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No time out: scaling material diversity and change in the Alpine foreland Neolithic

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Abstract

Within a project exploring the difference which high-precision chronologies make for narratives of the European Neolithic, this paper examines the place of material culture in the flow of social existence. In contrast to approaches based on imprecise chronologies and stressing gradual change, we examine increasingly high-resolution dendrochronological data in the Neolithic of the northern Alpine foreland, where sharp boundaries between material styles were not in evidence. While 60-year filters allow a more differentiated analysis of the relative distribution of Cortaillod and Pfyn pottery, higher-resolution dendrochronology enables a very detailed narrative of the rapid introduction of Corded Ware in the Lake Zürich area, highlighting significant differences between eastern and western Switzerland. At the scale of individual sites, Concise shows continuity of the local potting tradition, despite repeated episodes of outside influence. At the short-lived site Arbon Bleiche 3, pottery changes much less than diet. This reveals a complex pattern of exactly contemporary diversity, seen even more sharply at the very briefly occupied settlement of Bad Buchau Torviesen II. To get at agency within the flow of social life, we need as much temporal and spatial detail as possible, close attention to the material, and approaches that allow for nuanced narratives.

Keywords: material culture, Neolithic, Alpine foreland, social practice, dendrochronology, pottery, settlements, timescales, culture concept, analytical scale

No time out: approaches to socially embedded material

A convincing case has recently been made for the quiet emergence of a new vocabulary in approaches to the study of the Neolithic, conceptualising the past through ‘medium abstract terms’ grounded in both theoretical interpretation and detailed scientific observation (Robb 2014, 26). Interestingly, the list of shifts does not explicitly include material culture itself. Despite claims for a ‘new materialism’ (Fowler and Harris 2015, 127), this dimension of Neolithic studies appears to us to remain highly fractured. Strands of several kinds of approach still co-exist, and continue to develop, though in uneven ways.

If culture history seems to many to be interpretively limited, not to say at a theoretical dead end, it still provides the basis for the organisation of large amounts of data at broad temporal and spatial scales and hence remains crucial to the ways in which we model chronological change (right down to the way we classify material: see Wobst 1997). Of the many alternative approaches, few have made a direct impact in our study region and period. A relevant debate on ethnogenesis, hybridity and cultural mixing has largely remained a feature of archaeologies of colonialism (Burke 2009; Liebmann 2013; Silliman 2015; Voss 2015). Post-processual reaction to processual functionalism, in the form of the exploration of material grammar and symbolic action, by contrast, has generally had a very limited spatial scope and frequently explored rather timeless contexts. Finally, in relational ontologies, things themselves are claimed to be active participants in the social world (among many others: Ingold 2000; 2011; Webmoor 2007; Witmore 2007; Olsen 2010; Jones 2014; Weismantel and Meskell 2014; Fowler and Harris 2015), but this has so far rarely been accompanied by extensive case studies (but see Fowler 2013). If relational ontology is the prominent and rather noisy new kid on the block, it is also worth noting the thoughtful, socially oriented reworking of older approaches, for example in the literature in German (such as by: Furholt 2014b; Hafner and Suter 2005; Kienlin and Zimmermann 2012; Röder *et al.* 2013; Suter 2014). These differences often still seem to follow familiar fault lines, between British, American and Scandinavian theorists on the one hand, and continental European practitioners on the other. Yet another approach is provided by the extensive and varied field of evolutionary archaeology, which can be either narrowly concerned with the way the transmission of memes (claimed as culture's analogues to genes) increase an individual's chances of reproductive success (Shennan 2002) or be applied as a more general approach to change, investigating how material culture 'adapts' to ever-changing environmental and social circumstances (Cullen 2000; Hosfield 2009; Bettinger 2008).

In spite of their evident differences, these approaches share some fundamental ideas about how new items and practices could be introduced into prehistoric societies. For most, the default position is that this would happen gradually. Innovations are introduced slowly, reach a peak and then smoothly decline, as in the 'battleship curve' that is the foundation for much culture-historical work. There is no need to invoke any thought or even awareness on the part of prehistoric actors. Indeed, the analogy chosen by evolutionary anthropologists is of 'drift': undirected, small-scale changes due to some kind of copying error and occurring even at times when there are no outside selection pressures (Shennan 2002, 54–6). This is the default position of much relational archaeology, as it stresses the embeddedness of actors in much wider

networks, meshworks or environments mutually attuned to each other and therefore changing in unison, at a comfortable speed.

The alternative possibility, of rapid and directed change, has been seen as the one in need of explanation and has therefore attracted more controversy in some quarters. While not explicitly denied in relational approaches, it has been more or less shelved alongside the notion of a particularly human kind of agency, which had until recently been the main theoretical foundation for exploring diversity and change at the small scale of social action (Dobres and Robb 2000). The idea of rapid cascades of change, in which an innovation is suddenly adopted simply because it has reached a momentum of its own, has been introduced into evolutionary approaches (Bentley *et al.* 2011, 69). This tipping point can be reached for instance when the kind of artefact involved becomes important for signalling group cohesion, or where there is a trend towards following individuals perceived as particularly successful (Bentley *et al.* 2011, 115). Innovations which spread rapidly over larger scales are still often discussed in terms of adaptations to outside pressures, such as environmental degradation, and their effects on social coping mechanisms (Gronenborn *et al.* 2014). Even population replacement, long reviled as theoretically unsophisticated, is enjoying a limited come-back on the basis of archaeogenetic studies (see Hofmann 2015), though these kinds of narratives hold the danger of sidelining local differences. In some archaeological approaches, considerable effort has gone into developing graphs and mathematical models which can help us distinguish between these two options of drift and directed change (Bentley *et al.* 2011, 115; Shennan 2009). Yet in all these traditions, they are seen as mutually exclusive and unidirectional processes.

In sum, there is still no coherent, integrated or widely agreed approach to material culture, which exploits to the full both the specifics of time and place, as mapped by now well over a century of data collection in European Neolithic studies, and the possibilities of multi-scalar analysis. Specifically, our claim here is that material culture assemblages are not helpful when seen as totalising entities, as simply instances of a pre-defined type, but only once objects, contexts and practices are considered at a series of scales and at as fine a chronological resolution as possible. One of our main aims in this paper is hence to show how more complex patterns of diversity, change and continuity can be traced on the basis of a more precise chronology. We show that, even when we are just investigating one kind of artefact, different modalities of change can succeed each other in time quite rapidly, and that different practices can coexist when we look at different scales of analysis. We also argue that fluidity and diversity can be traced not only at the small-scale level of individuals, households or local communities, but also in regional trends.

Our approach, like many others, is based in the flow (DeLanda 2006, 45; Rockefeller 2011) of social practice. It is best caught in the memorable claim of Harold Garfinkel (1988, 103) that there is ‘no time out’.¹ Michael Carrithers (2010, 167) has argued for a ‘cultural project’ which ‘entails the finding and displaying of variation in the cultural rhetorical resources which people use on themselves and one another to establish a scene, make a movement and lead to a performance’. Thus, our approach is broadly speaking contextual, and we explore the potential that non-correspondence, diversity and lack of fit have for conditioning change. Their relevance emerges when we study how the social embeddedness of different kinds of material culture is played out at a variety of temporal and spatial scales. This is what we will examine using a specific case study.

The northern Alpine foreland: temporal and spatial scales

Our subject matter is the material sequence in the Neolithic of the northern Alpine foreland, from the later fifth to the earlier third millennium BC (c. 4300–2800 BC;² Figs 1–2, Table 1), where the well-known, rich data from hundreds of waterlogged settlements provide robust temporal and spatial control for patterns and trends in the development of material culture. Through their well-preserved on-site evidence, such settlements also offer a thoroughly documented domestic context for the use of materials and things. Of these, pottery used in household contexts is the item most often employed to trace sequences of change and it hence also forms the focus of this study, but we additionally draw on other categories of material culture to some extent. The quality of the evidence, with chronologies based largely on dendrochronology (Billamboz 2013; Ruoff and Gross 1991), allows us to look not only at regional variation and what appear to be modest rates of change, but also intra-site differences and some situations of strikingly rapid change.

Our starting point is a view of multiple spatial and temporal scales through which social life was played out. For all the wealth of evidence for settlements, the great majority in this area were probably markedly short-lived, coming and going within a pulse of fewer than 20 years; many small hamlets and villages appeared and disappeared, marking a kind of social fluidity at the local level and in the short term (Ebersbach 2013; Hofmann 2013). There was probably greater continuity, however, in the tenure of local landscapes and their resources, including fields and clearances (e.g. Hofmann *et al.* 2016; Styring *et al.* 2016). How then was material culture employed in this kind of social setting?

The large scale: refining culture history

Looking at pottery only, material culture in most of the Alpine foreland Neolithic shows a remarkable stability against foreign influences, even if those were both substantial and repeated. Most of the pottery through the sequence in our study area had rather simple forms and was quite plain; there are very few decorative elements. The differences between discernible regional traditions were not extreme, but on the whole rather subtle. Traditional concepts of grouping similar objects into archaeological cultures are therefore difficult to apply and rather unsatisfying, although — or because? — the density, quality and temporal resolution of available data are the highest for any Neolithic area in Europe (Stöckli 2009; Hafner and Suter 2003). The widely shared elements in material culture, house architecture and burial customs (which are largely invisible) may be one manifestation of a social strategy of fluid allegiances, picking up and using influences from close and even more distant neighbours without fundamentally changing one's own traditions. These traditions and preferences, possibly even individual skills, variously related to households, local or regional identity groups, wider exchange networks and finally to truly large-scale phenomena like the jadeite axes of the fifth and fourth millennia cal BC (Pétrequin *et al.* 2012) and Beakers in the Final Neolithic. The whole story of the foreland Neolithic is, as in many other situations, a mixture of continuity, the incorporation of new objects, techniques and ideas, and connection to wider worlds.

Traditional concepts of cultural history map dots to create 'boxes' or entities with similar content, labelled as archaeological cultures. Overlaps occur both in time and space, as with the Pfyn and Cortaillod pottery styles between 4000 and 3700 BC (Fig. 3). But with the help of dendrochronologically dated material, greater definition is possible at different temporal scales. We applied some relatively fine-resolution mapping, with greater precision than usually employed in culture history. Mapping of regional pottery styles in time-slices of roughly two generations (60 years) shows that the Pfyn and Cortaillod styles of pottery did not occur in the same areas at the same time (Fig. 4). This also demonstrates the slow spread of Pfyn pottery from Lake Constance to the south and south-west, reaching Lake Zurich in the 38th century and Lake Zug in the 37th century BC. That these kinds of patterns of distribution and change have often appeared smoother and slower is at least partly an artefact of the fuzzy dating frameworks we generally have to employ at such larger scales, as also argued in a recent parallel study of change among pueblo communities in the central Mesa Verde region of the south-west of the United States (Tim Kohler, *pers. comm.*; cf. Schwindt *et al.* 2016).

This is the most common kind of interpretation used to explain gradual change: continuity (often also thought as population or ethnic continuity) combined with slow change under the influence of outside triggers (cf. Stöckli 1995, 32–7; Knopf 2002, 151–7; 259–68; see also Voss 2015). An alternative is to see population movements provoking a gradual change in material culture, for example at the transition from Cortaillod to Pfyn (Gallay 1995, 288). While the way culture history describes how pottery developed from the Cortaillod to the Pfyn style is thus not completely wrong (and was never likely to be), such broad-scale patterns and stock explanations gloss over a lot of variation. Finer-resolution chronology enables other, finer insights into change and diversity. In what follows, we will first outline several possibilities for interpreting these kinds of differences more fully.

Inter-site differences, regional diversity and rapid change

After more than 500 years — from the later fourth into the early third millennium BC — of coarse, thick-walled and mostly plain Horgen pots, a new ceramic style appears with Corded Ware. These new pots are not only made in a more sophisticated way, they also show a wider variety of forms and decoration (Hafner and Suter 2003, 36; Stöckli 2009, 69, 207–9). At the regional scale, this change from Horgen style pottery to Corded Ware is the most striking example of discontinuity in the whole Neolithic sequence of the Alpine foreland, and took place within one or two generations around 2750 BC in the Lake Zurich area (Fig. 5). There are only three sites which possibly date before 2750 BC. Of these, Erlenbach Winkel (2766–2765 BC), has unfortunately not yielded any pottery (Tobler 2002, 23, 26, 43–4). In Pfäffikon Irgenhausen, Weberwiesli, the felling date of 2765 BC is connected with a cultural layer containing a beaker with corded decoration (Altorfer 2010, 251–253, Kat. Nr. 12), and layer 17 of Zürich Parkhaus Opéra (associated with felling periods 2753–2750 BC and 2735–2727 BC; Bleicher and Harb 2015, 121) has early Corded Ware pottery. Latest Horgen pottery with associated dendrochronological dating (2764–2762 BC) is reported from Steinhausen Sennweid at Lake Zug (Röder and Huber 2007, 226–30). Although the correlation between felling phases and cultural layers is often difficult or even impossible, it is remarkable that no cultural layers with mixed Horgen and Corded Ware pottery have been reported.

On Lake Biel in western Switzerland, the earliest Corded Ware influences are visible in a dated layer from Sutz Lattrigen Rütte (2726–2688 BC). The layer below (2763–2752/2746 BC) contained no Corded Ware material (Stöckli 2009, 113; Suter *in press*), another striking example of the apparent speed of change in this period. Rapid and complete changes in pottery

Commented [TD1]: Suter will certainly be the only editor, all others are just contributing... Means that this reference should be 'Suter in press'

Change 'Suter et al. in press' to 'Suter in press' in the refs to Sutz Lattrigen Rütte in **Table 1**

production and house building techniques are also visible in the French Jura region at Lake Chalain and Lake Clairvaux between the Horgen and Ferrières phases, with latest Horgen sites ending around 3100 BC and earliest Ferrières sites built from 3040 BC onwards (Pétrequin *et al.* 2005, 152, fig. 7).

Such striking indications of rapid change have led many authors to postulate not only cultural change but also population change (among others Stöckli 2009, 208; summary in Furholt 2014a, 71; Pétrequin *et al.* 2005, 154, 162). For some, this is connected with wider interpretations of the Final Neolithic horizon, in which warlike people introduced cattle nomadism and patriarchy into a peaceful world ruled by matriarchal societies (as criticised in Röder *et al.* 1996, 273–98, 376–8). Indeed, new archaeogenetic studies principally in central Europe suggest large-scale population influx at this point, at least for the regions so far sampled (and which do not include Switzerland: Haak *et al.* 2015). But as different authors have pointed out, there are many continuities in the Alpine foreland in important aspects of daily life, ritual practices and settlement organisation (Strahm 2010a, 320–3; Bleuer *et al.* 2012, 263–6; Hafner and Suter 2004, 230), as well as in material culture, for example axes (Hafner and Suter 2003, Abb. 11; Stöckli 2009, 69, 196, 207–9). So a total change of population here seems unlikely (Hafner and Suter 2003, 36). In general, house building techniques, settlement layouts and burial customs show a high degree of variability throughout the Corded Ware pottery distribution as a whole and are frequently connected with earlier local traditions, so that one cannot simply claim a ‘unified culture bound by tight rules’ (Besse *et al.* 2012, 281–6; Hecht 2008; Furholt 2014a). If the transition towards the Final Neolithic is analysed in some detail both in space and time, rapid change can be demonstrated for some areas of life, mainly pottery production, but this is counterbalanced by much continuity.

But there are also other options for explaining the rapid and widespread adoption of new pottery styles and perhaps new people. In western Switzerland, the development around 2750 BC is different. Instead of the whole production of pottery being changed, local traditions carry on side by side with Corded Ware pottery. Furthermore, elements of Corded Ware pottery are ‘translated’ into something mostly resembling local pots, but with some Corded Ware style decoration or with a flat instead of a curved base (Stöckli 2009, 114, Abb. 68). As in the east, settlement traditions (location, layout and architecture) remain unchanged in western Switzerland — and burial customs, whatever they were, still remain mostly invisible.

Even if classical interpretations of population changes, based mainly upon typological analyses of pottery, are still debated today, it has been difficult to understand how people completely replaced their ceramic inventory so rapidly and readily, while following 1500-year-old traditions in other aspects of their lives. Here, since technological or functional improvement does not seem to be a factor, we need to evoke social strategy and context. The speed of this change at the beginning of the Corded Ware period in our study region — which is only visible through high-resolution dating — hints at deliberate decisions by potters, perhaps from one generation to the next or even within a single generation, to do everything connected with pottery differently from that point on. It is also remarkable that all the potters in any given settlement and even in a whole region like the Lake Zurich area decided to do so — in strong contrast to earlier examples of high intra-site diversity (as we explore further below).

This is not the place for an in-depth discussion of models describing what might have happened in those societies in transition (but see Strahm 1995; Hafner and Suter 2004, 229; Sherratt 1987, 93–6; Nicolis 2001). Most likely, changes in the social function of pottery as an indicator of contacts and connections are a key here. What strikes us as noteworthy is the contrast between the eastern Swiss Corded Ware, with rapid change only in pottery, and western Switzerland, where hybrid pottery traditions developed, incorporating elements from several styles otherwise regarded as distinct in culture-historical narratives.

The pattern of adopting and transforming Corded Ware ideas and practices at different scales and with different intensities within the small area of modern Switzerland seems to repeat what occurred in general in a great range of different communities across Europe (Doppler *et al.* 2012, 294; Strahm 2010a, 321; Furholt 2008, 25; 2014a). What high-resolution chronologies in Switzerland successfully highlight is that regions only a few days' travel from each other reacted differently, with the merging of traditions rather than complete change. Above all, only a part of life — and of material culture — was affected, while other important aspects like settlement structures remained unchanged.

To help explain regional differences in the uptake of Corded Ware, we could understand it as something new absorbed into a cultural setting (that of Horgen) which was open and already long connected with areas to the north (from which, broadly, Corded Ware must have come). Change followed an old line of contact, communication and exchange. By contrast, in western Switzerland Corded Ware influences led only towards a transformation of local pottery traditions, not a total break, possibly due to another setting and cultural context. Overall, looking in more

detail at large-scale cultural phenomena reveals ever more diversity, and to understand its origins and repercussions radical shifts in scale, both spatial and temporal, are necessary.

Intra-site diversity and models of change

Difference without change

In the first half of the fourth millennium cal BC, there are two distinct pottery traditions on either side of the Jura Mountains, on the western flank of the Alpine foreland: the Néolithique Moyen Bourguignon (NMB) and Cortailod. These traditions can be distinguished by form, decoration and technique, especially tempering. Occasional imports and imitations demonstrate that there were contacts. At Concise sous Colachoz (Lake Neuchâtel), Elena Burri (2007; 2009) has developed a complex model of influence, tradition, learning and cultural transfer. Of the six main occupation layers (that is, newly built settlements) at Concise sous Colachoz, each with several settlement phases, four show a combination of local, Cortailod style and non-local, NMB pottery in different proportions. There are also hybrid forms such as NMB-style pots with Cortailod decoration and technological transfer with Cortailod forms but NMB tempering technique and *vice versa*. As each occupation phase (labelled ‘ensemble’) is dated by dendrochronology, this site offers the possibility to study long-term developments during and following phases of ‘foreign’ influence (Table 2).

Burri’s interpretation is based on ethnoarchaeological studies which suggest the familiar ideas that pottery in the Neolithic was a domestic production undertaken mainly by women (see also Knopf 2002, 259–68), and that if women moved they might be expected to continue to make their own pottery in a new place of residence in the way they had learned it from their own mothers. According to Burri (2007, 169–75; Fig. 6), in E2 some NMB women came over the Jura Mountains into a Cortailod context, and lived side by side with local potters.³ They continued to make their own pottery, but there were transfers and combinations of both tempering and decoration, in both directions. Ten years later, in E3B, mutual influences had already transformed part of the NMB pottery tradition into some hybrid forms, while the majority of pottery continued to be made in local Cortailod tradition. The cultural transfer process came to an end without leading to significant changes in the local pottery style tradition, and NMB potters (perhaps daughters of NMB women) were seen as largely assimilated. In E4A, a new influx of NMB women occurred, but because of the less sophisticated quality of NMB pottery and the preferred use of Cortailod tradition tempering material, Burri (2007, 170) suggests that the number of women coming in was rather small, but possibly caused a kind of revival of NMB fashions, with third-generation potters in the female line of descent again imitating old forms,

though using technically superior local tempering. E4B might hint at another acculturation and transfer process, similar to that in E3B. In E5 NMB pottery is again made, comparable to E4A, but this time with a striking difference: new NMB potters lived only in the western part of the Concise village. At the same time, the directly adjacent and partly contemporaneous settlement E6 might have been founded by people following the Cortailod tradition of pottery, but coming in from another part of the Swiss plateau, installing themselves in a separate settlement. The pottery of E6 slightly differs from the Cortailod-style pottery of locals (in E5), for example by using another temper, and E6 pottery has no traces whatsoever of any NMB tradition (Burri 2007, 170).

Concise sous Colachoz raises two important dimensions of cultural change. First, potters following two different traditions of pottery production could live side by side within one settlement, and there are no hints whatsoever that this was connected with status divisions.⁴ Secondly, nearly 200 years of repeated and perhaps considerable influx of foreign people initiated different processes of separation, acculturation and cultural transfer, but this did not result in far-reaching cultural change. Cortailod-style pottery survived unchanged. NMB elements disappeared not only once, but repeatedly, although up to 50 percent of pottery was made in the NMB tradition in some phases. After at most two generations, NMB traditions had disappeared more or less completely, as potters were ‘assimilated’ (Burri 2007, 176).

Concise sous Colachoz is not a single phenomenon, and there are other sites on the Swiss plateau with NMB-style pottery in Cortailod contexts (Stapfer 2012, Abb. 7–9, Tab. 1). Cortailod settlements seem to have been open to outsiders even if they wanted to go on with their own ceramic traditions. The same openness continues over the centuries and is for instance also evident in our following case studies of Arbon Bleiche 3 and Bad Buchau Torwiesen II. In the other direction, however, from the Cortailod distribution westwards into NMB settlements, there is only rare evidence for the occurrence of single pots in foreign styles. This suggests either that people moved in one direction only, or that pottery may have been viewed quite differently in the west, without any opportunities for creative recombination. This question could only be answered with corresponding future studies in the NMB area.

It seems clear that people producing Cortailod-style pottery could absorb influences, objects and techniques from outside areas without changing their own traditions. Even on-site triggers such as foreign potters living side by side with locals did not cause change in the local pottery tradition. Thus a single category of material culture — pottery — studied at the same site over

several generations, within a high-resolution chronology, already tells a striking story of repeated and intense foreign influence completely absorbed by local traditions without changing them in the long term. Yet whether pottery is a good indicator for such processes can only be assessed when several categories of material culture are taken into account.

Beyond pottery: integrating other strands of evidence over short timespans

Comprehensive studies of artefact patterning involving a range of materials were undertaken in Arbon Bleiche 3 at Lake Constance (Leuzinger 2000; de Capitani *et al.* 2002; Jacomet *et al.* 2004; Doppler 2013). The settlement was founded in 3384 BC and ended with a catastrophic fire in the years 3370 or 3369 BC. Due to this event, a burnt layer preserved the last moments of settlement activity, which can be compared to the cultural layer as a whole, accumulated over 15 to 16 years. As there are also reliable plans of 27 whole or partially excavated houses, detailed analysis of the diversity of finds distribution patterns has been possible (Doppler 2013, Abb. 48, 50). This offers the chance to correlate intra-site diversity with the question of whether change is visible in time spans markedly shorter than one human generation.

Most of the pottery found at Arbon Bleiche 3 can be classified as belonging to a Pfyn/Horgen transitional horizon. However, foreign pottery of Boleráz style (an early phase of the Baden culture) can make up as much as 30 percent of all potsherds found in one single square metre without showing clear concentrations within single houses (de Capitani 2002, 216, Abb. 318). According to analyses so far, most of the foreign-style pottery was produced from local clay (Bozon 2004, 310–12). Somewhat less frequent, but also distributed in different parts of the excavated area, are sherds with Bavarian parallels, mainly in Altheim/Cham style (de Capitani 2002, 217–20). As at Concise sous Colachoz, these foreign influences do not appear to have impacted the production of local pottery, which instead follows its own trajectory towards a simplification of the shape spectrum (the near-disappearance of other ceramic forms in favour of cooking pots), an increase in vessel size and greater wall thickness. The comparison of form frequencies, sizes and sherd thickness between the cultural layer as a whole and the burnt layer on its own has shown some subtle differences that may match the general, longer-term development of pottery (de Capitani 2002, 169–171). But the rather slight changes in pottery production co-exist with much more rapid shifts in other spheres of life.

The animal bones especially reveal interesting patterns. Fluctuations in the proportions of domesticated and wild animal remains could be used to suggest three phases within the short span of settlement (Doppler 2013, 134–5 Abb. 34–7). The first was defined as a pioneer phase

with three houses only, connected to the establishment of the site. It is characterised by high proportions of wild animal bones. The following phase seems to have been one of consolidation and sees larger amounts of domesticated animal bones, but also a definite reduction in overall meat consumption. This phase begins at the same time as the construction sequences for ten further houses. Finally, during the last years of the settlement, a tendency towards an increased consumption of wild animals (red deer and boar) correlates with possible shortages in basic staples (reduced cereal harvests) and possibly a time of crisis (Doppler 2013, 129–44, 208–14).

Things get even more complicated if not only temporal changes in finds assemblages are taken into account, but also spatial diversities between houses and house groups. These were identified on the basis of the systematic contextualisation of tool assemblages, archaeobiological data, indications of house-based pottery styles, the investigation of individual subsistence activities and especially also reflections on settlement dynamics. Given this, complementarity in house inventories and cooperation between groups of houses (even if using different pottery styles) seem plausible (Doppler 2013, 181–8, 215–20). The connected groups of houses consist of two to three buildings which could be labelled as ‘households’ in the sense of basic units of production and consumption. It seems insufficient to interpret the differences in the material culture associated with individual houses in terms of social hierarchy, especially since the houses are very uniform in size and construction materials (Leuzinger 2000, 51–87, 173). Instead, we propose that the settlement structure of Arbon Bleiche 3 should be understood as an agglomeration of groups of people belonging to dynamic, flexible networks (Doppler 2013, 223–4; Hofmann *et al.* 2016), facilitating social integration and mobility between settlements (Doppler 2013, 220).

There are several key aspects to this example. On the one hand, both gradual (e.g. ceramic) and rapid (e.g. faunal) changes occur at an intra-site level. On the other hand, it is striking that the rapid temporal changes are barely visible in the pottery or stone tool spectrum, but concern mainly food production and diet. They might reflect developments within the settlement’s lifecycle as well as reactions to outside triggers, such as climate. Not all materials and practices are subject to change at the same speed and for the same reasons. The changes in pottery, for example, come closest to the model of stochastic drift playing out over long timescales. At Arbon Bleiche 3, these tendencies can only be identified because we are already aware of them thanks to the long-term culture historical framework within which we work. Instead, diet, agriculture and husbandry are more sensitive to short-term changes within the brief life of the settlement (Doppler *et al.* 2012). Furthermore, spatial differences between houses and house groups generate

a large part of the observed diversity. This stresses the need for a holistic study and contextualisation of different finds categories. Certain artefacts and practices are most important at certain social scales. The mixed pattern of differences between house groups (spatial), rapid changes (phases) and long-term drift can only be disentangled by contextualising each material category not only in time and space, but also with regard to its embedded place in different aspects of life. This is also crucial for balancing the interpretive weight we accord to single, all-encompassing explanations of diversity, as our last example shows.

The advantages and disadvantages of the freeze-frame

Within Bad Buchau Torwiesen II, a very short-lived (3283–3279 BC) Late Neolithic settlement on the Federsee in south-west Germany, several specialists have mapped distributions of archaeological, archaeobotanical and archaeozoological finds, as well as analyses of building structures, loam patches and so on (Fig. 7). The generally low density of objects, together with the absence of complete, usable tools and pots, led to the inference that the settlement was abandoned deliberately. The observed spatial patterns seem to reflect the deposition of waste by inhabitants over at least five, but not more than ten years (Schlichtherle 2011, 20). Overall, there was not only a high degree of diversity in house sizes, building techniques (ground-level or elevated) and building materials, but also qualitative and quantitative differences in the distribution of pottery traditions, spindle whorl forms, flint sources, and all kinds of craft and economic activities. House 1, sometimes together with Houses 2 and 3 at the entrance to the settlement, can be distinguished by size and building technique as well as higher quantities of objects and a greater diversity of associated categories. The other houses further along from the village entrance show gradual differences in object density and diversity as well as larger quantities of wild plant resources and fish, and less sturdily built houses (Schlichtherle 2011, 25; Maier 2011, 109, 111, 116).

One archaeological interpretation has focused on quantitative differences and special objects (such as exotic raw materials) and has understood them as indicators of differences in status and wealth, even denoting ‘social classes’ with economic interdependencies and a ‘ranked society’ (Schlichtherle 2011, 27). The observed diversity is so high and encompasses so many different aspects of ‘culture’ that the settlement community could seemingly never have been a technological, typological and material culture unit. Instead, different cultural influences and traditions are argued to hint at an agglomeration of different social units with various origins and traditions which map on to other divisions, with ‘high status’ indicators associated with the late

phase of the local Pfyn-Altheim pottery style, and 'lower status' households showing affinities to the early Horgen-style pottery (Schlichtherle 2011, 22–3).

In opposition to the simplified archaeological reading presented above, the suggested sets of co-occurring traits in fact vary between the different specialist analyses (Dufraisse 2011, Abb. 5; Maier 2011, Abb. 20, 22; Vogt 2011, 22; Schlichtherle 2011, Abb. 25; see above Fig. 7). Analyses of sedimentology, loam distributions and phosphate densities, for example, were interpreted as hinting at shared and relatively uniform general building patterns, with central fireplaces, a main entrance facing towards the settlement road and an additional opening (door or window) at the side walls of the houses (Vogt 2011, 71). Whether the spatial patterns of archaeobotanical macro-remains and differences in the intensity of cattle keeping are status-related is also seen more cautiously by the individual finds specialists (Maier 2011, 116). For example, it is noted that a cattle stand is not necessarily connected with the respective house inhabitants owning more animals or having a better diet (Schmidt 2011, 313). Charcoal analyses show different groupings of houses compared to other kinds of artefacts, while in general the supply of firewood seems to have been individually organised by every single house (Dufraisse 2011, 354).

Although the final synthesis is still forthcoming, it is obvious that intra-site diversities at Bad Buchau Torwiesen II are very complex. Where one draws groupings between different houses seems to be related to the kinds of objects and practices involved, rather than being connected to exclusive, watertight identities repeatedly represented in different aspects of daily life. The more categories analysed, the more complex the observed patterns become. In addition, the short duration and deliberate abandonment of the settlement complicate interpretations, as it remains unknown which objects were taken away when people left.⁵ Without arguing that the interpretation of status differences preferred by Schlichtherle is necessarily wrong, we would like to use this case study to emphasise that many other interpretations are possible. For instance, considerations of age, gender and life cycles, possible production and consumption units beyond the single house level, cooperation and complementarity of activities or materials between houses, and possible seasonal or even year-round absences of people and animals could all have had an important influence on object distribution patterns within the settlement (Trachsel 2005; Doppler 2013, 204–20; Ebersbach 2002, 193–6).

So, close focus on single, short-lived sites with abundant material of varying kinds does not necessarily provide easier answers. On the contrary, the matrix gets denser and we see how

simplistic we may be in other situations and if only one or two categories of objects such as pottery and flint are analysed.

Discussion

We have tried to demonstrate the greater insights into the diversity of practice, rates and kinds of change and the nature of cultural interaction that come from higher chronological (and also spatial) resolution. Even using still relatively coarse blocks of 60 years enables far greater discrimination in the analysis of change, using the example of the Cortaillod and Pfyn pottery styles in the earlier fourth millennium BC. Using more precise dendrochronology — though of course not without related archaeological problems and challenges — the introduction of Corded Ware pottery into eastern Switzerland can be seen as a dramatic and very rapid innovation around 2750 BC, but one which was accommodated in a situation of considerable continuity in other spheres of life, while in western Switzerland there was influence and assimilation of the new style rather than wholesale adoption. The dendrochronologically dated sequence of the Concise sous Colachoz settlement in western Switzerland enables a series of ceramic innovations from over the hills to the east to be tracked in detail, as well as their effects, or more often their lack of effect, on local traditions. Still finer-grained change can be seen in the very short, 15- or 16-year occupation of Arbon Bleiche 3, while the even shorter, five-year-long or so occupation of Bad Buchau Torwiesen II acts almost as a kind of freeze-frame, with perhaps, by conventional expectations, surprising diversity of practice among and between the individual houses — perhaps households — of the small settlement.

Our examples have highlighted the production and use of pottery in particular, with studies of divergence and convergence (cf. Liebmann 2013, 27), and of the introduction, maintenance and varied uptake of ceramic styles. They show, in our view, how much would be lost if we followed the conventional procedure of ‘suck in and smear’ (Baillie 1991), with low-resolution chronology lumping together and smoothing out all sorts of differences, subtle or otherwise. This further reinforces our belief in the flow of social interaction. As Michael Carrithers has put it (2010, 160), ‘human life is a continual transaction, a continual argument. We are always at the point of having to make an account; we have to explain something, we have to act, we have to react, we have to speak or display, we have to pay attention; we continually are in a position of having to deal, or having to negotiate with others’. To get at this kind of agency, we need as much temporal and spatial detail as possible.

This is not to claim that everything is the same, when seen through sharper or more powerful lenses. To the contrary, higher-resolution chronology enables a much greater discrimination among kinds and rates of interaction and change. For a start, in the particular cultural context of our chosen case study, we have stressed from the outset the varied dimensions of social existence, with its pulse of short-lived residence and frequent abandonments and fresh foundations, giving a sense of fluidity to the flow of life, within longer-term tenure of chosen parts of the landscape. Sharp boundaries are not a feature of the potscape here (nor is decoration a prominent feature), and connection and openness may also have characterised the social landscape as well. While the introduction of Corded Ware pottery remains very striking, it was only one of a whole series of introductions and influences; perhaps the extent of the ceramic shift in this instance has as much to do with the scale of change in the networks *beyond* the Alpine foreland as with conditions within it. Comparison with the Concise sous Colachoz context is revealing, where repeated contact and arguably the actual movement of (female?) potters did not fundamentally shift local tradition. With things put into their actual order of appearance and the tempo of change established, we can hope to distinguish between different kinds of social performance (Carrithers 2010, 167) as well as different kinds of significance which pottery could take on. Those in turn can be followed at varying social scales, from the regional, in which integration and porous boundaries can be claimed, within normally slow-changing traditions, to the local or site-specific, in which studies such as those of Concise sous Colachoz, Arbon Bleiche 3 and Bad Buchau Torwiesen II (and indeed a host of others not discussed in this paper) show the extent of directly contemporary diversity. Perhaps there is a direct link between these two dimensions. Traditions could have been maintained for long periods of time (the span of the Pfyn and Horgen styles, for example) *because* the people acting within these contexts and value systems were able to exercise choice and assert more individual allegiances and preferences in their production and use of pottery in daily life, while still being part of a shared existence in many other dimensions.

We have deliberately concentrated on pottery in this paper, but a brief comparison with copper is also instructive (and if more space were available, there is also much to say about stone axes, other lithics, beads, and other material categories). The introduction and use of copper, including the local manufacture of objects shown by the presence of moulds, provides an example of the introduction into the Alpine foreland of a completely new set of material and associated practices (cf. Turck 2010, 42–52; Strahm 2010b) (Fig. 8). It can be dated quite precisely, but although copper is often connected in the literature to far-reaching social and ideological upheavals, we can track different reactions to this innovation by communities with different pottery traditions.

People who produced Cortaillod-style pottery did not integrate the new material as fast and as region-wide as those with Pfyn-style pottery, and they did not produce copper objects themselves (Turck 2010, 45; Fasnacht 1995, 184). Copper appeared from the 39th century onwards and reached its highest frequencies between 3750 and 3625 BC, when nearly every site with Pfyn-style pottery also has both copper objects and mould fragments, showing local production (almost certainly using imported ores or ingots). Settlements where Cortaillod-style pottery is dominant only used — rather than produced, on the basis that there are no moulds — copper objects, in small quantities. A detailed mapping of types of copper objects also shows that in the west ornaments predominate, while people with Pfyn-style pottery had a huge interest in copper axes. The speed of change for the introduction of metal is significantly faster than for the gradual change of pottery styles during the first half of the fourth millennium BC. Generally, the introduction of copper had no observable influence on local traditions, from settlement layouts to house sizes or other aspects of material culture. Copper was simply added to the existing set of objects and copper items coexisted for more than 200 years with their counterparts made of stone (such as axes and beads) or other materials (such as bone awls). After the 36th century BC metal occurrence declined markedly, re-appearing again in the third millennium BC both from south-western and eastern copper sources (Cevey *et al.* 2006, 25; Turck 2010, 49). Once again, a more nuanced chronological and temporal frame enables better characterisation of innovation and its varied uptake and effects. Rather than representing a fundamental stage of socio-technic development, in this particular open cultural context copper looks more like a fashion, which faded in due course.

There are both practical and wider interpretive implications in the approach advocated here. We do not propose doing away with a culture history approach. In practical terms for the study of the Neolithic in Europe as a whole, this has maintained close attention to and detailed knowledge of material culture, in a manner quite healthily resistant to changing theoretical fashions. But its interpretive frames of reference could now (and this is long overdue) radically be extended. One place to start could be by using the debate about ethnogenesis and hybridity, mentioned at the start of this paper. Discussing ethnogenesis, or the transformation of shared consciousness of difference and ideologies of shared and divergent history, ancestry and tradition, Barbara Voss has given a long list (2015, 658–659; cf. Liebmann 2013, 27) of competing and overlapping processes to think about, including ‘diaspora, hybridity, assimilation, bricolage, mestizaje, acculturation, syncretism, and creolization’. Opinion clearly differs on how useful these various terms may be, some favouring hybridity, for example, as an index of radical change (Liebmann 2013, 31), but others seeing it as rather toothless, since so many situations show mixture,

assimilation and amalgamation (Silliman 2015; cf. Voss 2015). The debate is useful because it requires us to *characterise* the nature of social and cultural change, rather than just list traits or observe the many-stranded or polythetic (Clarke 1968, 36) nature of archaeological culture.

One single potsherd can tell the story of an individual (the potter's signature), a specific local or regional pottery tradition (Pfynd style) and a general long-term trend (wall thickness). Rather than categorising process for one kind of artefact (pottery is 'creolised/hybridised'), there are different timescales *within* each object, which can show different processes or flows at different temporal (not just spatial) scales; long-term technological traditions of coil building may coexist with medium-term fluctuations in preferred design and temper or rapid and short-term change in the role which pottery played in communication networks beyond the region. We need good chronologies to understand these intersecting rhythms, especially since there is no easy correspondence between the longest temporal continuity and the largest spatial scale. To get at them, this paper has relied on high-resolution dendrochronology, which is not widely available for the study of the European Neolithic, but formal modelling of radiocarbon dates in a Bayesian statistical framework is the next-best option, and could be much more widely adopted (Bayliss 2009).

Conclusions

Neither evolutionary nor relational approaches seem to us to capture the detailed histories of human agency and engagement which we have advocated here. Many evolutionary approaches tend to generalise, and effectively bypass much sense of agency at all. Relational approaches seek to distribute agency among a whole host of other 'actants'. While both may contribute something to understanding long-running traditions and possible cultural drift, neither helps enough (though we acknowledge the recent modelling of rapid cascades of change in evolutionary approaches) with situations of swift change, at the varying scales examined in this paper, in which people, households and communities take decisions, make choices and put preferences into practice, creating patterns too contradictory to fit neatly into a single model.

The way ahead therefore seems to us to rest in combinations of maintaining traditional interest in material itself, radically extending the interpretive social and cultural framework within which material can be interrogated, from a starting point in the flow of social existence, and pushing the refinement of chronological resolution as far as it can possibly go. So far this approach has no single label. It could be seen in part as an update of what was previously called 'contextual archaeology' (Hodder 1986, 118–46). We have deliberately exploited high-quality evidence from a

particular set of favourable conditions in one part of Neolithic Europe, but it would be a mistake to regard that as some sort of special reservation or to confine the observations made from this dataset to that area alone. Perhaps the most radical move would be to re-energise the concept of culture *history* itself, with renewed and optimistic emphasis on the possibilities now available for writing much more detailed histories everywhere of the flow of social life and the place of material culture in it.

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Figure captions

Figure 1. Location of main sites mentioned in the text. Site numbers are given in Table 1. Background map: Swisstopo (open source).

Figure 2. Main archaeological cultures mentioned in the text and their approximate dates (after Hofmann *et al.* in 2016, table 1).

Figure 3. Map of settlements with Cortaillod-style pottery and Pfyn-style pottery between 4000 and 3700 BC.

Figure 4. Maps of the distribution of pottery styles over time. Each map has a time resolution of *c.* 60 years. 'Transition' refers to various kinds of pottery that combine Pfyn and Cortaillod traits and cannot be classified in chronologically meaningful terms.

Figure 5. The transition from Horgen to Corded Ware in the Lake Zurich area: sites with felling periods (dendrochronology). Blue numbers indicate Horgen style pottery, red numbers Corded Ware pottery. In sites with black numbers the correlation between felling phases and cultural layers was not possible or no cultural layers were preserved at all.

Figure 6. Development of pottery forms and tempering (grey shade: calcareous; white: crystalline) over several settlement phases at the site of Concise sous Colachoz (lake Neuchâtel), in relation to NMB pottery style influences from north of the Jura mountains (after Burri 2007, fig. 198).

Figure 7. Bad Buchau Torwiesen II, different house groupings (after Schlichtherle 2011, Abb. 25, Maier 2011, Abb. 20; Abb. 22; Dufraisse 2011, Abb. 5; Vogt 2011, Abb. 22).

Figure 8. Occurrence of metal objects and moulds in settlements with Pfyf-style or Cortaillod-style pottery during the 39th to 36th centuries BC. Each map has a time resolution of *c.* 60 years. Object and mould symbols without settlement symbols indicate sites without high-resolution dating (data base and mapping: Géraldine Middea, R. Ebersbach).

Table captions

Table 1. List of sites mentioned in the text; see text for details.

Table 2. Concise sous Colachoz: different kinds of NMB-style influences in local Cortaillod style traditions during the 39th to the 35th centuries BC. Columns represent different settlement episodes with their dendrochronological dating, while rows show the relative intensity and kind of influences. Table by authors after information in Burri (2007, 169–176; 2009).

¹ ‘For ethnomethodology the objective reality of social facts, in that and just how it is every society’s locally, endogenously produced, naturally organized, reflexively accountable, ongoing, practical achievement, being everywhere, always, only, exactly and entirely, members’ work, with no time out, and with no possibility of evasion, hiding out, passing, postponement, or buy-outs, is thereby sociology’s fundamental phenomenon’ (Garfinkel 1988, 103).

² Dating is indicated as follows: ‘cal BC’ refers to calibrated radiocarbon dates; short spans with exact years in brackets followed by ‘BC’ refer to dendrochronological dates (e.g. 3766–3763 BC); ranges in centuries BC are generalisations based on dendrochronology. Dendrochronological dates include only A-dated material with preserved sapwood (*Waldkante*).

³ We stress that this is the interpretation of Burri. There is no clear evidence for specialised pottery production.

⁴ One of our anonymous referees raised the very good question of whether raiding and bride stealing could be in operation here. Though plenty of sites have burning episodes, conflict is not generally discussed in depth in the context of the Neolithic of the Alpine foreland (although it is often mentioned as a possible reason for settling on the lakes, see e.g. Mainberger and Mainberger 2010; Pétrequin and Pétrequin 2008, 146; Pétrequin *et al.* 2005). This is in part because of the lack of preserved human skeletal material. But it deserves to be considered further in future research.

⁵ This is in addition to various taphonomic factors which could influence finds densities, for example whether floors were raised (allowing for the accumulation of debris immediately beneath houses) or not. The way in which finds density is measured in the first place is also important for pattern creation; at Bad Buchau Torwiesen II, simple presence/absence of objects is used, rather than density-sensitive methods (such as number of finds per cubic metre of soil).