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ORIGINAL PAPER

How Wealth Happened in Neolithic Central Europe

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Abstract This paper advances the proposition that three key technological and logistical systems matured during the fourth and third millennia BC in Late Neolithic/Copper Age Europe: transportation infrastructure, durable goods made of metals, and capital investment in oxen used for traction. As risk rather than uncertainty became the dominant condition under which decisions were made, the convergence of these factors permitted individuals and households to accumulate genuine wealth.

Keywords Europe · Neolithic · Wealth · Animal traction · Metallurgy · Risk

Introduction

This paper is dedicated to the memory of Andrew Sherratt. Andrew's métier was the 'hypothesis-generating synthesis', an essay that looked at a large problem in European prehistory to advance a testable proposition that stimulated future investigation. Such was the hypothesis of the Secondary Products Revolution, which caused many of us who were simply looking at animals as sources of meat to think further about their assumptions. Sometimes these propositions have taken a long time to test empirically. While many scholars were persuaded by the concept that secondary products were important in Neolithic Europe, although perhaps not so much of their 'revolutionary' character, it is only recently that techniques for studying lipid residues on pottery have provided persuasive direct evidence for early dairying. The study of the osteological traces of animal traction is still an emerging discipline. Part of Andrew's persuasiveness was the sheer pleasure one derives from reading his essays: their clarity, their organization, their use of evidence. I have assigned them as readings when teaching a freshman writing seminar, as examples to emulate, and I hope that this can be yet another part of his legacy.

In European prehistory, wealth is often part of a triad of abstractions that also includes status and power. It most often is found in discussions of the Bronze Age, in which it

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appears as a fully-formed element in the economic system. The goal of this paper is to examine the creation of wealth in prehistoric Europe, particularly during the two millennia prior to 2000 BC. In particular, I would like to explore the interconnections of durable goods, critical infrastructure, and capital investment as three elements whose development spanned several millennia, but which reached a critical point in their maturation that permitted a fairly sudden burst of what might be called, for lack of a better term, wealth. The purpose of the discussion here is to go back further into the Neolithic to examine the roots of wealth in prehistoric central Europe.

I would define 'wealth' here as the accumulation of personal goods, both common and luxury items, that could be translated into status, be inherited and, with the passage of generations, result in persistent differentiation between the haves and have-nots. Wealth is an abstraction. Property, valuables, and commodities provide it with physical substantiation, but it must be remembered that wealth does not exist until people say that it does. In this discussion, it is assumed that property rights have existed for several millennia, since they are an important prerequisite for agriculture, and that the acquisition and trade of desirable commodities such as flint, amphibolite, and finished stone tools were already familiar practices.

An important distinction must be made between wealth and income. For example, agricultural surplus and herd productivity can be considered to be income. Clearly these are desirable and can produce short-term gains, even a surplus. Eventually, however, the grain and meat are eaten, the seed grain planted the following year, and the surviving animals returned to their pastures. Income eventually can play a role in the management of wealth, but at the very early stage discussed here, the income of the Neolithic farming household was not the foundation on which true wealth emerged. Income is a *flow*, while wealth is an accumulation of assets.

Archaeological discussions of wealth are scarce, for there is a widespread view that it simply could not exist in pre-market economies. I respectfully disagree. In agrarian societies like those found in prehistoric Europe during the Late Neolithic, only some concept of wealth, however simple, can account for their extraordinary efforts to procure resources and for their rapid technological innovation. When wealth enters into anthropological thought, it is often in the form of 'inalienable wealth' (Weiner 1985), in which objects, often perishable or mundane, acquire value due to their biographies and effectively remain the possession of their owners even as they circulate throughout society. Rather than being accumulated with the ability to be used in economic transactions in which their title is lost to the original owner, inalienable goods are dispersed while title to them is retained, thus establishing the identity of their owners in a complex interplay of history and symbol. Archaeologists have sought to identify inalienable possessions in prehistoric contexts, but the assumption that this type of wealth must preclude the existence of alienable wealth in pre-state societies does not seem sustainable. The discussion below makes the assumption that alienable wealth was not an alien concept in Neolithic Europe, whether or not there was a parallel or perhaps intertwined practice of defining identity through the circulation of inalienable possessions.

The Late Neolithic, or Copper Age, Crucible

My focus here is on the period between about 4000 and 2000 BC in central and eastern temperate Europe north of the Balkans, largely but not exclusively in the Danubian drainage. The societies of the fourth and the third millennia BC in this area are those of the

Late Neolithic and what regionally is also called the Copper Age or the 'Eneolithic'. Outside southeastern Europe, this period is generally called the Late Neolithic. It is characterized by many different regional cultures based on pottery form and decoration, settlement types, and burial rites. Among the more prominent are Bodrogkeresztúr, Baden, and Boleráz in the Carpathian Basin, the southern and eastern Funnel Beakers and Globular Amphora north of the Carpathians, and the Horgen, Mondsee, and Cham groups to the west. The final stages of the Late Neolithic are characterized by the widespread Corded Ware/Single Grave complex and its congeners.

During these two millennia, the technological, social, symbolic, and economic aspects of Neolithic society that had emerged over the previous two millennia converged and interacted to produce the archaeological cultures that launched the complex societies of later prehistory. Central Europe during the fourth and third millennia BC was thus a vast crucible in which people moved about, traded, intermingled, intermarried, and fought. In other words, it provided fertile conditions for the creation of wealth.

Precursors: Early Neolithic Households and Hamlets

By 4000 BC, this area had been settled by Neolithic farmers for nearly two millennia. Farming households grew barley and wheat and kept a mix of livestock, about which more will be said later. The distribution of Neolithic households across the landscape varied from region to region and over time, but they generally formed loose clusters. These clusters of households might be termed 'hamlets', in the sense introduced in a very different context by the anthropologist Frank Cancian (1996) and adapted by me (Bogucki 1999) to the central European Neolithic. Neolithic hamlets are clusters of loosely affiliated households which lack any durable and persistent structure for collective action, either internally or externally. Collaboration takes place on an ad hoc basis, and each household conducts its own external affairs. Residential proximity means that relationships (friendly, pragmatic, and antagonistic ones) develop among the constituent households, and certain individuals may be distinguished by their wisdom, skill, luck, or assertiveness, but any asymmetries in status, power, and wealth are transient. Such societies might also be termed 'transegalitarian' in the construction of Brian Hayden (2001), a concept again requiring some adaptation to the central European Neolithic but apt nonetheless (Bogucki 2003).

Household Risk, Skill, Know-How, Initiative

The Neolithic household was the principal organization that dealt with several key abstract concepts that had been a part of human existence since the dawn of time: risk and uncertainty, skill and know-how, and initiative and ambition. These were not really matters that could be addressed collectively, at the scale of the hamlet, nor would they have been confined to individual decision and action. Jan Apel (2001) has drawn attention to know-how and skill, and I believe that the household would have been the key arena for their transmission within and across generations, somewhat akin to the transmission of athletic ability today. Households also would have been the incubators of initiative, and the motivation for technical and social initiative and resourcefulness would have been largely generated within the household.

A large element of Neolithic household management would have required an ability to assess the risks and uncertainties of the economic and social environment and to make decisions based on this assessment. Much of the story of the European Neolithic and comparable societies worldwide is the shifting ways in which they were subject to risk and

uncertainty and how they dealt with it, although we can only assess this speculatively. I propose that there were two stages in the approaches of Neolithic societies to risk and uncertainty in central Europe. The first can be assigned roughly to the period before the middle of the fifth millennium BC, while the second runs from the middle of the fifth millennium to the last part of the third millennium. Thus the first corresponds to the initial establishment of agricultural communities and their consolidation, while the second corresponds to the Late Neolithic or Copper Age crucible.

Earlier Neolithic Risk Aversion

I believe that the early Neolithic farmers of central Europe operated in an environment where they had to cope with considerable uncertainty, which was mitigated by a relatively favorable climate. In the triadic formulation common among those who analyze risks and uncertainties (e.g. Chapman and Ward 1997; Ward and Chapman 2003), they became adept at dealing with the 'known knowns', and they certainly realized, albeit perhaps not self-consciously, that they didn't know what they didn't know, the 'unknown unknowns'. At the same time, I believe that they were not especially comfortable in dealing with the 'known unknowns', which made them highly risk averse.

The principal accomplishment of Early Neolithic societies in central Europe was the geographical expansion of a standard suite of crops and livestock in a consistent type of landscape zone using a proven settlement model (Bogucki 1995). Aside from this, I submit that we do not see great innovations that required deviation from a proven system emerging from the earlier Danubian societies of central Europe. Saying this does not diminish their achievement, which brought agriculture to the doorstep of the Atlantic Façade and Scandinavia within a matter of centuries, but simply to suggest that another step needed to be taken before the wealth creation process could start.

Transforming Uncertainty into Risk

Between 4500 and 4000 BC, while agriculture was being established through the transformation of foraging societies in northwestern Europe and eventually in Scandinavia, the Neolithic communities in central Europe experienced a transformation of their own, in which they began to take more risks rather than to follow the by-now safe and sure path. One indication of this is the proliferation of diverse settlement forms and locations, including shifts from the valley bottom habitats of the early Danubian groups to higher elevations on watersheds. Another is the proliferation of burial practices, such as the construction of long barrows, large open cemeteries, and cist graves. Another is the investment in dedicated ceremonial locations such as the rondels of the Carpathians. Yet another is the exploration of the properties of copper, particularly at locations distant from the sources.

By the late fifth millennium BC, the Neolithic agricultural systems of central Europe had matured to the point where different proportions of crops and livestock could be employed and where farmers could take risks putting crops into poorer soils. This in turn drove innovation in agricultural technology and in herd management. Environmental variability was mapped, and the working landscape was transformed permanently (Bogucki 2008).

By 4000 BC the Neolithic inhabitants of central Europe had become much better than their predecessors at dealing with known unknowns. By building enough elasticity into their economies and social world to deal with risks that they were able to assess with a high

degree of confidence, they had reduced the number of unknown unknowns that made the early farmers so risk averse. They had minimized uncertainty and had come to understand risk, which established the conditions under which wealth could develop.

No Wealth Without Risk

Thus, before about 4000 BC the farming inhabitants of central Europe were making educated guesses, and after 4000 BC they were comfortable with taking risks. Why is this important? It created new opportunities for ambition, and there is no wealth without risks and ambition. I am confident of this statement because if one could get wealthy without ambition and without taking risks, then everyone would be rich. In the modern world, a small amount of wealth can be attributed to luck and celebrity, and a somewhat larger amount can be attributed to inheritance (although fortunes can be lost more easily than they can be made), but most wealth is due to ambitious people taking risks. Entrepreneurs and small businesses create much more wealth than Lady Gaga (American recording artist known for flamboyant costumes c. 2011). But what further conditions are needed to make this happen quickly? For later Neolithic Europe, three factors can be identified: critical infrastructure, durable goods, and capital investment.

Critical Infrastructure: Watercraft, Roads, Wheels

The fourth and third millennia BC in central and eastern Europe also saw the elaboration of the critical transportation infrastructure whose foundations lay in the previous two millennia. A network of paths and trails had existed in central Europe for millennia, even before the appearance of farming. The central European forests were certainly not trackless thickets. By the late fifth millennium BC, such arteries would have been established elements of the working landscape. Major rivers still would have posed barriers, and the main trails that evolved into roads probably would have run along their edges just back from the floodplains. The regular use of fords and crossing points would have established nodal points along these routes into which overland trails would have funneled.

Around 4000 BC, we see a shift in many parts of central Europe to settlement on the higher landscape zones as well as the first evidence for sustained Neolithic land use in piedmont and mountain areas. This movement away from the valley bottoms suggests that people were comfortable moving orthogonally to the major streams. In mountain areas, higher passes that did not contain major rivers also became nodes on the communications network as trails funneled into them on one side and radiated out on the other.

Crossing water barriers and using streams and lakes as thoroughfares required watercraft, and it is likely that the dugouts in use since Mesolithic times became larger and more elaborate. Rivers pose a challenge in that they have current, particularly the high-energy streams of upland areas. An individual rower can easily go downstream, but going upstream against the current would require several powerful rowers, and even then there would be stretches where it would be difficult to defeat the current. Most of the smaller Neolithic watercraft on interior waters probably operated as ferries from one bank to another, much like the *traghetti* in Venice. Major advances in watercraft occurred in coastal and maritime areas. Bronze Age craft such as the Dover Boat certainly reflect preceding centuries of increasing expertise, and it seems likely that along the coastlines, estuaries, and slower streams of lowland Europe, such robust watercraft played a key role in Neolithic transportation infrastructure.

During the fourth millennium BC, we find the first evidence of wheeled vehicles, and the key question is whether they played a role in the transportation infrastructure. It has long been my belief that the major role for wagons was local, moving heavy things within the landscape of the Neolithic hamlet, such as firewood, harvested crops, animal carcasses, and building materials (Bogucki 1993). But one can envision a role beyond the hamlet for short overland movement along the wider trails.

The key point about the development of transportation infrastructure during the second part of the Neolithic was that Neolithic hamlets became part of regional and interregional webs of information and commerce, and these create opportunities for ambition and taking risks. People become more confident that they can control the known unknowns and that they have reduced the unknown unknowns to an acceptable level once they hear about other people doing similar things. They also create pathways for innovation and the fruits of innovation to flow, which brings us to the next key element in Neolithic wealth creation, durable goods.

Durable Goods: Metallurgy as Materials Science

In modern economic terms, 'durable goods' are defined as those lasting more than three years (Baumohl 2005, p. 116). The emergence and refinement of metallurgy finally made it possible to have artifacts that would last for this long and longer in active use. No other category of artifact in active use in Neolithic central Europe (in contrast to curated ceremonial objects, such as the jadeite axes of the fifth millennium BC from the Alps) truly fits this definition. Neolithic pottery certainly broke easily. Flint tools became dull and were discarded or reworked. Ground stone axes from amphibolite to other course-grained rocks are often found broken, or the edge has been salvaged and rehafted until it finally became dull. Bone and antler also break eventually when actively used. Grinding stones were quickly worn down, with their gritty residue abrading Neolithic teeth. Everything other than metal breaks fast and when it breaks, it stays broken. Metals are different.

With copper metallurgy, Neolithic peoples could produce the first truly durable goods. Indeed, when the copper axe does go dull or breaks it can be melted down and recast. The same raw material can be recycled over and over. Metallurgy also becomes a vehicle for the development of skill and know-how, much like flint-knapping and pottery-making but now more of an empirical science than an art. With copper metallurgy, we have the earliest materials science, which eventually led to the development of bronze, the first engineered metal.

Animal Traction: Capital Investment in Uneaten Oxen

We now come to the third element of the wealth-generation triad in Neolithic Europe: capital investment, specifically capital investment in uneaten oxen used for traction. By 4000 BC, cattle had been part of the Neolithic economy in central Europe for nearly two millennia, and they probably were used not only for meat but also for dairy products during this time. What changed around 4000 BC? Animal traction for pulling wagons and ploughs came into widespread use in central Europe (discussed extensively in the papers in Pétrequin et al. 2006), almost certainly after several centuries of experimentation. The emergence of animal traction had a number of effects, including breaking through household labor bottlenecks (Bogucki 1993) and allowing heavier soils to be cultivated,

but its main impact on the creation of wealth was to transform the economic value of male cattle from just meat and hide producers into power. Oxen became worth keeping for a long time, but at a significant cost. They needed to be fed, of course, but for pulling wagons and ploughs, they also needed to be trained. In this training lay another opening for the application of individual and household skill and innovation.

Computer experts often use the term 'killer app' or killer application for a program that is so desirable that it makes the underlying technology take off. For example, the Visicalc spreadsheet led thousands to purchase the Apple II computer in the late 1970s. The usefulness of the term can be extended backward, such that the incandescent bulb can be considered the killer app for electricity, which had limited industrial and telegraphic uses previously.

Animal traction was the killer app for secondary products. It permitted hitherto quiescent animal economies that had existed as a complement to crop agriculture to take off. Wealth-in-animals became the third leg, alongside durable goods and transportation infrastructure, of the Late Neolithic/Copper Age tripod that permitted the emergence of genuine opportunities for ambition through risk-taking.

Wealth Happened Quickly

Once these three tracks converged during the fourth and third millennia BC in central Europe, wealth quickly began to be accumulated. Ambition and risk could be directed toward tangible goals and moderated in response to social and economic conditions. Households that could propagate and transmit their skill and ability in animal management and the production of metal objects now had hitherto unimaginable opportunities for alienable wealth.

Possibly the most telling evidence of this process is the appearance of flint daggers, modeled on central European metal forms from the late third millennium BC, in southern Scandinavia (Apel 2001). Here, durable goods are being copied in a local material, while knowledge about them could only have been transmitted over a developed transportation and communication infrastructure between central Europe and the Baltic region. Meanwhile in Poland and eastern Germany, burials of paired oxen, quite possibly draft animals, are found in Globular Amphora contexts and may reflect the role of these animals as assets rather than food.

Indeed, the creation of wealth may have happened too fast for some Neolithic households. Societies in which a considerable part of household wealth lies in animals are especially prone to what might be termed 'poverty traps', self-reinforcing mechanisms that create conditions from which a household has a difficult time escaping (McPeak and Barrett 2001; Barrett 2008). For example, sudden, unexpected animal loss can be a great shock to an agropastoral household, and households that have fewer assets to begin with can find themselves trapped in a downward spiral. Thus along with sustainable wealth in Neolithic Europe may also have emerged sustained destitution.

Finally, it seems clear that the opportunities to create wealth (or to become impoverished) were ubiquitous throughout central Europe. After 3000 BC we cannot speak of any area as a backwater, stuck in the Danubian world or the post-forager world. All of Europe was interconnected. Eventually, the synergy among metallurgy, transport, and animal wealth led to spectacular regional florescences, such as Únětice, and the opportunities spread beyond central Europe to Wessex and Scandinavia. The challenge for future directions in research will be to explain what factors—presumably self-reinforcing,

increasing-returns mechanisms of some sort—took wealth creation to the next level during the Bronze Age.

Conclusion

This essay has advanced the proposition that during the fourth and third millennia BC over much of Europe several key technological, logistical, and, for lack of a better term, attitudinal factors converged to create a dynamic cultural environment in which it is possible to speak of *wealth* as opposed to income. During the second half of the Neolithic, people became more comfortable with risk and were able to assess opportunities for personal and household gain. Certain individuals and households were more comfortable with risk than others, and they would have been able to refine and transmit their technological and social resourcefulness in assessing risk.

At the same time, several technological and logistical systems, which had been developing for several millennia already, reached a key level of maturity (Fig. 1). The linkage of all of Europe by a network of trails, water crossings, passes, and portages linked hamlets in a web of information and commerce. Copper and eventually bronze metallurgy led to the production of durable goods which were both functional, valued, and recyclable. Finally, animal traction from uneaten cattle was a breakthrough application within the suite of secondary animal products that created genuine wealth-in-animals.

Within this social and economic crucible, ambition flourished. Individuals, and their households, could now have genuine wealth at their disposal, in contrast to the income derived from crops, meat, and barter for consumable materials such as flint. At the same time, the potential arose for unlucky, unresourceful, and risk-averse individuals and households to find themselves in poverty traps, locked in a downward spiral of destitution from which it was difficult to emerge. The Copper Age crucible was a complicated and challenging world, which is precisely what makes it so fascinating to archaeologists today.

Fig. 1 The copper hoard from Bytyń in western Poland, discovered in 1873 and dated variously to the Late Neolithic and Early Bronze Age, combines these three factors in a single iconic image: durable goods; transportation infrastructure (the hoard is believed to have been produced in southeastern Europe or the Mediterranean world); and animal traction (the yoked oxen). Photo courtesy of the Archaeological Museum, Poznań, Poland. Used by permission

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