

# Animal traction and household economies in Neolithic Europe

PETER BOGUCKI\*

*Most archaeological interest in the story of European social evolution has looked to the grand picture, as the bands combine and climb at last to achieve states and empires. What about the structure of European Neolithic as it was experienced at home, when the ox, the pig, the sheep and the goat came to live in the domestic unit of the single household?*

The goal of this essay is to explore some interrelationships among domestic animals and Neolithic households and to propose some hypotheses about the role of domestic livestock, especially cattle, in Neolithic social and economic organization. Neolithic sites in Europe typically yield samples of animal bones ranging from enormous to minuscule in their numbers of identifiable specimens. Faunal remains are assemblages of dead animals, and as a result there is a long-standing bias towards viewing livestock as subsistence resources, with far less consideration given to their economic roles while living. This bias is understandable, for faunal remains are archaeological data and prehistoric living animals are abstract concepts. While the concept of 'secondary products' has addressed this issue to some degree, there is still a tendency to think in terms of 'products' rather than viewing animals as 'assets' in the Neolithic economy. This essay attempts to recast the discussion to take the role of living animals, particularly domestic cattle, into account. In particular, it explores the implications of a neglected aspect of the Secondary Products Revolution (SPR), cattle husbandry and animal traction, for other aspects of prehistoric society in temperate Europe.

## Revisiting the Secondary Products Revolution

It has been more than a decade since Andrew Sherratt (1981; 1983) coined the term 'Secondary Products Revolution' for the emergence of a pattern of animal exploitation in the Late Neolithic/Copper Age of south-

eastern Europe and the Middle Neolithic of central Europe about 3000 BC. In its broadest outlines, the SPR represented a shift in the use of domestic animals from their serving mainly as providers of 'primary products' requiring the death of the animal, such as meat and hides, to their exploitation for 'secondary products', renewable resources taken from living animals, such as milk, wool and animal traction. Although some (e.g. Chapman 1982; Bogucki 1984) have taken issue with the 'revolutionary' character of this concept by pointing to evidence for some elements, such as dairying, in earlier prehistoric periods, nonetheless it is clear that approaches to animal husbandry became progressively more complex during the Neolithic.

Evidence for the SPR in temperate Europe comes from sources summarized by Sherratt (1981; 1983) and Greenfield (1988; 1989): ceramic sieves and vessels presumed to have been used in milk handling; animal figurines; remains of wagons, wagon parts and ploughs in burials and waterlogged deposits; wagon models and representations on pottery; rock-carvings of wagons; and plough-marks on fossil soils under barrows. Faunal evidence has been presented by Greenfield (1988; 1989). Evidence for the initial use of secondary products is diffuse and scattered geographically, although it is temporally rather sharply defined. Rarely does a single site provide a corpus of data which, taken alone, provides convincing evidence for secondary products. Perhaps it is simply a matter of time and recognition of relevant data

\* Forbes College, Princeton University, Princeton NJ 08544-4000, USA.

until local developments can be documented better. Recently, for example, Milisauskas & Kruk (1991) have presented evidence from Bronocice in southeastern Poland, dating to c. 3500–3000 BC. Here, cattle form the major component of the faunal assemblage, with cows comprising just over half of the specimens that could be sexed and oxen – castrated males – accounting for about 20%. In addition, Bronocice has yielded a vessel with representations of what are almost certainly wagons, and a horn core has furrows worn in it, possibly the results of yoking with a rope across the horns. Thus, for at least one major settlement complex in central Europe, a good case can be made for the use of animal traction between 3500 and 3000 BC.

The very name ‘Secondary Products Revolution’ reflects the emphasis on products and their consumption in transforming Neolithic society. Archaeologists have tended to see animal husbandry primarily in terms of consumption, focusing on the direct return from the livestock in *products* – for subsistence, for clothing and for tool manufacture. Animal traction for ploughing and cartage is treated as yet another product – which it is, in the sense that it reflects the consumption of the energy provided by an animal. What is missing, however, is the role of animals *apart* from consumption in Neolithic economic structure.

The conflation of ‘economy’ with ‘subsistence’ has led, in my view, to a limited view of Neolithic animal husbandry. Recognizing the importance of secondary products, an advance over the earlier ‘animals=meat’ equation, still entails a consumption-focused approach. Yet animals as *livestock* had a role in the Neolithic economy, a role more difficult to investigate or even to infer from proxy evidence. The changes in animal exploitation during the Late Neolithic in temperate Europe are concurrent with changes in settlements and burials which have been interpreted as evidence for emergent social differentiation. Recent discussions have characterized the social structures as ‘low-level hierarchies’ (Milisauskas & Kruk 1984; 1991) or as ‘chiefdoms’ (Kristiansen 1982), conveying the notion of social strata and a distinction between *élite* and non-*élite*. No one has

suggested a causal relationship between the use of secondary products from animals and the emergence of differences in access to status, power and wealth, but hints have been made at a connection. For example, Milisauskas & Kruk (1991) suggest that wagons may have been a *perquisite* of *élite* individuals. A goal of this essay is to explore this connection in greater detail and from a different angle: that of the varying abilities of individual households to accumulate resources.

### Household economics

Taking a household perspective on the use of animals in Neolithic Europe means making the assumption that the household, however constituted, was the significant unit of economic decision-making. This position has considerable support from economists and anthropologists, studying small-scale agrarian societies, who view the household as the social context of decisions about procurement, allocation, and consumption of resources (e.g. Netting 1974; Barlett 1982; Huijsman 1986; Singh 1988; Ellis 1988, among others). Household members share cultural values and expectations, and by definition live in similar physical and social environments. Economically, the household is a co-operating group that jointly makes production decisions (Barlett 1982). Socially, it is the unit of reproduction and the focus of social interactions and obligations. In short, the household is an appropriate analytical unit for studies of both subsistence farming and peasant societies today.

Some may take exception to this position, particularly with reference to Neolithic Europe. Polanyi (1957: 254) wrote:

Only under a comparatively advanced form of agricultural society is householding practicable, and then, fairly general. Before that the widely spread ‘small family’ is not economically instituted, except for some cooking of food; the use of pasture, land or cattle is still dominated by redistributive or reciprocal methods on a wider than family scale.

Those who see the economies of small-scale societies as an instituted process generally cannot reconcile this with the formalist notion of individual household decisions as

shaping economic change (Johnson & Earle 1987: 11). Yet many researchers, unconstrained by this theoretical debate, routinely use the household as the fundamental analytical unit in studying the economic behaviour of small-scale agrarian, pastoral and agro-pastoral societies. For example, Sutter (1987: 197) in studying the Fulani, a pastoral society in Senegal, writes:

The sampling unit selected in this research was the *galle*, or household, for it is at the household level that animals are owned, budgets are managed, and key economic decisions concerning the herd are made.

Archaeologically, there is increased interest in household units as basic units of analysis (e.g. Ashmore & Wilk 1988). Yet it is very difficult, if not almost impossible, to identify actual households, and archaeologists must be content with proxy evidence for domestic groups. Distinct, yet essentially similar, modules consisting of houses and associated features within larger settlements or dispersed individually are generally taken as reflecting some sort of household structure. At Brześć Kujawski in Poland, the author and his collaborator have searched for household units (Bogucki & Grygiel 1981; Grygiel 1986), with some success. Tringham and her colleagues have also looked for evidence of households on Balkan Neolithic sites (Tringham 1991). Perhaps with time we will document the existence of households and their role as 'organizational denominators' (Bawden 1982) of society across Neolithic Europe.

In the meantime, is it possible to assume that households constituted the primary unit of economic decision-making in Neolithic Europe? Although some of us in taking this position (e.g. Bogucki 1988) have been criticized (e.g. Chapman 1991), Tringham & Krstić (1990: 603) argue:

It is not essential to be able to identify 'households' in the historical and anthropological sense of the term. It is sufficient to be able to investigate changes in co-residence and cooperative activities of domestic groups on an archaeological site.

In their view, the 'household' concept, a concise way of saying 'kin-based co-resident domestic group', can be the theoretical basis

for making further inferences about resource allocation and consumption. Accordingly, Tringham & Krstić (1990) have suggested, for the Later Neolithic and Early Eneolithic in southeastern Europe, a shift from larger corporate groups to smaller co-resident groups. Competition among such units and the inequalities inherent in their developmental cycle over time would have formed the basis for the emergence of social differentiation.

Viewing Neolithic society through the decision-making of individual households provides a new way of looking at the economic role of domestic livestock. For this discussion, the actual size and constitution of these 'minimal residential groupings' is of less importance than the idea that economic decisions were made by a group smaller than a village or a lineage. This implies that control over productive resources, 'ownership' in a real sense, was vested in these smaller groups. In some societies, 'ownership' and resource management occur at a sub-household level as well (e.g. Sutter 1987: 198), which could also have been the case in Neolithic Europe. Without worrying about the minutiae, let us move to the interplay between household structure and access to status, power, and wealth.

#### **Limitations on household access to status, power and wealth**

Each household, as a self-interested economic unit, can be said to pursue a strategy of accumulation. This should not be equated with some sort of 'primitive capitalism'; rather, each household looks for opportunities to acquire resources, property, favours and obligations that can provide economic and social security and possibly advancement. There may be socially-instituted avenues for 'decumulation', so the accumulative process is not necessarily linear or unidirectional. A major goal is accumulating sufficient resources to establish the households of offspring as viable economic units.

Different households have different degrees of success in the pursuit of their accumulation strategies; yet this does not automatically imply social inequality. Many societies have levelling mechanisms that put a damper on excessive accumulation. Some households

take risks, others manage their resources conservatively. Hazards have varying impacts on households of differing size, composition, holdings, and reserves. But the fact of accumulation and competition at household level does not in itself lead to long-term or permanent inequalities between households.

Each household undergoes a developmental cycle, from founding to dissolution. In his classic discussion, Fortes (1958) describes its five stages:

- 1 Establishment – the new household, possibly still dependent on its parental household(s), builds a house and establishes a farm;
- 2 Expansion – the new household becomes clearly independent and children are born;
- 3 Consolidation – the household expands to its fullest point;
- 4 Fission – children begin to marry and leave the parental household, perhaps associated with the relinquishment of control over household resources from the parental to the filial generation;
- 5 Decline – the final stage, which often contributes to the expansion stage of filial households, if the parental household becomes lodged in them.

Fortes' model assumes a two-generation structure of households and their filia. In many societies, these stages may not be clear cut, especially if the development takes place over three generations as children remain in parental households after marriage and birth of their first children. In polygynous households, different sub-sections of a single residential group may be at several of these stages simultaneously. The household structure is not static, but constantly changing. Similarly, relationships are constantly changing between parental households and those of their offspring, as well as between them and other households into which they have entered into alliances through marriage and betrothal. One effect of this is the transfer of assets from the parental household to its filia.

Another effect is that households in a settlement usually find themselves in some sort of asymmetrical relationship with each other, depending on where they are in the developmental cycle. These social and

economic asymmetries would be characterized as 'inequality' (e.g. Tringham & Krstić 1990: 606) if they were permanent and cumulative. So long as the range of variation in the abilities of different households to accumulate and to disperse assets falls within a very short range, each household finds itself at different times on the plus side and on the minus side. The crucial question, then, is: when do these asymmetries become permanent (or, at least, lasting) and cumulative?

#### **Land, labour and (perhaps) capital in Neolithic Europe**

Among small-scale agriculturalists, as is the case in most societies, land, labour and capital form the elements of the productive system; their control provides access to status, power and wealth. Within household subsistence economies, land and labour are usually critical in determining household production. In most parts of the world today, ability to acquire land is viewed as the primary factor limiting household subsistence production. I have argued (Bogucki 1988), however, that in Neolithic Europe arable land was relatively abundant. Although by the Late Neolithic optimal habitats might have been thoroughly settled, there was still adequate arable land on watersheds and lesser-quality soils. In many parts of temperate Europe, tracts of virgin forest were not broken for agriculture until this millennium. Instead of land, labour supply was a major limitation on Neolithic household production (Bogucki 1988), as in most 'pre-capitalist' societies (e.g. Meillasoux 1972; Bourdieu 1977): the matching argument can be made that control of labour is the basis for social inequality (Bourdieu 1977). Tringham & Krstić (1990) have seen unequal control of labour by households as the basis of social inequality in the Late Neolithic and Copper Age of southeastern Europe; Webster (1990) has argued more broadly for control of labour a major factor in the development of social stratification in prehistoric Europe.

In a household economy, the labour available does indeed define the limits within which the household as an economic unit can produce. Of particular importance is the household developmental cycle. The labour that a particular household can mobilize

depends on where it is in this cycle. A Neolithic household which this year can provide two able-bodied parents and several late adolescent children will in 15 years put forward two enfeebled parents and such of the children as remain in the parental household. Labour does not of itself translate into cross-generational wealth in a subsistence economy. As households fission and decline, the cycle starts anew.

Moreover, a household cannot support an unlimited amount of labour, even at its peak. The parts of the agricultural cycle which require considerable amounts of labour, such as land-clearance, planting, weeding and harvesting, occur as relatively short periods: 'labour bottlenecks' (Richards 1985: 68; Jaeger 1986: 7). The household economy must balance its labour requirements for these bottlenecks against its ability to support this workforce all the year. Timeliness is also an essential element in agricultural operations, and labour must be available in the necessary amount at very specific moments (Shahbazi 1992). Labour, then, is a very inelastic resource, impossible to store, which limits the ability of any one household to produce simultaneously for survival and for accumulation in the absence of ways to transform the productive equation.

Archaeologists have tended to avoid a concept of capital in the production equation of Neolithic societies, believing there is a qualitative difference between kin-based 'pre-capitalist' economies and profit-oriented capitalist ones. The conflation of 'capital' and 'capitalism' is unfortunate. Although these Neolithic societies can be legitimately termed 'pre-capitalist', in that there was not a *category of people* whose sole livelihood came from the manipulation of capital, nonetheless there are elements of the productive structure that are neither land nor labour – yet also did not exist solely for consumption. Livestock can play a dual role both as consumable product and as an investment which figured in a household's accumulation strategy. Can animals be considered 'capital'? Domestic livestock certainly constitute assets beyond their direct return in the form of food.

The idea of livestock as 'investments' is not new in economic anthropology (e.g. Barth

1964), but the orientation towards products has led many subsistence-minded archaeologists to see herds of domestic animals primarily in terms of their food-yield, especially for meat. Yet anthropologists and economists who study livestock-keeping societies see this as only one aspect of an animal economy, which they term 'offtake'. Offtake for meat is an outcome of carefully-considered decisions rather than something done casually, for it means the consumption of an asset. Almost no societies keep livestock which can potentially yield secondary products and traction only for their meat. The return on this 'investment' can come in a variety of currencies: security, prestige, wealth, dowry, alliances, secondary animal products and – ultimately – meat.

#### **Animals and the Neolithic household**

In a vast archaeological literature on the use of animal products by prehistoric peoples, the different uses of the major Old World primary domesticates are well known. Pigs provide meat, hide, bristle and bone. Sheep and goats yield milk and, in the case of sheep, wool in addition to meat, skin and bone. Cattle provide meat, milk and hides. A distinction is usually drawn, appropriately, between the pigs which yield their products only upon death, and the sheep, goats and cattle which provide secondary products.

Cattle are unique among these species in their strength which can be harnessed and converted into animal traction. In discussions of the SPR, animal traction is rightly treated as another secondary product, alongside milk and wool. Yet there is a crucial distinction. Meat, milk and wool are raw materials for food and clothing, for which the animal *converts* nutrient energy into a material, a relatively inefficient process by the time that the humans use these materials. Animal traction, in concentrating and exploiting nutrient energy, *replaces* human labour directly and expands what humans can do. The energy return to humans from animal traction follows a different pathway, suggesting that the relationship between humans and animals used for traction will also be different, even if the latter are ultimately consumed at the end of their useful lives.

*Animals as insurance*

It has become commonplace to view Neolithic domestic livestock as 'insurance' against subsistence shortfalls from cultivated crops, a 'walking larder' in which an investment in time and labour acts as a hedge against future deficits in other subsistence resources. In this discussion, however, two important distinctions must be made. The first is between animal use during the earliest stages of the Neolithic in the Near East, eventually in Europe, and that during the later European Neolithic, while the second is between cattle and smaller stock such as sheep, goats and pigs.

For the earliest stages of animal husbandry in the Near East and in southeastern Europe, a reasonable case can be made for livestock as a subsistence reserve. Sheep and goats, the major components of domestic herds during this period, have the obvious characteristic of small size. Flocks could be culled a member at a time while leaving most of the breeding stock intact. A household could be sustained over a few days by one animal, whereupon another could be killed. Sheep and goats, in the absence of needs for secondary products, lend themselves to short-term liquidation during difficult times.

Pigs, with their prolific reproduction and rapid growth, are even better as a 'food bank'; they have been important in temperate Europe from the middle of the Neolithic until modern times in this capacity, although unsuited to arid regions like the Near East and North Africa. Pigs proved tremendously adaptable and enabled households to have a 'trash compactor' which converted domestic refuse and barely-edible forest products and field waste into meat. Once sheep and goats became valuable producers of secondary products in temperate Europe, pigs would have been the animals that could be liquidated as individual small units.

Where does this leave cattle? Cattle simply do not make sense as an investment for meat alone or only as insurance against agricultural deficits, particularly in an agricultural system in which the household was the primary productive unit. Cattle take almost 4 years to reach their optimal meat weight. Cows and draught oxen have productive lives up to a decade. For a Neolithic household, the

investment made in a cow, bull or ox would have had a different character and purpose from that made in a sheep, goat or pig. Cattle would have been for the long term, to be liquidated only when their value began to decline or in emergency.

Individual households in Neolithic Europe presumably kept small cattle herds. In the forested environment of central Europe, limitations on grazing land and on household labour would have kept the herds small. Neolithic households probably kept no more than in many central European farmsteads today, at most 10 head of cattle and usually far fewer. The smaller the herd, the greater the need to maximize the productivity of each individual (Low 1985: 111–12). A household simply would not have the luxury of raising cattle in such small numbers simply for beef. During the Early Neolithic in temperate Europe, before c. 3500 BC, a possible economic rationale for cattle keeping was provided by dairy products (Bogucki 1984; 1986). Males would have been useful only until reaching their maximum meat weight between 42 and 48 months, with a few being kept on for breeding. Cattle were still a costly investment, for to obtain the long-term productivity of half of the calves born, a household had to absorb the expensive short-term productivity of the other half.

*Animal traction*

The emergence of animal traction in the 4th millennium BC would have provided the missing element which made male cattle valuable beyond their 4th birthday. The birth of a male calf promised a long productive life, rather than a passing windfall of meat four years hence.

Animal traction enabled households to make a quantum leap in their allocation of labour, by multiplying productive capacity beyond that which human labour can provide. The two areas to which animal traction would be applied, tillage and cartage, address two of the most labour-intensive aspects of an agrarian economy: the production of field crops and the transport of bulk goods from remote locations to the residential base.

Singh (1988) has discussed the economics of animal traction for plough agriculture in Burkina Faso (West Africa), one of the few

modern situations in which households using animal traction can be compared with those that do not, although the crops used (millet, sorghum, peanuts and corn) are not directly comparable with European Neolithic wheat and barley. Singh found households using animal traction are able to cultivate an area almost twice that of households without animal traction. He does not entirely attribute this to animal traction, however, since these were also generally larger households (averaging 13.5 members as opposed to 9.9 members for non-traction households) and the direction of causality between these two characteristics is not known. Even correcting for family size, however, households using animal traction brought more land under cultivation. A labour-hour in a traction-using household cultivated about 30% more land than in a non-traction using household. Yields per hectare actually dropped with animal traction for millet and sorghum, but the increased area meant that the absolute yield per household was considerably higher. In the most significant finding, the use of animal traction saved labour input per unit area by an average of 30–40%, particularly on heavier clay soils.

Other studies in West Africa (Barrett *et al.* 1982) indicate that households with ox-ploughs expend 31% less labour time per hectare than households with hand hoes. In Ethiopia, McCann (1984: 4) reports, a frequent rate of exchange is one day's use of a team of oxen for four or five days of human labour. The labour costs involved in maintaining the animals can be spread throughout the year outside of the crop cycle and through members of the household too young to contribute to field labour. In the West African study reported by Barrett *et al.* (1982: 65–6), the average age of those taking care of livestock was 12.6 years, so cattle allow young household members to contribute towards work in which they would otherwise not participate. Animal traction can thus significantly alter the producer/consumer ratio that Chayanov (1986) viewed as the determinant of the economic success of a household.

Oxen pulling wagons would have reduced household labour costs substantially as well. What would have been carted? While subsistence-oriented archaeologists would

look first towards crops, this may not have been the primary use of wagons, and it would have been seasonal in any event. Rather, carts would have been used more for bulk items that needed to be supplied regularly and which would require multiple trips to and from remote locations. An example would be fodder, in the form either of tree branches or of hay. Quite possibly, however, the most important item for carting would have been wood, in the form of timber for construction and for firewood.

Archaeologists have rarely paid serious attention to the fuel requirements of pre-historic settlements, which even in pre-metallurgy times would have been considerable. Firewood should not necessarily be equated with logs. At Bronocice, most of the charcoal remains were from small branches used as firewood (S. Milisauskas pers. comm.), and even the gathering of adequate kindling and small limbs from short distances requires considerable time. Neolithic fires would have been kept burning constantly, and 'temperate' Europe can become very cold even on a summer night. Recent studies of Third World economies have shown that firewood collection is a significant time-consuming household activity, particularly for women, along with agricultural work and water carrying (e.g. Barnes *et al.* 1984; Kumar & Hotchkiss 1988). By hand, it can take several hours daily in some environments. Using draught animals and a wagon, a household could save significant amounts of time in transporting and stockpiling firewood.

The savings in human labour provided by animal traction could be applied directly towards agricultural productivity or to other extractive activities, such as flint mining. Animal traction would have been especially important during the labour bottlenecks of the agricultural cycle. While it is not yet possible to say where the labour bottlenecks were in the Neolithic agricultural system (land clearance and weeding seem the most likely), anything that would have allowed more human labour to be brought to bear would have had a pay-off in agricultural productivity.

The emergence of animal traction in Neolithic Europe transformed the role of domestic cattle from being simply sources of

nutrition to productive assets in the Neolithic agro-pastoral economy. Their role would have been different from that of livestock in primarily pastoral societies where they are exploited for milk and meat. In such societies, cattle are assets and perhaps capital, but in a very rudimentary sort of way. In traction-using agricultural societies, however, cattle transform the *labour* dimension of the production equation, making it extremely elastic. The household that has control of draft animals is able to manage its labour in a way that is less constrained by its developmental cycle than the household without traction. Animal traction also would have affected the labour supply of a Neolithic household in a way that permitted it to develop many other dimensions of its accumulation strategy as well – higher crop yields, small-stock ownership, participation in other extractive and production activities.

#### **Cattle and Neolithic household accumulation strategies**

The ownership of cattle as a productive asset would have introduced an important dimension to the Neolithic household's accumulation strategy. Cattle and their offspring became a means to transfer capital assets across generations. Let us consider the possible ways in which a Neolithic household could acquire cattle.

We can presume that most new households would have been limited in the number of cattle that they could possess. Brideprice, gifts and inheritance could have transferred livestock from parental households to those of offspring. Barter for small stock or other products would allow a household in the upward swing of its accumulation cycle to acquire cattle. Once a household had acquired enough cattle, the birth of calves would have formed a significant part of the accumulation strategy, to propagate the household herd or to exchange outside the household. One also cannot rule out the possibility of theft and rustling from other households, although it is doubtful that such irregular practices would have been common in a tightly-knit Neolithic community. Warfare or raiding between communities, perhaps more frequent (Milisauskas & Kruk 1989: 88–9), would have been another avenue for the acquisition of

livestock. These mechanisms would lead to direct property rights of the household over the stock, their products and their work.

Many societies, both pastoral and agro-pastoral, offer other institutions through which new households or households without adequate livestock can obtain the use of animals. These involve the lending or renting of livestock, either for their subsistence products or for their traction. The lending can be either for as short as a single day (e.g. the use of a team of oxen) or for the life of the animal (e.g. the husbanding of animals by livestock-less household). Loaning out a team of oxen gives a household an additional return on the animals' maintenance, since it is doubtful that they could be in use at all times on one farmstead. Indeed, it may have been more effective for smaller or new households to borrow draught animals rather than commit time and energy to their maintenance. Long-term lending also has economic rationale. If livestock are viewed as productive assets, it represents a way to manage the resources of the cattle-owning household, which retains control over the productive assets and 'value' of the animals while shifting the labour costs of maintenance to others (Starr 1987).

These arrangements involve households as lenders in the expansion and consolidation stage, and households as borrowers in the establishment or decline stage. Such mechanisms for the transfer of capital resources across generations are routine in many societies in order to ensure the eventual establishment of new households as viable economic units. Although an asymmetrical relationship may exist between borrower and lender, the developmental cycle of the new household and a successful accumulation strategy will make this a temporary situation. Once the household reaches its expansion and consolidation phase, participation in such a relationship may cease to be necessary.

The developmental cycle and the accumulation strategy of a household does not always follow an idealized model. The human members of a household are prone to disease, accidents and death. Animal populations are vulnerable to disease, predation and theft. Bad decisions were as much a reality of Neolithic life as they are today. The premature demise of prime breeding stock or draught



oxen would seriously disrupt a household's management of its livestock assets. Several calamities could put a household into a downward spiral from which it would be difficult to recover simply by reallocating other resources (such as by trading small stock, intensifying agricultural production, selling labour or exchanging offspring for brideprice or dowry). Livestock, especially cattle, were not 'money in the bank' for the Neolithic household but an investment which carried risk of failure.

If livestock, particularly cattle, emerged as productive assets in Late Neolithic Europe, the potential was created for some households to find themselves in a downward spiral brought on by hazards, calamities, and mismanagement. Failing households would be limited in the degree to which assets could be transferred to subsequent generations, creating an economic stagnation or impoverishment. Other households, emerging with disproportionate control over livestock, could transfer them to descendants, or loan them to other households in need of either draught animals or livestock of their own to produce secondary products. These households would have found themselves in an upward spiral of acquisition, particularly as livestock multiplied and wise management decisions continued.

### **Emergence of dependency relationships**

We tend to think about the origins of social differentiation in terms of the emergence of élites. Typically, the model is one of a small segment rising above the rest of society to economic or social dominance or to greater authority. Movement is seen as invariably upward, towards the apex of a progressively more exclusive pyramid of social hierarchy. Yet we really do not know much about the process of social differentiation within previously 'egalitarian' societies. Is it always that an élite rises, or is it the disadvantaged who fall? While these are two sides of the same coin, new perspectives on the emergence of social differentiation follow from an examination of the latter possibility. In other words, rather than some individuals or households emerging as an 'élite' at the very beginning of a process of social differentiation, perhaps it was the other way around,

with impoverished households slipping below the societal 'average range' for assets. The apparent development of élites and hierarchies may have been only a later development when the number of disadvantaged began to outweigh those who had retained access to wealth and status.

The interplay of animal traction, secondary products, and agricultural productivity would have set Neolithic households without adequate livestock at a disadvantage. Let us expand on the consequences for a household unable to take advantage of animal traction and to control adequate domestic livestock at crucial times. Peters (1986: 140) reports from Botswana:

Households at the end of the queue for draft power are likely to be kept there not only by the conditions of production but also by labor supply factors. Many exchanges for draft power involve the offer of a household member's labor in return for the use of draft. As a result, cattleless farming households run the risk not only of failing to acquire draft animals early enough to plant at the 'best' times but also of having to provide labor during the crop cycle on the lender's fields at the expense of their own fields. Poorer households may be unable to break out of a cycle of low output and income in part because they lack adequate access to draft and in part because, to borrow draft, they are forced to spend less time on their own fields than they would wish or than is necessary.

Under these conditions, households trapped in a downward spiral could be forced to enter into dependency relationships with others. Such relationships might take a variety of forms. For instance, ethnohistoric sources document the existence of clientship during the 1st millennium AD in Ireland (Gibson 1988), and descriptions of this institution in Celtic society by Caesar and others indicate that it was widespread in later prehistoric western Europe (Champion 1985). Clientship is often mentioned in ethnographic accounts as a consequence of the inequitable distribution of animal traction (e.g. Alverson 1979; Peters 1986). While it would be premature to say that hypothesized dependency relationships between households in Late Neolithic Europe already had the contractual form of patron-client relationships, it may eventually be possible to demonstrate that elements of the social structure of later prehistoric and

early historic Europe have considerable antiquity.

### Conclusion

Is it an overstatement to say that the roots of social differentiation in prehistoric Europe lie in animal ownership, with the development of animal traction as the crucial turning point? Perhaps. Nonetheless, I am persuaded that the opportunities for households to pursue accumulation strategies, constrained by their developmental cycle and environmental hazards and with cattle as a vehicle for the transfer of assets across generations, provided a set of conditions which contained the kernel of variation in access to status, power and wealth. Within such a system, other factors, such as trade in metals and flint, could have added a 'multiplier effect', yet it is difficult to see how trade alone could have formed the basis of an agrarian household's accumulation strategy. Instead, livestock – especially draught animals – provided self-regenerating productive assets in the way that they displaced human labour and provided greater elasticity in the household labour budget.

In a recent article in *ANTIQUITY*, David Anthony & Dorcas Brown declared (1991: 22)

Horses, not wheels, provided the first significant innovation in human land transport, with an effect comparable in scope to that of the introduction of the steam locomotive or private automobile.

Horses and cattle had impacts on different scales and in different ways. Horse riding indeed triggered an important transformation of human mobility and social interaction over long distances. On a mundane level and a local scale, the ownership of livestock, particularly of cattle used as draught animals, may have provided a source of household differentiation equally significant for human social development in the Old World. When archaeologists are interested in exotic tin and copper, trade and exchange, mortuary ritual and burial monuments as proxy evidence for late Neolithic/Early Bronze Age social differentiation, it is all too easy for them to overlook the lowly oxen.

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