# 8. Conclusions and future work

## 8.1. Summary of the argument.

### 8.1.1. How has food been valued in debates about domestication?

Traditional debates about why agro-pastoralism was introduced and adopted in southern Scandinavia tend to take a linear perspective to the processes involved. In other words these explanations are based on a one-to-one cause and effect relationship, with the domestication almost an inevitable outcome. Initially this was expressed by the palaeoeconomic school of thought that stressed solely how the practical, nutritional contributions of domesticates made them superior foods. Such arguments focused on how mostly a-social alterations to the production base such as environmental change *forced* the adoption of these new plants and animals. The underlying assumption in all cases is that the primary, singular value of food is as a facilitator of work and industry; a supposition stemming from the formalist economics of the industrialised west. A benefit of this approach which is driven by formalist laws of value is that it has generated *explanations* of change, based on the mechanics of measurable value such as calories. However, the generation of these explanations is facilitated by the simplicity of a singular cause-and-effect relationship; non-linear dynamic relationships between multiple processes are not attempted. These explanations are also facilitated by a strong association with a positivist paradigm, which works from the same premise regarding the measurability of value. As a result, a large amount of presently available datasets for the investigation of food at the transition to agriculture are a legacy of palaeoeconomic concerns with validating possible weaknesses with a predominantly hunting-based diet. Animal foods are emphasised, whereas plants are often mentioned as incidental or their involvement is more speculated. The *relative importance* of animals and plants is conventionally considered to fall on the side of animals, but this comes about because of a lack of investment in *developing* methods to maximise the possibilities of the very fragmentary plant food record.

Following a strong palaeoeconomic influence on debate, a concern with social explanations for why agriculture was adopted was explored. These discussions

continued the trend for one-to-one cause and effect explications of why domesticates were adopted. Rather than *expanding* understandings of value to include such socially embedded reasons why food was important such as its involvement in prestige economies, production was instead *substituted* with consumption. Thus a dichotomy was established between food production and food consumption. The paradigmatic differences that support this division mirror the contradictions between a formalist and substantivist reasoning of value and the way it articulates with society.

It was argued that many of the valid challenges posed by the formalist-substantivist debate were side-stepped when the trajectory of post-processual linguistic discourse equated value with meaning. Both formalism and substantivism weakly account for the *motivations* that prompt social change, for formalist arguments the value is utility, whereas substantivism relies on *categories* of value as proxies for the values themselves such as 'prestige', meaning an artefact either falls into a value category or doesn't. Diverging into post-modern linguistics of meaning promised to penetrate the paradoxical phenomenon that the (re)production of society that we seek to understand comes about from socially embedded motivations. However, it was argued that such an approach has had a detrimental effect both on the explanation of motivations and on explanations of change in archaeology. Linguistic conceptions of meaning are inherently intransient. In Derridean post-structuralism meaning is composed entirely of signifiers, the nature of the object perpetually situated in a web of relations between subjects and thus insubstantial. The result of such a conception of meaning has been a rendering of value as insubstantial too, which is detrimental to understandings of *motivation* to change because any stimulus is diffused. There is no sense of the relative importance of different artefacts, and classes of artefact are often studied in pluralized isolation. Coupled with a post-processual distrust of the power weightings in 'grand narrative' explanations, the understandings of why food traditions changed has been hindered most recently. Whilst the pluralism encouraged by post-processualism promises a potential non-linear dynamism in explanations of change, this was undermined by a fundamental inability to characterise the *content* of meaning, namely values, and use this to discuss the relative importance of foods.

### 8.1.2. *How* has this study altered appreciations of food value across the transition to agriculture?

Following a rereading of Derrida's theory of Writing, it was suggested that a substantial essence can be theorised for meaning, weighting the concept to become more representative of the nature of value. Such a move away from hyper-reductionism reintroduces the possibility for investigating stimuli that motivated change in past food traditions. This is the theoretical point of departure for an investigation of Cuisine, or more simply food values. Food production through consumption is socially embedded, redolent with the purpose of achieving social (re)production. Since society is composed of multiple denominations and group affiliations, what we have sought to investigate are multiple processes of (re)production, Cuisine is a combination of values that engage manifold processes of change. A foray into ethnographic inspirations revealed that Cuisine can *be* many things to different groups, orbiting value themes such as aesthetics, poison, medicine, consciousness alteration, and pollution, to name a few. These types of values become relevant in certain social contexts; the relative importance of certain foods is expressed through the context of their social engagement through the chaîne-opèratoire of production to consumption. Engaging with these processes of evaluation has allowed for the suggestion of different values for foods across the transition to agriculture, as well as some of the contexts in which those values become especially pertinent socially.

Appreciating how value prompts certain trajectories of change has required datasets that can support discussion of the *relative importances* of different foods. Pottery residues offered potential for this, but have required methodological developments to rebalance plant foods into discussions because lipid residue analyses are weighted towards animal foods. Following an evaluation of the available techniques of residue analysis it was decided that characterisation of the lipid fraction and measurement of lipid isotopic composition should be supplemented with plant microfossil analyses of the surface deposits. This multi-disciplinary approach aimed to generate datasets that conveyed detailed information about a range of foods used, across the wide spatio-temporal range offered by pottery that spans the transition to agriculture. The diversity of approaches succeeded in generating detailed and comparable datasets

across sites, which could be used to disaggregate multiple processes of food evaluation across the transition.

Methodological developments were made in the field of plant microfossil analysis from carbonised pottery deposits. Starches, phytoliths and calcium oxalates were the subject of a novel extraction process. Manual observation of starch forms and features, that is the norm for analysis in archaeology, was improved upon using a trained programme for objective automated classification. The training and testing of the programme using modern reference plant specimens that have commonly been found on archaeological sites from this region found that the grains were highly specific and identifiable, and that classifications could be performed with a high degree of sensitivity. Preliminary investigations were also made of the taxonomic value and survival of phytoliths in temperate European ceramic residues. This is a novel approach to residue analysis in a temperate setting, as plants are traditionally not considered to produce phytoliths in a cool climate. The combination of multiple plant proxies offsets the variation in taxonomic resolution offered by each to a certain degree.

### 8.1.3. Summary of how cuisine is implicated in changes across the transition to agriculture.

The multi-disciplinary data were interpreted to suggest ‘social models’ of how foods are implicated in multiple processes of evaluation, subject to continued verification. It has been suggested that foods are involved in multiple processes of evaluation in the Late Mesolithic, which motivated the adoption of domesticated food types in a certain sequence, at varying rates and for potentially different reasons. In some cases it seems cuisine changes to include domesticates were a secondary outcome of other motivations. Thus the processes to domestication were not necessarily linear. Nor do these processes document a singular, deliberate shift to a more efficient subsistence economy, or one that contrarily bestowed the category of value, prestige.

Evidence from pottery residues suggests that different domesticated foods *became* important over several centuries in the period around 4100-3900 BC in southern Scandinavia. This extended period of adoption supports the idea that there were *varying motivations* for incorporating these new foods at different times, as part of multiple processes of evaluation. In a pottery cuisine context milk is the first

identifiable domesticated food. It has been suggested that one reason for the early adoption of dairy foods was because of a perceived medicinal value to the cuisine, because of an association with the nurturing offered by human breast-milk. Burial evidence suggests a late Mesolithic social context preoccupied with the issue of infant mortality. Milk is introduced to cuisine in coincidence with many examples of burials that staged a breast-feeding scene as well as other nurturing imagery. In addition, ceramic-Mesolithic skeletal remains from Skateholm suggest a shift to an earlier and multiple weaning regime as milk becomes evident in the archaeological record, leading to the postulation that part of the reason milk was introduced was as a breast-milk substitute. Such a stimulus to change cuisine is not motivated by an efficiency value, rather a medicinal one. In this view a domesticated cuisine comes about as a secondary consequence of other social concerns.

There is some evidence from pottery residues that dairy foods such as cheese were imported in Michelsberg-style vessels, and this may be one of the earliest processes for acquisition. In hunter-gatherer and early farmer populations where ancientDNA evidence suggests a much *higher* incidence of lactose intolerance, a dairy food processed of lactose would be an essential introduction. It was suggested that a corollary of medicinal values for dairy foods was a negative, toxic value to some adults. This may explain why imported versions of dairy cuisine were another process by which domesticated foods came to be incorporated into hunter-gatherer culinary traditions. More locally to southern Scandinavia, this sense of a dangerous value to milk is formalised in traditions of pottery use during the Funnel Beaker period. At Neustadt in particular it has been suggested that some vessels suited to the processing of liquid were used exclusively for the processing of dairy foods. These vessels seem to exclude any plant material, in particular acorn type starches which are otherwise prevalent. Tannic acid which is removed from acorns by boiling inhibits lactase in the gut, suggesting an acknowledgement of the potentially toxic element to dairy foods. This contradiction of culinary practices may account for a slight reduction in plant foods after the inception of dairy in cuisine.

The management of culinary transformation is a pervasive theme in pottery cuisine. It has been argued that this stems from the almost proto-alchemical explorations of chemical alteration that occurred with the inception of pottery. The constituents of the vessel paste and temper, as well as their alteration through the process of

construction and firing embody potent transformation imagery. The making-safe of dairy foods is one expression of the transformative value of a specifically pottery cuisine; in cheese-making for example, different states of *Being* of the milk are visited before the dangers are overcome. Liquid becomes curd solid, curds are split to release liquid whey. Similarly, many of the plant foods that were classified on the basis of starches have toxic values to them requiring transformation through boiling. Acorns are an example of this. In this way, a value of pottery cuisine is undirected towards a domestication outcome. The *types* of foods that were being transformed *harness* pottery cuisine values as a contributor in the eventual adoption of dairy foods, but the primary process of evaluation was perhaps much differently motivated.

Both the incidence of recovery of plant remains in vessels, and a translation of this into calorific contribution suggest that plants may have been relatively more important than has previously been suggested. Whilst animal foods display regional cuisines, plant foods tend to cross-cut regional distributions of other foods. Wild plant food representation massively outweighs any suggestions of domesticated cereals. Minor proportions of starches classified as cereals are difficult to take as convincing. This starch evidence is not backed up by any dendritic cereal long cell phytoliths. Experiments with the cooking of einkorn (*Triticum monococcum*) suggest that whilst starches *do* survive boiling and residue formation, it is in an altered form that may be more susceptible to enzymatic attack in the burial environment. Although the lack of evidence for cereals may therefore be a preservation issue, we can be certain that wild foods persist in importance across the transition. As the evidence currently stands there is no reason to disagree with the accepted idea that cereal domesticates were a later incorporation into cuisine than other animal domesticates.

The findings from phytolith analysis suggest that a silica rich seed was used as a spice food in both pointed-based and funnel beaker pottery. The most consistent representative of this type of silica body in modern reference specimens is garlic mustard (*Alliaria petiolata*). It was suggested that the value of *taste* and the use of spices may have contributed to a consolidation of cereal cultivation in the middle and later Neolithic. Many ‘weed species’ are also potential spice plants, encouraged to colonise by clearings and disturbed ground. Plants commonly considered to be

spice plants such as poppy (*Papaver somniferum*) follow in the wake of cereal agriculture. Those spices already in use in southern Scandinavia in hunter-gatherer cuisine may have been encouraged and their use enhanced by altered cereal management regimes, concomitantly facilitating an elaboration in the tradition of spicing food as new spices get introduced.

## 8.2. Verification methods and future work.

In blending a positivist dataset with more theoretically driven enquiry the interpretations proposed in chapter 7 are open to a degree of verification from future agendas for research.

### 8.2.1. Starch analyses.

Starch analysis is a relatively young archaeobotanical sub-discipline, and there is still a considerable amount of potential investigation into the precise conditions under which starches preserve and degrade. It has been shown through investigation and case studies that starches *do* preserve in carbonised deposits. Not only are there variations in preservation brought about by amylose:amylopectin ratios, size, hydration and form of grains, there also exist small proportions of resistant starch in many taxa, the detailed properties of which are still being established. However, due to this former caveat it is unclear whether some taxa are simply not being represented, and cereals may fall into this group. Future work would benefit from experimentation into the responses of cereal starches to different forms of processing; variations in heat, responses to fermentation, mixtures with other foods, for example.

The collection of modern plant reference material for both starches and phytoliths is ongoing, though being subject to seasonal limitations. The incremental growth of the database of training starch used in the automated classification programme is continuing and is linked to a collaborative initiative to produce online open access to starch images coordinated by Professor Karen Hardy. All reference material from these investigations will be contributing. The photographic record of archaeological starches is subject to continued verification as the automated starch classification database expands. However, the results presented here are considered a stable

preliminary base because of the common presence of these plant types on sites from the region.

### 8.2.2. Phytolith and calcium oxalate analyses.

The presence of numerous phytolith types in archaeological samples with potential taxonomic significance suggests this avenue of research is deserving of further investigation. Primarily this will involve the further exploration of phytolith production in temperate European species and situations. The collection of modern reference material is ongoing. It is intended that the acquisition of greater numbers of modern reference phytoliths will lead to the development of a methodology for their automated analysis. Since phytolith identification is much more dependent on multiple planes of visualisation, techniques involving the use of CAT-scanning are being explored. CAT-scans allow for a 3-dimensional rendering of microfossils, through a microscope coverslip which means artefacts identified by optical microscopy can be targeted. It also means that multiple samples need not be prepared of what is a limited resource of foodcrust. It has been suggested that the spicing of food was practised in both Ertebølle and Funnel Beaker pottery. Such a claim will be incrementally substantiated or disputed with the acquisition of more modern reference specimens.

Calcium oxalate crystals were not found to be a useful microfossil in the study of carbonised organic residues in this context. This may be because the process of boiling dissolves the crystals, and is part of the role of the vessel. Their discovery in Lapita-era pottery (Crowther 2000) suggests they are perhaps subject to differential preservation under varying thermal regimes. This has not proved detrimental to the results reported here, but the more precise conditions of preservation as part of wider investigations into starch preservation present a viable avenue of research.