke, Petsarve 1:38	ESP 73	2 (f)
Endre, Hulte	GM GF C 7398	1
Fröjel, Bottarve	SHM 14777	1 (f)
Fröjel, Gustavs 5:1	SHM 32581	1 (f)
Fröjel, Near the church	SHM 8001	1 (f)
Fröjel	SHM 9325	1
Garda, Bote	GM GF A 2543	1 (f)
Havdhem, Nickarve	SHM 1044	2 (f)
Havdhem, Sigers 2:1	SHM 31663,	1 (f)
Hejde, Väntinge	GM GF C 6089	1
Hejdeby, Råby	GM GF C 9876	1 (f)
Hogrän, Stora Enbjänne 3:1	1998	2 (f)
Källunge, Skäggstäde	SHM 6425	1
Källunge, Lilla Tollby	GM GF C 9087	1 (f)
Kräklingbo, Kärrmans 1:1	1992	1 (f)
Levide, Bondarve 1:29	Unclear	1 (f)
Linde, Amlings	GM GF C 6860	1
Linde, Oddvalds 1:15	SHM 34066	1 (f)
Mästerby, Bander	GM GF C 8777	1
Öja, Domerarve	SHM 16072	2 (f)
Roma, Roma Kloster 2:1	1990, 2010, 2011	5 (f)
Stånga, Maldes	SHM 4878	1 (f)
Stenkyrka, Smiss 1:14, III	2008, 2009	1 (f)
Tingstäde, Myrvälder	SHM 1375	17 + 5 (f)
Väte, Bottarve 1:5	SHM 32211	1 (f)
Visby, Mellangatan, Kv Valvet	GM GF A 1941, 1942 & 1967, GF B 704 & 705	2 + 2 (f)

well as Germany and Britain, have provably been active on the island. On a number of occasions, looters have been exposed *in flagranti* (Hellqvist & Östergren 2011, Appendix 2). The most recent case was unravelled in 2009 when three Swedish looters were apprehended as they embarked on an illegal survey. According to the group's private documentation, which was seized by the police, it had been actively looting on Gotland and mid-Sweden over a period of several years (Hellqvist & Östergren 2011:8pp & Appendix 5). The three were found guilty of violation of the Cultural Heritage Act and sentenced to prison and heavy fines.

The salvage projects have resulted in a large number of metal detector surveys on Gotland. Via reports and archival documentation both on Gotland and in Stockholm, I have been able to establish that at least *388* individual *farming properties* were metal detected between 1973 and 2010. As mentioned initially, *Paper II* is central to this thesis and presents a compilation of metal-detected sites which have yielded finds which can be connected to non-ferrous metalworking – in all 72 individual find sites (CAT, section B). These are mainly situated in farmland, which is included in modern crop rotation and submitted to regular ploughing; a limited number – 12 sites – have been excavated to some extent. The 72 sites are located within 56 properties and are physically represented by geographically delimited clusters of finds. At a majority of the sites, the finds that can be connected to non-ferrous metalworking are few. This is, of course, a matter of definition, but in the preparation of this study, I chose to define whether a find site had been utilised in non-ferrous metalworking or not based on the occurrence of diagnostic find categories; thus, metal spillages, casting jets, moulds or other varieties of technical ceramics need to be present at a site in order for it to be interpreted as a metalworking or workshop site (cf. Table 3). I also recorded the occurrence of other finds with a less distinct connection to metalworking, such as bronze bars, weights and tools; these might indicate that metalworking has taken place at a site, but they cannot be solely used as direct evidence. It is also important to reflect on the objects themselves as there are qualitative differences between the types of diagnostic objects. Hence, the occurrence of master models is particularly noted as they indicate repeated production of the modelled objects. Such repeated production – or possibly, mass production, for example of brooches – ought normally to be seen as connected to a more organized form of metalworking.

4.4 Sites and subgroups

A survey of the diagnostic finds based on both quantitative (i.e. the number of finds) and qualitative (i.e. how advanced the craft was comparatively speaking) aspects showed that a total of 89 sites (Fig. 13; Table 3) –

including the 17 sites which have mainly been surveyed and excavated without the aid of metal detectors (CAT, section A) and the 72 metal-detected sites (CAT, section B) – had seen non-ferrous metalworking to some extent. These could be further divided into four subgroups:

1) Farm sites, i.e. ploughed-out find clusters from seemingly ordinary farms with a limited number of diagnostic finds both from a quantitative and qualitative point of view, for example metal spillages, casting jets and fragmented hearth lining. This is by far the largest subgroup with 51 sites (CAT nos. 1, 8, 11, 18, 20, 21, 22, 24, 25, 27, 28, 29, 30, 31, 32, 36, 40, 41, 42 A, 42 B, 43 A, 43 B, 43 C, 44, 45, 47, 48, 49, 50, 53, 54, 55, 56, 57, 59, 61, 65, 67, 68, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 81, 82).

2) Workshop sites, i.e. contexts or find clusters that indicate extensive non-ferrous metalworking through abundantly occurring diagnostic finds of both more and less qualitative types – for example master models and dies, but also large amounts of spillages, casing jets and fragmented hearth lining. In total 15 sites (CAT nos. 9, 15, 19, 26, 38 A, 39 A, 51 A, 51 B, 52 A, 52 B, 58, 60 A, 60 B, 62, 63).

3) Potential workshop sites, i.e. sites which at first appear to be ordinary farm sites since they have yielded few finds, but which are separated from that group by the occurrence of certain diagnostic finds that are qualitatively on a level that indicates a more extensive metalworking – for example master models and dies. In total 11 sites (CAT nos. 13, 33, 34, 35, 37, 38 B, 39 B, 46, 64, 69, 80).

4) Harbour sites, i.e. the often quite large coastal settlements with abundant traces of non-ferrous metalworking – and, not to forget, other crafts. In total 6 sites (CAT nos. 2, 6, 14, 16, 17, 23).

This leaves 6 sites as undefined (CAT nos. 3, 4, 5, 7, 10, 12). These are mainly known through stray finds without more precise find contexts. Even though subgroup 2 and 3 offer the best possibilities to study and understand Gotlandic non-ferrous metalworking, it is important to keep in mind that the sites in subgroup 1 are just as important. Due to the previously mentioned practice to of removing unsurveyed plough soil, it is hard to compare these to similar sites on the Swedish mainland; since no record has been kept of potential find clusters in the upper strata, it is possible that the find situation was similar there. The available documented and published data seems to point in another direction though – when non-ferrous metalworking do occur on the mainland it seems to have been confined to larger settlements and sites which are more comparable to subgroup 4, i.e. more or less culturally

intermixed nodes for trade and interchange (though cf. Dunér & Viberg 2006:20 & 126pp; Werthwein 2008).

All find sites in subgroup 1 appear to be ordinary farms, even though it has to be remembered that the primary reason for their initial discovery was that most of them harboured silver hoards. The finds left by non-ferrous metalworking are very few when sites in subgroup 1 are compared to those of subgroup 2. Thus, the distinction between the two subgroups is quite easy; the physical remains of non-ferrous metalworking at subgroup-1 sites might quite possibly have been rendered by one or a limited number of metalworking sessions. In *Paper I,* I discuss workshops and remains left by metalworking and stress that there is an imminent risk of over-interpreting metallurgical finds. This is due to the fact that even limited metalworking at a site leaves traces that often survive very well in the cultural deposits – e.g. slags, burnt clay and spillages, while remains from other just as important activities such as woodworking and textile production might not survive at all. When trying to interpret a site it is thus of great importance to not be too carried away by the archaeometallurgical debris. Instead, one should – when possible – try to look at the context first. This might sound as if I am stating the obvious, but all too often archaeologists get blinded by metallurgy and overemphasise its importance; a single hearth-pit in the floor of a longhouse might make the excavator speak of the building as a smithy while it should rather be connected to constructional work or be seen as the result of a single metalworking episode (*paper I*:92).

The workshop sites – subgroup 2 – are generally easy to identify based on the sheer quantity of diagnostic finds. One site in subgroup 1, for example Glammunds in Akebäck parish (CAT no. 18), yielded 7 copper-alloy spillages, 2 lead spillages, 1 copper-alloy casting jet and 2 weights after 10 individual metal detector surveys, while a site from subgroup 2, for example Stora Enbjänne in Hogrän parish (CAT no. 52 A), yielded 48 copper-alloy spillages, 7 lead-alloy spillages, 4 spillages of undefined alloy, 3 copper-alloy casting jets, 3 fragments of metal impregnated hearth lining, 6 weights, 2 ingot fragments and 1 fragment of a balance scale after *one* metal detector survey. However, it ought to be stressed that artefacts are not just 'found' during surveys – metal detection is a craft, totally dependent on the skills of the surveyor. If he or she is inexperienced or unfocused, many finds might not be recovered at all. Additionally, metal detectors have limitations in terms of search depth – a normal layer of plough soil is between 20 and 40 cm deep, while a modern metal detector, as mentioned initially in Chapter 1.11, is seldom effective below 25 cm. Preferably, a find site should thus be surveyed on at least two occasions with intermediate ploughing. Even then, crucial and valuable diagnostic finds might sit undetected in the plough layer. This fact renders the demarcation between subgroup 1 and 3 somewhat problematic – many sites within the former group have, unlike Glammunds in Akebäck, only been metal detected on a limited number of

occasions. It is therefore quite possible that the soil at these sites might still hide objects that would actually place them in subgroup 3 – possible workshop sites. Another methodological problem is that sites that have yielded few finds of economical value are less likely to be metal detected a sufficient number of times, despite other evident research potentials (cf. CAT no. 34 & *paper II*). When such sites are eventually re-surveyed it might be too late, as find clusters and extant *in situ* structures may have been eradicated by ploughing and other types of soil scarification.

In *Paper IV,* Andreas Viberg and I present a study aimed at investigating and evaluating magnetic survey as a possible supplement to metal detections. One of the surveyed sites – Odvalds (formerly Smiss) in Linde parish (CAT no. 57) – has been metal detected on seven occasions and yielded finds that show that the site harboured a metal workshop. In 1985, several patches of darker soil and concentrations of metal impregnated hearth lining fragments were recorded on the site (Zerpe 1985), but in 2008 nothing of this could be seen when I visited the site. This observation was confirmed by the results of the magnetic survey, which showed a large inclusion of magnetically detectable 'noise' in the plough soil but no clear structures. On-site trial excavations also showed that the cultural deposit had, with few exceptions, been ploughed down to natural levels. Another site, which was submitted to limited magnetic survey, garnered a fundamentally different result. There, at Nygårds in Eke parish (CAT no. 26), the gradiometer indicated that large magnetic structures were present below ground. No trial excavation has been undertaken at the site, but a hypothetical interpretation might be that the magnetic anomalies were caused by the extant remains of iron furnaces or large collections of iron slag. An important clue as to why the remains at Nygårds survive more intact than those at Odvalds can be found through studies of historical maps – they show that while the find site at Odvalds is located in the middle of an area which had been ploughed already before c. 1700 AD, the site at Nygårds remained a meadow until the late 1930's. The latter site has simply not been submitted to scarifying agricultural work long enough to blur and dislocate it on a more profound level. All in all, magnetic surveys appear to be well suited for the evaluation of ploughed-over metalworking sites on Gotland, in particular as a means of determining whether larger portions of unharmed or only slightly dislocated deposits are present in or below the plough soil.

The last and fourth subgroup – the harbour sites – is also the most complex from a Gotlandic perspective. As these sites were not farm units, there were no incitements to move them like the inland settlements. They lay by good harbour or landing sites and could be operational over long periods of time. The general trend during the Viking Period seems to have been elimination of a large number of smaller harbour sites in favour of sites with good, larger harbours. There seems to have been a drive to concentrate the activities to these sites, and eventually mainly (though far from exclusively)

to Visby in the later medieval period. One of the five sites which has yielded finds rendered by non-ferrous metalworking, Häffinds by Bandlunde bay in Burs parish on the southeastern coast (CAT no. 23), can roughly be dated to the 10th century by means of *t.p.q.* dates of Arabic Dirham in three of the five silver hoards that have been recovered within the settlement area. The metal detector surveys at Häffinds have been confined to a part of the settlement that was cleared for farming in the 1950's though it is clear that the main settlement area stretches far into what is today an unploughed pasture. A small trench was, however, excavated in this area in 1982, following the illegal recovery of a silver hoard in 1980. The repentful looter turned the hoard in to the RAGU and after some persuasion he also pointed out the point of recovery to the staff. Nothing dateable was recovered in the trench – but the hoard itself, consisting of three animal-headed braided arm rings and a solid ditto, might possibly be interpreted as dating to the late 11th or early 12th centuries on typological grounds, thus prolonging the Häffind site's active time by well over a century. A second site – by Paviken in Västergarn parish on the west coast (CAT no. 16) – might also be of an earlier date as no dateable finds indicate activity post c. 1000 AD (Lundström 1981:115p). It seems to have been succeeded by the nearby wall-enclosed and, to date, not fully understood settlement by Västergarn (CAT no. 17), which most likely was active up through the 13th century (cf. WKG III:490p). Further south, at Bottarve and Nymans in Fröjel parish (CAT no. 6), extensive excavations have shown that a harbour site with diverse production was present in the 11th and 12th centuries, but possibly even earlier due to the presence of earlier graves below parts of the settlement. Traces of a long range of crafts have been recovered at Fröjel – including large-scale silverworking. Visby – the present capital of Gotland – is also included in subgroup 4 (CAT no. 14). Even though it is hard to determine the full extent of the town's earlier history, it is clear that it sits on deposits that date back to – at least – the Vendel period, and clear evidence of late 10th century non-ferrous metalworking has been recovered during excavations in the 1970's (Andersson 1976). All sites in subgroup 4 offer a broad spectrum of finds, many of which can be directly or indirectly connected to non-ferrous metalworking. It should be noted that these sites probably cannot be used as a template to interpret other, less defined sites on the island though. Sometimes, as with the so-called Fröjel workshop (CAT no. 6 B), this must by necessity be done though as it stands unparalleled on Gotland. The harbour sites will be further discussed in Chapter 5 & 6.

4.5 The metalworkers

It is a simple fact that metal objects do not make themselves – every single archaeological metal artefact is an outcome of the thoughts and designing

hands of one or several individuals. Despite this, there is a general tendency to avoid discussing these on an individual level; they are often lumped together in a constructed collective of 'smiths' and, at best, identified through tools in graves. Such 'Smith's graves' are more common in certain areas of Scandinavia (e.g. Norway – Grieg 1922; Müller-Wille 1977), but not on Gotland, where only a few *possible* burials of that type have been documented to date (e.g. Stenberger 1937; CAT no. 4). A second source of knowledge about individual Viking Period metalworkers is offered by written accounts such as the Icelandic sagas, but in *Paper III*, I discuss these from a source-critical point of view initiated by Unn Pedersen (2009). She pointed out that there is a clear difference between how metalworkers and metalwork is described in written sources and how it must have been carried out in reality. In short: one must not mistake the real metalworkers for the idealized dittos in the sagas. The latter group is generally depicted as semi-mythical beings with larger-than-life capacities, and they are often provided with traits that separate them from ordinary humans. It can thus be quite complicated to get these 'liminal' literary individuals to match the real, archaeological find materials, a fact that should act as a warning sign for an all too liberal use of such 'ideal smiths' as a starting point in archaeometallurgical interpretations of contexts and artefacts. In the following, I will thus try to focus on what can actually be concluded about the real metalworkers and, when possible, stay clear of the ideal ones.

4.5.1 Free or unfree?

Whether metalworkers and other skilled artisans were free or unfree is hard to tell from archaeological sources, but if other sources are brought in for comparison, the picture becomes clearer. According to the Gotlandic Law, thraldom was still practised on Gotland in the 13th century and various paragraphs stipulate how thralls should be treated. Other written sources do mention unfree, or at one point unfree smiths. The most famous is probably Völundr/Weyland in Völundarkviða, a passage in the Poetic Edda. It tells of the smith Völund who is imprisoned on an island and forced to produce various items; but it also tells about his dreadful revenge on his capturer, King Nidud. Völundarkviða is also one of the most quoted sources of the abovementioned group of ideal metalworkers as Völundr, in alleged solitude on his island, manages to produce a wide array of objects that demand the assistance of at least one aide to accomplish if magic intervention is ruled out. A second, less mythological account is a rune-stone from Hørning in Jutland (DR 58). The inscription tells that '*Toki Smith raised the stone after Þorgils Guðmundarson who gave him gold and freedom*'. The inscription uses the word *frialsi* for the final 'freedom' which in this context means '*freedom from thraldom*'. This is hard to question; Toki thus seems to have been both a metalworker *and* a thrall.

One reason why early metalworkers are sometimes thought of as unfree might be a notion that individuals who were not nobles did not normally get to handle precious metals. These can, instead, be thought of as being provided by more high-ranking individuals who possibly saw the metalworkers themselves as possessing such a value as trained artisans that they simply were not entitled to be free (cf. Straume 1986).

Such arguments are hard to transfer onto the Gotlandic – or any Scandinavian – social framework as we currently know it. It could certainly be argued that there were unfree metalworkers on the island – but nothing in the archaeological material gives them away as such. Recently, Stefan Brink treated Scandinavian thraldom at length and presented several very valid arguments. Like Brink (2012:253), I am not at all convinced that the general tendency in our modern cultural context to 'filter' everything that includes even the slightest measure of unfree labour through a pre-understanding built on Roman and 18th and 19th century North American slavery is suitable for studies of thraldom in Iron Age and Early Medieval Scandinavia. These model societies simply do not bear any greater resemblance to those in Scandinavia. Instead, Brink stresses that the social standing of a Viking-period thrall was probably more complex than earlier research has accounted for. By compiling archaeological, historical, and philological sources, he is able to show that an unfree state was not confined to the low-ranking work force, which is normally intended when thralls and thraldom are discussed. Unfree individuals could be found at many levels within contemporary social hierarchy. Hence, instead of discussing whether metalworkers and other similar specialists were free or unfree, it might, instead, be more prudent to try and establish if any larger portion of the general population were *actually* free in a modern judicial sense. From that perspective, even the social group that is normally seen as the core of the free population, the Oðal farmers with allodial land, cannot be said to meet more modern standards as they were more or less tied to their family lands (cf. the discussion above in 2.7). On Gotland, there are also some indications of time-limited thraldom, indirectly implied by several passages in the Gotlandic Law (Brink 2012:263p). All in all, it seems quite possible that some metalworkers – on Gotland and elsewhere – upheld a status as unfree, but since the societies of the Norse cultural sphere were so profoundly pervaded by alliances and far-reaching commitments, such arrangements was probably not seen as out of the ordinary. Additionally, if time-limited thraldom actually did exist on Gotland in the Viking Period (it should yet again be remembered that the Gotlandic Law is dated to around 1220 AD), it might be better to consider it as a mutual agreement where the would-be thrall exchanged his social and judicial rights as a free individual for certain benefits assured by the would-be thralholder, who also took on the judicial responsibility for the unfree during a specified time segment. A major disadvantage of such a system is, of course, a potential misuse by the

thralholders, who could simply ignore that the contracted time had elapsed. In a judicial system that either lacked or had a very weak and potentially biased executive force, it must be presumed that single, unaffiliated and unfree individuals had scanty prospects for building a legal case against a free man.

Regardless of whether an individual metalworker was free or unfree, the main issue, at least in eastern Scandinavia, has always been to identify the metalworker as such since a vast majority of the Iron Age burials, both cremations and inhumations, are quite anonymous concerning the professional capacities of the buried individual.

4.5.2 Lead in bone

To broaden the possibilities of identifying 'real metalworkers' beyond the 'Smith's graves' – i.e. burials with tools for metalworking included among the deposited inventories - a study of metal inclusion in human bone was initiated. It came to comprise samples from 31 individual inhumation burials from mainland Sweden, Gotland, Denmark and Iceland and the results are presented in *Paper V*. The samples were submitted to Trace elements analysis by means of Flame Atomic absorption spectroscopy (F-AAS), measuring levels (in ppm) of lead, copper and zinc in every sample. An underlying condition for the study is that individuals involved in traditional, unventilated metalworking, especially casting and brazing, can normally be expected to have been exposed to metallic fumes which were absorbed by the body and deposited into the bones (cf. Flora *et al.* 1990). The purpose of the study was to test the hypothesis that a metalworker, particularly one involved in the working of non-ferrous metals, ought to have elevated levels of metals in his bones. Other studies (e.g. Aufderheide *et al.* 1988) have shown that lead, in particular, tends to be tightly bound to skeletal tissues long after the death of the individual, and since lead was used in a number of metallurgical processes, it might act as a possible key marker of metalwork. A sample from what would count as, to date, one of Gotland's only typical 'Smith's grave' – a 2nd Century AD inhumation (cf. Stenberger 1937) – was included in the study as a reference, along with samples from a number of possible 'Smith's graves'. The majority of the sampled individuals lay in burials that were regarded as anonymous since they did not include any objects that could be connected to metalworking. On Gotland, the burial practices changed during the course of the Viking Period and, as a result, intentional deposition of grave goods seem to have become less important; eventually, it disappeared in most graves. This does not, however, include objects of a more personal nature; dress jewellery, mounted belts and knifes should probably be seen as parts of the dress in which the individuals were buried rather than outright grave gifts (cf. WKG III:536). Aside from the 2nd Century inhumation, only two preserved Gotlandic inhumations contained

objects that can be connected to metalworking. Both of these came from the same cemetery at Lilla Bjärge in Vallstena parish. One – Grave no. 52 – included a hammer and the other – no. 104 – iron bars (Wickman-Nydolf 1999); both graves were sampled and analysed.

The analyses showed that the Gotlandic reference individual had extremely elevated levels of skeletal lead compared to the majority of the "anonymous" individuals – and so had one of the potential metalworkers, an Icelandic individual who had tentatively been interpreted as a silver smith based on the grave goods (Hayeur-Smith 2001). Some of the other potential metalworkers, among these grave 52 and 104 from Lilla Bjärge, did not display increased levels of skeletal lead, something that might be explained with that they simply were not involved in non-ferrous metalworking, or that the objects that marked them as potential metalworkers were added to the grave inventory for unknown reasons. A third individual with high levels of skeletal lead offers an interesting and thought provoking exercise in interpretation: The sample came from the skeleton of a male with clinically established Achondroplastic dwarfism (Larje 1985). Besides high levels of skeletal lead, he also yielded high levels of zinc. Nothing in the grave, which was excavated at Kopparsvik south of Visby on the Gotlandic west coast, indicated that he had taken part in metalworking. This individual might offer a possible connection back to the literary, idealized smiths – if these stories have any real bearing on the actual situation in Viking Period Scandinavia, it might have been seen as suitable for such an atypical individual to be a metalworker. It is hard to transfer such theories out of the realm of speculation, though, especially since two other individuals with dwarfism (cf. Arcini & Frölund1996), who were sampled and analysed in the study, did not yield elevated levels of either skeletal lead or zinc. All in all, the trace elements analyses seems to show that elevated levels of skeletal lead *might* be an indication of non-ferrous metalworking, but more analyses of both 'Smith's graves' and more anonymous inhumations ought to be carried out to establish a more significant pattern of results. It should also be noted that elevated levels of skeletal lead can be caused by contamination from soil or intake via food, but based on what is known about the individual burials and their original locations, none of the results presented here can be refuted on such grounds.

It should be remembered that lead, in particular, is toxic, even in low concentrations, and the higher levels of skeletal lead established from the metalworkers speak of severe clinical problems for these individuals. This illustrates an issue that is seldom discussed in archaeology: the fact that non-ferrous metalworkers must have been subjected to several medical conditions which can – today – be directly related to their exposure to heavy metals. Lead, as well as mecury, must surely have been problematic. The analyses of gilded Viking-period objects are few, but it has been possible to show that they were largely fire-gilded using amalgamated gold as described

above (cf. 3.3.3). The removal of mercury by heat was a crucial part in this process, but it also meant that the air around the gilded work piece became saturated by vaporized mercury. The number of gilded objects is simply enormous – on Gotland alone, gilding can be found on several thousand of the *surviving* objects. Gilding appears to have been a standard decoration on many artefact types and, hence, the workshops, which produced the gilded objects, must have handled substantial volumes of mercury. Today, it is commonly known that lead and mercury are mortally dangerous, but that knowledge is of a fairly recent date (cf. Drasch 1982; Retief & Cilliers 2006). It might actually be seriously considered whether some of the irrational and violent behaviour ascribed to Viking Period metalworkers, for example Skalla-Grímur Kveldúlfsson (e.g. [Einarsson]:2003:54; Jakobsson 2013:159p), was sparked by lead or mercury poisoning. Regardless, it must expected that the mortality among non-ferrous metalworkers was considerably increased and the life expectancy much shorter than for non-metalworkers.

4.5.3 Heredity among Gotlandic metalworkers

A number of the Gotlandic workshop sites offer potentially interesting insights to a seldom-discussed question concerning metalwork and metalworkers: Whether metalworking was hereditary or not. Given the special knowledge requested by non-ferrous metalworkers, a hereditary system would ensure that the younger generations learnt the craft from a very early age, yet this is also very hard to discern using the archaeological record as a primary source. Normally, when a workshop is situated in a town or an emporium, not much can be said about the metalworkers other than how skilled they were – when moulds and similar qualitative artefacts were present – and when they worked there – if the workshop can be dated more securely. A brilliant example of this came to light during excavations at Viborg Søndersø on Jutland, Denmark (Iversen *et al.* 2005). Thanks to good preservation conditions for wood and macrobotanical remains, it was possible to uncover a very detailed chronology of the site, which included a metal workshop that had also been utilised for antler working (cf. *Paper II).* But, even though it was possible to more or less pin-point the *season* during which the building had been active as a forge every year, it yielded very little about the actual metalworkers. The same, though not as detailed by any standard, goes for the workshop at Bottarve in Fröjel – it was used for a number of metallurgical processes, probably in the latter part of the 11th century and the metalworkers were Gotlandic judging from the moulds recovered at the site, but that is about all that can be said about them.

As mentioned above in Chapter 2.2, it seems to have been normal to relocate most Gotlandic inland settlements on a regular basis. Just how far

Figure 6. Find clusters with 3 separate workshop sites by Stora Enbjänne in Hogrän. Based on Paulsson 2011a & d. ©Lantmäteriet Gävle 2001 Medgivande I 2011/0094

these settlements were moved seems to have varied greatly, but they seem, especially during the late Viking Period, to have been moved over quite long distances (Östergren 1989:238). This custom seems not only to have been confined to more ordinary farms, as there is some evidence that speaks in favour of a repeated relocation of workshop sites. At a number of these sites several find clusters have been found at rather close distance from each other. These clusters all include diagnostic finds, which distinguish them as belonging to either subgroup 2 or 3 (CAT nos. 38 A & B, 39 A & B, 51 A & B, 52 A & B, 60 A & B). The finds might be used to formulate two propositions: First, that the workshop sites also encompassed working farms since they were relocated as more ordinary farms. This is especially evident at the sites at Stora Enbjänne and Allvide in Hogrän (CAT nos. 51 & 52; Fig. 6). Here the division into two separate sites is most probably inaccurate as they are geographically positioned next to each other. Instead, it might be assumed that the find clusters represent three different stages of the same workshop -/farm site moving (CAT nos. 51 B & 52 A are most probably parts of one single, large find cluster in between 51 A and 52 B). Second, the moving workshop sites indicate that metalworking was connected to particular farms over a long period of time. It might not be too bold to suggest that this indicates that the craft was passed on within these families.

4.6 Tools in graves, at settlements and in fens

As mentioned in Chapter 3.4 there are quite a number of tools, mainly hammers and sets of tongs, which have been recovered from Gotlandic settlements. Unfortunately, due to their multiple uses, these cannot be exclusively connected to metalworking in the same way as dies or ingot moulds. They are, however, interesting from a contextual point of view. As for graves on Gotland, there are a few that include tools, but the only grave that included tools that, with certainty, were intended for non-ferrous metalworking – grave 13:2 from Gannor in Lau parish – dates to the early Roman Iron Age (Stenberger 1937). The tools in question were a small hammer and a small pair of tongs with angled jaws that most probably was designed to lift crucibles. Bone samples from the individual in the burial were found to have vastly increased levels of skeletal lead in comparison with most other individuals in the study (*paper V,* Table 1). One additional Gotlandic burial – grave 52 from Lilla Bjärge in Vallstena (within sight of CAT no. 80) – included a potential metalworking tool, a hammer, and another grave from the same cemetery – grave 104 – included iron bars. None of these latter individuals yielded notable levels of skeletal lead.

The Mästermyr tool chest is one of the more well-known archaeological finds from the Gotlandic Viking Period. Ever since a farmer ploughing a newly drained part of the vast fen Mästermyr discovered it in 1936, it has drawn the attention of generations of archaeologists. The full find comprises two copper cauldrons, three large iron tin bells, an iron chain, a (presumed) fire griddle and an oak chest filled with tools for woodworking, iron forging, coppersmithing and, probably, casting – in all c. 130 objects of copper-alloy, iron, lead and wood (Arwidsson & Berg 1983). Soon after its discovery, the Mästermyr find started to gain a life of its own; the seemingly down-to-earth find of tools, of which many could without any greater effort be identified by 20th Century craftsmen, sparked the imagination of people far beyond the academic sphere. The find site – the fen – also helped in creating what would become the grand narrative of the find: A travelling craftsman losing his entire collection of tools whilst crossing the fen in a boat that capsized or by going through the ice in the winter (cf. Arbman 1962:14pp). This must be seen as highly speculative; instead, it is much more likely that the tool chest was deposited intentionally in the fen, probably close to its edge next to firmer ground. In this it, as pointed out by Julie Lund (2006), mimics a range of other tool hoards. Lund discusses these finds in terms of sacrificial deposits in or close to wetlands. A second Gotlandic tool find, which is not treated by Lund, derives from Martebo myr on the border between Lummelunda and Martebo parish on the island's north-central part. Martebo myr is yet another of the fens that was drained and transformed into farmland in the 19th and early 20th centuries. Like Mästermyr, it was a vast wetland, stretching over seven parishes and repeated finds of logs and

would-be wooden constructions have been reported since the 19th century. Close to one of these constructions, called *Korspall*, several tools have been recovered, along with swords, arrowheads and keys (SHM 20854, Svensson 2002; Pettersson 2009). A third wetland deposit was recovered in 2009 by means of metal detector at Eskelhem Alvena (former Ammor) in Mästerby (CAT no. 60 C). It was not a tool hoard as such, but its composition, consisting entirely of cast but unfinished copper-alloy objects – 5 sword pommels and 17 fish-head pendants – connects it to the tool hoards (Gustafsson 2011). From aerial photos, it is clear that the find site was, during the Viking Period, located within the northern perimeters of yet another drained fen – Fjäle myr.

What was it, then, that made the Gotlanders deposit tools in the wetlands? First, it should be established that this practice by no means occurred only on Gotland – rich finds of tools have been recovered at several other sites throughout Scandinavia (cf. Lund 2006). Wetlands have attracted ritual attention well before the Iron Age, and the objects have most probably been deposited for many different reasons – one possible explanation of many could, of course, be that the owner himself had died and that his tools for some reason could not stay at the farm. But in the case of the Mästermyr tools, it might be more sufficient to speak of a full farm's set of tools rather than one individual's. Additionally, it is important to understand that many of the stray tools, which have been recovered from Gotlandic farmlands, might originally have been part of hoards that have been ploughed-out.

In the end, it might come down to the fact that different parts of Scandinavia had different customs on all social levels during the Viking Period. While Norway has a large number of 'Smith's graves' in which metalworking tools were included, Sweden and Gotland have few – if any – graves of that type and thus it is possible that the Gotlanders – to some extent – deposited the tools of deceased metalworkers in wetlands instead.

4.7 Gotlandic society and the metalworkers

The use of cultural-specific clothing and dress accessories has evidently been a widespread means to signal cultural affiliation all over the world. Late Iron Age Gotland was no exception and it seems as if the wearing of Gotlandic dress was more or less compulsory for people living on the island. That being said, it should be remembered that all such assumptions are based on the occurrence of specific dress-related items in burials, i.e. under circumstances that must be considered highly regulated from a ritual perspective. What people wore in everyday life is hard to establish, but it is often asumed that the funerary vestments are the same as those worn in life, or at least reflect these (Thunmark-Nylén 1983d:153). However, since the soils are ill suited to preserve textiles and other organic materials, the

knowledge of the local fashions would be very limited if it had not been for the abundant dress jewellery and other dress-related objects made from metal.

Anders Carlsson and Lena Thunmark-Nylén have presented statistic estimations for the total production of two such object types: animal-head brooches (A. Carlsson 1983a & b) and box brooches (Thunmark-Nylén 1983a). Both are somewhat outdated today, but they are still interesting for the sake of comparison. Carlsson based his assumptions on a statistical model and came to the conclusion that between 72,000 and 108,000 animal-head brooches could have been produced on Gotland between c. 800 and 1100 AD (A. Carlsson 1983b:199). Thunmark-Nylén used another model and estimated that c. 10% of the burials included a box brooch. This led to the burial of 15,000 brooches (at the most) that needed to be replaced over a period of 250 years (Thunmark-Nylén 1983:120p). According to the latest in-depth presentation of the two brooch types (WKG III), there were approximately 1,750 animal-head brooches and 850 box brooches known in 2006. Since then, the numbers have increased further due to various metal detector surveys (e.g. Hellqvist & Östergren 2011). The figure 15,000 brooches might seem impressive, but as Thunmark-Nylén pointed out in the abovementioned study, these 15,000 were produced over a period of 250 years. If the total number of brooches is divided evenly over this timeframe they will only equal 60 brooches per year (Thunmark-Nylén 1983, Fig. 107). The same mathematical exercise with Carlsson's maximum – 108,000 animal-head brooches over a period of 300 years – gives a yearly production of 360 brooches. The statistics might serve as an example, but it is less likely to have much to do with aViking Period reality. The later types of animal-head brooches (WKG type 7), for example, were of a simple design produced without time-consuming ornaments. They could be mass-produced in larger series using less time than double-scaled or highly decorated brooches. Here, it is important to remember that, even though the parallel might not be entirely wrong, Gotland during the Viking Period ought *not* to be compared to the highly effective production centers of the modern world. The metalworkers most probably had no concept of industrial production of the kind that attempts to break competing producers by means of flooding potential markets with cheap objects, i.e. swift to produce. By and large, we know very little of how the production of dress ornaments, functional as less functional, was organized – for example, we do not know if brooches were 'bespoken' by their potential wearers or if they had to make do with what was available from the workshops. It is probably safe to presume that both systems co-existed, given the occurrence of elaborate one-of brooches as well as quite crude copies of simple designs. The assumed stages of the production itself have been presented for both animal-head and box brooches. For the former type, Carlsson has suggested a direct-copy procedure during which the casting mould for the brooch is created from a

master copy that is covered with mould loam. Carlsson also presented a plot of 44 brooches illustrating the decreasing sizes of brooches, which is said to have been copied on other brooches; the ratio between the individual brooches length and width thus create a relative chronology. He also presented a potential master model – a back-less 'brooch' of considerable size from Lundbjärs in Lummelunda (SHM 8807) (A. Carlsson 1983b:199p). Carlsson explains the decrease in size as being solely attributed to the mould loam's shrinkage in the process of drying. This will not give the full picture though, since the decrease in size is also affected by other factors such as the shrinkage of the metal itself when it solidifies in the mould. Furthermore, the earliest version of the brooch type in question, which dates from the early 9th century, normally has a fixed back plate cast in one with the front, a feature that demands the use of beeswax (to create a casting cavity between the decorated front and the inner loam core). Like the metal, beeswax shrinks considerably when it solidifies and Carlsson's plot must thus be re-evaluated with these factors included. Practical experiments have shown that an average shrinkage rate of up to 6% can be expected (Lønborg 1994b:154) when lost-wax moulds are produced from a master model. Carlsson suggested a time span of c. 200 years between the master model and the smallest brooch, but a brief estimate shows that the smallest brooch is only about 20% smaller than the model – effectively meaning that no more than roughly three direct-copy generations separate them if the shrinkage rate of 6% is to be used as a measure. Another important feature to take into account is the fact that moulds made through the direct-copy method not necessarily need to end up smaller than the model. When the clay, which is used to copy the model, is removed, it is easy to flex and shift it somewhat outwards to loosen it from the surface, thus rendering the imprint somewhat larger than the original. The effect of this can be observed both on original artefacts and in experimental replicating and it can be hard to come to grips with. It can be successfully dealt with by measuring, though, but then it is not the objects exteriors that should be measured, but rather their ornamental features. One example can be seen in the model of a fish-head pendant, which was found at Klints in Othem (CAT no. 62; *paper III*, Fig. 2). When it was compared to the unfinished pendants in the Mästerby hoard (CAT no. 60 C), it could be established that all pendants that could be measured were wider than the Klints master. However, when the ornamental fields were measured by means of high-resolution 3D models (Fig. 7), it became evident that the ornamental fields on the Klints master were c. 5-6% larger than their counterparts on the Mästerby pendants.

Figure 7. Illustration of how ornamental fields are measured on computerized 3D models to establish shrinkage. Detail of master model for fish-head pendant (left) and unfinished pendant (right), cf. Fig. 3D. Both scans conducted by the author

4.7.1 Workshop specialisation

According to Lena Thunmark-Nylén, there is some evidence for a division between the metalworkers who produced animal-head brooches and those who made box brooches (1983a:124p). She mainly built this hypothesis on the assumed traditions dating back to the Vendel Period and production of disc-on-bow brooches. This connection is indirectly supported by the finds from Stora Förvar on Stora Karlsö (CAT no. 2), where mould fragments for both types have been found in relative proximity to each other, accompanied by the crown of a button-on-bow brooch which was recovered in context inside the cave. Another feature, which speaks in favour of Thunmark-Nylén's interpretation, is that the needle arrangement on early animal-head brooches differs significantly from those on disc-on-bow-/box brooches. Thus: Thunmark-Nylén interprets the Gotlandic brooch production as divided between two traditions that also can be said to represent two separate guilds of casters that later were separated even further when the ’box-brooch makers’ turned to production of highly elaborate brooches with filigree- and silver decorations which is seldom seen on animal-head brooches. The other ‘guild’ – the animal-head brooch makers – eventually started to produce simpler box brooches via the direct-copy method.

My view on this situation is somewhat different. Thunmark-Nylén (and A. Carlsson 1983) seems to have forgotten the production of other non-ferrous objects. As mentioned above, Thunmark-Nylén statistically estimated that 60 box brooches needed to be produced every year to replace those deposited in burials; this leaves plenty of time for production of other objects. I completely agree with her that it seems likely that the large silver encased and gilded box brooches were produced in a limited number of workshops, but then again: there are other Gotlandic artefact types that include these decorative elements (silver encasing, gilding, nielling and

filigree-work). I thus believe that the brooch makers, or at least metalworkers using the same workshops, produced a range of other objects, for example various pendants and possibly also silver adorned weapons. Additionally, there might not necessarily have been two contemporary 'guilds' of casters operating on the island. Instead we might see the result of a systematic 'out-reach' among the Viking-period metalworkers: In *paper II* I have discussed this as a possible explanation to the sparse but still observable metalworking at the sites of subgroup 1, i.e. farms with few traces of non-ferrous metalworking. What we see at the subgroup-1 sites might be traces left by metalworkers who, possibly as a part of their training, produced smaller objects from metal which had been collected for the purpose by the inhabitants of the subgroup-1 farms. Such outreaching production might also have brought an increased status to the metalworker, who could 'show off' his skills to an untrained audience. Such production, away from the main workshop was probably better suited for objects that were cast in direct-copy technique using master models or extant objects as models. More complicated objects, such as gilded and nielled box brooches, were better suited to be cast in the workshop on the home settlement.

4.7.2 Workshop organisation

The working of non-ferrous metals on Gotland, as during any other part of Viking Period Scandinavia, was dependent on a steady supply of metal from the outside world. The skills were local, but the metals were certainly not, and they needed to be brought to the island. Sadly, we only have a very obscure picture of how they were distributed locally; one suggestion is that the metal was mainly provided by the would-be clients. This is based on the often very rich finds of non-ferrous metal fragments recovered by means of metal detecting at settlements all over Gotland. The bulk of the metal used seems to have been re-melted scrap metal, but as shown above finds of copper-alloy bars are also relatively common, mainly in the form of severed fragments, but also as full bars. Given the results in *Paper II,* it is possible to look at the distribution of affirmed and possible metal workshops (Fig. 13). The geographical position of these give an admittedly incomplete, but still interesting picture that can be further compared with other features, for example names of farmsteads.

Gotlandic place names, especially farmstead names, occur repeatedly over the island. These farms are normally distinguished from each other by the addition of the parish to their name as they normally just occur once per parish – the farm Odvalds in Linde parish is thus referred to as *Linde Odvalds* while Odvalds in Fide is called *Fide Odvalds.* One of these repeating farm names is *Smiss* – a genitive form of smith, i.e. *the Smith's* [farm]. Smiss as a farm name is documented in 29 parishes

Table 2. Smiss farms, Smiss-related farms and Smiss-related toponyms in Gotlandic parishes. A: Parishes with documented Smiss farm, B: Parishes with documented Smiss-related farms, C: Parishes with Smiss-related toponyms, cf. Fig. 8. Source: SOFI place-name registry and Ersson 1985

Parish	A	B	C	Toponym	Comment
Akebäck	X			Smiss	Farm
Alskog	X			Smiss	Farm
Ardre			X	Smidåker	Field
Atlingbo			X	Smidåker	Field
Björke		X		Smidgarde	Farm
Bro			X	Smidtomten	Field
Dalhem	X			Smiss	Deserted farm
Eke	X			Smiss	Farm
Ekeby		X		Smide	Farm
Eskelhem			X	Smidåker	Field
Fårö	X			Smiss	Renamed farm
Fide			X	Smidåker	Field
Fleringe	X			Smiss	Farm
Gammelgarn			X	Smidåker	Field
Ganthem	X			Smiss	Farm
Garde	X			Smiss	Farm
Gerum	X			Smiss	Farm
Grötlingbo	X			Smiss	Farm
Hablingbo	X			Stora smiss	Deserted farm
Hangvar	X			Smiss	Deserted farm
Hejde	X			Smiss	Farm
Hejdeby			X	Smidnäs	Field(?)
Hellvi			X	Smidåker	Field
Hemse	X			Smiss	Farm
Hogrän			X	Smidhögard	Meadow
Hörsne	X			Smiss	Farm
Klinte			X	Smidåker	Field
Kräklingbo	X			Smiss	Farm
Lärbro	X			Smiss	Deserted farm
Lau	X			Smiss	Farm
Levide			X	Smidåker	Field
Linde	X			Smiss	Farm
Lojsta			X	Smidåker	Field
Lummelunda	X			Smiss	Farm
Lye	X			Smiss	Farm

Table 2. continued

Parish	A	B	C	Toponym	Comment
När	X			Smiss	Farm
Rone		X		Smissarve	Farm
Sanda	X			Smiss	Farm
Silte		X		Smissarve	Farm
Sjonhem	X			Smiss	Farm
Sproge			X	Smidåker	Field
Stånga		X		Smissarve	Farm
Stenkumla		X		Smissarve	Deserted farm
Stenkyrka	X			Smiss	Farm
Tingstäde	X			Smiss	Farm
Tofta			X	Smidskogen, Smidtäppu	Forrest, Field
Träkumla			X	Smidåker	Field
Vall	X			Smiss	Deserted farm
Vamlingbo	X			Smiss	Deserted farm
Vänge			X	Smidkviar	Small road
Väte		X		Smide	Farm
Östergarn	X			Smiss	Deserted farm

throughout the island (cf. Table 2 & Fig. 8) and it is also included in other farmstead names such as *Smissarve* – normally interpreted as referring to an earlier connection to a Smiss farm (translating as '*inherited from the Smith's'*) (Olsson 1994:73). Other variations on the same theme also occur – for example *Smide* (literally translated as 'Forging'), *Smidegårde* ('the Forge farm') and *Smidåker* ('the field by the forge') – a name that might not be connected to the Smiss-farms, but might refer to local smithies on farms. Even though an early Norse smith was not necessarily a metalworker, the term can refer to almost any craftsman working in harder materials. The Smiss farms might, at some point, have been included in a larger organization, possibly within the Things, but much more research has to be carried in order to establish whether this hypothesis is credible. Figure 8 shows the distribution of Smiss farms and Smiss-related farms and toponyms on Gotland. It enables an overview of how the Smiss farms relate to each other and shows that they mostly tend to cluster together, i.e. that even though there is only one Smiss per parish, these are not spread evenly over the island, but are located in parishes next to each other. The implications of these clusters are hard to interpret, but one explanation might be that one of the Smiss-farms in each cluster is older than the others and relates to an older parish structure with fewer, larger parishes. When these were split

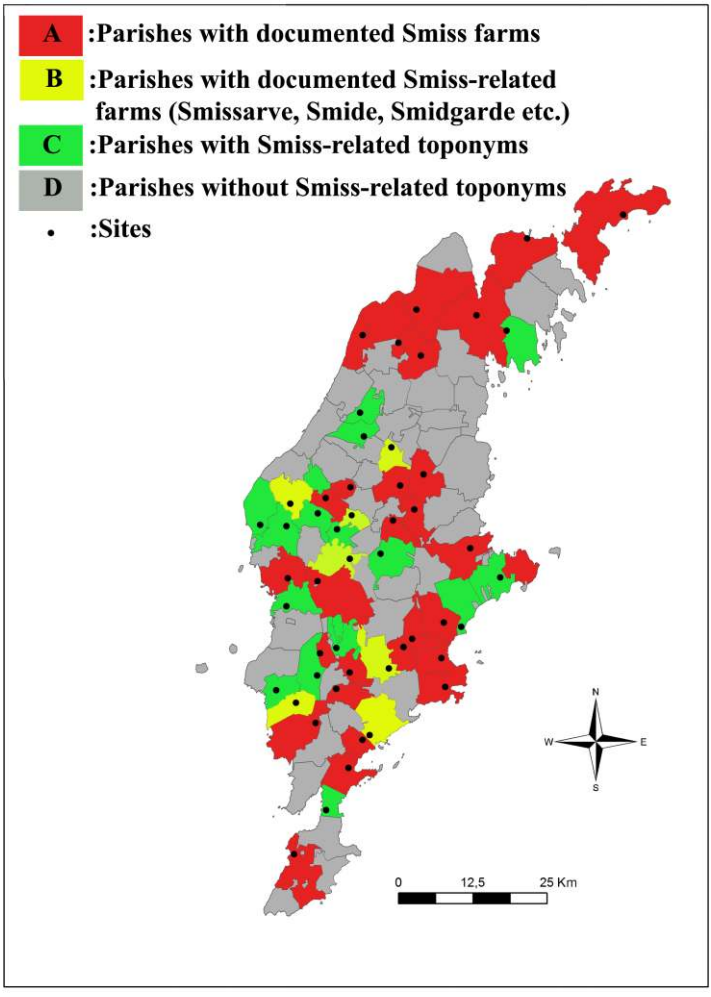

Figure 8. Geographical distribution of Smiss farms, Smiss-related farms and Smiss-related toponyms, cf. Table 2. Black dots indicate the individual sites.

up into smaller parishes during the course of the Medieval Period, new Smiss-farms were named after the original farm by rule of convention. If this was indeed the case, it would imply a rather strict organization of the parishes.

The distribution of Smiss-farms features a rather good concurrence with the finds of non-ferrous metalworking displayed in Figure 13, with the exception of the cluster of Smiss-farms on the mid east coast. Only one undisputable workshop site in this study (at Smiss in Linde parish, CAT no. 58) can be directly connected to a Smiss farm though. There, rich deposits of smithing slag close to the 18th century main building show that the farm once had a very active forge, but these deposits most probably date to the 17th-18th

centuries. This brings that, even though another Smiss, in Eke parish on the southeast coast, can be indirectly connected to non-ferrous metalworking via the Smiss tool hoard, the question of the Smiss-farms' age and importance as organizational units must presently, be left unanswered.

4.8 Workshops and metalworkers – some concluding remarks

In this chapter, I have presented and discussed two fundaments in Gotlandic non-ferrous metalworking – the sites where it occurred and the individuals who performed it. As shown above, non-ferrous metalworking has been carried out at a large number of settlements, some of which have yielded incontestable proof of quite extensive production on a level that signals regularity and proficiency. These workshop sites are a key to understanding both the immediate production of jewellery and other non-ferrous objects and the overall organisation of the craft on a regional and inter-regional level. The pursuit of the craftsmen has been less rewarding, but trace elements analyses of skeletal lead clearly constitutes *one* possible method to shrink the gap between ourselves and the Viking Period metalworkers. Besides, allowing us to identify them among other anonymous individuals also offers a way to validate, and if needed avoid, the automatic association between so-called 'Smith graves' and actual metalworking.

In the following chapter, I will go on to discuss the prerequisite for the secluded Gotlandic society: the surrounding world. It is an inevitable fact that without repeated interaction with other cultures, Gotland would never have developed into the socially distinct culture reflected in the archaeological record and the scantily written accounts.

Later, in Chapter 6, I will return to the Gotlandic metalworkers and their workshops for a closer discussion of their role in both the formation of the Gotlandic identity and the development that would eventually lead to the adoption of a coin-based economy on the island.

5 Beyond Gotland

When an insular society is studied – even a seemingly secluded one like Viking Period Gotland – one must never forget its neighbouring areas. All sources, written as well as archaeological, point to an intensive and dynamic interaction between Gotland and the Baltic countries, Russia and the southern Baltic rim on the other – not to mention the Scandinavian countries. It appears as if these contacts were largely built on terms established by the Gotlanders, i.e. it seems to have been the Gotlanders who sailed out, rather than foreigners travelling to Gotland. During the course of the late Iron Age, the existing North European networks for exchange and trade appear to have been directed towards a number of newly established emporia or 'proto-towns' (e.g. Clarke & Ambrosiani 1993). These sites probably served multiple purposes, and most of them, as we know them today, are located along contemporary waterways. Certain emporia, such as Haithabu in southern Jutland, were also connected to well-established overland routes, linking Scandinavia with the Continent.

5.1 Gotlandic harbour sites

Even though Gotland has a coastline of c. 800 km (including that of Fårö island, north of the main island), it is far from favourable for landing ships along its entire length. Several research projects over the last 50 years have tried to come to grips with the issue of how the coast was utilized in previous periods (e.g. Hansson 1967; D. Carlsson 1998). Historical accounts along with Medieval and post-Medieval archaeological remains of seasonal fishing hamlets, as well as extant dittos, can tell much about the situation during the historic period (cf. d'Agnan 2010). The Iron Age usage of the coast is more enigmatic at first glance, though mainly due to the fact that the glaciostatic uplift has transformed the coastline quite significantly over the last millennium. As a result, many coastal features are now to be found somewhat withdrawn from the coast at a distance, which is determined by the local topography. Starting in the 1960's, repeated attempts have been made to identify these early harbour and landing sites through topographical studies and phosphate surveys of potential sites (D. Carlsson 2011d:26pp). This has led to the identification of a number of confirmed and potential landing or harbour sites (e.g. CAT nos. 1, 6, 16). The significance of these has been discussed repeatedly since then and a number of additional sites

have been located and surveyed (D. Carlsson 1987). As can be expected, this group of sites is quite divers; some were most likely only used by the inhabitants of one or a few farms, while others, often at topographically and nautically favourable locations, might have served a much larger organizational unit. Some researchers have interpreted these larger harbours as connected to the *Sättingar* or the Things, i.e. that there was a central harbour site in every Sätting – six in all (cf. Lundström 1981:121pp). That would mean, however, that at least one Sätting – Hejde, on mid-west Gotland – would have had two quite developed co-existing harbour sites in the 11th century: Västergarn and Bottarve/Nymans in Fröjel.

Several of these larger harbour sites feature traces of particularly active metalworking, ferrous as well as non-ferrous, and as mentioned above, six of them are included in this study as they have yielded traces of extensive non-ferrous metalworking. From a broader perspective, I regard it as somewhat hazardous to uncritically interpret these sites along the same standards as the inland workshop sites, as the harbour sites seems to have actively strived *outwards* in a fashion that does not seems to apply to the inland settlements. But regardless, it is not possible to leave them out as the site by Bottarve in Fröjel has yielded the hitherto best preserved metal workshop recovered on Gotland (cf. *paper III*:97; CAT no. 6 B).

Irrespective of how these sites are to be interpreted and fitted into the island's social structure, it is probably safe to assume that they acted as focal points for the interchange of people, ideas and objects to and from Gotland. Initially, they might have been intended as bases for regional endeavours and for the local inter-Gotlandic exchange, but in a time when other Scandinavian emporia and town-like sites were laid out and attracted merchants from many areas – including Gotland – it would have been strange if the Gotlandic harbours were closed to non-Gotlanders. On the other hand, it seems as if most other parts of Gotland *were* indeed closed to outsiders, at least as long as they did not force themselves onto the island. Judging from the general lack of non-Gotlandic artefacts on Gotland, many visitors might never actually have gotten beyond the perimeters of the harbour sites they visited. A striking exception to this distribution of non-Gotlandic finds is evident through the occurrence of a particular type of cast copper-alloy comb plate. Combs of this type have been recovered from England to Russia, but the only site that has yielded casting moulds for such plates is Haithabu (Hilberg 2009:78pp). No less than six combs with cast side-plates have been recovered on Gotland (two additional copper-alloy fragments might also derive from combs – cf. WKG III:256; Lundström 1981:87) and this has led Volker Hilberg to the assumption that Gotlandic merchants acted as middlemen in the spread of such combs throughout the Baltic Sea area (Hilberg 2009:80). Five of these finds were recovered from burials and the sixth – two fragments of a comb plate recovered by means of metal detecting at Botvalde in Stånga parish (SHM 31677) – has also been

interpreted as originating in a ploughed-over cemetery (Östergren 1989:155p). These combs appear to be a genuine example of a foreign artefact type which gained a wide acceptance among native Gotlanders beyond the harbour settlements.

Ever since the harbour sites were acknowledged by researchers, there has been much debate as to how they relate to the surrounding social landscape : were they established by local potentates (e.g. A. Carlsson 1993) or were they communal projects (Westholm 1989:79pp)? Even though Visby eventually became the dominating port for trade, it seems as if it was not the sole site even rather late during the Medieval Period. The many harbour sites on the island are probably reflected in the use of the terms *Gutenses* – Gotlanders in general – and '*the Gotlandic coast*' in records and treaties (e.g. Schück 1924:3). According to one Medieval source – the Town Law of Visby – an agreement stated that every visitor should be granted peace for himself and his possessions on a strip of land eight fathoms (c. 14 m) wide counting from the shoreline all around the coast. It has been suggested that this free zone was the origin of the term 'the Gotlandic coast' (Westholm 2007:58).

Another important clue to the understanding of the harbour sites and their importance has been pointed out by Dan Carlsson: By examining 17th century records over the Västergarn- and Fröjel sites, he has been able to show that there is something unusual about the structure of ownership within these former harbour settlements. At Västergarn, there was a large area enclosed with a semi-circular rampart, probably in the 11th century. The enclosed area does not apply to the normal 17th century system of ownership, with properties owned by the local farms. Instead, it was partly divided into plots owned by people from other parts of Gotland. The same arrangement is visible on a stretch of land north of the enclosed area. At Fröjel, the approximate site of the harbour settlement also displayed similar atypical ownership structures – instead of being owned by the nearby farms, the land was divided into smaller portions that were owned by farms in other parts of Fröjel and the nearby parish Eksta (D. Carlsson 2011d:28p). Even though this is a snapshot from the 17th century, it seems to refer back to significantly older traditions. It thus appears as if some harbour sites, at least during the later Viking and Early Medieval periods, were a common interest for many inland farms, rather than of a few potential potentates. Additionally, it is worth noticing that the formerly prevailing interpretation of the Västergarn-harbour complex as planned but never fully completed has been disproven by excavations over the last eight years – instead, there are now several good indications of late Viking and Early Medieval period buildings within the wall-enclosed area (D. Carlsson 2011d:93pp).

One interesting feature that has to be discussed is the fact that three of the six harbour sites included in this study are located in close proximity of churches – Visby, Paviken/Västergarn and Fröjel (CAT nos. 14, 16, 17 & 6).

A fourth site, Pilgårds/Mojner in Boge (CAT no. 1), is also located close to the local parish church and it is often described as another harbour site (for a different opinion cf. D. Carlsson 2008:91p). I, however, have chosen to cautiously categorize it as a farm site since the 1991 excavations were inconclusive concerning the extension of the settlement. The fact that churches were constructed at these sites could, in my opinion, be an indication of the importance the harbour sites held for these specific areas in the time of the local conversion. As mentioned above, the positioning of Gotlandic parish churches has been studied chronologically (though the target area of the main study did not include any of these four parishes). The study showed that the churches, in most cases, had been constructed at sites that were optimal vis-à-vis the settled areas of respective parish (Lindquist 1981). In both Västergarn and Fröjel, it is clear that a church positioned by the coast cannot in any way have been placed there due to such reasons – instead the churches ended up where the 'action' was – by the extrovert harbour sites (cf. D Carlsson 1999b:181).

If the information above is correct, one must then ask why the church of Burs parish was *not* constructed near the harbour site at Häffinds (CAT no. 23) by Bandlunde Bay. Even though the construction of an irrigation pond in the 1970's is thought to have destroyed most of the harbour area, there are reasons to believe that a large settlement, extending far beyond the areas that were surveyed and partly excavated in the 1980's, was present there in the 10th and 11th centuries. The answer could be that the Bay, like most of the coastal waters on the Gotlandic east coast, is rather shallow and that it was rendered less suitable for sailing by the gradual land uplift. As trade found new avenues to take, the Häffinds-site fell into decline and vanished. A more dramatic explanation might be found in a version of a local legend, which has gained a lot of attention after the recovery of four silver hoards in a very delimited area by the so-called Stavers brya (brya [*Gotlandic*]: watering hole). It tells of a local well-off farmer or chieftain called Stavar or Staver who, after hiding a large amount of treasure, fell in battle against raiding Vikings (Westholm 1995:22p). During the excavations of the settlement in 1983-85, large amounts of burnt clay daub were recovered, indicating that the area, at some stage, might have been subjected to widespread fire. One possibility might thus be that the site at Häffinds was thoroughly destroyed during a coastal raid. Either way, when Christianity's importance increased during the 11th century, it seems like the site was not an option for the location of a parish church. The church yard by Burs Church is one of several on Gotland that have yielded Viking Period graves, i.e. furnished with Viking Period dress attires (WKG III:608). This shows that Burs Church – or rather, a wooden predecessor – was in use during the later Viking Period. The contents of one of the Häffinds-hoards, no. VI – six arm rings, two of which can be dated to the latter part of the 11th century, do, however, imply that the harbour settlement was still, or yet again, populated

at a time when wooden churches were evidently erected at other sites. Even if the Häffinds settlement was important enough to have been bestowed with a wooden church, it would be very hard to recognize it as such. Technically speaking, it would be possible – the presumed 11th century settlement has only seen minimal excavation (4 m^2; Östergren 1989:87) and thus its full extent and density can only be roughly estimated. It cannot be ruled out that the site might hold remains of an early church, but since the area is located in an unploughed and slightly forested pasture, it would probably take extensive geophysical survey or the recovery of typical churchyard finds of the type encountered at Burs Church in the late 19th and early 20th centuries or at Fröjel in 1990 (D. Carlsson 1999b) to give it away.

The harbour site at Fröjel is also by far the best-reported Viking Period settlement on Gotland and thus it is hardly surprising that the Fröjel excavations have yielded the hitherto best remains of non-ferrous metalworking on the island. The so-called Fröjel workshop – excavated in 2000 at Bottarve by the Fröjel harbour site (CAT no. 6 B) – has been thoroughly treated in a number of papers (Gustafsson & Söderberg 2005; Söderberg & Gustafsson 2006; Gustafsson & Söderberg 2007; *paper III*, Fig. 4) and will thus only be discussed briefly here. One of the most important structural finds from the workshop building was a large cupellation hearth for silver – it showed that large amounts of silver had been refined at the site and that the silver, as evidenced by a second pit-hearth that had been filled-in with mould fragments and several crucibles (of which two were more or less intact), had been cast into a number of Gotlandic artefact types commonly found in silver hoards. The cupellation process itself must have been an important part of the handling of silver on Gotland as it guaranteed the pureness of the silver circulated on the island. The size of the cupellation hearth in the workshop implies that substantial amounts of silver were refined at a time. Due to the nature of the process (cf. 3.2 above) – in which lead is used to oxidize base metals out of the silver – the end product must have been a rather large piece of solid silver, which, due to the shape of the cupellation hearth, must have been a circular 'cake', plano-convex in section. Similar-looking 'cakes' of silver have been found in a number of hoards, most recently in one dating to the 12th century uncovered at Övide in Eskelhem parish in the summer of 2012 (Langhammer 2013). The hoard comprised several pieces of such silver cakes and the results of an analysis of three (F no. 743-45) of these by means of μXRF show that they all consist of very pure silver, ranging between 92 and 97% (Thuresson 2012). The concentration of silver in the sampled cakes speaks in favour of them as the end result of cupellation.

The Fröjel workshop was hardly the only place where large-scale silver refining occurred on Gotland; the purity of the silver seems to have been a general issue to the late Viking Period Gotlanders. To refine and transform it

into locally accepted objects in well-known styles might have been a way to increase the silver's local viability.

The cupellation hearth in the Fröjel workshop is the only secure find of large-scale silver refining on Gotland to date, but there are possible fragments of litharge-soaked hearth lining from at least two other sites on the island (CAT no. 19 & 58), However, no analyses of their composition have been carried out to confirm the ocular characterization. The presence of at least one fragment of a scorifiers at the Fröjel harbour site also indicates that more small-scaled cupellation, normally interpreted as connected to trade and transactions (Söderberg 2006 & 2011), occurred, which is hardly surprising given the character of the find site.

5.2 Production of non-Gotlandic objects

Despite the evident large-scale production of indigenous objects, there are also strong indications of a simultaneous production of non-Gotlandic jewellery on the island. Such items were probably assumed to be mainly intended for areas and clienteles well beyond the Gotlandic shores. The most striking evidence for this production is probably the fragments of the mould for a type P 25 oval brooch recovered on Stora Karlsö in 1973 (cf. Chapter 4.2). However, the occurrence of several complete but unusable – i.e. not fitted with pin arrangements – oval brooches in other contexts also speaks in favour of production for 'export'. It is easy to get carried away and interpret this as evidence for trading enterprises directed towards the surrounding areas, potentially conquering new markets for Gotlandic produce. I would not go so far though. These objects seems to have been produced in the direct-copy technique and without large-scale analyses of extant brooches to establish if it is possible to connect brooches *outside* Gotland to the model brooches recovered *on* the island, not much can be said in this matter. Above I have stated that it is possible that objects produced as direct-copies, like the presumed Gotland-made oval brooches, did not demand as much of the metalworker as, for example, silver encased and gilded objects. This does not mean that all objects that left the island were of a lower quality though. This can be illustrated by a group of cast zoomorphic sword pommels. In 1990, one of the find areas at Stora Sojdeby in Fole parish (CAT no. 38 B) was metal detected. One of the finds from the survey was reported as '*half a sword pommel*' (Almquist et al. 1990b). In retrospect, this was truer than the authors might have suspected. The site has yielded rich finds from non-ferrous metalworking over the years and the half pommel fits well into that picture. To the naked eye, it is possible to make out some faint and shallow ornaments on the surface, but through raking-light photography it was

Figure 9. The ¨half" sword pommel from Stora Sojdeby (SHM 34600:64) with superimposed reconstructed pattern. Scale bar in mm. Photo by the author.

possible to recreate the full pattern (Fig. 9). The piece was evidently produced by pressing a loose, but fully decorated pommel into soft clay or mould loam; the imprint was then used to cast a copper-alloy positive. The intention was probably to create a master model. The pommel has no known counterpart fitted to a sword, but it is probably a development of the same basic motive as can be found on the Dybäck sword and the Vrångebäck pommel (cf. Rydbeck 1932). In 2009, the metalworkers hoard from Eskelhems Alvena in Mästerby (CAT no. 60 C) was unearthed during a survey; it included five additional – whole - pommels of the same type (Gustafsson 2011). These new pommels differed from the piece from Stora Sojdeby in that they were all unfinished; for unknown reasons, they had been deposited by the edge of the fen Fjäle myr along with 17 likewise unfinished fish-head pendants. A closer examination showed that there originally must have been at least six pommels since two of them were miscast, leaving several open holes. These had been mended with soldered-in patches and since both pommels had large holes in the ornamental 'nose' tendrils, the caster had used pieces of a sixth pommel to repair the pattern (cf. Gustafsson 2011, Fig. 2). An additional fact could be established by measuring the five pommels: One of them, Find no. 206, is larger than the other four and all ornamental fields are deeper and more plastic than the others. The difference is approximately 6% - it could therefore be assumed that pommel 206 was used as a model for the others.

Figure 10. Zoomorphic sword pommel from Gråsand, Denmark. Scale 1:1. Photo by the author

As stated above, none of the Gotlandic pommels are finished – a fact that can be established due to the fact that there are three extant, finished pommels. Curiously enough, none of these have been found on a sword; they are all stray finds. One was found in a bog near Gråsand in Jutland, Denmark (Horn Fuglesang 1980:130p), the second in southern Romania, at Păcuiul lui Soare close to the Bulgarian border (Popa 1984). The third pommel is currently part of a private collection in Moscow, Russia, but is said to have been found on the Taman peninsula, north of the Black Sea. These three pommels are all made up by a copper-alloy base, very similar to those found in the Mästerby hoard – but all concave areas are gilded and convex, protruding areas have been adorned by niello-inlayed silver casings. The grooves on both sides of the central lobe have been fitted with twisted silver wires to create a herringbone pattern (Fig. 10). Separately, these three pommels might not yield much information beyond pure technological data, but when they are placed in context with the two Gotlandic workshop finds (the Mästerby hoard was found well within sight of the workshop site CAT no. 60 A) and other Gotlandic finds of similar design (e.g. SHM 20700 & 34080 – embossed silver rings with similarly engraved patterns), it is quite possible to attribute them to Gotland. They then serve to illustrate just how far the Gotlandic networks can be followed – the pommels need not have been worn by Gotlanders, but there ought to have been some kind of connection.

It might also be suitable to reflect somewhat further on the non-Gotlandic objects that were being produced on Gotland. One previously mentioned hypothesis might be that they were produced to be uttered? outside the island. A second thought might be that the objects were produced as diplomatic gifts. The Gotlanders probably knew from experience that a peace treaty only holds as long as it is paid for; hence, it is just as likely that the oval brooches and other non-Gotlandic objects were brought by Gotlanders to act as tributes in the areas visited during travels both east and west of the Baltic Sea.

As a side note, it should also be pointed out that the many of the finds of fragmented mainland oval brooches that have been recovered at Gotlandic workshops sites dated to the 11th century (e.g. CAT no. 62) should probably

not be interpreted as remains of production; instead, they might rather reflect the situation *after* the abandonment of the Viking Period material culture on the Swedish mainland. This ought to have resulted in a surplus of brooches brought to the island as scrap metal.

5.2.1 The lake Furen find

An archaeological find that is often discussed as an indication of Gotlandic interaction with mainland Sweden is the so-called *Furen find*. The find, currently in the collections of the Swedish History Museum (SHM 3947), was allegedly found during bog ore collection in Lake Furen in the south-Swedish province Småland in 1868. Through comparison with other finds, it has been dated to the 12th century (Zetterberg 1958). The full find comprised a very large collection of small objects such as sewing needles, round tin brooches, penannular brooches, buckles, strap fittings and coils of metal wire to mention just a few categories. Several of the objects in the find were probably produced on Gotland and the find is assumed to have been lost by a pedlar who might have acquired some of his stock from Gotlandic tradesmen. An alternative interpretation might, of course, be that he was one of the fabled Viking period Gotlandic tradesmen and that the non-Gotlandic objects in the find had been included in his stock via journeys to other areas. Regardless, it is a simple fact that the objects in the find – Gotlandic as well as non-Gotlandic – are rather crude and do not represent any greater levels of craftsmanship. This makes them all the more interesting, though, since they might be seen as examples of the everyday items that people of lower social strata used. Such objects might not necessarily have been included in grave inventories. Of particular interest are the simple round tin brooches and a large collection of tin triple beads (which were 'refound' in 2007 after having survived in the anonymity of the museum storage for decades). As mentioned in Chapter 3.1.4., tin objects are rare in Scandinavian finds from the late Iron Age and the Early Medieval Period. Due to this fact, no straight parallels for these objects are known, but that does not imply that they were not produced on Gotland. The would-be Gotlandic objects, on the other hand, appear to have been produced by a less skilled metalworker and it is even possible that they were produced in a non-Gotlandic milieu mimicking Gotlandic objects in much the same way as Gotlandic metalworkers copied non-Gotlandic objects during the 9th and 10th centuries as described above.

5.2.2 Gotlandic souvenirs

The fashion of wearing paired animal-head brooches and single box brooches was, as mentioned, a very specific Gotlandic custom that was often supplemented with other specific pieces of both functional and merely decorative dress jewellery. Outside Gotland, this custom only seems to have

been practised (to a limited extent) in a few culturally mixed enclaves east and south of the Baltic Sea (Grobiņa, Latvia – Thunmark-Nylén 1983; Wiskiauten, Kaliningrad – Ibsen 2009). Despite this, single finds of Gotlandic brooches have been found at several other locations. The excavations of Haithabu harbour, for example, led to the recovery of one complete box brooch and the outer shell of another, the former filled with lead (Kalmring 2010:434pp); a similar use of animal-head brooches has also been observed (WKG III:30). Presumably, they were used as weights in the same fashion as has been observed repeatedly with, for example, Irish ornaments (Pedersen 2008). Additionally, the upper part of a 10th century fish-head pendant – a typical non-functional Gotlandic piece of jewellery – has been recovered from the Sorte Muld-area on Bornholm, Denmark (Aarsleff 2008:119). These latter objects did, of course, end up in their new contexts as a result of some kind of connection with Gotland, but they should probably be seen more as peculiar souvenirs brought home from visits on the Gotlandic coast rather than indicators of Gotlandic cultural influence.

5.3 Inside and outside worlds

Initially in this chapter, I stressed the importance of studying the surroundings when an insular society like Gotland is investigated. Numerous examples show that distinct cultural expressions generally need to be reflected against those of other social and cultural groups in order to survive; after all, the very notion of identity is shaped by positioning individuals and groups in relation to each other. One of the overall assumptions in this thesis is that the Gotlandic metalworkers played an important role in this game of cultural reflection and positioning. In the following chapter, I will thus try to discuss and examine the validity of that hypothesis, along with a number of more far-reaching assumptions regarding the Gotlanders relation to silver and the local transition from a bullion-based economy to that of a monetary one.

6 Conclusions and synthesis

In this chapter, I will try to further develop some of the major conclusions drawn earlier in this study. To interpret the material remains of societies that are largely historically undocumented can be problematic – those of late Iron Age and Early Medieval Gotland are by no means an exception. Since this is one of the paramount issues in archaeology, there are, of course, a number of more or less established approaches to overcome some of it, beyond the primary reconstruction of presumed material cultures. Colin Renfrew and Paul Bahn (1998:164) have argued that it is essential to begin from the other end, though, to gain a profound concept of the social organization in a studied group or society as this serves to delimit and target the questions needed to understand more basic features such as technological practices. Personally, I often hesitate to apply more far-reaching social theories to archaeological finds and their contexts, but I fully acknowledge the need to reflect certain features against adequate theoretical models and will do so in the following. Generally speaking, studies of early non-ferrous metalworking normally include an intermittent amount of outright experiments, ethnographical analogies and – sometimes – social theory.

Experimental approaches are sometimes popularly presented as the opposite of scholarly theory – as an open-minded, let-go of the academic armchair with the outspoken goal to fill in blank spots and increase the understanding of, for example, a technological process or the production of a monument. Unfortunately, such 'experiments' all too often take on an air of boy scouting for grown ups, sacrificing the scientific approach on the altar of recreational socialisation, i.e. instead of living up to scientific standards, the activities are adjusted to meet the hopes and wishes of those involved. Even worse are the cases where modern economical limitations are allowed to adjust crucial parameters in the experiments; generally speaking, the rule of 'all or nothing' ought to be used more extensively throughout experimental archaeology. If a project cannot be performed according to scientifically given standards, it probably should not be performed, or at least not be labelled as experimental archaeology.

Ethnographic analogies are sometimes presented as a middle way between theory and practice. By looking at how a process is performed and viewed by people in quite modern, yet traditional societies, the archaeologist gains insights that can be used to reflect the presumed incitements? of individuals acting within the social frameworks of past societies. However,

if there is one important lesson to be learnt from ethnography, it is that if one particular society looks upon a feature or an object in a certain way, there will generally be other societies which look at it in a different manner (cf. Hodder 1982). Additionally, if these 'model' societies are situated in environments drastically different to that which one set out to interpret – how does that affect the outcome of the comparison?

Social theories are more seldom used in studies on technology; thus the 'why?' questions of this field of study often tend to get trapped in processual arguments of a quite functionalistic nature (cf. Renfrew & Bahn 1998:441). Such an approach will inevitably cause important aspects central to the understanding of – for example – metalworking to be overseen. With all this in mind, I try to tread lightly yet carefully in the tracks of interpretation below.

6.1 Technology from a theoretical point of view

This thesis is mainly concerned with a range of techniques that, together, make up what is commonly known as non-ferrous metalworking, an artisanal niche thoroughly presented in Chapter 3. Needles to say, many of the processes involved are highly individual given that the preferences and choices of the performing metalworker have a considerable impact on the finished product. Yet, still, crafts are normally performed within technological frames that can be quite distinct from one area or social group to another even when individual variation is taken into account. It is also important to remember that the reception of a technology is never entirely based on rational consideration, not even in quite modern surroundings – there will always be elements of socially governed preferences involved in the technological choices (Lemonnier 1993:6).

Studies of technology and technological choices have a long tradition, not least in France drawing on the schools of sociology and anthropology established by Émile Durkheim and Marcel Mauss, but in particular André Leroi-Gourhan. In the early 1940's, Leroi-Gourhan developed a line of thought centred on the evolutionary relation between man and technology (Audouze 2002:283). Even though some of Leroi-Gourhan's original assumptions have been rendered obsolete by more recent research, his teachings have inspired a considerable number of researchers. One of the more notable of these is the anthropologist Pierre Lemonnier. In 1992 he suggested that technology can be seen as consisting of five interrelated components (Lemonnier 1992:5p) – *matter* (on which the technology *acts*), *energy* (which is used to *affect* the matter), *objects* (the *tools* used to affect the matter), *gestures* (the bodily actions which *control* the objects) and *specific knowledge* (the *know-how* of the involved individuals). A basic presumption concerning these five components is that changes to one

normally affect the other four. Lemonnier further (1992:97), in a critique of archaeological approaches to material culture studies, stated that studies that only account for the shapes and styles of artefacts are incomplete; as long as they do not include considerations of other structures that must have governed the production and use of the studied artefacts, these will inevitably be less well understood.

One such structure with bearing on the Gotlandic find situation is discussed in *paper II* – as a possible reason to why traces of non-ferrous metalworking occur at otherwise quite normal farm settlements. At the majority of these sites, the finds imply that the metalworking only occurred once or on a very limited number of occasions. The main question, however, ought to be why it occurred *at all*. Even though simple conditions are normally not a hindrance for an experienced metalworker, it is still remarkable that casting occurred away from the main workshops on a scale evidenced by the finds from sites in sub-group 1. What was the driving force behind the metalworkers outreach? Jan Apel has observed and described a similar practice in the production of Late Neolithic flint daggers (2009:119p). Through extensive studies based on re-fitting and experimental production, Apel has been able to establish that the later stages in production generally occurred in broad public. These stages were also the most demanding in terms of individual skill, i.e. to execute them one needed to be an expert flintknapper. Other, less demanding stages of the production occurred away from the public. Apel concluded that a possible explanation to this course of action was that knappers wanted to increase their personal prestige by showing-off their expert skills to others. Furthermore, displaying only the most difficult stages was a way to avoid exposure of professional secrets. If this line of thought is applied to Viking Period metalworking, it is possible that it was carried out at the farmsteads for a similar reason – to gain an increased public respect via displays of seemingly magic production stages. The transformation of metal from solid to liquid and the subsequent casting of it into shapes desired by the commissioning spectators would be impossible to copy by the normally skilled bystanders who lacked the know-how of the metalworkers. Thus, the metalworking could also play a part in the social arena.

6.2 Casting identities

Even though dress was also an important medium for display of cultural and social distinction in past societies, it is severely biased to modern researchers by the simple fact that so few extant complete examples survive in the archaeological record. On Gotland – and elsewhere throughout the Norse cultural sphere – the readily observable markers of such Viking Period cultural distinction mainly survive in the form of dress jewellery and fittings.

The various types of these objects evolved over time, but already early in the Viking Period most of them had reached the general shape they kept until the Viking Period material culture complex was abandoned altogether in the 12th century, effectively marking the end of the Gotlandic Viking Period. The active role of the metalworkers in the development of new styles and sub-types is seldom discussed in archaeology – instead the focus is normally set on techniques and ornamental styles. However, it must be recognized that it was indeed the metalworkers who actively incorporated non-Gotlandic styles and influences in and on distinctly Gotlandic objects.

It is possible to observe a close connection in styles between the Gotlandic and mainland-Scandinavian types – when a new animal style became fashionable on the mainland it soon 'arrived' on Gotlandic jewellery. This tendency to embrace new styles clearly shows that the contacts with the Scandinavian mainland were intensive; yet the Gotlanders – or rather, the designing artisans in interaction with the intended users who commissioned the dress accessories – did not conform and embrace the influencing objects and the material culture they represented. Given the Gotlanders strive to travel far beyond their island it might seem surprising that the local customs were actually kept and developed over time and not simply replaced by the material culture that evidently reached the island. But that is a matter of fact; in some cases the influences seems to have gone the other way though – as, for example, with early tongue-shaped pendants (Type 1 WKG III; *Paper II*, Fig. 3), so similar to equal-armed brooches of type P 70-72 that all coincidence ought to be dismissed. As the design goes, the brooches are essentially made up of two adversely positioned pendants and a central, domed crown. The chronological relationship between the two artefact types is somewhat unclear, but since the ornaments on known pendants are much more crisp and detailed compared to the ornaments on the brooches, it might, with some caution, be argued that the pendants inspired the brooches. It should not, however, be ruled out that both artefact types were inspired by a third, to date unknown type, displaying the same ornamental features.

Furthermore, not all Scandinavian animal-styles did enter the Gotlandic dress jewellery. Certain styles, like the gripping beasts, gained a wide distribution both on animal-head and box brooches (cf. WKG II, Taf. 16 & 54), while Jellinge and Mammen style objects are less common even though several niello-inserted silver details on various brooches can possibly be ascribed to these styles (cf. WKG II, Taf. 20:4c). Later styles, such as the Ringerike style, seem to have gained a wide use on fittings like strap-dividers (cf. WKG II, Taf. 137:16-19) and – notably – cast-on elements on keys and arm-rings (cf. WKG II, Taf. 205), but more seldom on brooches. The last of the Scandinavian animal styles, the Urnes style, seems to have made a great impact on the island since it was used to adorn both animal-head and box brooches (cf. WKG II, Taf. 30 & 71-2) as well as late picture

stones. The Gotlandic use of the Urnes style is however distinguished from that of mainland Scandinavia by its often very regular appearance. While, for example the Urnes style embellished rune-stones of eastern mid-Sweden display a large variation in composition, the Gotlandic Urnes style kept a very cohesive expression which might derive from mainland Scandinavian models – for example so-called Urnes brooches which were mass-produced in southern Scandinavia (cf. Lønborg 1994a).

All in all, and in good accordance with Barth's model, it actually appears as if the cultural pressure from embellished non-Gotlandic objects was a driving force behind the resourcefulness of Gotlandic artisanship during the first two thirds of the Gotlandic Viking Period. Based on this, I would like to suggest that the metalworkers stand out as active and skilled defenders of the Gotlandic identity. Over a period of 300 years, they successfully managed to embrace and reshape major influences in ornamentation styles that reached the island. It must be assumed that these carried a profound meaning to the societies both in mainland Sweden and on Gotland, yet the Gotlanders did not simply copy the objects and conform to the full Scandinavian cultural concept. Instead, they clearly signalled that they were aware of these issues, but still saw themselves as parts of a self-governing society. Even though the metalworking artisans produced these socially important objects, it should not be left out that the wearers, the commissioning clientele, most probably had an importat say in this process. It must thus be assumed that the creativity of the designers was subjected to the scrutiny of the intended wearers – if they, on the basis of social convention, rejected a design, it probably never gained any wider spread. Reversely, if a design became favourable among the wearers, it was evidently massproduced (as shown by, for example fish-head pendants). But by the late 11th century, when the Scandinavian mainland societies largely stopped producing such objects, the Gotlandic metalworkers seem to have lost their 'sparring partners' – this loss might have brought the simplification in both animal-head and box brooches that became evident at that time: most striking is the disappearance of animal style ornamentation. Thus, by the end of the Viking Period, most brooches were only fitted with simple fields of round pits (WKG animal-head brooches type 7 and box brooch type 6) as if – in the words of Gustaf Trotzig (pers. communication) – 'only the intermediate spaces of the previous ornamental scrolls and beasts survived in the form of the pits'. It is possible that the Gotlandic brooches, without the mainland jewellery to relate to and be distinguished from, lost some of their meaning as markers of identity. They were still in use up into the 12th century, but maybe more as relicts, signifying the cultural affiliation of the user to an ever narrowing circle of individuals within the insular social framework. Instead, it apparently became increasingly important to signal affiliation to the pan-European Christian culture.

One group of finds that stand out from the Gotlandic normality is the mainland Scandinavian brooches (cf. 2.3). As previously mentioned, they have been suggested to signal political and/or cultural ties with mainland Sweden. Anders Carlsson has repeatedly argued for this interpretation and exemplified his assumptions via finds from the farm Valve in Eskelhem parish near Paviken (CAT no. 16). For a long period of time during the late 19th and early 20th centuries, a substantial amount of finds were recovered at Valve, mainly through illegal grave robbing. Among these finds are a number of non-Gotlandic objects – two penannular brooches with lion head terminals and one fragmentary equal-armed brooch (A. Carlsson 1993:137pp). Anders Carlsson has interpreted these finds as possible signs of foreign contacts and ties among the family residing at Valve. He has also suggested that this might indicate that Valve was inhabited by individuals from the island's higher political strata, individuals that acted as local chieftains and were possibly involved in the foundation and control of the Paviken harbour site (A. Carlsson 1988:96; 1993:133). Dan Carlsson has recently (2011d:63pp) treated the Valve example and showed that the number of graves is much larger than previously assumed. He concluded that this contradicts the interpretation of the graves by Valve as belonging to an individual farm; instead, he suggests that the graves – of which only a small number (eight visible structures) survive – once belonged to a coast-bound cemetery of the kind known from several other harbour sites, such as Gustavsvik, Slite, Lickershamn and Fröjel (D. Carlsson 2011d:74). He thus dismisses Anders Carlsson's argument that Valve farm should have upheld a special position *vis-à-vis* the Paviken harbour site. Concerning the question of the atypical objects, he compares them with similar finds from other coast-bound cemeteries, for example Gustavsvik north of Visby where two of the graves excavated in 1899 included mainland Scandinavian jewellery: one large round brooch and one equal-armed brooch (cf. D. Carlsson 1998:68pp & 84p). Thus, while Anders Carlsson interpret the foreign objects as demonstrations of equally foreign contacts upheld by certain families, Dan Carlsson regard them as a more common phenomenon, connected to the culturally mixed harbour sites. Despite this, it is noticeable that equal-armed brooches not only occur at the harbour sites but also at several inland localities (e.g. CAT nos. 22, 38 A, 47, 54, 62, 64, 67). In light of these finds, I would not dismiss the foreign objects as unimportant, rather the opposite. The occurrence of several fragmentary equal-armed brooches (five fragments in all) in the find cluster by the workshop-site at Stora Sojdeby in Fole parish (CAT no. 38 A) might serve as an example. The simplest way to interpret these finds is of course to dismiss them as imported scrap metal intended for re-melting. There is, however, a possibility that the brooches were used as models in a production similar to that of oval brooches (cf. 5.2). It is thus possible that such locally produced smaller 'foreign' objects, in contrast to the larger oval brooches, were actually (at least in part)

intended for a Gotlandic clientele. Whether this was the actual situation is, of course, hard to establish, but if so, its social implications should not be neglected. I would like to at least partly concur with Anders Carlsson; what if the wearers of atypical, foreign objects actually intended to display a social positioning somewhat beyond the accepted norm? There is, of course, a risk of over-interpreting the finds; the foreign objects in the burials could, after all, just have been included in the grave goods as curiosities without greater implications, but the fact that individuals buried with, for example, equal-armed brooches are to be found on coast-bound cemeteries might imply something different: A slowly increasing division between the harbour sites and the rest of the island. Later, in the Medieval Period, that development would come to a head in the increased division between Visby, originally a harbour site, and the 'country', i.e. the rest of the island. Given that mainland Scandinavian objects are so scarcely found in Gotlandic grave inventories, it must be assumed that the inclusion of such artefacts in some graves does signal something in particular. This must not necessarily be interpreted as affiliation and subordinance towards the mainland-Swedish powerbase, though, it could also be seen as an effort to display difference in general, to break the Gotlandic norm.

6.3 Organized metalworkers

The possible existence of some kind of higher organization among Viking Period artisans has not been sufficiently discussed as of yet. In the case of Viking Period Gotland, it has to be asked whether it was possible for individual metalworkers to consciously protect and develop the concept of Gotlandic identity on their own accord, or if they acted within and were backed up by some kind of early version of craftsmen's guilds. This question cannot be thoroughly answered, but it provides an interesting base for assumptions. Thus, it can probably be assumed that most metalworkers on the island knew of each other – Gotland is not very large and the regular gatherings in connection with local and regional Things speak in favour of this. If they did indeed collaborate is, to some extent, far from certain. Features that might be seen as indications of mutual style might just as well signal copyism, given the apparent tradition of direct-copying in casting. The same ambivalence is at hand in the question of how the fashioning of, for example, the ornaments on brooches was developed. As stated above, there is a clear development of both the styles and the shapes of the artefacts themselves over time. These changes must have been brought about by someone. Even though it is most reasonable to presume that the ornaments and designs on the artefacts were accomplished by the metalworkers, it is still an open question if they acted on an individual basis, i.e. added to and modified patterns and overall design in sole discretion over time, or if the

development was brought about according to a more controlled plan. Based on the artefacts' properties, for example the quality of the patterns and the general artisanal execution, I regard it as plausible that there were a number of workshops that led the development. In these milieus, the original patterns were developed and incorporated in the prevailing styles, slowly altering them. But not all metalworkers needed to be master sculptors – the direct-copying method, as already mentioned, meant that even casters with limited artistic talent could cast long series of quality objects – if they could only come by good master models or suitable copies of the object they wanted to produce. The 'half' sword pommel from Stora Sojdeby (Fig. 9) should probably be seen in this light – as an attempt by a local caster to copy or 'bootleg' an extant pommel and thus avoid the tenacious basic modelling. This brings that finds of master models does not automatically mean that the designing artisans were based at the sites of recovery – a certain circulation of models must be considered even though its extent is impossible to estimate. Sadly, this also means that 'leading' workshop milieus cannot be identified at this stage. Further excavations might change that in the future, as such leading workshops might stand out from others, for example through the scale of the production. But at present, we can only presuppose the existence of the workshops and artisans that quite literally cast the Gotlandic identity.

So far I have mostly treated the rich finds of hoarded silver in passing. This is highly intentional. The effects exerted on humans by precious metals seem to be both cross-cultural and universal – high and low alike tend to get bedazzled by its shine. In short, it tends to take more room than is actually proportional. However, it is impossible not to discuss silver as it is such a prominent part of the overall cultural concept of Viking Period Gotland – and it is, of course, an indisputable fact that the empirical base of this study would have been very limited if it had not been for the campaigns to salvage silver hoards. I will not dwell on individual hoards, though, but instead focus on how the silver entered Gotland and how it appears to have been regarded by the contemporary society.

6.4 Guardians of value?

As noted in Chapter 2.7, there are several, often conflicting, explanatory models for how the silver reached the island, but evidently it was brought to Gotland and eventually some of it ended up in hoards. That summary misses out on a major point though: The fact that a large portion of the imported silver – just how large is impossible to estimate – was transformed from coins, ingots, sundry objects and hacksilver and reworked into a number of typically Gotlandic artefact types such as bracelets, penannular brooches and fingerings – not to mention silver encasings on various jewellery and

Figure 11. Counterfeit silver bracelet from Tystebols, Stenkyrka. Note the verdigris-coloured copper-alloy core. Photo by the author. Not to scale.

weapons. This process must have occurred in a large number of workshops on Gotland and over a long period of time. Of these, one, the Fröjel workshop, has been excavated and interpreted along modern archaeological standards. Luckily enough, the Fröjel workshop preserved all features needed to interpret the process also on a more general level. Above I expressed some concern as to its representativity from a more regional perspective; for a discussion on silverworking, however, that concern is of lesser importance though. What we have is a harbour site with rich traces of both ferrous and non-ferrous metalworking and a large number of finds that is considered diagnostic of trade, such as weights and balances. Thus, we can, so to speak, follow the incoming silver from the shoreline and up. It is also possible to follow it within the workshop itself, via the cupellation hearth and crucibles over in the casting moulds for Gotlandic objects. Based on this, it might be possible to present another aspect of the Gotlandic artisan metalworkers – that as potential guardians of value. It is easy to establish that even though the hacksilver is often profusely tested by means of pecking, the Gotlandic silver objects are hardly ever touched. The reason behind this could either be that test-pecking was not used on Gotland to any greater extent and that it was already inflicted on the silver when it reached the island, or that Gotlanders, in general, trusted the native objects. The latter seems to be the more plausible of the two, but that assumption still does not explain *why* Gotlandic silver was trusted. Coins were, most likely, the single most important source of silver for Iron Age metalworkers. Normally, these held a uniformly high content of silver – but in certain areas, for example mid 11th century Norway, an increased debasement of issued silver coins has been documented (Elfver 2007). This likely underscores that the need to control and alter the incoming silver stock also increased and saw a wider use among metalworkers in general. Anders Söderberg (2011) has investigated this subject in a paper where he discusses Norse policies concerning silver in the 11th century. One of several important conclusions drawn in the paper is that the Scandinavian societies at that stage appear to have been in between a weight and purity based bullion economy and a more nominal economy based on coins. Söderberg argues that there seems to have been a well-functioning system for assaying and a general and widespread awareness of value in the Viking Period, especially on Gotland. This might imply that a close to monetary administrative approach was practiced (Söderberg 2011:26). Several Gotlandic silver arm

rings are fitted with punched symbols on their rear sides. These have previously been discussed by Lena Thunmark (-Nylén), who unsuccessfully tried to connect them to geographically defined workshops, i.e. as signatures of sorts (1974:31), but as one group of symbols closelymimics those found on silver coins, Söderberg suggest that they should rather be understood as a transferred symbol of trusted value. He states that the symbols might have been placed on the arm rings to demark them as more than jewellery – the coin symbols might thus serve as an official approval of purity, i.e. to signal that the arm rings were not primarily pieces of jewellery but rather ornamented ingots with an asserted, weight-based value (Söderberg 2011:24pp). Christoph Kilger has suggested a similar interpretation of early coins minted in Sigtuna during the first part of the 11th century – as their weights vary significantly, Kilger suggests that they were not primarily intended as coins but as silver bullion fitted with a royal approval of asserted purity. The outer resemblance with coins is thus intentional, but since the weights were not standardized they had to be weighed in batches when transacted (Kilger 2011:273).

I strongly concur with Söderberg that the majority of the insular 'jewellery' found in the hoards should be seen as ornamented ingots and as clear signs of an incipiant monetisation on Gotland. But who were behind this development? As with most such issues, I believe that the answer should be sought in judicial bodies and superstructures that could enforce a systematic control of the silver. On Gotland that force ought to have been the Things or, as it presumably was an issue of common interest: the Gotlandic Allthing. One close-at-hand interpretation, which admittedly cannot be confirmed by the find material, is that the handling of silver was regulated from the start, i.e. that only certain officially appointed assayers and metalworkers got to produce these monetised objects. In this way, it could have been possible to guarantee that the silver held a certain standard.

If that was the intention it ought, given human nature, to be expected that the system would soon be faced with individuals trying to override it – counterfeiters. An interesting example of such a seemingly successful forgery has been recovered at Tystebols in Stenkyrka parish (SHM 16835). It is a rather substantial silver bracelet. One end has been cut off, exposing the fact that it is actually made up by a thin layer of silver cast over an inner copper-alloy core (Fig. 11). As made evident by hammer marks near the cut, the piece was apparently straightened and treated as a solid silver bar until the core came to light. To date, this is a unique piece, but I would not be surprised if several other similar forgeries are to be found, for example if more silver objects undergo X-ray examination.

Above, in Chapter 2.4, the Early Medieval Icelandic economical system based on individual pricing after a non-monetary denomination (*Lögeyrir*) was presented. As mentioned, there the value of the Icelandic currency was a reoccurring annual matter for the local Things. There is nothing in surviving

written accounts that imply that Gotland used a similar system, but one must also consider that a large exchange of goods and services probably occurred via transactions of commodities without the involvement of an outspoken currency. Regardless, early Gotland, as described here, exhibited a number of features that might imply the use of a non-monetary currency within the local economy; the overall handling of silver concerning purity, weight and control strongly speaks in favour of this. Based on what we know, it might also be possible to formulate a hypothesis based on the harbour sites presumed position as nodal points in an internal and external network of exchange: that they acted as free zones where non-Gotlandic parties could interact with potential Gotlandic partners. The foreigners probably had to declare both their goods and their intents on arrival and, based on the Icelandic example, quite possibly submit their trading goods to pricing according to a predetermined standard. Certain goods, notably silver, were transformed into monetirised objects of value in accordance with the regulated standards. The foreigners might not even have been allowed to enter the island beyond the harbour settlements. This is supported by the very sparse number of non-Gotlandic objects beyond the harbour sites and possibly also by the code on wergild in the Gotlandic Law. As mentioned in Chapter 2.6, the stipulated wergild for a non-Gotlander was smaller – 10 Marks of silver (1 Early-medieval Mark ~ 203 g – cf. Brøgger 1921:83) than that for a Gotlander – 3 Marks of gold (1 Mark gold = 8 Marks of silver, i.e. 3 Marks of gold = 24 Marks of silver – cf. Holmbäck & Wessén 1979:259). This difference might have served as indirect warning to non-Gotlanders not to leave the relative security of the harbour sites, thus creating a cultural bulkhead between these and the Gotlandic settlements in their hinterlands. In Iceland, the Goði who priced the trade goods also had the right of pre-emption and I would not count it as impossible that a similar privilege was held by individuals connected to the Gotlandic judicial and political structure – judges, harbour bailiffs and similar official in charge of the harbour sites.

With the organisation and fundamental idea of a secured value firmly in place within the Viking Period society, the next step in monetisation was probably relatively close – the shift from a mainly bullion-based economy to an exclusively Gotlandic coinage.

6.5 The advent of Gotlandic coinage

The introduction of specific Gotlandic coins in the 1140's AD is often, beside the final abandonment of the indigenous material culture, seen as the watershed which marks the end of the Viking Period and the beginning of the Medieval Period on the island. The first find of Gotlandic coins is included in one of the last typical Viking Period silver hoards, the substantial Burge hoard. It features a mixed content, such as ingots, bracelets and

various coins. Even though the Burge coin is larger and heavier than other early Gotlandic coins, it is still deemed as connected to the coinage (Myrberg 2008:142). In her recent (2008) Doctoral thesis, Nanouschka Myrberg has studied the introduction and dynamics of the earliest Gotlandic coinage (c. 1140-1220). She discusses a number of underlying reasons for the introduction of coinage on the island and suggests that it came about as a reaction to several developments, both on Gotland and in its surrounding areas. One of the leading reasons, according to Myrberg is an increased effort to emancipate Gotland from mainland Swedish superiority. She thus suggests that the coins, in their capacity as symbolic mediators of trustworthiness and stability, signalled and communicated an increased Gotlandic autonomy vis-a-vis the rulers on the mainland (Myrberg 2008:152). She further suggests that the coins could also have formed part in an internal Gotlandic powerplay, aiming at strengthening Visby's position on the behalf of other contemporary harbour sites (Myrberg 2008:159p). According to Myrberg, much of the inspiration for the Gotlandic coinage from a technical and stylistic point of view can be traced to Friesland and northwestern Germany, indicating that the craft of minting was introduced by these areas. Studies of the metal composition in a large number of early Gotlandic coins indicate that the silver content initially was high, but towards the 13th century an increased debasement is evident (Myrberg 2008:79pp). If Myrberg is correct in her suggestion that the coins should be seen as a means to reduce foreign influence, it is hardly surprising that the silver content is high in the newly established currency; communication of trustworthiness and stability would hardly come easy from debased coins, rather the opposite.

Even if the Gotlandic coinage chronologically falls outside the scope of this thesis, I find it worth discussing. Myrberg argues that some kind of political force must have been behind and controlled the early minting. She suggests that the Gotlandic Allthing was that force (Myrberg 2008:154p), probably led by certain families, which were engaged in and profiting from trade and outbound contacts. Given the suggested management of silver described above, I cannot but see the coinage as a natural development in a world where coin-based trade became ever more important. Furthermore, I fully agree with Myrberg in her suggestion that the coinage upheld and communicated a local Gotlandic identity – to cite the main English title of Myrberg's thesis – 'A Worth of Their Own'. However, I am less convinced by her assumption (2008:176) that this assertion of a local identity and worth sprung out of the remodelling of the religious, political and economic landscape that evidently took place in the early 12th century. Above I have argued that the Gotlandic material culture attests that the Gotlanders had a markedly different ethnic expression, compared to the mainland Swedes. Even though Gotland was officially politically subordinate to Sweden, this seems not to have spread to the expression of identity and affiliation. I would

instead suggest that the coinage might, to some extent, represent a new phase in the display of Gotlandic identity. The Gotlandic material culture seems to have come to a dead end in the early 12th century (cf. 6.2); but up until then, the Gotlanders seem to have succeeded in remodelling the deeper meaning of the insular dress in concurrence with Christianity and its all-encompassing discourse. Thus, the dress and dress-related jewellery seem not to have carried an immediate connection to pre-Christian practises even though such a connection is commonly suggested as a reason for the dismissal of the mainland Scandinavian strap-dress with oval brooches and related accessories (Hayeur-Smith 2005:83). Animal-head and box brooches, on the contrary, occur in Christian contexts such as church yards (cf. 5.1 above). Nevertheless, as time went by, more and more Gotlanders evidently laid-off the indigenous jewellery in the beginning of the 12th century and eventually the typical insular dress disappeared entirely. However, since the cultural – and presumably political – tension between mainland Sweden and Gotland appears to have persisted (cf. for example the abovementioned difference in wergild between Gotlanders and non-Gotlanders and the special terms for taxation and ecclestical matters in the Gotlandic Law – Holmbäck & Wessén 1979:304pp & 313pp), there is a clear possibility that the coinage, beside its basic monetary functions, also came to act as a mark of difference. Since minting on the Swedish mainland (Scania not included) did not re-start until after the advent of Gotlandic coinage, the introduction of a local coinage on the island corresponds well with the previous use of other objects as markers of ethnicity – a coin is, after all, as symbolic an object as a brooch.

Exactly to which extent the mid-12th century Gotlandic non-ferrous metalworkers were involved in coinage is impossible to answer, but it must be seen as an established fact that they evidently possessed skills to ascertain both the purity of the silver stock for the coins and the mere crafts-related sequences of the production. Additionally, Myrberg suggests that due to possible signs of corrosion on the coin dies, there is some indication that minting was not something that occurred more than periodically (Myrberg 2008:147). Thus, even if the techniques used to mint seems to have been imported from outside Gotland, there is a good probability that the individuals involved in the coinage were the direct succesors of the artisans who produced the earlier markers of identity. In the initial phase, they might even be the same people working partly with more 'normal' silversmithing and, when called for, intermittently producing coins.

6.6 Harbours, hinterlands and hierarchies – a synthesis

In this thesis, I have tried to shed some light on the non-ferrous metalworking on Gotland. The general thought has been to focus on the

physical traces of the craft itself; however, in doing so it is impossible not to acknowledge the remains of social structures that simultaneously shine through. Even though most of Iron Age and Early Medieval Gotland was dependent on farming, in particular the rearing of cattle judging from the large areas of meadows which formed substantial parts of Gotlandic farms all the way up until the 19th Century, trade must have been an indisputable part of the early economy. It is hard to determine if the harbours and trading settlements that came to act as focal points of this trade were founded and governed by a number of socially elevated families, i.e. a local elite, or if they were communal undertakings where individual farms acted as 'share holders' via plots, initially only inhabited during the season of sailing. These two alternative ways of governance would of course have meant quite significant differences in the social structure of the sites, but since so little is known of the physical structures to date, not much can be said about it. What *can* be said is that there seems to have been an increase in the differences between the harbour sites and the ordinary hinterland settlements in the course of the later Viking Period, and even though it was slow, it can be observed in a longer, chronological perspective. It is not hard to try to imagine the reasons behind this development – most notably exposure to the outside world. From the finds, which have been recovered on the island, it is possible to see that the non-Gotlandic influence mainly seems to have stayed at the harbour sites. The cultural interchange rather sparked counteractions from the Gotlandic side, visible through the incorporation of pan-Scandinavian ornamental styles in strictly insular jewellery – as comments to the Scandinavian development rather than a sign of assimilation. By and large, the Gotlandic society appears to have developed *in parallel* rather than *together* with the rest of Scandinavia. Given the importance of jewellery and other demarking features in the interplay between socially and culturally defined groups, I argue that the metalworking artisans played a vital part as defining creators of identity in their contemporary society. This phenomenon was by no means limited to Gotland, but due to the island's physical properties as an extremely well defined region – it is after all an island – it is more visible throughout the local archaeological record.

It has, by means of this archaeological record, been possible to show that non-ferrous metalworking occurred throughout Gotland, but not on the same scale, qualitatively speaking. The occurrence of settlements with more clearly defined workshops implies that a system of workshops was laid out over the island and that there was a tendency of regionalisation, as can be observed on the distribution map in Figure 12. The artisans of these workshops evidently utilized a wide number of techniques and apparently did not refrain from the production of objects that did not belong within the local material culture. Furthermore, I maintain that many of the artisan metalworkers played a crucial part in the overall treatment and attitude towards silver on Gotland; by ensuring the purety of the silver that entered

the island, they actively partook in establishing a possible bullion-based pre-monetarian economy on the island. This system was probably of vital importance later in the medieval period, and enabled Gotland to swiftly becom fully monetised in the 12th century. It might be argued that since objects of trusted silver with a guaranteed purety, such as arm rings and penannular brooches were firmly accepted within the insular economy, the implementation of coinage was a small and undramatic change for the contemporary Gotlanders. Coins were, after all, just a new take on the established concept of guaranteed value.

Returning to the harbours, it seems as if a number of these gained an increase in traffic over time, a development which eventually made them evolve into social entities in their own right with a focus on craft production and handling of trade goods. What were once small provisional settlements with utility buildings, often not more than booths on the shore (cf. Andersson 1976), developed into more permanent settlements as trade increased. The people living in these harbour settlements, under the influence of the repeatedly occurring interaction with people from other cultural contexts, possibly came to see themselves as somewhat different from Gotlanders of inland farming settlements. The difference was probably very discrete to start with, but as the harbour communities became more established, this might have become more and more clear that this was a kind of proto-urbanisation, even though the cemeteries by the harbour sites were largely laid out according to normal Gotlandic customs. Even small differences in mentality and self-concept might have been enough to challenge old hierarchies and customs and start a chain of events that would eventually lead to a division of the Gotlandic society with Visby on one side and the island, lead by the Allthing, on the other. As Visby grew, the other larger harbour sites dwindled and eventually vanished to a large extent. Whether the people of these sites preferred to follow the market and become fully urbanised in Visby or instead returned to a more rural lifestyle is an open question – many families probably tried to uphold a median position as long as possible. Some harbours, like that at Västergarns, seem to have been active throughout the Medieval Period, but they cannot in any way be compared to Visby. The tension within the Gotlandic society would continue to grow though as Visby became more and more independent and multi-ethnic, both economically and demographically; the finds from the harbour sites might thus be interpreted as an indication of what would come later in the Medieval Period when open conflicts led to civil wars between Visby and Gotland (Yrwing 1978:27pp).

The time of local cultural subdivisions had run out by the mid 12th century. Christianity as a cultural concept had been thoroughly established on Gotland and its material culture had a set of diagnostic objects that were few and more or less alike throughout Western Europe. For the rural non-ferrous metalworkers, this meant that most of the market disappeared – the

production of more high-status objects mainly seems to have occurred in Visby, as was the essential new non-ferrous commodity – the three-legged copper-alloy cauldron (Engeström 1974). Outside Visby, the local production mainly came to concern simpler objects such as belt buckles and basic fittings, while larger objects, such as church bells, were probably cast by itinerant specialists (Skyllberg & Anund 2003). A new rural artisanal niche seems to have arisen during the Medieval Period, though: decorative stone carving. Gotlandic artisans started to utilise their native limestone to produce ornamental pieces, most notably baptismal fonts, which were exported to the whole of Northern Europe well beyond the Baltic Sea (Berggren 2002).

The development on Gotland mainly followed that on the mainland, the previous seclusion had all but gone and thus the island was increasingly annexed by the Continental High Medieval culture in most respects. But despite this fact, there seems to have been an element of individuality present in the general mindset of the Gotlanders, a desire to differ: Despite Papal reprimands, they continued to do trade with pagan tribes along the eastern Baltic rim. Further, while runic writing dwindled and eventually disappeared from most areas of mainland Scandinavia, it persisted for centuries on Gotland, also in sacral environments (cf. Jansson *et al.* 1979; Snædal 1994:23). Thus, Gotland kept some of its individual distinction throughout the Medieval Period and to some extent stayed another country far away.

English language revision: Carmen Price

7 Sammanfattning

Denna avhandling behandlar icke-järnbaserat metallhantverk på Gotland under sen järnålder och tidig medeltid (ca. 750-1140 e.Kr.). Den består av en sammanfattande del – en s.k. kappa – och fem artiklar som var och en belyser olika aspekter av metallhantverk, hantverkare och deras relation till det omgivande samhälle från ett lokalt och interregionalt perspektiv. Bland annat omfattar artiklarna studier av restprodukter från metallhantverk, både som individuella fynd och som generella föremålsgrupper samt verkstadslämningar som informationskälla. Vidare undersöks i vilken grad arkeometallurgisk prospektering kan ge information om överplöjda hantverksplatser och slutligen presenteras ett försök att identifiera individuella metallhantverkare med hjälp av spårämnesanalys.

I kappan sammanställs och utvecklas resultaten från artiklarna. Inledningsvis redogörs för avhandlingens upplägg ur praktiskt och teoretiskt hänseende. I kapitel 2 diskuteras det gotländska källäget ur ett brett perspektiv. Ön har alltid haft, och har fortfarande i någon mån, en särställning gentemot det svenska fastlandet. Gotlands geografiska position i Östersjön skapade förutsättningar för ett särpräglat samhälle som inte vare sig kan eller bör tolkas utifrån en rent fastlandsskandinavisk förförståelse. Under det första årtusendet e.Kr. växte en lokal kultur med, vid ett snabbt påseende, paradoxala inslag fram. Trots att gotlänningarna av nöd och hävd interagerade med omgivande områden upprätthölls vad som får betecknas som en lokal, insulär identitet – man befann sig i ett tillstånd av central avskildhet. I ännu högre grad än vad som är fallet för det fastlandsskandinaviska området så är tidiga, skriftliga källor få och rudimentära. Den primära källan till gotländsk förhistoria, den s.k. Gutalagen med det vidhängande parti som brukar benämnas Gutasagan anses primärt sammanställd tidigast under 1200-talets första hälft. Brottstycken från bevarade handelsavtal och juridiska mellanhavanden ger, tillsammans med nedtecknade anekdoter och korthuggna standardfraser på gravhällar en grovhuggen men ändå skönjbar bild av det gotländska lokalsamhället under medeltid och den tidiga efterreformatoriska perioden. Det är dock viktigt att beakta att det är just det medeltida Gotland som speglas i dessa källor. När tidigare perioder skall tolkas återstår i princip endast arkeologiska källor och då framförallt i form av metallföremål. Dessa omhändertogs dels av bönder i samband med den ökande nyodling som följde på 1800-talets skiftesreformer och dels i samband med mer moderna efterundersökningar av de många

ädelmetallskatter som gjort gotländsk kulturhistoria känd även långt utanför akademiska kretsar. Dessa skatter som främst deponerades under vikingatiden (för Gotlands vidkommande ca. 750-1140 e.Kr.) har sedan länge attraherat inte bara antikvariska myndigheter och intresserad allmänhet utan även regelrätta plundrare. De senare har sedan handburna metalldetektorer blev tillgängliga på marknaden under 1970-talet hemsökt gotländska fyndplatser i mer eller mindre organiserad form. För att tackla detta problem introducerade Riksantikvarieämbetets dåvarande gotländska enhet, RAGU det som kommit att kallas Skattfyndprojektet år 1977. Detta projekt hade till syfte att föregripa plundrarna genom proaktiv metalldetektering av kända och förmodade skattfyndplatser. På ett tidigt stadium stod det klart att metalldetekteringarna inte bara resulterade i fynd av föremål av ädelmetall. På de flesta fyndlokaler, som på metodologiska och antikvariska grunder var överplöjda (dvs ursprungliga kulturlager var ohjälpligt störda) återfanns även en lång rad föremål som kunde knytas till boplatser och gravläggningar. I övriga delar av Sydskandinavien har undersökningar av stora ytor i samband med utbyggnad av infrastruktur och bostäder resulterat i att en stor mängd boplatsområden från sten, brons och järnålder kunnat lokaliseras under de senaste 50 åren. På Gotland har sådana undersökningar endast utförts i mycket begränsad omfattning och därför utgör de metalldetektorfunna fyndklustren en ovärderlig källa till förståelsen av kulturlandskapets utveckling på ön. De medger att tidigare bygder och gårdslägen till viss del kan rekonstrueras och förstås i ett geografiskt sammanhang, något som tidigare bara varit möjligt med den tidiga järnålderns bebyggelse då denna i många fall bestått av byggnader med manifesta stengrunder. Dessa s.k. stengrundshus (vilka i äldre litteratur även kallas kämpgravar eller kämpgravshus) har fortfarande, trots en mycket hög bortodlingsgrad i vissa fullåkersocknar, stor spridning på ön. Stengrundshusen har använts som bas för att beräkna bl.a. befolkningstryck, markutnyttjande och regionell indelning. Men liksom i fallet med de senare skriftliga källorna är detta behäftat med vissa problem – inte minst när de tillämpas som källa till den sena järnålderns samhälle. Redan tidigt under Skattfyndprojektet kunde det dock fastställas att det i många fall fanns en koppling mellan deponerade silverskatter och tidigare gårdslägen; skatterna hade i många fall deponerats i vikingatida byggnader. Det ursprungliga Skattfyndprojektet avbröts i samband med att RAGU avvecklades under sent 1980-tal. Behovet av att proaktivt räddningsundersöka fyndlokaler med hög attraktionskraft på plundrare medförde dock att det fick en serie efterföljare som bidrog till vidare insamling av metallföremål och dokumentation av äldre boplatser. Bland fynden som omhändertogs i samband med metalldetekteringarna intog föremål med tydlig koppling till metallhantverk en särställning redan på ett tidigt stadium. Många av dessa kan med fördel användas för att kategorisera och kvantifiera den produktion som försiggått på respektive fyndplats. Detta utgör det empiriska grundunderlag på vilken

avhandling vilar och fyndplatserna redovisas i katalogform direkt efter referenslistan. Av kostnadsskäl, främst p.g.a. dyrbar konservering, blev det dock från mitten av 1980-talet praxis att kvarlämna järnföremål odokumenterade i marken. Detta har på ett naturligt om än olyckligt vis kommit att inskränka studien till det icke-järnbaserat hantverk då den för en bredare förståelse viktiga empirin i stort sett saknas för järnhantverket. Det bör dock poängteras att många metallhantverkare under tidigare perioder sannolikt arbetat både med järn och med andra metaller i samma verkstäder. Den mångfaldiga användningen och spridningen av järn och de mycket likartade restprodukter som uppstår vid järnsmide försvårar dock redan från början användandet av dessa i ett kronologiskt betingat sammanhang – i en omrörd kontext så går det inte att okulärt skilja smidesrester från t.ex. vikingatid från sådana som avsats under senare epoker. En annan viktig aspekt är frågan om professionalitet och hur denna avspeglas i fynden. I enlighet med det som redan sagts om järnsmide så är det i princip omöjligt att skilja spår av rent brukssmide från sådana som avsats vid mer högdrivet konstsmide. När rester av icke-järnbaserat hantverk återfinns kan det redan från början förutsättas att de speglar ett högre teknologiskt kunnande än vad som kan förutsättas för motsvarande fynd som renderats av järnsmide. Materialet är i sig självt en indikation för professionalitet.

Kapitel 3 omfattar en genomgång av detta icke-järnbaserade metallhantverk med speciellt fokus på de metoder och tekniker som kunnat identifieras via gotländska fynd och fyndplatser. Inledningsvis presenteras de olika metaller som använts, följt av en genomgång av hur dessa metallers kvalitet bedömts och reglerats. Därefter presenteras, i kronologisk arbetsordning, de tekniker som använts vid framställning av föremål i t.ex. silver och kopparlegeringar. Avslutningsvis diskuteras de mer praktiska förutsättningarna för utförandet av metallhantverk – hur verkstäder och hantverksplatser varit beskaffade och hur de tolkats av tidigare och nuvarande forskare.

I kapitel 4 behandlas de för avhandlingen helt centrala frågorna om var icke-järnbaserat metallhantverk förekommit, i vilken omfattning och på vilken kvalitativ nivå detta utförts. Detta sker med utgångspunkt i de fyndlokaler och fynd som redogörs för i katalogen och tabell 3. De totalt 89 fyndlokalerna indelas i fyra undergrupper – 1) gårdar med begränsade spår av icke-järnbaserat metallhantverk, 2) verkstadslokaler med rikliga spår av icke-järnbaserat metallhantverk, 3) potentiella verkstadslokaler med ett fåtal men kvalitativt signifikanta fynd med anknytning till icke-järnbaserat metallhantverk och 4) kustnära hamnboplatser. De senares representativitet ur ett gotländskt perspektiv kan till viss del diskuteras då de kännetecknas av en utåtriktad strävan som till största del verkar saknas hos andra gotländska boplatser. Vidare diskuteras metallhantverkarnas sociala situation, bl.a. om hantverket varit knutet till särskilda släkter vilket möjligen kan indikeras av att verkstäder med spår av mer omfattande produktion verkar ha varit knutna

till speciella gårdar. När gårdsläget flyttas – något som på Gotland varit vanligt och regelbundet förekommande långt upp i medeltid och som eventuellt delvis kan förklaras med juridiska teknikaliteter runt arv – går det, med utgångspunkt i fyndspridning, att se att verkstaden flyttar med. En annan viktig men till stora delar hypotetisk diskussion är huruvida gotländska metallhantverkare varit fria eller ofria – en frågeställning som dock till viss del avfärdas på grund av den latenta anakronism som ofta kännetecknar sådana resonemang. Istället påtalas den diskussion runt generell ofrihet som förts under senare år; denna har som grundtes att i princip ingen individ under järnålder var fri i modern mening – alla var knutna till andra genom implicita eller explicita avtal och grundläggande sociala konventioner. I detta sammanhang diskuteras även de hantverksanknutna depåer av verktyg som återfunnits på Gotland och det påpekas att de möjligen kan tyda på en lokal tradition att deponera verktyg i våtmarker snarare än i gravar.

I kapitel 5 diskuteras Gotland och omvärlden, bl.a. det faktum att det på Gotland verkar ha producerats föremålstyper (främst smycken) av fastlandsskandinavisk modell trots en tydligt observerbar norm beträffande den lokala materiella kulturen. I detta sammanhang återkommer även den fjärde undergruppen av fyndlokaler med spår av mer omfattande icke-järnbaserat metallhantverk, de kustnära hamnboplatserna. Dessa boplatsers roll i lokalsamhället ställs mot deras faktiska funktion som brohuvuden för icke-gotländska influenser. Det påtalas att det finns tendenser som tyder på att dessa boplatser över tid utvecklades i en delvis annorlunda riktning än ön i stort, något som slutligen ledde till den uppdelning mellan stad och land som kännetecknar Gotlands senare, historiskt dokumenterade utveckling.

I kappans sista avsnitt, kapitel 6, sammanfattas och utvecklas de resultat och resonemang som förts i tidigare kapitel till en diskussion runt lokal identitet och hur denna upprätthållits trots närheten till övriga Skandinavien. Att smycken och dekorerade metallföremål ingick som en viktig del i detta är ställt bortom allt tvivel, men den enskilde metallhantverkarens roll i identitetsskapandet har sällan diskuterats. Mot bakgrund av den samlade fyndbilden bör det dock gå att slå fast att öns metallhantverkare inte bara var passiva producenter. Istället måste de, eller i alla fall ett antal tongivande hantverkare bland dem, ses i ett interregionalt sammanhang; genom att inkorporera icke-gotländska strömningar i form av mönster och motiv på strikt gotländska föremålstyper upprätthölls och utvecklades en lokal identitet som rörde sig parallellt med Östersjöområdets övriga kulturella sammanhang – särskilt då de fastlandsskandinaviska. Denna parallellitet poängteras – det gotländska har inte utvecklats oberoende av andra regioner utan som ett resultat av upprepade och långvariga kontakter med dessa. Att detta skett på eget initiativ av enskilda hantverkare ses som mindre troligt, det får snarare anses som sannolikt att någon form av organisation har övervakat denna utveckling. En sådan organisation skulle i slutänden ha

kunnat utgöras av det gotländska samhällets högsta styrande enhet, Landstinget, en inrättning som sannolikt går att härleda tillbaka till yngre järnålder. Även smyckebärarna, den tilltänkta kretsen av mottagare av de identitetsbärande föremålen bör ha haft del i denna utveckling – kreationer som inte vann allmän acceptans bars helt enkelt inte i någon högre grad, de fasades ut och smältes om i likhet med äldre föremålsformer. Det föreslås vidare att metallhantverkarna även fyllt en viktig roll i hanteringen av det för det gotländska lokalsamhället så viktiga silvret – genom sin expertis kunde de stå som garanter för silvrets värde. Även denna funktion föreslås kunna ha kopplingar till en central organisation som Landstinget i och med att strikt gotländska, lokalt producerade föremålstyper av silver så ofta deponerats oskadda utan att ha huggits upp eller skadats genom hackprobering. Det förefaller som om gotlänningar hade en större tillit till sina egna föremålsformer vilka producerats i enlighet med rådande normer om stil och silverhalt, medan icke-gotländskt silver i hög grad deponerades i fragmenterat och hackproberat skick. Acceptansen av standardiserade värdeföremål liknas vid ett premonetärt förstadium till den gotländska myntningen som inleddes i mitten av 1100-talet. Att myntningen togs upp just på Gotland tolkas dels som ett led i denna utveckling – d.v.s. att steget mellan standardiserade värdeföremål och mynt följer en inre logik och dels som ett led i att från gotländsk sida upprätthålla sin särart. Denna hade gotlänningarna till stora delar blivit tvungen att lämna bakom sig i samband med att nya handelsnätverk etablerats och att en kristen enhetsidentitet etablerats över hela Nord- och Centraleuropa. Mynten agerar då som en markör av öns särställning sedan den centrala avskildheten blivit ohållbar som samhällsnorm.

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Dannemarck ofuervundet, deris friheter frataget, stappelen forstørret, med huis mere sig hafuer tildraget, vnder vis tid oc aartzall, saa meget som hafuer vaeri at sancke oc udsøge. Facsimile of the 1633 edition. Barry Press. Visby.

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List of Abbreviations

ATA: Antiquarian Topographical Archives, Stockholm

CAT: Catalogue

GM: Gotland County Museum, Visby

RAÄ:	Swedish National Heritage Board
SHM:	Swedish History Museum, Stockholm
t.p.q.:	*Terminus post quem* (the earliest time an event may have happened – normally used in connection with minting)
WKG:	Die Wikingerzeit Gotlands, cf. Chapter 1.4

Catalogue – Gotlandic sites with indications and direct traces of non-ferrous metalworking

This catalogue consists of three parts – first two maps, one (Fig. 12) shows the geographical distribution of the individual find sites mentioned in the catalogue while the other (Fig. 13) shows the distribution of the four sub-groups (c.f. Chapter 4.4). This is followed by a Table (Table 3) over key artefact types recovered at the 89 sites in the catalogue. The third and last part, the catalogue proper, is divided into two sections. Section A comprises 17 Gotlandic sites with traces of non-ferrous metalworking. These have either not been metal-detected at all or only as a supplement to other fieldwork. Section B comprises 72 sites that have primarily been metal-detected. The references given under the single entries are normally connected to reports, etc. in the ATA. The finds themselves are mainly held by the Swedish History Museum, Stockholm – especially those recovered in the 1970's, 80's and 90's. Some of the finds are also held by Gotland County Museum, Visby – but a large portion of finds from recent years have not been added to any collection at the time of writing and is temporarily held by the County Administrative Board in Visby.

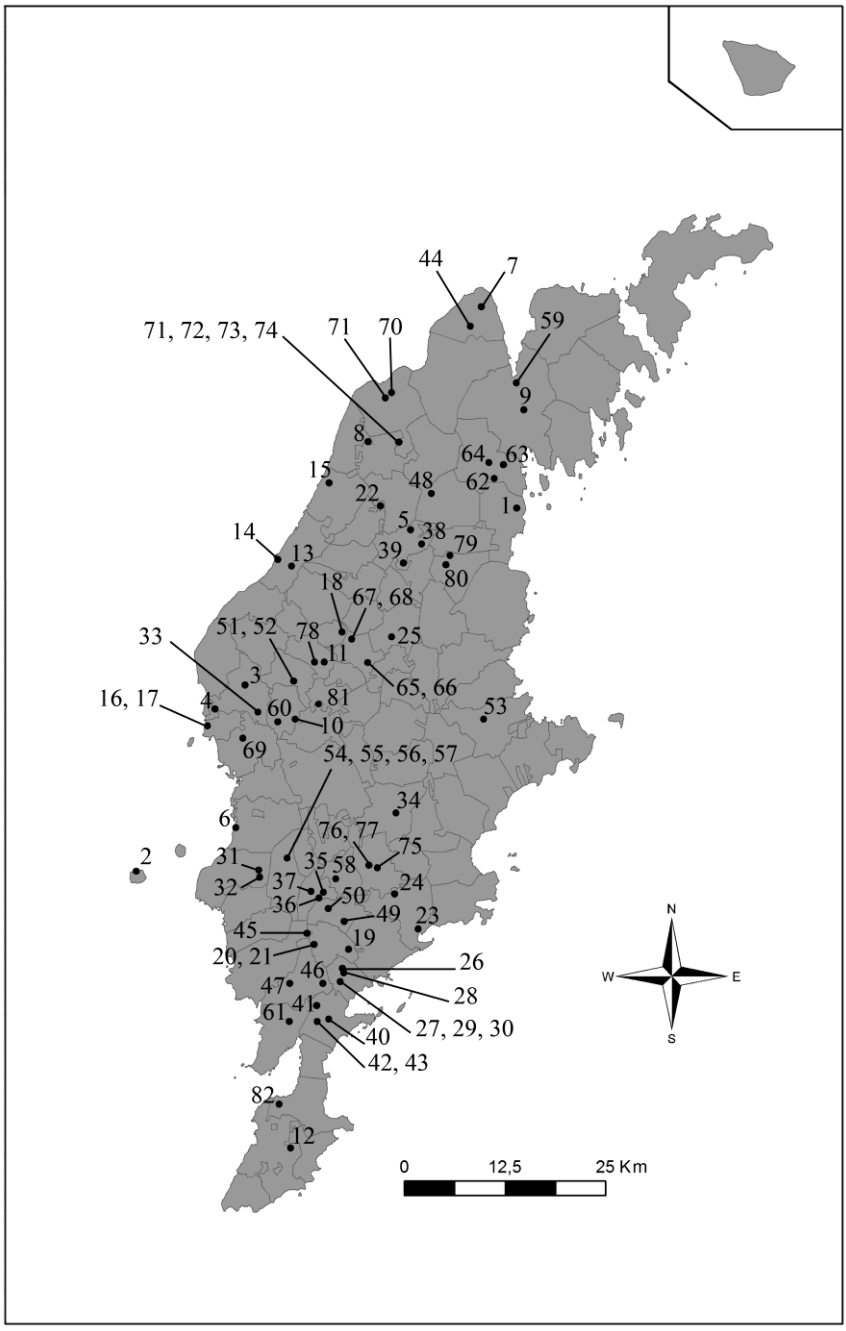

Figure 12. Find sites treated in the Catalogue

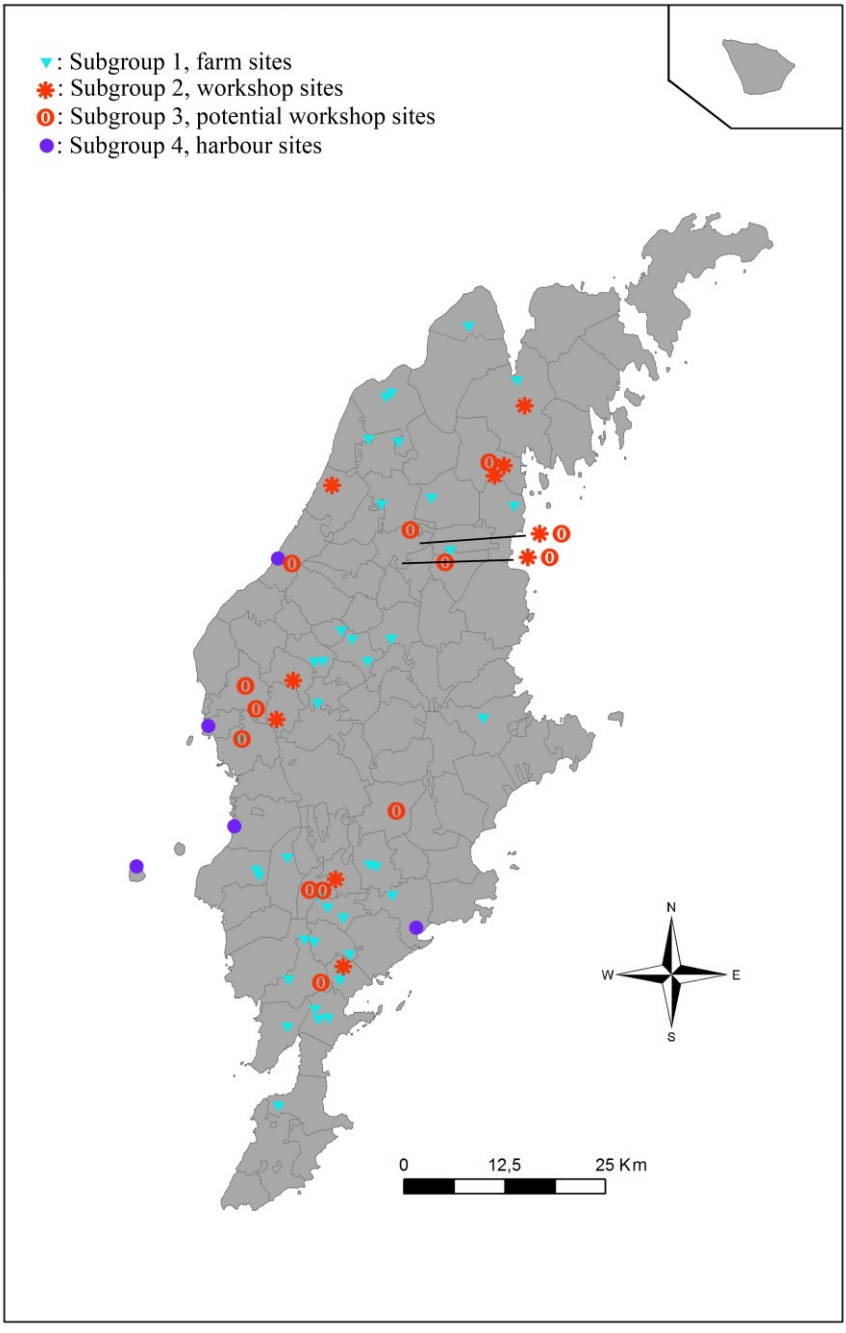

Figure 13. Workshops and sites utilized in non-ferrous metalworking according to four sub-groups (cf. Chapter 4.4)

Table 3. The occurence of key artefact types at the sites included in the thesis. (F) = Fragment, X = finds present but numbers uncertain – cf. respective CAT no.

CAT no.	Sub-group	Spillages	Casting jets & sprues	Weights	Metal impr. Hearth lining	Ingots	Crucibles	Moulds	Dies	Matrices	Master models
1	1	2	1				1 (F)	2			1 (?)
2	4	1					1 (F)	1 + 248 (F)			
3	-				2	1					
4	-							1			
5	-										1 (?)
6A	4		8		4	18 (F)	169 (F)	5 + 58 (F)		1	
6B	4				x		2 + 3 (F)	x			
7	-						15 (F)				
8	1	2	1	2	1		2 (F)	2			
9	2	5			3		19 (F)				
10	-										
11	1	4		1				1			
12	-						1 (F)				
13	3				8		2 + 1 (F)				
14	4								1		
15	2	12			>400	1 (F)					
16	4	8	2	36		9 (F)	15 (F)	5 (f)			1 (?)
17	4				2						

Table 3 continued

CAT no.	Sub-group	Spillages	Casting jets & sprues	Weights	Metal impr. Hearth lining	Ingots	Crucibles	Moulds	Dies	Matrices	Master models
18	1	9	1	2							
19	2	34		2	23						
20	1	4			1	1 (F)					
21	1	10	1	1	3						
22	1	1	1		1	1 (F)					
23	4	34	3	180	1	5 (F)					
24	1	8	1		x						
25	1	16	2		2						
26	2	450			50					1	
27	1	91	7	12	3	1 (F)					
28	1	3	1	4	1	2 (F)					
29	1	4		1	2	1 (F)					
30	1		1								
31	1	1	1	1							
32	1	9			2	1 (F)					
33	3	59			4						
34	3	22	1	1	1			1		1	1
35	3	14		2	1	1 (F)					1

Table 3 continued

CAT no.	Sub-group	Spillages	Casting jets & sprues	Weights	Metal impr. Hearth lining	Ingots	Crucibles	Moulds	Dies	Matrices	Master models
36	1	1	2		1						
37	3	8	4	4							
38A	2	71	3	3	1	2 (F)					2
38B	3	7	1								1 (?)
39A	2	27	2	4		2 (F)					
39B	3	5	2	1	1						
40	1	6			1						
41	1		1	1							
42	1	17	1	3							
43A	1	7	4	2		2 (F)					
43B	1	5	1								
43C	1	16	1								
44	1	5						2 (F)			
45	1	11		2	4	1 (F)					
46	3	23		1		2 (F)					1
47	1	24	1	4	9	2 (F)					
48	1	5	1	1							
49	1	5			2						

Table 3 continued

CAT no.	Sub-group	Spillages	Casting jets & sprues	Weights	Metal impr. Hearth lining	Ingots	Crucibles	Moulds	Dies	Matrices	Master models
50	1	2	1	3							
51A	2	34	1		8						
51B	2	20	1		1						
52A	2	59	3	6	3	2 (F)					
52B	2	47	2		1	23					
53	1	2	1		1						
54	1		1	5							
55	1	9		4							
56	1	10	4	4		2 (F)					
57	1	2	1								
58	2	108	3	2	4						
59	1		2	1							
60A	2	26	1	3		1 (F)					1 (?)
60B	2	9			3						
61	1				5						
62	2	31	7	8		4 (F)			2		1
63	2	152	6	8	136						
64	3	37	1	1	2						

Table 3 continued

CAT no.	Sub-group	Spillages	Casting jets & sprues	Weights	Metal impr. Hearth lining	Ingots	Crucibles	Moulds	Dies	Matrices	Master models
65	1	11	1			3 (F)					
66	-	33		136		5 (F)					
67	1	15		1	1			1 (F)			
68	1	10	1	7	5	1 (F)		2 (F)			
69	3	57		2	20						
70	1	6					2 (F)				
71	1	2	1	1		1 (F)					
72	1	4	2								
73	1	1	3								
74	1	1	1								
75	1				1						
76	1	31	1		2	1 (F)					
77	1	8	1					1 (F)			
78	1	3		1	1	1					
79	1	38		1	1	1					
80	3	5		18							
81	1	9	1								
82	1	2			2						

A. Sites with traces of non-ferrous metalworking – mainly identified without metal detection

1. **Boge, Pilgårds 1:10 & Mojner 1:67, Raä 96**
   Farm site or possible harbour site. Viking Period and Medieval settlement area by the Gulf of Boge close to Boge church. Partly excavated in 1942 (SHM 22938) & 1991 (SHM 35108)

   - 1 copper-alloy spillage
   - 1 spillage of undefined alloy
   - 1 copper-alloy casting jet

   Additional finds: 1 fragmentary crucible with remains of copper-alloy, 2 sandstone ingot moulds, 1 copper-alloy brooch of presumed Russian origin with unpierced pin lugs – possible master model.

   Ref: Stenberger 1942; Wennersten 2000

2. **Eksta, Stora Karlsö, by the mouth of the cave**
   Stora Förvar, Raä 138
   Cultural deposit, possibly from coastal harbour site. Stray finds found before 1908 (SHM 13418) and small excavation 1973 (GM 0176-2006)

   - 1 tin spillage
   - 2 fragments of clay casting moulds, of which 1 is the lower part of a mould for casting the crown of a button-on-bow brooch (SHM 13418:3)
   - 246 fragments (450 g) of clay casting moulds (GM 0176-2006), among them 2 for a mould intended for at least 1 oval brooch (type P 25) and 1 fragment from a mould for a box brooch (type 2a)
   - 1 possible sandstone mould
   - 1 crucible fragment

   Ref: ATA; Örjestad 2008

3. **Eskelhem, c. 400 m NE of Simonarve (sometimes Sinnare) farm, unregistered**
   Possible but indefinable workshop site. Inspected by John Nihlén in 1932, samples of ferrous slag, "bronze spillages" and "copper slag" were collected on that several other occasions

   - At least 2 fragments of metal impregnated hearth lining in a box of mixed slag at Gotland County Museum. Collected in 1930 from a patch of "copper slag"
   - 1 hammered-out copper-alloy ingot (SHM 20246)

   Additional find: 1 worn and/or intentionally scrapped box brooch (SHM 20246)

   Ref: Nihlén 1932; Gustafsson 2013

4. **Eskelhem, Valve, Unregistered**
   Finds from inhumation graves uncovered in 1885 during the clearing of a stone wall

   - 1 small sandstone whetstone and ingot mould (L: 9.7 mm) with matrix for pressblech bosses on one side (SHM 8415)

   Possibly part of the grave inventory of a metalworker's burial

   Ref: SHM, WKG

5. **Fole, Ryftes, Unregistered site**
   Stray find. Recovered in or before 1899, from a possible but indefinable workshop site.

   - 1 large oval brooch (type P 37) with unpierced pin lugs and very clear ornamentation. Possibly used as a master model (GM GF Dep. C 469)

   Ref: WKG IV:190

6. **Fröjel, Bottarve 1:17 & 1:19, Raä 188**
   Costal harbour sites. Excavated repeatedly between 1987-1990 and 1997-2005. Metal detected occasionally.

A. Bottarve 1:17
Settlement deposits in ploughed field, overlayering burials

- 1 gold spillage
- 3 silver spillages
- 106 copper-alloy spillages
- 1 lead/-alloy spillage
- 3 spillages of unknown alloy
- 8 copper-alloy casting jets
- 4 fragments of metal impregnated hearth lining
- 18 ingots/parts of -

Additional finds: 2 halves of stone moulds – 1 for dress pin heads, 5 stone ingot moulds/fragments of -, 169 fragments of crucibles, 47 (77 g) fragments of clay moulds, 2 fragments of scorifiers, 1 bone drawplate (broken)

B. Bottarve 1:19
Same settlement as 1:17 but in an adjacent unploughed meadow; workshop building with clear evidence of extensive silver working by way of two pit hearths – one for casting and one evidently used for cupellation (as indicated by litharge soaked bone ash hearth lining). 2 intact and 3 fragments of crucibles, a large number (960 g) of clay casting moulds fragments.

Ref: D. Carlsson 1999a; Dahlström & Eriksson 1999, 2000, 2001, 2002, 2003a & b & 2004; Gustafsson & Söderberg 2005 & 2007

7. **Hall, in a field belonging to Norrbys farm, unregistered**
Unknown context. Stray find recovered during ploughing in 1917

- 15 fragments of a crucible and/or red slag (SHM16000)

Connected with glass working by Nerman (1951)

Ref: ATA; Nerman 1951

8. **Lummelunda, Burge 1:69, Raä 93:2, find area I**
Late Viking Period – Medieval farm site. Partly excavated in 1966 (SHM 29559), 1969 (SHM 29560), 1970 (SHM 29561), 1971 (SHM 29562) 1972 (SHM 29842), 1973-175 & 1977-1979 (SHM 32823). Metal detected 1972 & 1984 (SHM 31661)

- 2 copper-alloy spillages
- 1 copper-alloy casting jet
- 2 weights
- 1 fragment of metal impregnated hearth lining

Additional finds: 1 miscast (disc-on-bow brooch), 1 lump of lead, 2 crucible fragments, 2 stone ingot moulds, 1 hammerhead

Ref: SHM; WKG IV:523 pp; Östergren 1985l

9. **Lärbro, Lilla Källstäde 1:4, Raä 122**
   Workshop site. Large area with settlements and clear traces of metalworking during a very long time span, probably from 900-1500 A.D. Excavated in 1968, 1969,1970, 1971 & 1972 (all SHM 34995)

   - 5 copper-alloy spillages
   - 3 fragments of metal impregnated hearth lining

   Additional finds: 19 crucible fragments

   Ref: ATA 8959/92

10. **Mästerby, Myre 1:11 (?), Unregistered**
    Reported occurrence of charcoal, slag and "copper slag", i.e. metal impregnated hearth lining, in a field. Samples were collected and sent to the Technical Museum in Stockholm in 1932 (TM 11232).

    Ref: ATA

11. **Vall, Levide 1:46, Raä 21**
    Farm site. Excavated in 1905 (SHM 12592 & 32281), 1906 (SHM 13329 & 32282) & 1913 (SHM 15616). Destroyed through land development in 1966

    - 4 copper-alloy spillages
    - 1 weight

    Additional find: 1 sandstone ingot mould, 1 hammered out fragment of an oval brooch

    Ref: ATA; WKG IV:762

12. **Vamlingbo, Fridarve, unregistered**
Context unknown. Stray find brought to Gotland County Museum, precise find spot uncertain

- 1 fragment of a crucible (GM C 11159:4)

Ref: GM

13. **Visby, Artilleriet 1:33, Raä 164**
Potential workshop site with remains of several pit hearths and possible furnaces. Excavated in 2004 & 2010.

The finds have not yet been compiled and reported but several of the 7 hearth/furnace bottoms displayed patches of verdigris, i.e. signs of metal inclusion caused by casting spillages. At least 8 stray fragments of metal impregnated hearth lining were found.

Additional finds: 2 crucibles as stray finds in the settlement deposits – 1 with remaining metal – and fragments of a third crucible in a posthole.

Ref: Wickman-Nydolf 2011

14. **Visby, Visby town, Kv. Apoteket 4-5, Raä 107**
Coastal harbour site. Settlement deposit excavated in 1975. Small building (3.4 by 3.4 m) roughly dated to the late 10th/early 11th Century. Debris from antler working found in the same deposit

- 1 copper-alloy die for round pressblech-brooches

Ref: Andersson 1976:17

15. **Väskinde, Stora Klintegårde 4:1, Raä 178**
Late Viking Period or Early Medieval workshop site. Excavated in 1961 (GM GF C 18178- 90)

- c. 10 copper-alloy spillages (exact number not specified in the finds list)
- 1 ingot/fragment of -
- c. 60 copper-alloy cuts and shavings
- c. “4 dl” of metal impregnated hearth lining fragments

Additional finds: the bottom of a stave vessel was recovered during the excavation. It was plastered and kept at Gotland County Museum until

2001 when it was excavated and identified as a cooling barrel which later had been used as a waste bin. The following finds were recovered from it:

- 2 copper-alloy spillages
- 297 small fragments (100 g) of metal impregnated hearth lining

Ref: ATA; Wernborg & Hellquist 2001

16. **Västergarn, Ammor 5:12, Raä 4 & 65**
Coastal harbour site – the Paviken harbour-complex. Partly excavated in 1967-1973

- 5 copper-alloy spillages
- 3 lead/ -alloy spillages
- 2 copper-alloy casting jets
- 36 weights
- 3 fragments of balance scales
- 8 fragments of copper-alloy ingots
- 1 fragment of a lead/ -alloy ingot

Additional finds: 15 secure and 4 uncertain fragments of crucibles, 5 fragments of clay casting moulds, 5 fragments of oval brooches, 1 small Thor's hammer pendant of lead without suspension hole

Ref: Lundström 1981; Lundström et al. 2004

17. **Västergarn, Stelor 1:28, Raä 50:3**
Coastal harbour site, part of the Västergarn complex. Early Medieval settlement deposit. Excavated in 2000

- 2 fragments of metal impregnated hearth lining

Ref: Wickman-Nydolf 2001

B. Sites with traces of non-ferrous metalworking identified via metal detection

18. **Akebäck, Glammunds 1:2, RAÄ 40**
Farm site. Metal detected in 1986, 1987 (SHM 31964), 1989, 1991 (SHM 34704), 1997 (SHM 34161), 1998, 1999, 2000, 2005, 2007, partly excavated in 1986.

- 7 copper-alloy spillages
- 2 lead spillages
- 1 copper-alloy casting jet
- 2 weights

Ref: Pettersson 1986; Östergren 1989; Kilger 1998; Ström & Landgren 2000; D. Carlsson 2005, 2007a;

19. **Alva, Binge 1:6, RAÄ 148**
Workshop site. Metal detected in 1984 (SHM 31674), 1985 (SHM 31738), 1986 (SHM 31894), 1990 (SHM 34075), 2010

- 27 copper-alloy spillages – 1 with adhering mould fragments (possible miscast, SHM 34075:25)
- 7 lead spillages
- 23 fragments of metal impregnated hearth lining
- 2 weights

Additional find: 1 possible fragment of litharge soaked cupellation hearth lining

Ref: Östergren 1984a, 1985a, 1986b; Almqvist & Engström 1993a

20. **Alva, Rangsarve 1:16, Raä 54 & 160, Find area I**
Farm site. Metal detected in 1980 (GM GF C 11931), 1983 (GM GF C 13183), 1984 (GM GF C 13183), 1990 & 2009

- 1 copper-alloy spillage
- 3 lead spillages
- 1 fragment of metal impregnated hearth lining
- 1 ingot/ fragment of -

Ref: Östergren 1980

21. **Alva, Rangsarve 1:16, Raä 54 & 160, Find area II**
Farm site. Metal detected in 1980 (GM GF C 11931), 1983 (GM GF C 13183), 1984 (GM GF C 13183), 1990 & 2009

- 4 copper-alloy spillages
- 5 lead spillages
- 1 spillage of unknown metal
- 1 copper-alloy casting jet
- 3 fragments of metal impregnated hearth lining
- 1 weight

Additional find: 1 rectangular lead plate

Ref: Östergren 1983a, 1985b; D. Carlsson 2010c:9pp

22. **Bro, Truer, Raä 126**
Farm site. Metal detected in 1990 (GM GF C 17481)

- 1 copper-alloy spillage
- 1 copper-alloy casting jet
- 2 fragments of metal impregnated hearth lining
- 1 ingot/fragment of –

Additional finds: central knob of an equal-armed brooch

Ref: Engström & Ström 1990

23. **Burs, Häffinds, Raä 229 (partly registered)**
Coastal harbour- and trading settlement. Metal detected in 1980, 1982 (SHM 31409), 1983, 1984, 1985. Partly excavated in 1956, 1975 (SHM 30945), 1982, 1983, 1984, 1985

- 1 silver spillage
- 38 copper-alloy spillages
- 5 spillages of undefined alloy
- 3 casting jets
- 1 fragment of metal impregnated hearth lining
- 180 weights
- 1 complete and 2 fragmentary balance scales
- 5 ingots/fragments of -

Additional finds: 2 fragments of tongs, 2 miscasts (silver arm ring, copper-alloy sword shape)
Ref: Nylén 1956 & 1972:54; Östergren 1982b; Varenius 1982; Brandt 1986, 2002; Gustafsson 2010

24. **Burs, Änges 1:27, Raä 205**
Farm site. Metal detected in 1990

- 8 copper-alloy spillages
- 1 casting jet
- Fragments metal impregnated hearth lining mentioned in the report

Additional finds: 1 severed polyhedral knob from penannular brooch, possible pseudo-weight

Ref: Andersson 1990

25. **Dalhem, Hallfose, RAÄ 47, Find area I**
Farm site. Metal detected in 1977, 1990 (SHM 34080), 1998 (SHM 34073). Partly excavated in 1999 (SHM 34074)

- 15 copper-alloy spillages
- 1 lead spillage
- 2 copper-alloy casting jets
- 2 fragments of metal impregnated hearth lining

Additional find: 1 large cuboid piece of copper alloy

Ref: Östergren 1989; Almqvist et al. 1990a; Rydén 1999

26. **Eke, Nygårds 2:1, Raä 162**
Workshop site. Metal detected in 1993, 1994 & 2001. Surveyed by means of gradiometer in 2010

- c. 450 copper-alloy spillages
- c. 50 fragments of metal impregnated hearth lining

Additional finds: 1 copper-alloy matrix for pressblech bosses

Large amounts of metal impregnated hearth lining observed in the field, most still remain on site

Ref: Andersson 1993, 1994, 1995; Ström 2001a

27. **Eke, Petsarve, RAÄ 152, Field 64**
An uncertain number of farm sites. Metal detected in 1982, 1983, 1986, 1994, 1997 & 1998. Partly excavated in 1984

- 91 copper-alloy spillages
- 2 copper-alloy casting jets
- 5 casting jets of unknown alloy
- 3 fragments of metal impregnated hearth lining
- 12 weights
- 1 ingot/fragment of -

Ref: Andersson 1997, 1998, 2000

28. **Eke, Bölske, Field 40A, Unregistered**
Farm site. Metal detected in 1994,1995, 1996

- 3 copper-alloy spillages
- 1 copper-alloy casting jet
- 1 fragment of metal impregnated hearth lining
- 4 weights
- 2 ingots/fragments of -

Additional finds: 1 hammerhead

Ref: Andersson 1994, 1995, 1996

29. **Eke, Petsarve 1:2, Field 71, Unregistered**
Farm site. Metal detected 1986-90, 1993, 1995, 1997

- 4 copper-alloy spillages
- 2 fragments of metal impregnated hearth lining
- 1 weights
- 1 ingot/fragment of -

Ref: Östergren 1989; Andersson 1994, 1995, 1996

30. **Eke, Petsarve 1:38, Field 72B, Unregistered**
Farm site. Metal detected in 1996

- 1 copper-alloy casting jet

Additional find: 1 possible iron hammerhead

Ref: Andersson 1996

31. **Eksta, Rondarve 1:12, Raä 239, 544 & 545**
Farm site. Metal detected in 1990 & 2010

- 1 copper-alloy spillage

- 1 copper-alloy casting jet
- 1 weight

Ref: Almqvist & Engström 1993e; D. Carlsson 2010b

32. **Eksta, Stora Mellings 1:11, Raä 169**
Farm site. Metal detected in 1978, 1983 (SHM 31608) & 1990 (SHM 34117)

- 9 copper-alloy spillages
- 2 fragments of metal impregnated hearth lining
- 1 ingot/fragment of -

Additional find: 1 fragment of an oval brooch

Ref: Östergren 1979b; 1983c ; Almqvist & Engström 1993d

33. **Eskelhem, Tjuls 1:53, Raä 130**
Potential workshop site. Metal detected in 1987 & 2010. Surveyed by means of gradiometer in 2010.

- 59 copper-alloy spillages
- 4 fragments of metal impregnated hearth lining

Ref: Östergren 2008b

34. **Etelhem, Nygårds 1:9, Raä 150**
Potential workshop site. Metal detected in 1980 & 1990 (SHM, inv no. Pending)

- 22 copper-alloy spillages
- 1 copper-alloy casting jet
- 1 fragment of metal impregnated hearth lining
- 1 weights

Additional finds: 1 copper-alloy matrix for 2 bird-shaped filigree pendants, 1 mould of lead (possibly for casting beeswax bracelet-ends), 1 copper-alloy master model for polyhedral ornament (?)

Ref: Almqvist et al. 1990d

35. **Fardhem, Gerete 1:7, Raä 62 & 89**
Potential workshop site. Metal detected in 1990 (SHM 34689) & 2000 (SHM 34690)

- 13 copper-alloy spillages
- 1 lead/ -alloy spillage
- 1 fragment of metal impregnated hearth lining
- 2 weights
- 1 ingot/ fragment of -

Additional find: 1 lead master model for tounge-shaped pendant

Ref: Almqvist et al. 1990e; Ström 2000d

36. **Fardhem, Gerete 1:29, Raä 29**
Farm site. Metal detected in 1990 (SHM 34068)

- 1 copper-alloy spillage
- 1 copper-alloy casting jet
- 1 lead/-alloy casting jet
- 1 fragment of metal impregnated hearth lining

Additional find: 1 lump of lead

Ref: Almqvist et al. 1990f

37. **Fardhem, Överburge 1:20, Raä 86**
Potential workshop site. Metal detected in 1985 (SHM 31741), 1986 (SHM 31893) & 1992

- 5 copper-alloy spillages
- 3 lead spillage
- 4 copper-alloy casting jets
- 4 weights

Additional find: Row of 4 polyhedral copper-alloy weights joined by sprues – work piece or possible master model

Ref: Östergren 1986c

38. **Fole, Stora Sojdeby 2:7, Raä 170**
1 workshop and 1 potential workshop site.

A. Find area I
Workshop site. Metal detected in 1990, 1992, 1993 (SHM 34300:a, b/1, -:c), 1999 (SHM 34303), 2009

- 68 copper-alloy spillages
- 3 lead spillages
- 2 copper-alloy casting jets
- 1 lead/ - alloy casting jet
- 1 fragments of metal impregnated hearth lining
- 3 weights
- 2 ingots/fragments of -

Additional finds: 1 large lump of lead, 1 fragments of an oval brooch, 5 fragments of equal-armed brooches, 1 master model of zoomorphic sword pommel, 1 fragment of lead master model for key.

B. Find area II (250 m N of area I)
Potential workshop site. Metal detected in 1992 (SHM 34300:b/2)

- 6 copper-alloy spillages
- 1 lead spillage
- 1 copper-alloy casting jet

Additional finds: 1 fragment of a lead brooch, 1 imprinted lead plate

Ref: Almqvist et al. 1990b; Almqvist & Engström 1992 & 1993c; Ström 1999; D. Carlsson 2011c

39. **Fole, Stora Tollby 2:1, Raä 184, Find area II A & B**
One workshop site (II B) and one potential workshop site (II A). Metal detected in 1990, 1991 (SHM 32569), 1998 (SHM 34074), 1999 (SHM 34262) & 2001

A. Find area II B
- 27 copper-alloy spillages
- 2 copper-alloy casting jets
- 4 weights
- 2 ingots/ fragments of -

Additional finds: 2 lumps of lead, 1 fragment of an oval brooch, 1 crown for an oval brooch (type P 52) with remaining casting sprue and mould core, 1 copper-alloy miscast

B. Find area II A (c. 50 m N of II B)

- 5 copper-alloy spillages
- 2 copper-alloy casting jets
- 1 weight
- 1 fragment of metal impregnated hearth lining

Additional finds: 1 fragment of an oval brooch

Unspecified within Raä 184

- 6 copper-alloy spillages

Additional finds: 1 unfinished copper-alloy work piece, 1 lump of lead

Ref: Almqvist et al. 1990g, 1991; Elfver 1999; Kilger 2000; Ström 2001b

40. **Grötlingbo, Domerarve 1:38, Raä 175, 264 & 265**
Farm site. Metal detected in 2009

- 5 copper-alloy spillages
- 1 lead spillage
- 1 fragment of metal impregnated hearth lining

Additional find: 1 unfinished pin for penannular brooch(?)

Ref: D. Carlsson 2010c:73pp

41. **Grötlingbo, Norrkvie 1:16 & 1:24, Raä 121, Find area IV**
Farm site. Metal detected in 1983 (SHM 31605), 1984 (SHM 31618), 1989 (SHM), 1990 & 1998 (SHM 34343)

- 1 copper-alloy casting jet
- 1 weight

Ref: Östergren 1984c; Ström 1998e

42. **Grötlingbo, Roes 1:47, Raä 164 & 165**
Farm site. Metal detected in 1999 (SHM 35138 & 39), 2001 (SHM 35138 & 39) & 2009. Partly excavated in 1999

- 8 copper-alloy spillages
- 9 lead spillages
- 1 copper-alloy casting jet
- 3 weights

Additional find: 1 silver ingot

Ref: Ström 2004; D. Carlsson 2010c:33pp

43. **Grötlingbo, Uddvide 1:20, Raä 283, 287 & 291**
3 farm sites in the field east of CAT no. 42. Metal detected in 2009. Find area C was partly excavated in 1989. The sites were plundered in 1989 and find area C (Raä 291) might be the original find site of the two imprinted pieces of lead included in KMK 102031 (*paper II*)

A (Raä 283) North-eastern part of the property, c. 350 m northeast of find area C
- 3 copper-alloy spillages
- 4 lead spillages
- 3 copper-alloy casting jets
- 1 copper-alloy casting sprue
- 2 weights
- 2 ingots/fragments of -

Additional finds: 1 part of a foldable balance. 1 unfinished needle

B (Raä 287, 292 & 293) Southeast part of the property, c. 80 m north of find area C
- 2 copper-alloy spillages
- 3 lead spillages
- 1 copper-alloy casting jet

C (Raä 291) South-eastern corner of the property
- 3 copper-alloy spillages
- 13 lead spillages
- 1 copper-alloy casting jet

Additional find: 1 part of a foldable balance

Ref: Jonsson & Östergren 1989; D. Carlsson 2010c:45pp

44. **Hall, Hall 1:48, Raä 147**
Farm site. Metal detected in 1977 (SHM 31199), 1982 (SHM 31415), 1983 (SHM 31622) & 1998, partly excavated 1983.

- 5 copper-alloy spillages

Addtional finds: 2 fragments of clay casting moulds

Ref: Östergren 1986b; Ström 1998d

45. **Havdhem, Havor 1:13, Raä 187, SE find area**
Farm site. Metal detected in 2009

- 9 copper-alloy spillages
- 2 lead-alloy spillages
- 2 weights
- 4 fragments of metal impregnated hearth lining
- 1 ingot/fragment of -

Ref: D. Carlsson 2010c:81pp

46. **Havdhem, Lingvide 2:1, Raä 53, Find area II**
Potential workshop site. Metal detected in 1981 (SHM 31320), 1982 (SHM 31405), 1983 (SHM 31611), 1990 & 1998

- 13 copper-alloy spillages
- 10 lead-alloy spillages
- 1 weight
- 2 fragments of balance scales
- 2 ingots/fragments of -

Additional find: 1 copper-alloy die

Ref: Östergren 1981; 1982a; 1983b; Almqvist & Engström 1993b, Ström 1998b

47. **Havdhem, Ragnvalds 1:10, Raä 153**
Farm site. Metal detected in 1984 (SHM 31668), 1985 (SHM 31743), 1987, 1998 & 2009

- 13 copper-alloy spillages
- 10 lead-alloy spillages
- 1 spillage of undefined alloy

- 1 copper-alloy casting jet
- 9 fragment of metal impregnated hearth lining
- 4 weights
- 2 ingots/fragments of -

Additional find: 1 fragmentary equal-armed brooch

Ref: Östergren 1985f, 1985g, 1987; Ström 1998a, D. Carlsson 2010:85pp

48. **Hejnum, Riddare 1:17, Raä 43, Find area II**
Farm site. Metal detected in 1983 (SHM 31643), 1985 (SHM 31745) & 1998

- 5 copper-alloy spillages
- 1 copper-alloy casting jet
- 1 weight

Ref: Östergren 1985j; Ström 2003

49. **Hemse, Kodings 2:1, Raä 115, Find area I**
Farm site. Metal detected in 1990

- 5 copper-alloy spillages
- 2 fragments of metal impregnated hearth lining

Ref: Engström 1990

50. **Hemse, Ocksarve 2:1, Raä 64**
Farm site. Metal detected in 1984 (SHM 31662) & 1985 (SHM 31747)

- 2 lead-alloy spillages
- 1 copper-alloy casting jet
- 3 weights

Ref: Östergren 1985c, 1985d

51. **Hogrän, Allvide 1:23. Raä 62**
2 workshop sites. Metal detected in 2011

A. Find area I (SE part of the field c. 50 m SE of Find area II)

- 33 copper-alloy spillages
- 1 lead-alloy spillage

- 1 copper-alloy casting jet
- 8 fragments of metal impregnated hearth lining

B. Find area II (NV part of the field, extension of CAT no. 52, Find area I)

- 18 copper-alloy spillages
- 2 lead-alloy spillages
- 1 copper-alloy casting jet
- 1 fragment of metal impregnated hearth lining

Ref: Paulsson 2011b

52. **Hogrän, Stora Enbjänne 1:25, Raä 62**
2 workshop sites. Metal detected in 2010

A. Find area I (SE part of the field c. 50 m SE of Find area II)
- 48 copper-alloy spillages
- 7 lead-alloy spillages
- 4 spillages of undefined alloy
- 3 copper-alloy casting jets
- 3 fragments of metal impregnated hearth lining
- 6 weights
- 2 ingots/ fragments of -

Additional finds: 1 fragment of a balance scale

B. Find area II (NW part of the field)

- 43 copper-alloy spillages
- 3 lead-alloy spillages
- 1 spillages of undefined alloy
- 1 copper-alloy casting jet
- 1 copper-alloy casting sprue
- 1 fragment of metal impregnated hearth lining

Additional finds: 23 copper-alloy ingots recovered in the same field during ploughing (SHM inv no. 17612 & 24301).

Ref: Paulsson 2011a; SHM

53. **Kräklingbo, Kärrmans 1:1, Raä 280**
Farm site disturbed by fire line construction. Metal detected and partly excavated in 1992.

- 2 copper-alloy spillages
- 1 copper-alloy casting jet
- 1 fragment of metal impregnated hearth lining

Additional finds: 1 pit hearth with abundant traces of iron smithing, 1 fragment of a copper-alloy ingot found c. 50 m NNE of the settlement in an area with finds from the early/mid Iron Age.

Ref: D. Carlsson 1993

54. **Levide, Bondarve 1:22, Raä 121, find area D**
Farm site. Metal detected repeatedly between 1977 and 2000

- 1 copper-alloy casting jet
- 5 weights

Additional find: 1 fragment of an equal-armed brooch

Ref: Östergren 2004a

55. **Levide, Bondarve 1:22, Raä 125, find area G**
Farm site. Metal detected in 1977, 1980, 1989 & 2002

- 6 copper-alloy spillages
- 3 spillages of undefined alloy
- 4 weights
- 3 fragments of balance scales

Additional finds: 1 silver miscast, 1 piece of lead used for production of pressblech foils.

Ref: Östergren 2004a

56. **Levide, Bondarve 1:22, Raä 128, find area O**
Farm site. Metal detected repeatedly between 1977 and 2000

- 6 copper-alloy spillages
- 4 spillages of undefined alloy
- 2 copper-alloy casting jets

- 2 copper-alloy casting sprues
- 4 weights
- 2 ingots/fragments of -

Ref: Östergren 2004a

57. **Levide, Bondarve 1:22, Raä 122, find area S**
Farm site. Metal detected repeatedly between 1977 and 2000

- 2 copper-alloy spillages
- 1 copper-alloy casting jet

Ref: Östergren 2004a

58. **Linde, Odvalds 1:13, Raä 109:1**
Workshop site. Metal detected in 1985 (SHM 31737), 1990 (SHM 34064), 1992 (SHM 34077), 1993 (SHM 34067), 1999, 2009 & 2010. Partly excavated in 2009 & 2010.

- 106 copper-alloy spillages
- 2 lead-alloy spillages
- 3 copper-alloy casting jets
- 4 fragments of metal impregnated hearth lining
- 1 weight

Additional find: 1 large lump of lead, 1 fragment of an oval brooch (type P 52). 1 possible fragment of litharge soaked cupellation hearth lining

Ref: Gustafsson & Viberg 2011

59. **Lärbro, Stora Vikers 1:34, Raä 627**
Farm site. Metal detected in 1998, 1999, 2000, 2005 & 2007

- 2 copper-alloy casting jets
- 1 weight

Ref: Ström 2002; D. Carlsson 2007c

60. **Mästerby, Eskelhem Alvena 1:21, Raä 64 & 88**
2 workshop sites and a wetland deposition. Metal detected in 1984 (GF C 13184), 2000, 2006, 2010 & 2011

A. Find area II:

- 25 copper-alloy spillages
- 1 lead/ -alloy spillage
- 1 copper-alloy casting jet
- 3 weights
- 1 ingot/ fragment of -

Additional finds: 1 miscast, 1 master model(?) for pendants

B. Find area III:

- 8 copper-alloy spillages
- 1 lead/ -alloy spillage
- 3 fragments of metal impregnated hearth lining

C. Raä 88 – ploughed-out depot recovered in 2006, 2010 & 2011

- 5 unfinished copper-alloy sword pommels (zoomorphic)
- 17 unfinished copper-alloy pendants (fish-head -)

Ref: Östergren 1985k; Ström 2000a; Landgren et al. 2006; Gustafsson 2011; Paulsson 2011

61. **Näs, Lingsarve 1:4, Raä 65**
Farm site. Metal detected in 1984

- 5fragments of metal impregnated hearth lining

Ref: Östergren 1985e

62. **Othem, Klints 1:16, Raä 233**
Workshop site. Metal detected in 2000 & 2002. Largely destroyed by land development in 2002. Partly excavated in 2007

- 29 copper-alloy spillages
- 2 lead/ -alloy spillages
- 7 copper-alloy casting jets
- 8 weights
- 4 ingots/fragments of -
- 1 possible fragment of a pan from a foldable scale.

Additional finds: 2 dies – 1 for D-shaped pressblech brooch-fittings and 1 for bird-shaped filigree pendants, 1 master model for fish-head pendant, 1 top mount for box brooch with adhering mould fragments, 1 crown for an equal-armed or oval brooch, 5 fragments of oval brooches (1 of type P 48, 7 of type P 51 – some of which appears to be miscast), 1 miscast silver brooch, 1 lead plate with punch marks.

Ref: Ström 2000b; Pettersson 2005; Carlsson & Jonsson 2011

63. **Othem, Spillings 1:36, Raä 179, 250, 251, 252, 253 & 254**
Viking Period and Medieval settlement and workshop sites. Find site of the Spillings hoard. Metal detected i 1986, 1999, 2000, 2001, 2003, 2004, 2005 & 2007. Partly excavated in 1999, 2000, 2004, 2005 & 2006

- 124 copper-alloy spillages
- 27 lead/ -alloy spillages
- 1 spillage of unknown alloy
- 1 copper-alloy casting jet
- 3 copper-alloy casting sprues
- 2 lead/-alloy casting sprues
- 8 weights
- 136 fragments of "copper-alloy slag", most of which are probably metal impregnated hearth lining

Additional finds: 1 plano-convex slag cake with copper-alloy inclusions, 1 fragment of an oval brooch, 1 large lump of lead

Ref: Almgren et al. 1999; Widerström 2000, 2005; 2006; Widerström & Örjestad 2004; D. Carlsson 2007b

64. **Othem, Ytings 1:47, Raä 150**
Potential workshop site. Metal detected in 2009

- 34 copper-alloy spillages
- 3 lead/ -alloy spillages
- 1 copper-alloy casting jet
- 1 weight
- 2 fragments of metal impregnated hearth lining

Additional finds: 1 fragment of an equal-armed brooch, 1 miscast of lead

Ref: D. Carlsson 2010c:109pp

65. **Roma, Roma kloster 2:1, Raä 84, Find area II**
Farm site. Metal detected in 1990 (GM GF C 17489)

- 11 copper-alloy spillages
- 1 copper-alloy casting jet
- 3 ingots/pieces of -

Additional finds: Rods and lumps of lead

Ref: Almqvist et al. 1990h

66. **Roma, Roma Kloster 2:1. Raä 85 & 86**
Thing site (?). Metal detected in 1990 (GM C17489), 2010 & 2011

- 21 copper-alloy spillages
- 7 lead/-alloy spillages
- 5 spillages of uncertain alloy
- 136 weights
- 5 ingots/fragments of –

Additional finds: 9 lumps of lead

Ref: Almqvist et al. 1990i; D. Carlsson 2010a; Paulsson 2011c

67. **Roma, Snovalds 1:19, Raä 87 & 88, Find area I**
Farm site. Metal detected in 1982 (SHM 31418), 1983 (SHM 31615), 1997 (SHM 34070) & 2000 (SHM 34346)

- 14 copper-alloy spillages
- 1 lead/ -alloy spillage
- 1 fragment of metal impregnated hearth lining
- 1 weight

Additional finds: 1 fragment of a casting mould, 1 fragment of equal-armed brooch

Ref: Östergren 1989; Ström 2002

68. **Roma, Timans 2:1, Raä 73, Find area II**
Farm site. Metal detected in 1982 (SHM 31418), 1983 (SHM 31616), 1997 (SHM 34070) & 2000 (SHM 34346)

- 9 copper-alloy spillages (3 1983, 1+(1) 1997)
- 1 lead/ -alloy spillage
- 1 copper-alloy casting jet
- 5 fragments of metal impregnated hearth lining
- 7 weights
- 1 ingot/piece of -

Additional finds: 2 pieces of casting moulds. The so-called Ormika whetstone/mould (GM C9181) was found nearby (Raä 76)

Ref: v Friesen 1941; Östergren 1982c, 1983d; Persson 1997; Ström 2000c

69. **Sanda, Norrgårde 1:48, Raä 354**
Potential workshop site. Metal detected in 1986. All finds missing (2012)

- 50 copper-alloy spillages
- 7 lead/ -alloy spillages
- 20 fragments of metal impregnated hearth lining
- 2 weights

Ref: Östergren 1989

70. **Stenkyrka, Stora Bjärs 1:9, Raä 68**
Farm site. Metal detected in 1977 (SHM 31302), 1978 (SHM 31302), 2007 & 2008

- 6 copper-alloy spillages

Additional finds: 2 crucible fragments – 1 (GF C 9643) recovered in 1949 and 1 in 2008

Ref: Östergren 2008a

71. **Stenkyrka, Grausne 1:35 (Garde 1:28), Raä 134**
Farm site. Metal detected in 1977, 1978, 1979 (SHM 31203), 1980 (SHM 31265), 1981(31323), 1982 (SHM 31408), 1983 (SHM 31665), 1984(SHM 31665) &2007. Partly excavated in 1977

- 2 copper-alloy spillages

- 1 copper-alloy casting jet
- 1 copper-alloy weight
- 1 ingot/ fragment of -

Ref: Östergren 1979a, 1985h, 1989

72. **Stenkyrka, Smiss 1:14, Unregistered, Find area I**
Farm site. Metal detected in 2008 & 2009

- 4 copper-alloy spillages
- 2 copper-alloy casting jets

Ref: Östergren 2009b

73. **Stenkyrka, Smiss 1:14, Unregistered, Find area II**
Farm site. Metal detected in 2008 & 2009

- 1 copper-alloy spillage
- 3 copper-alloy casting jets

Ref: Östergren 2009b

74. **Stenkyrka, Smiss 1:14, Unregistered,**
Find area "south of field road"
Farm site. Metal detected in 2008 & 2009

- 1 copper-alloy spillage
- 1 copper-alloy casting jet

Ref: Östergren 2009b

75. **Stånga, Bosarve 1:58 (1:55), Raä 69**
Farm site. Metal detected in 1984, 1986, 1987 & 1999

- 1 fragment of metal impregnated hearth lining

Ref: Östergren 1984b

76. **Stånga, Tjängvide 1:17, Raä 150**
Farm site. Metal detected in 2009

- 31 copper-alloy spillages
- 1 copper-alloy casting jet

- 2 fragments of metal impregnated hearth lining
- 1 ingot/piece of -

Additional find: 1 miscast

Ref: D. Carlsson 2010c:115pp

77. **Stånga, Tjängvide 1:17, Raä 151 & 152**
Farm site. Metal detected in 2009

- 8 copper-alloy spillages
- 1 copper-alloy casting jet

Additional find: 1 miscast with adhering mould fragments

Ref: D. Carlsson 2010c:119pp

78. **Vall, Bryungs 1:38, Raä 46**
Farm site. Metal detected in 2009

- 2 copper-alloy spillages
- 1 spillage of undefined alloy
- 1 fragments of metal impregnated hearth lining
- 1 weight
- 1 lead ingot (l: 120 mm)

Ref: D. Carlsson 2010c:121pp

79. **Vallstena, Bjärs 1:15, Raä 192 & 226**
Farm site. Metal detected in 1982 & 2009

- 38 copper-alloy spillages
- 1 fragment of metal impregnated hearth lining
- 1 weight
- 1 ingot/piece of -

Additional find: large lump of lead (c. 400g)

Ref: D. Carlsson 2011a

80. **Vallstena, Bäntebingels 3:1, Raä 207 & 217**
Potential workshop site. Metal detected in 2009

- 2 copper-alloy spillages
- 3 lead/ -alloy spillages
- 18 weights

Additional finds: 2 droplets of gold, 1 D-shaped golden pressblech foil for a brooch

Ref: D. Carlsson 2011b

81. **Väte, Juves 3:1, Raä 113, 114 & 115**
Farm site. Metal detected in 2009 & 2010

- 2 copper-alloy spillages
- 2 lead/- alloy spillages
- 5 spillages of undefined alloy
- 1 copper-alloy casting jet

Ref: D. Carlsson 2010d

82. **Öja, Strands 1:31 (Gisle 1:6), Raä 70 & 114**
Farm site. Metal detected in 1984 (SHM 31659) & 2009

- 2 copper-alloy spillages
- 2 fragments of metal impregnated hearth lining

Ref: Östergren 1985; D. Carlsson 2010c:135pp