

Broadening Horizons: Effects of Expanding Trade Networks on Economic Decision-
Making at the Viking/Medieval Farm of Quooygrew, Orkney, Scotland

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The bulk of this paper is a draft of a grant proposal for the Wenner-Gren foundation, which supports dissertation research in Anthropology. It represents my current thinking about my dissertation project, and will hopefully both fill you in on what it is that I do as an archaeologist, and give you some idea about how the archaeology I do relates to larger questions about economy, agricultural development, and decision-making. In my presentation Monday, I hope to expand on some of the ideas in this proposal and make more explicit some of the connections between my project and New Institutional Economics.

I am currently working on expanding this proposal into a second proposal for NSF's dissertation improvement grant, which allows roughly twice the space and is much more loose regarding format requirements. In addition, I am contributing to an article by Dr. James Barrett (University of York) on agricultural changes in Northern Europe A.D.500-1500. I would appreciate any comments you have, although suggestions about areas of this proposal that could be expanded, and suggestions of additional sources I may not have encountered would be particularly helpful at this point.

The Wenner-Gren proposal answers five specific questions, which were limited to one single-spaced page each. I have included the questions at the beginning of each answer so that you can easily follow the organization of the proposal.

QUESTION #1: What is your research question or objective?

There has been much recent interest among anthropologists regarding interaction between communities and the broader international or global economic systems within

which they are embedded (Kearney 1995, Heinrich 1997, Schweizer 1997). The proposed paleoethnobotanical study of economic intensification at Quoygrew during the Viking/Medieval (V/M) transition (c.900-1100AD) will provide unique evidence of economic changes taking place at the site level, and insight into economic decision-making occurring during this period of significant economic and political change in the North Atlantic.

The V/M transition involved the beginnings of market economy and expanding international trade, radical changes in religious ideology, centralization of power, and the rise of urban centers (Blindheim 1982, Thurston 1997, Fossier 1999, Johaneck 1999, Barrett et al. 2000). Expansion of the economy accompanied changes in the structure and organization of trade (Johaneck 1999). Market economies and trade in high-bulk, low-value staple goods replaced trade in luxury goods fueled by traditional reciprocal obligations (Griffiths 2003). Agrarian communities shifted from subsistence-based to exchange-based production, leading to regular surpluses, and specialization of production in some areas (Marcus 1957, McGovern 1990, Bigelow 1992, Perdikaris 1999). The boom in trade that began with the V/M transition lasted until c.1350AD, when international trade contracted following a span of poor harvests in England c.1315-1322AD, and the Black Death c.1348-1350AD. Some historians suggest contraction was inevitable because the rate of economic growth c. 1100-1300AD exceeded environmental capacity given the level of technology available (Schneider 1991).

There is much debate among anthropologists and economic historians over the nature and chronology of the shift to a market economy in Medieval Europe. Was it gradual (Fossier 1999), or quick (Barrett et al. 2004)? Did changes in social organization and modes of production precede or arise from the economic boom (Saunders 1995)? Historical records

from Scotland during this critical period are rare (Fossier 1999), placing archaeology in a prime position to address questions about changes taking place at this time.

Quoygrew, located on the island of Westray in Orkney, Scotland, is an ideal location for research of this kind. It represents an economically diverse, high-status settlement in the North Atlantic occupied from the Viking age through the post-Medieval period. This site is the focus of an interdisciplinary project, the Viking Age Transitions Project (VATP), designed to investigate relationships between intensification of production, development of long-range trade, state formation, urbanization, and ideological change (Barrett et al. 2000). The proposed paleoethnobotanical study will contribute vitally to the VATP by generating key information on plant production/consumption, land use, and fuel use essential to understanding agricultural intensification at the site. Information provided by the proposed study will also be critical to developing an understanding of intensification in all areas of production at the site.

Many sites in the North Atlantic appear to have been economically diverse: inhabitants utilized a range of resources through fishing, farming and animal husbandry (Batey 1987, Huntley 1994, Huntley and Turner 1995, Morris et al. 1995). Enhanced production during the V/M transition in each of these areas is evident in the archaeological record. Intensification of marine resources appears in the zooarchaeological record in the form of coastal fish middens, while analysis of cattle bones suggests a potential shift towards managing herds for dairy production (Bigelow 1989, Barrett et al. 2000). Agricultural intensification is indicated by formation of heavily fertilized anthropogenic "plaggen" soils during this period (Simpson et al. 1998, Barrett 1999), but paleoethnobotanical studies identifying specific changes in crop production associated with the new "plaggen" technique have not yet been done. In addition, no archaeological study of the interaction between

spheres of commercialization at the site level has been done. Trade-offs between interests in farming, fishing, and animal husbandry are likely to have occurred because time, labor, and material investments needed for intensification of each resource were limited. For example, grass turf must have been heavily in demand as fuel (necessary for production of fish oil for exchange), as fodder for animals, and as the basic building block for building up and maintaining plaggen soils.

I propose to analyze data uniquely available from paleoethnobotanical study of carbonized macroremains in combination with data available from other specialist studies generated through the VATP in order to meet the following objectives: 1) identify economic activity patterns at the site across time and space; 2) understand the chronology of and relationship between fishing intensification, farming intensification, and changes in animal husbandry practices during a period of commercialization of these activities; and 3) understand environmental impacts of the increased production of these commodities.

QUESTION #2: How does your research question relate to the work of other anthropologists?

The interaction of local communities with growing international economic and political forces is a topic relevant not only to anthropologists (Mintz 1985, Acheson 1988, Ensminger 1990, Kearney 1995, Sherratt 1999) but to many social scientists including economists, political scientists, and historians (Saunders 1995, Fossier 1999, Johaneck 1999, Waltz 1999, Griffiths 2003). I will contribute to this work by providing new and unique data about the process of economic intensification at Quoygre, as a surplus of staple goods first began to be produced for international trade.

Identification of changes in economic activity during the V/M transition. Throughout the Viking and Medieval time periods, settlements in the North Atlantic were primarily multi-component farmsteads using a range of resources (Amorosi et al. 1998). However, economic growth and

expanding trade associated with the V/M transition encouraged specialization of production in Shetland (Bigelow 1992), Iceland and Greenland (Marcus 1957, McGovern 1990), and Northern Norway (Perdikaris 1999). Chiefs gained power from the ability to provide feasts for their subjects (Earle 1987, Dietler 1995, Demarrais, Castillo and Earle 1996). Public distribution and consumption of food and drink were used to amass “symbolic capital” (Bourdieu 1977). In areas like Iceland and Northern Norway, agriculture was marginal at best, and the trade of dried fish and fish oil for barley or malt became standard. However, this left chiefs in these areas vulnerable to manipulation of trade networks for political gain. In order to cut off supplies of bread and beer, Saint Olav, King of Norway from 1015-1028AD, actively worked to prevent cereals, malt and flour from being shipped northwards, thus consolidating his power (Perdikaris 1999). Trade manipulation may be one of the factors leading to the formation of states during the V/M transition. Historical records indicate that Orkney was an exporter of barley to more northern regions. Increasing production of barley at Quoygrew (part of the largely autonomous Orkney Earldom) may have had political consequences for Orkney as well as those areas relying on Orcadian barley. **I predict that both import and export of foodstuffs will increase over time at Quoygrew.** Paleoethnobotanical evidence supporting this would include increasing frequency of exotic imported foodstuffs (such as wheat, figs, grape, olive, and coriander), increased storage of cleaned barley grains, appearance of germinated barley grains in large numbers, and increases in crop weed seeds associated with fertilized plaggen soil.

Understanding the chronology and interrelationship between fishing, farming and dairy intensification.

Barley, used for beer and bread, is a crop requiring high levels of care. It was grown on plaggen soil purposefully built up and extensively fertilized to allow continuous cultivation. Oats, used primarily as fodder, were grown in less intensively cultivated fields surrounding

the settlement. This system increased the amount of land in cultivation, the amount of effort required for cultivation, and the degree of interaction between farming and animal husbandry (Fenton 1981, Dodgshon 1993, Miller and Gleason 1994, Simpson et al. 1998). Such a system increases the complexity of economic decision-making, since a judgment made in one area of production necessitates consideration of factors relevant to the others. **I predict that the degree of interaction between fishing, farming, and dairy production will increase over time.** Paleoethnobotanical evidence for this would include: weed seed assemblages suggesting specially grown hayfields for fodder, flax production increasing in tandem with evidence for fishing intensification as demand for fishing tackle increases, a positive correlation between the number of livestock kept at a certain period and the amount of oats produced at the site for fodder, and a positive correlation between the number of livestock kept and the size of the plaggen soil during that period.

Understanding environmental impacts of intensification. Henrich's (1997) study of the present-day Machinguenga shows that groups with sophisticated agro-ecological knowledge and previously well-adapted agricultural practices can overexploit resources and develop unsustainable systems upon entering global markets. Agricultural intensification is related to the desire to produce surpluses for purchasing trade goods, and can lead to practices that ultimately cause breakdowns in the farming system. In a study of manuring practice in Shetland, which is similar to that used in Orkney, Adderley et al. (2000) found that more fertilizer was applied than necessary to raise the organic content of the soil. Farmers employing hill-land turf were overexploiting this resource past the point where it was producing gains in soil fertility. At St. Boniface on Papa Westray, Lowe (1998) found fuel use changed from use of peat to use of turf during the V/M transition. This represents a shift to a less efficient fuel source and may have to do with the overexploitation and later

scarcity of peat on the island. **I predict that intensification of resource production at Quoygrew placed stress on the availability of environmental resources.** Replacement of efficient peat fuel with turf at Quoygrew would suggest overexploitation of this resource. Better understanding the chronology of declining production c.1250-1400 AD may suggest whether agricultural practices failed to be sustainable (Schneider 1991) or if the contraction of trade networks associated with the Black Death was primarily to blame.

QUESTION #3: What evidence will you need to collect to answer your research question?

Paleoethnobotanists have made significant contributions to the study of relationships between changes in economic decision-making at the community level and larger socio-political changes (Hastorf 1990, Chernoff and Paley 1998). Paleoethnobotanical studies are particularly useful for understanding the process of agricultural intensification (Van Zeist 1991, Morrison 1994).

I will use plant remains to identify changes in economic activity at Quoygrew. Studies show that given consistent methods of sampling across a site, it is often possible to interpret spatial and temporal changes in activity (Metcalf and Heath 1990, M. Jones 1991, McGovern 1992, Lennstrom and Hastorf 1995 Smith et al. 2001). Flotation samples were taken from nearly all secure contexts at the site and processed during the 1997-2004 field seasons (Williams 1972, Barrett and Gerrard 2002). I will analyze charred macrobotanical remains in samples from a large variety of contexts (including hearths, storage features, drying kilns, floor layers, byre areas where animals were kept, plaggen soils, and several large middens) and dates (c.900-1400AD) according to procedures outlined in Poaps and Huntley (2001), ensuring compatibility with published data from the site and region. I will identify seeds using the comparative collection housed at Washington University's Paleoethnobotany Laboratory, identification texts, and in collaboration with British archaeobotanists during

visits to Britain and via electronic conference. The data I acquire from this study will be used in the following ways:

Interpretation of crop production/consumption. I will interpret changes in crop production and consumption by analyzing changes in crop seed remains through time and by context type. Measures of absolute amount, density, frequency, ubiquity, and percent dominance will be used to describe changes in crop seeds over time (G. Jones 1991, Pearsall 2000, Fritz in press). Crop weeds and chaff can be used to identify the degree to which crop seeds have been “cleaned” or separated from chaff and weed seeds (Dennell 1976, Hillman 1981, 1984, Stevens 2003). This can provide clues to the purpose of the crop, whether for trade, local human consumption, or use as fodder.

Land use. Crop weed seeds in archaeobotanical samples can be used to identify ecological conditions in fields, and thus the agricultural practices contributing to them (Engelmark 1989, Henriksen and Robinson 1996, Charles, Jones, and Hodges 1997, Jones et al. 2000, Bogaard et al. 2001). Changes in assemblages of weed seeds over time indicate whether heavily fertilized pluggen soils are being created and enlarged, or if more marginal land is taken into cultivation. Fuel use changes provide information about use of peat-land and hill-land from which fuel is acquired.

Fuel use. It is important to be able to detect change in the use of various fuels over time, particularly because increasing demand for fuel to produce fish oil, as well as demand for ash byproducts used in fertilizer may have caused widespread environmental effects. Dung fuel can be recognized using archaeobotanical data (Hally 1981, Bottema 1984, Miller 1984, Miller and Smart 1984, Carter 1998). However, identification of peat and turf using archaeological seed remains has yet to be done (Dickson 1998). In order to produce distinguishable botanical “signatures” - assemblages of seeds that signal the presence of a

particular fuel type in an archaeological sample - I will experimentally char equal volumes of each fuel type using a muffle furnace. I will analyze uncharred seed assemblages from equal volumes of fuel to study effects of charring on seed assemblages. Ecological analyses of plant communities growing on Westray in areas historically used as sources of turf and peat fuel will be conducted. Fuel samples will be collected, as well as seeds and voucher specimens to use as comparative material. ANOVA statistical tests including Tukey's HSD will be conducted to determine if assemblages of weed seeds from various fuel types differ significantly, whereas separate trials of a particular charred fuel do not. This study will contribute to paleoethnobotanical study of fuel use in other areas of the North Atlantic where wood fuels are scarce.

Paleoethnobotanical study of Quooygrew, a multi-component site with occupation spanning the Viking/Medieval transition, will provide information about the ways crop production, land use, and fuel use changed during this period. Without data regarding changes in plant use provided by the proposed study, the large amount of data already generated by the VATP (Barrett 1997, Simpson et al. 1998, Barrett et al. 2000, Poaps and Huntley 2001, Batt 2002, Barrett 2003, Welsh 2004, Barrett n.d., Simpson et al. n.d.), remains incomplete.

Viewing plant data within the broader context of data will allow a more complete picture of changes of activity associated with commercialization of fish, grain, and dairy. Analysis of combined data will allow me to meet the three objectives of this study, and to provide a case study of how the onset, expansion, and contraction of international trade in staple goods affects local producers of those goods.

QUESTION #4: How have you prepared to do this research?

The proposed project requires experience in many areas, which can be grouped into the following categories: technical skills; experience with the site, region, and institutions

involved in the project; and familiarity with relevant anthropological, archaeological, biological, and economic theory.

Technical skills. I gained experience collecting and identifying plants in the field, as well as preparing herbarium sheets by taking classes in plant phylogeny and ecology from Dr. William Williams (St. Mary's College of Maryland) and Dr. Peter Stevens (University of Missouri St. Louis). By taking classes from and working extensively with my supervisor, Dr. Gayle J. Fritz, I have learned to identify charred macroremains from many areas of North America, and extended my skills in identification to include British plant remains by working on a pilot study of plant remains from Quoygrew with the help of several British archaeobotanists. During my visit to England to work with these researchers I obtained seeds from common British species to supplement Washington University's paleoethnobotany collections. I have training and many hours of experience in the use of scanning electron microscopy (SEM) including preparation methods, microscope operation, and darkroom processing. This will allow me to document small seeds or those with distinguishing characteristics inadequately viewed or photographed under stereoscopic magnification. Coursework I have taken covering zooarchaeology, archaeological chemistry, and archaeological methods will inform me in the incorporation of specialist studies done at Quoygrew into a comprehensive study of economic activity at the site.

Experience with the site, region, and institutions involved in the project. I was a member of Dr. James Barrett's excavation team at Quoygrew during the 2002 and 2004 field seasons. I am familiar with the area of study and have met many of the specialists who have contributed data concerning the site's economy. As part of my MA thesis at Washington University, I conducted a pilot study on samples from Quoygrew, which introduced me to the type of seeds I am likely to encounter and the methods of paleoethnobotanical analysis that will be

used in the proposed study (Adams and Barrett 2004). This initial study showed remarkable preservation of plant remains at the site. The samples I have analyzed thus far are rich in seed remains and include both domesticates (oat, barley, and flax) and many species of wild and weedy seeds. During the summer of 2003 I visited England and Scotland and was able to meet and work with several paleoethnobotanists whose research involves British archaeological plant remains: Dr. Allan Hall, Ms. Jacqui Huntley, and Dr. James Dickson. I was also able to spend time at University of York, Glasgow University, and University of Durham. Funds for a return trip to York and Durham will allow me to confirm identification of difficult seeds with these experts upon completion of the data collection phase of the proposed project. The availability of a high-resolution camera will enable consultation with these experts via electronic conference.

The Washington University Paleoethnobotany Laboratory has a large comparative collection of seeds from around the world, including the British Isles. I will add to this collection by collecting essential wild and weedy species from Orkney during the proposed research trip. In addition, proximity to the world-class Missouri Botanical Gardens and close working relationships between our institutions will allow me access to plant identification specialists and additional comparative material, should it become necessary.

Familiarity with theory from relevant disciplines. In addition to classes on anthropological and archaeological theory taken with Drs. John Bowen, David Browman, Margaret Brown, Fiona Marshall and Patty Jo Watson, I have taken several courses dealing with paleoethnobotanical sampling, quantification, and reporting, and sample formation processes with Dr. Gayle J. Fritz. My biology background includes experience in ecological theory sufficient to allow me to competently describe and analyze plant communities. I am also pursuing a certificate from the Center for New Institutional Social Sciences (CNISS) founded by economic historian

and Nobel laureate Douglass North. Through this program I have taken coursework in economics, political science, law, and economic anthropology, and participate in a weekly interdisciplinary seminar designed to encourage interchange among the disciplines that make up the social sciences. The experience gained and contacts made through this program have better prepared me to tie specific findings from the proposed study to regional and super-regional economic trends during the early medieval period, and throughout history.

QUESTION #5: What contribution will your project make to basic research in anthropology?

The proposed study is, in the broad sense, an examination of the relationship between economic change and socio-political change. Changes in production and consumption I observe at Quoygrew will contribute to discussions about the relationship between trade expansion and political and social change. They can be used to address broader questions such as: 1) the relationship between economic change and increasing social hierarchy. This is an important aspect of studying the origins of the feudal system. 2) the relationship between specialization of production and centralization of power. This is essential to understanding the mechanism of state formation in the North Atlantic. 3) the sustainability of agricultural practices related to intensification. This is a question of great interest to anthropologists studying modern agricultural communities entering the world market.

The V/M transition represents an early episode of expanding market trade linking distant localities resulting in a situation where local events were shaped by distant forces (Schneider 1991). Changes occurring during the V/M transition are not limited to growth in international trade, but involve new ideologies, centralization of power, and urbanization. Specialization of production occurring in Northern Norway, Iceland, and Greenland during this period meant that crops produced in Orkney at sites like Quoygrew became essential

exports to these regions. The increasing ability of groups and individuals to control the availability of staple goods like cereals may have led to the centralization of power.

Increasing risk associated with production of surplus goods for trade can also lead to dependency relationships at the community level. This period saw a rise in the number of tenants relative to free landholders (Amorosi et al. 1998). Relationships within communities were extremely important because of the risky nature of agriculture. Bad years meant fewer crops available for food, but also less fodder available for domestic animals. Fodder exchange was common between farmsteads in bad years, but such exchanges often led to owner/tenant relationships. Successful farmers, mostly those who had early advantages in farm placement, were repeatedly able to provide help (sometimes at less-than-reasonable terms) when needed by neighbors, thus establishing themselves as leaders. Establishment of hierarchies in places where yields from agriculture are particularly uncertain is noted from many areas of the world (Halstead and Jones 1989, Dietler 1995, Park 1992).

Archaeologists are in a unique position to offer anthropology the time-depth necessary to study issues of long-term economic change and environmental consequences of that change (Butzer 1996). Future consequences of modern intensification of production occurring in interaction with globalization are difficult to predict. Studies of archaeologically known periods of economic change and the way these changes appear in communities is one way to provide information on *long-term* social, political, economic, and environmental impacts of globalization.

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