Land, stone, trees, identity, ambition

Land, Stone, Trees, Identity, Ambition: the Building Blocks of Brochs

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Brochs are impressive stone roundhouses unique to Iron Age Scotland. This paper introduces a new perspective developed from architectural analysis and drawing on new survey, fieldwork and analogies from anthropology and social history. Study of architectural design and constructional detail exposes fewer competitive elements than previously anticipated. Instead, attempts to emulate, share and communicate identities can be detected. The architectural language of the broch allows complex layers of individual preferences, local and regional traditions, and supra-regional communications to be expressed in a single house design. The proposed 'productive households' model moves beyond ideas of competing elites at times of stress, and invites a new debate by expanding a more complex broch concept beyond the Atlantic core.

THE SCOTTISH BROCH H1

The broch, 'that tower of Scottish prehistory' (Hedges and Bell 1980, 87), continues to puzzle Iron Age archaeologists (Illus. 1). These impressive circular buildings survive in Scotland's far north and west, where one can still walk into a two thousand year-old stone structure, built without mortar, and with walls towering more than 10 m above head-height.

The earliest of these dry-stone roundhouses seemingly appear on Orkney around the seventh/eighth century BC (Hedges 1987a, 117) and construction stretched into the early second century AD in southern Scotland (Macinnes 1984, 237; see Illus. 2): almost a thousand years of brochs. The fourth to late second century BC seems to have been a high point of building multi-storey houses with a complex dry-stone wall (Gilmour 2005, fig. 17; cf. Old Scatness, Dunrossness, Shetland Islands, Dockrill et al. 2006, 105). Though five out of more than seven hundred structures still survive close to their assumed original height of around 10 m, outside Britain brochs rarely feature in archaeological narratives. Despite their architectural complexity, they are also usually missing from anthologies of ancient European architecture (with Kostof 1995, 222 as a rare exception). It is easily forgotten that brochs are contemporary with — and structurally similarly complex to — the world-famous Parthenon or circular Greek temples such as the Tholos of Athena in Delphi (Lawrence 1996, 111-14, 137-39). Perhaps brochs are difficult to integrate because they are unique to Scotland and hard to classify. After some 450 years since their first recorded description by Dean Donald Monro in 1549 (cf. Munro 1961, 51), scholars still do not agree on who built them and why, nor on how to name them: brochs, galleried duns or (complex) Atlantic roundhouses (Romankiewicz 2011, 15–21). The present paper wishes to address this debate over the interpretation of brochs by presenting a new approach to their study, and to highlight these fascinatingly complex structures to an audience outside the Scottish Iron Age.

DIFFERENT APPROACHES, DIFFERENT BROCHS H2

Antiquarian excavations of brochs focused on chasing walls and reaching lowest floor levels, producing composite plans and effectively unstratified artefact assemblages. The defensive connotations of the 'broch' term, derived from the Norse word for castle, suited their initial interpretation as prehistoric variants thereof (Childe 1935, 193–206), and their identification as elite residences. Smaller and less elaborate structures, the galleried duns, were described in surveys of the west of Scotland (e.g. RCAHMS 1928; 1988), in contrast to the narrowly-defined brochs. The latter relied on a truly circular plan and the presence of certain architectural features for positive identification (summary in MacKie 2002, 1–2). The less-regularly built duns were regarded as either of lower status or chronologically later. As a consequence of his review of the Iron Age record of the Western Isles, Armit integrated the brochs into a newly proposed category of "atlantic roundhouses" (1990, 59–60; 1992). This term could be further qualified to identify structurally simple or more complex examples (cf. Armit 2005a, 7–8). He also acknowledged that poor preservation may often prevent positive identification of a broch tower that would have been built to great height (Armit 1990, 60; review in Romankiewicz 2011, 19–21). Armit's Atlantic roundhouses, particularly on the Western Isles and Shetland, including brochs and galleried duns, could all represent the 'standard settlement forms of their time and were not only elite residences' (Armit 1997a, 248). While this interpretation levelled previous, hierarchically orientated models (cf. Hill 2011, 245 for review), it was questioned by results from concurrent investigations within the same areas (Sharples 1998; Parker Pearson and Sharples 1999). On the basis of special

landscape locations and complex patterns of consumption and deposition, Sharples and Parker Pearson (1997) regarded brochs as a separate group, at the upper end of hierarchical networks, extending over larger social, economic and political territories than in Armit's definition. Broch architecture represented 'embodiments of boundedness' by controlling land boundaries, access and thus status within, and in competition with neighbouring, units (ibid., 264). This robust debate of the 1980s–2000s circled around what constitutes an Iron Age elite and its different architectural representations in different geographical contexts (e.g. Armit 1997b, 268f). These issues and suggestions for addressing them were recently summarized by Hill (2011, 247-50). It seems that in order to move forward, the debate has to acknowledge the full complexities in Iron Age social and economic relations and their regional if not local variation.

While new excavations could be specifically designed to test the applicability of the different social models, the task of total excavation in modern times has become an almost unsolvable dilemma, given the responsibilities (and costs) of modern post-excavation analyses and the ethics of preserving and presenting successive periods of alteration and use (e.g. Loch Na Berie, Uig, Western Isles: Harding and Gilmour 2000; Old Scatness, Dunrossness, Shetland Islands: Dockrill et al. 2006, 105). New perspectives have recently approached the 'broch' via GIS-technology and phenomenological methodologies (Rennell 2012; Durham 2013), or in the context of wider house biography studies (Waddington 2014).

The underlying question which all these archaeological analyses and debates condense to, and which renders the broch so attractive yet enigmatic, is: "why?". Why did people build brochs (or something that looked similar to brochs)?

A fresh approach comes from architectural analysis, adding a new layer of investigation to test current interpretations. The architectural perspective differs as it first addresses the question of 'how?' before approaching the 'why?': 'how were brochs built?'. Structural data of brochs and architecturally related circular dry-stone buildings, such as wall dimensions and house diameters, were evaluated to test structural capabilities and to reconstruct possible building heights. Analysis of room layouts and access patterns informed about the use of space and spatial arrangements, guided by parameters such as room size and ceiling height, light provision and flow of movement. The important benefit of architectural analysis is its consideration of prehistoric design — the deliberate shaping of plans, but also of volumes, and the implications of three dimensional structures within their landscape context for archaeological interpretation. Tracing dry-stone masonry developments (Romankiewicz 2009a) and plan layout analyses (Romankiewicz 2009b) have both demonstrated the complexities of broch architecture. A comparative study of regional vernacular buildings (Romankiewicz 2011, 131–41) informed speculations about lost building parts and roofing materials (ibid., 159-175). This paper presents a summary of this research and expands from its results to propose a socio-architectural interpretation by approaching the 'why?' via the 'how?': 'what were the building blocks of brochs?

ARCHITECTURAL ANALYSIS H2

Detailed analysis of all aspects of the architectural process — the creation of interplay between material, structure and design — selected the best-preserved circular dry-stone structures in Scotland that retained evidence of architectural complexity. This could be evidenced either by well-coursed dry-stone masonry maintained throughout the wall (Illus. 3a, see Romankiewicz 2009a, 385–86; 2011, 1, 13, 29), inclusion of intramural space, or the construction of a double-wall on ground or upper floor level in which two wall leaves interlinked by lintels formed stable, superimposed units in a complex, aerodynamic system of cavities and corbelling (Illus. 3b; ibid., 29, 105–11, 151, 185). Such a definition based on the presence of one of these constructional criteria does not require all architectural details such as door fittings, internal ledges or stairs to be identifiable within a truly circular plan to acknowledge architectural complexity, as in the narrow definitions of brochs. Thus this study also includes structures variously identified in the literature as ‘proto-brochs’, ‘probable’ or ‘possible brochs’ and galleried duns with complex architectural features (cf. MacKie 1965, 126, 139f; 2002, 2). As architectural analysis demonstrates, the variation even within the narrowly defined broch group as well as the many similarities with other structurally complex roundhouses renders detailed typological differences arbitrary and affected by varying preservation (Romankiewicz 2011, 20, 24–29).

Thus the inclusiveness of Armit’s Atlantic roundhouse terminology has been very useful for this architectural analysis. However, the differentiation between

complex Atlantic roundhouses and broch towers relies again on their modern state of preservation. Armit's broch tower is also a complex Atlantic roundhouse, but a complex Atlantic roundhouse is not a broch tower when no physical evidence for upper wall detailing survives; a definition essentially congruent with the traditional narrow identification of brochs (Armit 2005a, 8). Poorly preserved broch towers cannot be recognized, which risks underestimating the quantity of tower-like structures and their distribution. While the limits of archaeological preservation are of course finite (ibid.), calculations of possible building heights based on wall thickness can demonstrate that complex Atlantic roundhouses were generally dimensioned for building heights of 10 m or more (see below and Romankiewicz 2011, 113–15). Although results cannot ultimately prove that all complex Atlantic roundhouses were built that tall, the separate identification of 'broch towers' may now be less informative, because architectural analysis implies that all structures with complex wall constructions and sufficient wall thickness had the potential to reach tower height even when upper wall indicators are not preserved. In addition, tower-like appearance is not simply an issue of absolute height but also depends on a building's footprint size and setting (see below and Romankiewicz 2011, illus. 214–15). Architecturally, the terms 'broch', 'complex Atlantic roundhouse' and 'broch tower' are interchangeable — and used here as such. The 'broch' term is preferred as it is concise and more widely known, albeit used here in a much wider definition than the narrow traditional one.

LAND: BROCH DESIGN IN ITS PRACTICAL AND EMOTIONAL CONTEXT OF LANDUSE AND TOPOGRAPHY

H1

Brochs were built in different landscape locations, as diverse as the Scottish countryside itself. Preferred broch locations varied regionally and reacted to the local topographical character. For example, almost 60% (i.e. 87 out of 148 analysed sites) were built in elevated positions, the majority in Argyll and Skye. Brochs on level sites, often within 100 m of the shore, dominate in Caithness, Orkney and Shetland (Romankiewicz 2011, illus. 100–102). While this obviously correlates with the geographical character of a region, arguments for specific landscape positions for brochs (in their narrow definition) imply that builders were free to choose specific sites: coastal or defensive (MacKie 2002, 42), or marginal beyond the fertile soils (e.g. in the Western Isles: Parker Pearson and Sharples 1999, 363). A model for Shetland relies on groups being able to move on if specific sites could not be appropriated (Fojut 1982, fig. 7). Such interpretations presume unrestricted access or power to overrule pre-existing patterns of land use comparable to a *landnam* process by new elites within indigenous societies (Cowley 2005 for Sutherland/Caithness), or even by newly arriving people (MacKie 1965).

Fojut (1982) and Armit (1992; 2002) have both argued that brochs controlled comparable units of land, based on broch distributions in relation to soil quality and resource access on Shetland and Barra, Western Isles, respectively. The

close proximity of sites in Caithness questions such arguments (Heald and Jackson 2001). Based on evidence for rebuilding of some Caithness brochs, Barber and Cavers (pers. comm.) have recently proposed that this remodelling may represent short-lived occupancies alternating with periodic abandonment. Environmental studies of broch sites on Shetland have demonstrated intense agricultural regimes. Middens were directly cultivated in proximity to the broch, close to where they were generated (Guttman et al. 2004, 61–62; Dockrill and Bond 2009, 45). Such correlations suggest close agricultural connections between a broch and its immediate surrounds and long-term investment strategies as demonstrated at Old Scatness (Dockrill et al. 2006). Field boundaries at Clevigarth, Dunrossness, Shetland Islands, a few kilometres to the north of Old Scatness have, however, been associated with poorer land quality, perhaps representing extensive farming or pastoral regimes (Turner and Dockrill 2005, 173). Such sites in close proximity may reflect different economic potentials or strategies, more complex systems of share and control, or differing chronologies associated with the brochs.

The question remaining is whether the construction of a new broch represented a manifestation of real power or a statement of ambition within evolving social networks. The supremacy of the broch-builder over the land is still only an assumption. There may have been restrictions or practical limitations for certain locations. Agricultural land may, for example, have been exempt from building over, or the deliberate consumption of fertile lands for building may have been a statement of conspicuous consumption (cf. Parker Pearson and Sharples 1999, 363). Armit has recently addressed such speculations in

convincing detail, arguing for a pattern of ‘redistributive inheritance’ within multi-household communities, where the broch becomes the permanent element while social pre-eminence of individual groups remains dynamic (Armit 2005b, 137–38).

PRACTICAL ASPECTS OF LANDSCAPE POSITIONS H2

The preference for bedrock sites (76% of the analysed structures, Romankiewicz 2011, 75) demonstrates more than a sensible choice for such heavy masonry structures. Bedrock sites also offered ready access to building stones, whether from outcrops or rocky shores. Quarrying bedrock would have altered the local topography and if deliberately targeted, could have advantageously shaped a site. At Underhoull and Hoga Ness, both Unst, Shetland Islands, for example, quarrying was most likely combined with the creation of the surrounding ditches, thus enhancing the sites’ defensible character (ibid., 77–78, illus. 107). Such evidence renders it difficult to determine cause and effect, but rather neatly combines the necessity of obtaining material with the creation of an impressive defensive system. Analogies can be found at medieval castles (ibid., 77).

Obtaining building material by shaping a site might also be identified at Dun Mhaigh, Tongue in Sutherland, Highland, or the hillock sites on Skye and in Argyll. Field investigations suggest that the steep rock faces typical at such sites are not the result of natural frost shatter but that the cliffs on which these brochs were built had been deliberately shaped. Although ancient quarrying evidence is difficult to prove and cannot be dated easily, the recurrence of such

topographical features would imply that quarrying was deliberately used to steepen the hillock edges almost to the vertical, again enhancing the site's defensible character. As another consequence, and probably similarly intended, this renders the broch much more impressive as its outer wall visually merged with the cliff face below (ibid., 77). This argument applies particularly to the so-called 'semi-brochs'. These had been interpreted as deliberately incomplete circles with the open side utilizing the defensive properties of the cliff edge where no wall was apparently needed (overview in MacKie 2000, 302–303). Dun An Ruigh Ruadh in the parish of Lochbroom, Highland, is a case in point. The cliff edge exposes a glacially worn surface, which obviously predates the dilapidated drystone structure on top (Illus. 4a). Close field inspection by the author in May 2013 suggested that originally a fully circular wall had been built very closely to the natural cliff edge (contra MacKie 2000). This would have merged the steep rock face with the broch wall on top (Illus. 4b). A small depression and exposed rubble at the top edge of the scarp coincide with the projected full circle of the broch wall (Illus. 4c). When eroding or collapsing, this area of ground seemingly caused the associated broch wall to fail and collapse, and created the outward distortion of the large stones still visible on either side of the fractured wall (Illus. 4d). At its full circular extent and making use of locally quarried stone and the treacherous cliff face, Dun An Ruigh Ruadh would have been an impressively tall structure on the slopes towering above Little Loch Broom (Illus. 4b). Its seemingly enhanced position would have allowed the builders to achieve more (impressive height) by using less (material and labour) — though at the cost of later collapse.

The integration of a particular topographical situation into broch design, or the reshaping of topography to enhance a desired effect indicates an underlying design concept: an apparent intention to impress from afar — and seemingly with as little effort as possible — until the real character was revealed when close-by. This suggests that the broch-builders were indeed able to select a particular site for both practical (quarrying) and conceptual reasons (enhancing height, defensive character and impressiveness).

GENIUS LOCI H2

As described above, architectural analysis as an analytical tool considers two- and three-dimensional data. Two case studies to reconstruct external elevations of brochs in their landscape context underpin the seemingly deliberate reaction of broch design to topography.

Dun Bharabhat on Lewis, Uig, Western Isles, with its 6 m maximum internal diameter is one of the smallest structures included in this architectural study (Illus. 5a). Despite relatively thin walls, these could have supported a wall height of perhaps 10 m, according to calculations using modern structural engineering formulae (Romankiewicz 2011, 112, illus. 149 and A.77-e). The 5 m-high walls reconstructed here (Illus. 5b) are a more robust estimate, accounting for variation in wall thickness (ibid., A-86). This reconstruction presents little more than half the surviving height of Dun Carloway, only 11 km north-east. In existing definitions, Dun Bharabhat is not a broch or broch tower. However, this takes no account of its setting on a small islet within a small inland loch, surrounded by a rocky ridge that encloses the horizon.

Because of this miniature setting and its small diameter, even the 5 m reconstructed wall height already generate a silhouette comparable with the tower-like character of Dun Carloway, especially when reconstructed with a 45° roof that adds a further 2–3 m to the overall building height. Given the restricted size of its islet (although part of the built-up area is today submerged), and aware of the surrounding topography, the builders of Dun Bharabhat adjusted its dimensions. Despite reducing diameter, wall thickness and thus building height, and therefore saving on material and labour, they arguably still achieved an impressive presence for a structure that was able to evoke the architectural language of the broch within its small-scale setting.

On the other extreme Edin's Hall, Duns in the eastern Scottish Borders is one of the largest structures in the dataset with an internal diameter between 15 m–17.5 m. Its situation on a wide open plateau within a multi-period enclosure renders it difficult to reconstruct its original setting. When reconstructed with a wall height comparable to Dun Bharabhat — here at 7 m — its large plan creates a completely different external geometry: low and squat, with little resemblance of a broch tower (Illus. 5c). In order to reach a proportionally comparable elevation and to dominate its surroundings, the walls would need a height nearing 17 m (Illus. 5d). Calculations of structural potential confirm that its thick walls could have supported such height (ibid., 113, 159 and illus. A.77-h.; see Romankiewicz in press).

It again seems that broch dimensions, including heights, reacted to the topography. When discussing the monumentality of brochs, it is therefore

important not to concentrate on the plan alone, or on total possible building height. To consider the third dimension within a site-specific setting and in relation to a building's footprint size requires acknowledgement that monumentality might have had different forms of creative expression in different landscapes.

Beyond structural evidence, other aspects influenced the choice for certain locations. Orkney brochs were often built upon earlier sites, as the sequence at Howe, Stromness, exemplifies (Ballin Smith 1994). Hingley (1996) and more recently Sharples (2006) interpreted this as a deliberate redevelopment of Neolithic tombs that would have established the broch inhabitants as the mediator between the Iron Age present and an earlier past. Sharples concludes that this was happening at a time of environmental stress and expanding peatbogs (2006, 287–88; cf. Romankiewicz 2011, 82), when connecting with the ancestors, who had seemingly lived successfully off the land before, could safeguard its fertility. While this is internally consistent, the same evidence could be interpreted the opposite way. At Howe for example, the centre of the chambered cairn was seemingly destroyed before the new broch was constructed on top (Ballin Smith 1994, 38). Visibly disturbing and superseding the Neolithic tombs with Iron Age brochs might symbolize the loss of meaning or taboo that had protected these sites before. The intentional encapsulation of the earlier tomb caused serious structural problems at Howe, just as the overambitious integration of the cliff face had at Dun An Ruigh Ruadh. At Howe, Iron Age determination succeeded in the form of more substantial rebuilding. Another reading of this evidence may suggest that the

understanding of the original function of these structures as tombs had been completely lost when the broch was built on top. The Iron Age 're-developers' may have interpreted these substantial circular buildings as earlier houses that could be re-occupied – an interpretation that chimes well with initial results from the author's ongoing investigations into timber roundhouse reuse (I thank one of my anonymous referees for this suggestion).

Whatever the precise interpretation of monument reuse we adopt, it seems that the character of a site had a direct influence on the design and construction of the broch at various practical and emotional levels. Sites appear to have been deliberately chosen to create a particular design. Broch-builders were apparently able to make such deliberate choices or adjust broch design accordingly. Similarities between structures are not only a result of similar geographies but an interplay between a given topography and design intentions that were able to enhance the topographical and emotional charge of a specific site. This concept is known in architectural design as reacting to the *genius loci* (cf. Romankiewicz 2011, 159). It allows exploration of one aspect of why brochs were built — as tall, tower-like houses, evoking a recurrent, recognizable design across different landscapes and with varying resources.

BROCH LANDSCAPES – ACROSS SCOTLAND H2

The narrow, traditional categorization of what defines a broch has resulted in studies concentrating on Atlantic Scotland. The few brochs recorded in the southern lowlands with their apparently late dates of the first and second centuries AD have been discussed as chronological outliers with very different

biographies (MacKie 2007, 1315, cf. 1301, 1304, 1322–23; overview in Macinnes 1984, 237–38). Armit integrated the so-called lowland brochs into his Atlantic roundhouse term (2003, 119), but similar to Macinnes interpreted them as 'new expressions of status and power' by southern elites (ibid., 132). This differs noticeably from his less hierarchical model for the Western Isles, in which he regarded Atlantic roundhouses as 'standard settlement forms' and not as 'only elite residences' (Armit 1997a, 248, see above).

Recent discoveries in north-east Scotland by Hatherley (in prep.) on and around the Tarbat peninsula at Scotsburn, Logie Easter, and at Tarlogie, Tain (both Highland), and excavation of the Black Spout monumental stone roundhouse near Pitlochry, Moulin (Perth and Kinross) (Strachan 2013) together present excavated indicators of a much more widespread and possibly much more frequent phenomenon of complex stone roundhouses. These examples have appeared beyond the narrow geographic and chronological realm of the lowland brochs (contra Romankiewicz 2011, illus. A.7). Circular, massive-walled structures in (north-)eastern, central and southern Scotland, albeit some of these are more mundanely executed, can demonstrate a structural complexity comparable to the north and west, but only when excavated (Romankiewicz 2009a, 386). Evidence at the Black Spout for example underlines that these structures are not 'misplaced Mousas', but integral parts of the local settlement pattern, seemingly inspired from the Atlantic west (Strachan 2013, 64–67, 112). The Black Spout roundhouse was deliberately positioned on a slope at a strategic location overlooking a river junction (ibid., 78). Perhaps similarly to Dun An Ruigh Ruadh, the topography

was exploited to create a more impressive appearance for the ‘façade’ from afar than was afforded to the rest of the building (ibid., 67).

Although not occurring in the same density as in the Atlantic area, the lowland brochs, together with these newly excavated ‘approximations’ or ‘appropriations’ of broch design in a local context, suggest that broch-building had acquired a significance or association in which it was worth investing to create a structure that conveyed a connotation or ‘message’ that could be read and understood beyond the Atlantic region. Even when expressed in local idiom this retained a recognizable, comprehensible meaning across Iron Age Scotland. If this shared message was readable then, these structures can arguably be read similarly today. The dates from Black Spout suggest that this process started in the third to first century BC (at 95% probability, Hamilton 2013, 53), well before the lowland broch phenomenon of the first two centuries AD. Further diachronic and geographic exploration might be worth attempting once Hatherley’s work is concluded.

STONE: MATERIAL TO CONSTRUCT WALLS AS WELL AS COMMUNITIES H1

Noticeable regional variation in broch masonry confirms the use of locally available stone (Illus. 6a-f). For brochs in Orkney, Caithness or the Western Isles only one material was available (sandstone for the first two, gneiss for the latter). The Skye brochs were predominantly built of basalt, the lowland brochs of sandstone. Even in geologically varied regions such as Sutherland, Shetland

and Argyll often one stone type dominates construction — or rather brochs cluster in certain geological areas (Romankiewicz 2011, 99). The different stone types have different structural properties, but calculations for seventy-six sites with sufficient data preserved — including sites previously identified as brochs as well as galleried duns — suggest that the great majority of these could have been easily built up to 10–15m high (based on the thickness of the outer wall of the double-wall construction). Only a small number of the analysed sites fall short of this figure, with maximum heights around 5–6 m (ibid., illus. 150 and 152). Their specific height is seemingly linked to topography as discussed for Dun Bharabhat.

Plotting stone properties against architectural parameters, however, demonstrates a direct correspondence between wall thickness and compression strength of specific stones (Illus. 7). The thickest walls, between 5–6 m, were built of the softest sandstones, predominantly on Shetland and in the lowland areas; basalt or gneiss walls typical for Skye and the Western Isles were on average 2 m thinner (between 3.2–3.6 m total double-wall thickness, ibid., cf. illus. A.76a-b). The latter rocks have a significantly higher compressive strength (ibid., 103; illus. 120). The fact that thinner walls were built of harder stone suggests an economical adjustment of dimensions, to achieve a similar structural soundness by using less material and labour. Such correlations were presumably intuitive, based on locally specific experience, rather than mathematically understood. For example, in regions where thick sandstone walls dominate, the walls of the occasional granite broch are also thicker than the gneiss or granite equivalents in the west (ibid., illus. 124); however, they

are still thinner than the sandstone walls of their neighbouring brochs. This assessment is still valid even allowing for survey bias when wall width is measured at the top of the surviving wall height: better preserved structures would — by nature of the tapering wall — produce thinner wall data; but some of the thickest walls are recorded in Shetland and Orkney with well-preserved structures (ibid., illus. 137).

TALL, TALLER, THE TALLEST? H2

A gneiss wall as thick as a soft sandstone wall could have supported a much taller structure than its sandstone equivalent. Why did Iron Age builders with access to basalt or gneiss not build walls as thick as the thickest sandstone walls and thus achieve greater building height? Instead, wall thickness was seemingly reduced with gneiss, granites and basalts. This implies that brochs were built to comparable heights irrespective of different structural properties of their stone, and that an economical construction was more important than achieving greater height (Romankiewicz 2011, 152).

A persistent argument in broch studies has been their competitive character with every new broch attempting to trump earlier ones with an even taller construction (e.g. Barrett 1981, 214–15; Sharples 2007, 181). Such interpretations imply a social climate of rivalry and underlying conflict. If architectural analysis now suggests that brochs of certain stone material *could* have been built higher but the choice was apparently made to build to similar heights and save on material and labour instead, interpretations regarding competing elites need to be revisited. It may be that structural reasons inhibited

building much beyond 10 m. Alternatively, it may mean that these communities were not competing with each other — at least not via building height. The recurring pattern is that of minimizing construction efforts by reducing materials and labour but achieving a similar effect, as so desperately demonstrated by Dun An Ruigh Ruadh. In this alternative interpretation broch architecture seems more an ideal to aspire to and emulate in order to participate, and thus belong to, the group of broch-builders, rather than to constantly compete and outshine. If local competition were the motive, such cunning designs as Dun An Ruigh Ruadh would arguably be counter-productive, because on close inspection, the wall utilizing the cliff edge for heightened effect would quickly have been revealed as being more appearance than substance.

ETHNOGRAPHIC EXAMPLES OF NON-COMPETITIVE CREATIVITY

H2

This alternative interpretation of broch-building societies might seem difficult to reconcile with current models. Modern, Western cultural perspectives lead us to read the iconic shape, towering height and elaborate construction of broch towers as propagated by an overly competitive social climate. However, where ethnographic analogies of competitive tower-like constructions have been rehearsed (Parker Pearson and Sharples 1999, 360-362), their applicability to broch towers is only implicit from the common locations of brochs on boundaries (ibid., 364). Unambiguous evidence for intergroup conflict is not preserved as weaponry finds are rare, burnt destruction horizons are

exceptional in Atlantic brochs and only few human remains have been recovered. Together, these absences of evidence fail to indicate a climate of prevalent interpersonal violence (ibid., 348, 362; Armit and Ginn 2007, 126; Shapland and Armit 2012, 101, 111).

Anthropological studies can present different notions of creativity in a non-competitive context. In Sawyer's (2012) overview on how to explain creativity, he introduces multiple non-Western examples. By analogy, this suggests that current competitive interpretations of broch-building may be too one-dimensional (for discussion of broch architecture in the context of art and craftworking see Romankiewicz in press). According to Sawyer, individuals in communities relying on cooperation 'emphasize that they are ordinary, similar to, and no different from others. [...] it's [*sic*] important for the work *not* to be different' (Sawyer 2012, 274). Sawyer explains that people creating objects or architecture in such societies have to retain a difficult balance: 'expressing a unique individual voice, while avoiding any aura of superiority [...], and generally don't [*sic*] receive any reward or status for their skill [...]: no one was supposed to be of higher status or superior to anyone else' (ibid., 270). Therefore, in Sawyer's model 'innovation and tradition are not opposed, as in the Western cultural model; they're [*sic*] always intimately and dialectically related' (ibid., 273). In this interplay, broch-building could be explained as groups striving to build similar structures to share the identities created by this type of architecture. Brochs were built to join an imagined community stretching across larger areas than their immediate locale. The benefit would not simply be becoming part of something bigger, but creating a signal of being

connected, cooperative and cooperating. While building tall houses will always contain elements of aspiration and competition, this may have been less endemic but more carefully measured against a neighbouring group on whose cooperation one might have had to rely on other occasions. Striking structural parallels between brochs in close proximity, such as Midhowe on Rousay (Rousay and Egilsay) and Gurness, Evie and Rendall, both Orkney, may display such instances of collaboration and exchange (Romankiewicz 2011, 61, 153).

Sawyer introduces another benefit of creating similar rather than competing objects: 'in small-scale cultures, artworks are supposed to be the same so that they'll [*sic*] be ritually effective' (Sawyer 2012, 274). Ritual connotations to the construction and use of brochs (e.g. Parker Pearson and Sharples 1999, 350–52) may have required an adherence to a unifying broch design to ensure meaningful accomplishment. However, architectural analysis also suggests that this overarching design theme allowed room to respond individually to existing traditions. Brochs varied across regions and were open to developments – the 'balancing act' described by Sawyer (2012, 270). Despite its unifying idea, broch design was not dogmatic.

BALANCING TRADITIONS AND ASPIRATIONS [2]

The different physical properties of the stone types not only equate to different structural properties as discussed above, but also create different masonry patterns. The sandstones laminate into long, even slabs that produce neat, well-coursed masonry (Illus. 6a). A similar although less regular effect can be

achieved in schist (Illus. 6b). The rougher, more intractable gneisses and basalts fracture naturally into angular blocks resulting in less regular masonry patterns (Illus. 6d-e; geological assessment by Fiona McGibbon, cf. Romankiewicz 2011, 99–102, illus. 120). Aesthetical value judgements are of course tainted by a modern familiarity with dressed masonry. The fact that rougher gneiss or basalt walls were still preferred even in regions where pockets of sandstone would have been available indicates that these rocks seemingly created the preferred aesthetics for that particular area (e.g. Isle of Lewis with sandstones around Stornoway; ibid., 101). The preference of certain aesthetics is also expressed by examples where the built masonry pattern did not follow the inherent character of the stone. The sandstone at Clachtoll, Assynt in Sutherland, Highland, was used in large, rough blocks to create a pattern more akin to gneiss or basalt (Illus. 6f). The local material is a hard variant and may have been more difficult to work into neat slabs. However, Clachtoll was built on a west-facing beach looking out to Lewis. Its builders may have developed their aesthetical preferences in dialogue with the gneiss brochs across the water (ibid.). At Glenelg, Highland, on the mainland across from Skye, the local gneiss was neatly worked into plane blocks and slabs (Illus. 6c), apparently imitating laminated sandstone masonry of Orkney and Shetland, not the angular basalt used on Skye. Given the Glenelg gneiss, such masonry patterns would have required particular dressing efforts and are therefore reserved for the visible parts. The upper galleries show less care expended on their faces. Thus within a traditional aesthetics created by the local stone, individual examples sought reference elsewhere, even if this involved additional efforts (ibid., 151, 197). When it came to aesthetics, the

least-effort solution was not always favoured. Such examples seem again to emphasize attempts to emulate and correspond, whether locally or with an outlook further afield.

TREES: STRUCTURAL AND SOCIAL IMPLICATIONS OF A SCARCE RESOURCE H1

The structural building parts that do not survive are the timbers. There is now general agreement based on surviving evidence that brochs were roofed and possibly contained upper floors (e.g. Bu, Stromness, Orkney Islands: Hedges 1987c, 11; Howe, Stromness, Orkney Islands: Ballin Smith 1994, 77; Scalloway, Tingwall, Shetland Islands: Sharples 1998; 30-31, Dun Bharabhat, Uig, Western Isles: Church 2002, 68). The timber source is key for developing reconstructions and carries social, economic and political implications. Despite the generally treeless landscapes of Scotland's north and west (Tipping 2003), the typical broch reconstruction relies on a large amount of timber, which implies the deliberate consumption of a scarce resource (Armit 2015, 185). If seemingly not available locally, where were these quantities of timber sourced? Fojut has rehearsed options and explored roofing solutions that would not leave archaeological traces to explain the relatively low number of brochs with evidence for posts (2005, 192–95). The detail of this argument in the light of new field survey is discussed elsewhere (Romankiewicz and Ralston forthcoming). Fojut's (2005, 196–99) reconstructions still require large structural timbers either transported across Scotland from timber-rich regions, obtained from Norway as a form of timber trade, or available as driftwood. So

far the driftwood option is the only explanation that has unambiguously been demonstrated archaeologically (Taylor 1999, 189; Church 2002, 71), but whether this provided sufficient quantities prior to the eighteenth century deforestations of North America remains unsolved (Fojut 2005, 197–98). Use of driftwood still raises questions regarding control of access, storage, and its structural integrity, but coastal brochs seem likely to have utilized such a ready resource (see Romankiewicz and Ralston forthcoming).

The determining dimension for roof timbers is their span across the interior. Analysis demonstrates that internal diameters were significantly smaller in exposed regions unfavourable for substantial tree growth (Illus. 8). Small internal diameters in Caithness, Shetland or the Western Isles (Romankiewicz 2011, 47, illus. 70) minimized spans to utilize smaller timbers. This clear link between structural design and availability of timbers suggests again — as for the relation between local stone and wall thickness (Illus. 7) — that broch dimensions were adjusted to local resources. It also indicates that broch-builders were perhaps more resourceful with their stone and timber than the 'conspicuous consumption' models like to advocate.

These findings inspired alternative reconstructions to further reduce the requirements for substantial timbers (ibid., 165). Gridshell constructions could employ scaled-up basketry techniques to provide a low-roof elevation, essential for areas exposed to high winds (Illus. 9). The gridshell only requires small timbers, *c.* 5 cm in diameter, which could have grown locally in sheltered pockets. The required maximum of one hundred tree shoots about 3 m long

(for Dun Torcuill, North Uist, Western Isles) could have been yielded from coppicing of carefully managed trees, even in harsh climates, especially if one 'tree' could produce three to four shoots (ibid., illus. A.80-e; see Romankiewicz and Ralston forthcoming). Such small-scale, locally managed woods may escape pollen core analyses, but evidence of narrow-ringed willow and pine at Dun Vulan, South Uist, and Dun Bharabhat, Uig, both Western Isles could represent such locally-sourced and managed examples (Romankiewicz 2011, 143; cf. Church 2002, 72; Taylor 1999, 190).

The narrow-ringed wood also implies that such slow-growing trees were curated over generations. Small-scale but long-term local woodland management, combined with the possibilities of gridshell roofs, suggests sustainable building rather than a profligate consumption of a non-local resource. Long-term woodland management also implies much more stable societies and ongoing land tenure than the outwardly defensive character of brochs might suggest (Romankiewicz and Ralston forthcoming). Changing the standard reconstruction of a broch roof to a gridshell built of small, locally sourced timbers implies a socially secure climate that endorsed future investment, perhaps within developing patterns of inheritance (ibid.).

IDENTITY: BROCHS AS MEDIUMS OF EXPRESSION, FROM INDIVDUAL IDEAS TO COMMUNAL CO-OPERATION H1

Structural analysis has highlighted the various means of expressing local, regional and supra-regional identity. Spatial analysis of plan patterns further

confirms this balancing interplay of tradition and individual expression at different levels. The size of the central circular area, for example, differed substantially as reflected in the different spans for timbers discussed above. However, the total internal space, including spaces within the wall, is surprisingly similar across different regions. While central and intramural spaces created different interior characters, most broch plans achieve between 100–130m^2 of interior ground floor space — comparable with modern bungalows (Romankiewicz 2011, 49). Despite different qualities of space, and perhaps different functions of cells and galleries, general layout arrangements show regional preferences. There is a predominance of axially-arranged patterns in Argyll and Skye, where an entrance to peripheral cell or gallery space was placed opposite the main door. Patterns identified as perpendicular prevail in Caithness, where openings to intramural spaces are clustered around the main entrance. With a light cone falling in through the long, narrow entrance passage, openings opposite would be highlighted; openings next to the main entrance would remain in the dark (ibid., 57–59). Such axial and perpendicular plan patterns have also been identified in recent analyses of timber and stone-walled roundhouses at Broxmouth, Dunbar, East Lothian (Büster and Armit 2013) and north-east Scotland (Romankiewicz in prep.), suggesting comparable spatial organization beyond the Atlantic roundhouse group. An assessment of Neolithic and Bronze Age plan layouts in Scotland's Atlantic zone implies that regional differences in broch plans reflect much older traditions of dividing and using internal space (Romankiewicz 2009a, 390–91; 2011, 45, illus. 69).

BUILDING BROCHS TO COMMUNICATE LAYERS OF IDENTITY H2

Architectural analysis has highlighted the overall similarities in broch design, even when buildings lacking specific architectural detail or which lie outside the Atlantic area are included. Their design created a prominence in the landscape responding to the *genius loci* in a practical and emotional dialogue. They conveyed an impressive, often towering character from afar by exploiting topography to enhance the broch to its best but also most economical result. A recurring theme has been the attempts to reduce material and labour while achieving maximum effect to emulate a certain design. These examples suggest neither conspicuous consumption nor the presence of an elite. I have proposed that similarities may reflect a deliberate adherence to an overarching architectural theme that emphasize links across broch-building areas. Such semblance contrasts with the noted regional differences. Topographical location and local materials (both stone and timber) have proven to be influencing factors for regionally distinctive structural designs, echoed in regionally typical plan layouts.

It thus seems that an overall broch 'language' developed to communicate the importance of domestic architecture in Iron Age lives. Within this overarching theme — viewed from a distance — regional 'dialects' concerning masonry patterns, plan layouts, and structural design can be discerned upon closer inspection, reflecting traditions much older than the broch idea. Brochs could be adjusted to and remained embedded within their local environment and community. This aspect may have represented an important design factor to be identified and acknowledged locally. More explicitly, there was no strict broch

standard. The overarching broch idea was strong but flexible enough to encompass different regional identities and to continue regionally specific expressions within this overall scheme. Different landscape situations, materials and construction methods produced different layouts and internal spaces, but aimed at similarly proportioned external elevations. By identifying regional and local deviation, architectural analysis is able to highlight that the broch group contained more variation than previously anticipated or postulated. The symphony of brochs is made of a cacophony of regional voices.

INDIVIDUAL CHOICES H2

Examples such as Dun An Ruigh Ruadh or Howe reveal that broch-building was not always successful. Structural failure, deformation and collapse indicate that no default template existed which could be secured by hiring expert broch-builders (contra MacKie 2010, 96–97). Broch-building was a process of experiment and experience (Romankiewicz 2009a), of success, failure, and (as Howe suggests), gradual improvement. Occasional deformation and collapse suggest that risks were taken to maximize appearance over structural safety. However, calculations of general building heights suggest that the wall width of the majority of brochs was over-dimensioned, presumably to ensure a stable but also lasting structure (Romankiewicz 2011, 113, cf. 115). Evidence of advances and regressions brings us close to individual choices. In the variation of dimension, structure and design, in success and failure, we gain glimpses of the group, perhaps even the individual decision — a personal prehistory emerges. The different masonry patterns analysed above are a case in point.

Some groups decided to build within the character of the local stone. Others differed from regional traditions by looking beyond the local sphere, which must have been similarly obvious then as it is now. Such variation does not need to conflict with a general perception that they were constructing similar buildings. By creating structures that were recognizable throughout Scotland — and recent discoveries suggest this was happening contemporaneously not just within the Atlantic region — the local broch-builders subscribed to a supra-regional idea, showing connections, cooperation and participation in a far-reaching concept. However, local tradition and individual differences were not lost but integrated, thus allowing for a complex, multi-layered edifice of social identities. While Hill has referred to these layers of relations and identities as 'messy' (Hill 2011, 252–53), it is this complexity that he has urged studies of Iron Age societies to consider in more detail, highlighting the need for cooperation between prehistoric households, locally as well as within larger geographical territories (ibid., 251, also 257). The architectural analysis of brochs has identified such greater resolution of social relations as expressed via the medium of substantial stone roundhouses across Scotland. Gerritsen has described a comparable use of architecture in the context of Dutch later prehistoric houses as constructing 'collective identities, [to define] themselves as groups in relation to their members, to other groups and to the world around them' (Gerritsen 2003, 5). We may still not be able to specifically answer why brochs were built, but can suggest they expressed and mediated different layers of identity — to neighbours near-by or passers-by from afar.

AMBITION: DOMESTIC ARCHITECTURE AS THE MATERIALIZATION OF GROWING HOUSEHOLD CONFIDENCE H1

Structural failures in attempts to build high reveal a general ambition to build tall houses, even where means or skills were seemingly restricted. Analysis showed early stone-built houses to have been constructed in so-called 'composite constructions' (Romankiewicz 2009a, 384). Deformation at Bu, Orkney, presents the best example that such a thick but uncompacted wall core of small stones and loose infill could not be retained within thin wall faces when loaded with a large superstructure. This realization seems to have fuelled improvements by constructing well-layered, coursed masonry across the entire wall core into which the wall faces were properly bonded (Illus. 3a). The change in construction method provided the stable base for tall structures. This improvement, traceable from the start of broch development, argues for an early ambition of Iron Age builders to achieve a certain building height (ibid., 388–89; cf. Armit 2003, 42). Sophistication in construction and application of materials were aspects which groups could seemingly develop. Advancing skill levels may then reflect a gradual shift from communal construction towards more specialization within communities. Such improvements suggest that during the later first millennium BC, broch construction had become a medium for social, economic, possibly political and symbolic expression in the Atlantic zone (Romankiewicz 2011, 202-203).

ARCHITECTURAL ELABORATION AS AN EXPRESSION FOR PRODUCTIVE HOUSEHOLDS [2]

The high end of (preserved) broch-building as represented by Mousa or Dun Troddan, Glenelg, Highland illustrates economic and social success, presumably a prerequisite to construct such elaborate domestic buildings. Although reflecting high masonry skills, their plan layouts and dimensions fitted well within local traditions (Romankiewicz 2011, illus. 69). This contradicts the existence of itinerant professionals applying general building standards. Especially where local stone was used to its best effect, it seems more likely that this was achieved by specialists embedded within local traditions rather than hired-in professionals unfamiliar with the properties of local stone and subsoil (wider argument in ibid., 199–201). Evidence of architectural advancements over time as at Howe (even if phases of occupation may be discontinuous, Cowley 2003, 79–80) allows improvements to be traced at a single site and thus argues for local developments in a climate of growing architectural sophistication.

The results from architectural analysis suggest that broch-building households had access to resources for building impressive stone houses and seemingly managed local woodlands over generations. They worked sufficient land to apparently produce the agricultural surplus which was presumably necessary to engage in such large-scale building projects. Out of their strong local tradition the broch-builders were aware of and reactive to architectural developments in other broch-building regions. The picture emerges of productive households,

who expressed their success and connectedness through elaborate domestic architecture.

The concept of the 'productive household' is borrowed from a social framework proposed by Green (forthcoming), based on the development of the English house between the fifteenth and eighteenth century. Green identified a five-tier structure with the 'great households' of royalty and gentry at the very top, concerned with emphasizing lineage and inheritance to perpetuate their status. Below this, Green argued for a level of 'status households' which had inherited some wealth to allow spare time for education and studies, hence consisting of lawyers, medics or clergy; they also showed interest in their heritage. The middle category were his 'productive households' which were concerned with the here and now. They made a living out of their own achievements, each generation self-sufficient and non-reliant on inherited wealth. The lower two categories consist of the 'exploited households' of labourers and slaves who earned their living from the three households above, and the 'house-less', the vagrant and poor, simply eking out a living. Their lack of a house represents their complete lack of status.

To approach an understanding of broch-building societies of the Early and Middle Iron Age, I propose to equate Green's productive households with the broch-building households. These Iron Age groups who worked areas of land with seemingly growing economic success had developed strategies that allowed them to "make a living" by producing surplus (termed 'self-reliance' by Hill 2011, 252; cf. Dockrill 2006, 106 for the extent of intensely manured

soils). In agreement with Armit's interpretations, these were not elite households focused on expanding their control and seeking justification of their status through emphasizing heritage and succession. They were concerned with production and reflected their present success through impressive homes, but were seemingly also very economical in their efforts to build them. Using Green's ideas, they would have had an eye on the present with little concern about a past. As argued above for Iron Age Orkney, the superposition of new stone roundhouses onto earlier monuments can be interpreted as deliberately replacing or breaking old taboos. In post-medieval times, a new productive household was created at the time of marriage, and marked either by a newly-built house or an inserted lintel-inscription signifying the take-over by the new head couple. This often initiated remodelling of the house. The construction of a new broch in a new area (e.g. Cowley 2005 for Sutherland), in proximity to an existing one (e.g. Keiss Road and Keiss Harbour, Wick, Caithness), or the remodelling of existing brochs (e.g. Howe), may represent a similar consolidation of a new productive household – although of course, (post-) medieval concepts of marriage and household composition cannot serve as a direct analogy to prehistoric systems of household formation. While prehistoric woodland management suggests some inherited resources and a future outlook to maintain conditions for the next productive household, the current one was arguably less concerned with respecting ancient legacies. Instead they aimed to connect with their contemporaries, locally as well as in other regions, by building similar-looking homes.

Green's full five-tier model reflects the post-medieval hierarchical society and of course contrasts with models of heterarchies or segmented societies based on African ethnographic examples, which have recently been proposed for prehistoric Britain and Ireland as more appropriate to explain "middle-ranking societies" (Hill 2011, 245, 248). The equation of productive households with broch households is as far as the present analogy can be applied. Architectural analysis of brochs does not support the identification of elite groups similar to Green's 'great households' and 'status households'. However, the post-medieval productive household also comprised workers and servants, who in Green's model represented not a social ranking but a transitional circumstance relating to age and associated lack of house ownership. The young, unmarried maid could become the married matron of a new household. It was only with growing material richness that the ambitions of these post-medieval productive households changed from focusing on the present to becoming concerned with past legacies. At this stage Green sees previously fluid social circumstances starting to solidify. With increasing wealth, the post-medieval productive household started mimicking the great or status households and adopting patterns of inheritance and lineage. Green interprets this as possessions becoming more personal and hereditary, rendering it much more difficult for the house-less maid to acquire her own household. As a result social ranking became static. While Green is able to develop this argument from historical documents, any prehistoric analogy can only be based on speculation given the limits of the archaeological record. However, growing success of some broch households versus others, as intimated by the different agricultural practices at Old Scatness and Clevigarth (see above), may indicate emerging inequalities.

Green's level of exploited households and house-less groups have so far escaped the archaeological record of Atlantic Scotland. While his two upper household groups are not relevant for the Iron Age (compare with Hill's model of non-triangular societies: Hill 2011), the productive households would have relied on labour and communal support. These social layers must surely have existed; however, the number of brochs of varying complexity, and thus possibly reflecting varying social success, might suggest that the difference between a productive and exploited household could still be expressed within the broch idiom, especially when less well-built or overambitious examples with restricted resources are considered. Green's vagrant and poor may not have left any archaeological record, or may have formed part of the productive broch households. Also, even if only the productive household occupied the broch, the wider community would have been involved in labour and supplying resources and thus must have had some form of link with the brochs and its inhabitants (Sharples 2007, 181). In particular the timber supplies, however extensive or limited, would have involved complex arrangements within the local community and with neighbouring groups regarding woodland management and driftwood control. Regional similarities between brochs could be interpreted as deliberately reinforcing communal identities through the medium of domestic architecture. Overstated competition would have misbalanced fine-grained regional and local relations and networks of cooperation.

Over time Iron Age broch-builders may have become agriculturally more and more successful and social interaction more complex. If the investment into brochs created a form of ownership this must have also catalyzed social and economic dynamics. Growing inequalities between households could be reflected in further variation of architectural elaboration. Within this variation, the tall, solidly-built structure (e.g. Mousa) compared to the cunning experiment (i.e. Dun An Ruigh Ruadh) may well represent subtle strata within social, economic and thus political relations. Armit (2015) has argued for the Western Isles that growing inequality between 'corporate households' resulted ultimately in patterns of inheritance and lineage-based land tenure (cf. Armit 2005b, 131, 138–40), not too dissimilar to Green's conclusions for post-medieval productive households. At this later point in time the option to become the next head of the productive broch household may have lost its fluidity and flexibility. The decline of broch-building and their ultimate abandonment supports the hypothesis that brochs were expressions of a particular social system. They fell from favour when these systems ceased to function.

It should also be remembered that the analysis has covered a period of almost thousand years, from the first 'proto-brochs' emerging around 700 BC until broch-building was finally abandoned in the first centuries AD. Construction, alteration and re-occupation would surely have produced change as a result of shifting social and economic circumstances and growing skill levels. The structures we encounter today are summaries of this history. However, the question of what developed first, broch architecture or a shared identity of self-

reliant households across wider geographical units, is difficult to answer. Britain-wide developments towards 'community identity' in the Early Iron Age (Haselgrove and Pope 2007, 11) seemingly found their specific expression in Scotland's north and west in massive-walled stone architecture. The gradual formation and expression of this new social system seems intimately linked with the confidence of building stone roundhouses as recognizable landscape features, and the commitment to the associated expenditure. An emerging identity of agriculturally successful, increasingly self-reliant households and its expression via more and more complex stone architecture seems to have developed hand in hand. Once linked, the architecture and its associated identity presented an aspiration to be emulated by others, as described above. As this process can only have been gradual, there may have been several geographical origins. The interpretation sought here is that of broch architecture as a dynamic process in which evolving social and economic relations are reflected and reinforced through massive-walled houses. This would place brochs within wider trends of contemporary substantial roundhouse architecture across northern Britain (Haselgrove and Pope 2007, 8; cf. Hingley 1992). It also renders the term 'complex Atlantic roundhouse' very attractive for emphasizing that these stone roundhouses were part of a zeitgeist that found expression in timber in more wooded regions. While the architectural achievement of complex Atlantic roundhouses (or brochs) remains phenomenal to the present day, the stimulus for building substantial residences can only be investigated as part of a much wider trend that is obviously less well-preserved when built with turf and timber (Romankiewicz in prep.).

CONCLUSION H1

Architectural analysis can of course not fully answer why brochs were built, but it can provide fresh insights into underlying social and economic complexities. By studying broch construction and design the analysis is able to identify different levels of expressing identity in the Iron Age through the medium of domestic architecture: supra-regional, regional to local and individual (in response to Hill 2011, 250). The process of building a broch, preparing the ground and gathering stones, timber and people created an impressive icon that presented an outwardly recognizable cultural coherence. This concept was predominant in the Atlantic core, but included other areas across Scotland, and was still strong enough to be applied in lowland Scotland into the second century AD. Over almost a thousand years, broch design developed a message that was widely understood and regarded as aspirational.

On closer examination each broch responded to its setting, the inherent properties of the local stone and seemingly also to now-lost, locally available timber and thatching materials. The possibilities of a gridshell roof based on evidence for small, slow-growing timbers suggest that communities even in inhospitable areas could procure their own broch-building resources locally. This would imply a stable social climate in which such resources could be curated for the next generation. Broch construction details show local and regional traditions and layouts, but with room for experiment, advancement

and individual decisions. Structural calculations indicate that brochs were built to similar heights, which reduces the case for overt competition via building height and suggests an intended coherence in exterior design. I have argued that these results reflect productive households embedded within or representing the whole of local communities; a model developed from Green's post-medieval 'productive household' concept. These prehistoric productive households appear assured in their own potential, show an ambition to display their present success, and were seemingly aware of wider roundhouse developments across northern Britain. As with interpretations of substantial timber roundhouses, large domestic buildings need not necessarily represent social and economic competition or stress. The stone-built presence of brochs can easily lead interpretations to overstate competitiveness, and by implication, intergroup violence and warfare. Results from architectural analysis indicate forward planning and careful resource management by local groups, along with participation in wider concepts. This suggests that interpretations should balance previous emphasis on competition, stress and hostility with more positive notions of intergroup cooperation in carefully concerted social and economic interactions.

Effective use of their resources — land, stone and trees — enabled the construction of impressive homes that created local, regional and supra-regional identities. These buildings displayed the ambitions of successful communities, which resonated with other groups, not simply in competition, but also in direct communication, balancing tradition with innovation and aspiration. What the broch created was something as old and as new as it could

be at the time: a statement of ambition, contacts, potential, tradition, individuality and belonging on very different levels – the building blocks of a multi-layered architectural design reflecting multi-layered societies.

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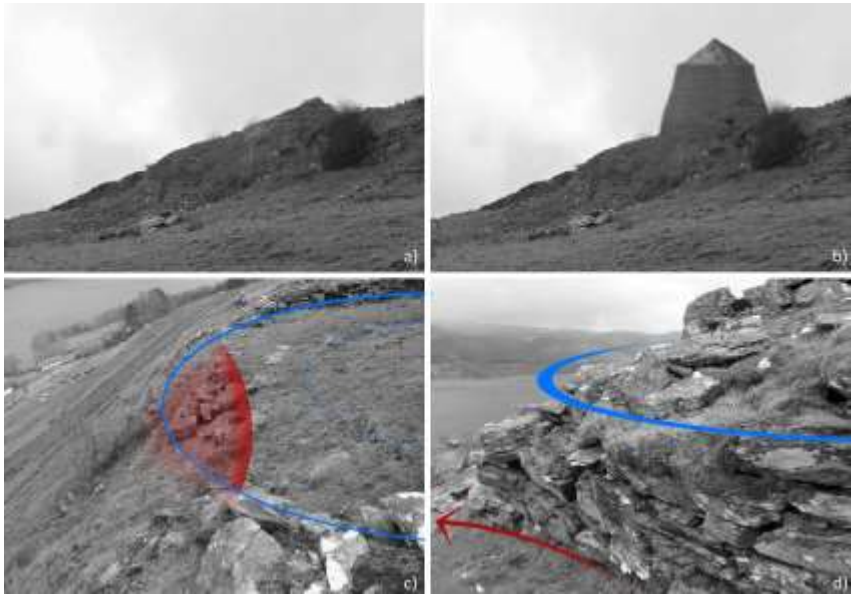
Illus. 1 The broch of Mousa, Dunrossness, Shetland Islands, still preserved to a height of 13 m (Photograph: T. Romankiewicz)

Illus. 2 Map of Scotland showing the location of sites mentioned in text.

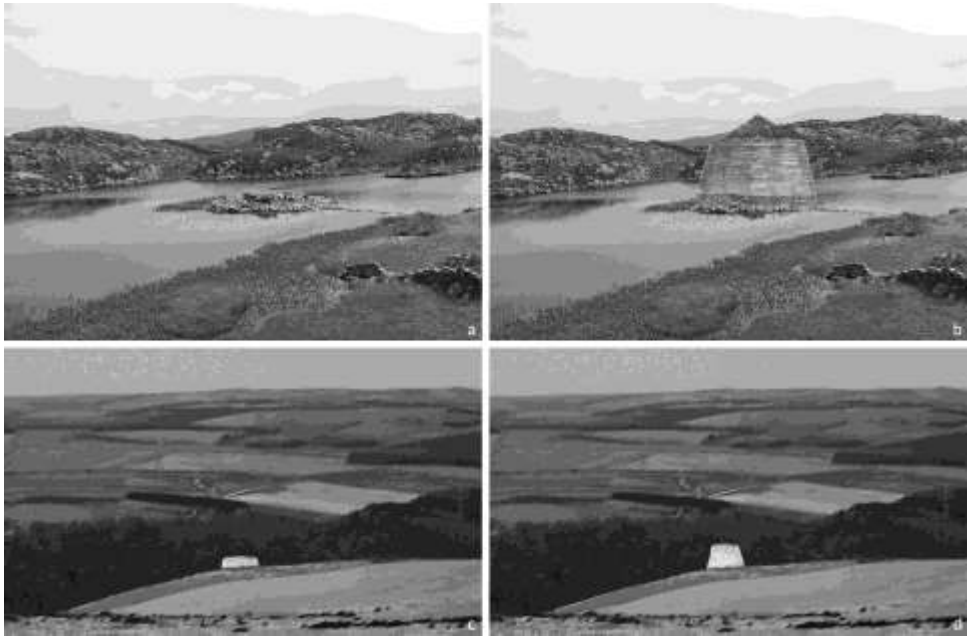
(Source: T. Romankiewicz)

Illus. 3 Different types of broch wall construction: a) well-coursed drystone masonry maintained throughout the wall core (Broch of Borwick, near Yesnaby, Sandwick, Orkney Islands); b) double-wall construction consisting of an inner and outer wall leave interlinked by horizontal lintels (Dun Troddan, Glenelg, Skye and Lochalsh, Highland) (Photographs: T. Romankiewicz)



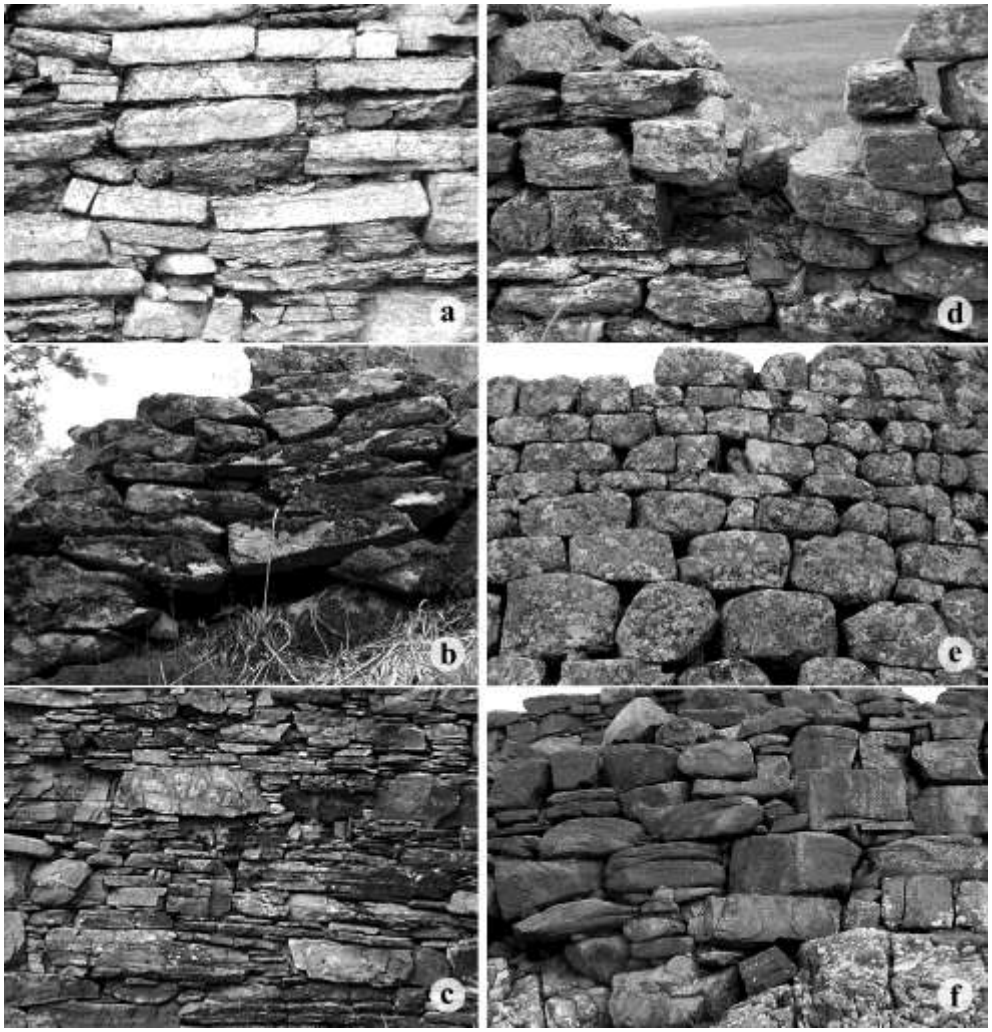
Illus. 4 Dun An Ruigh Ruadh, Lochbroom, Sutherland, Highland: a) as preserved in May 2013; b) the reconstruction shows a complete circular broch wall built of local stone merging with the steep rock face to create the effect of a much taller structure; c) small depression and rubble exposed at the scarp's

edge (area highlighted in red), the collapse of which seemingly caused the failure of the projected circular broch wall (blue outline of inner and outer wall face); d) red arrow marks the outward distortion of stones in northern broch wall face caused by the collapse of the western part of the wall; the blue circle indicates the original circular wall line (Photographs: T. Romankiewicz)

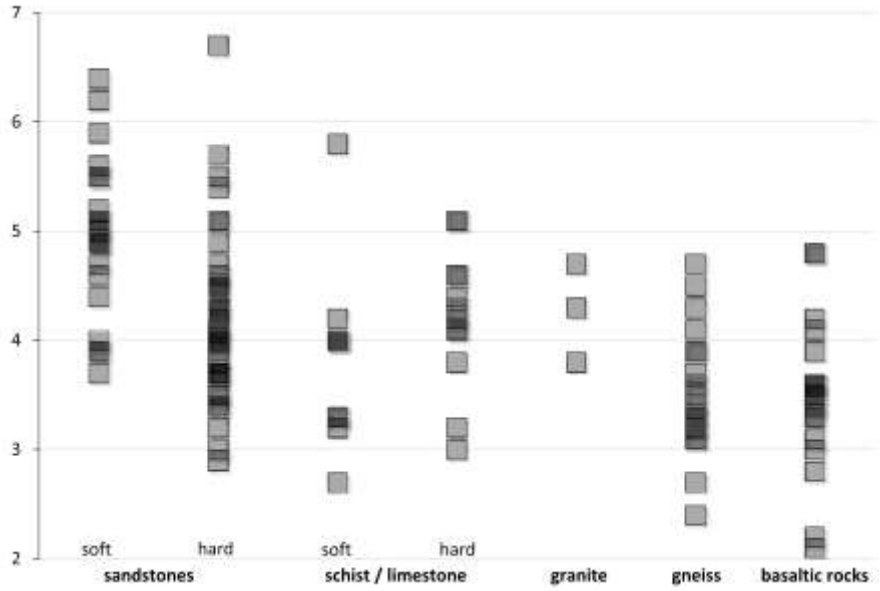


Illus. 5 Dun Bharabhat, Uig, Lewis, Western Isles, 6 m maximum internal diameter: a) as preserved in July 2005; b) reconstruction with 5 m wall height and a 45° roof resulting in about 7 m overall building height (Photographs and reconstruction drawings: T. Romankiewicz, after Romankiewicz 2011, illus. 214).

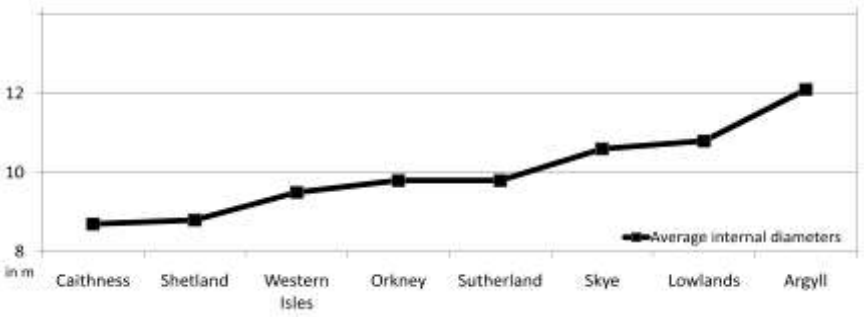
Edin's Hall, Duns, Scottish Borders, 15 – 17.5 m internal diameter: c) reconstruction with 7 m wall height and low roof; d) reconstruction with 17 m wall height in comparison in order to reach similar external proportions as the reconstruction of Dun Bharabhat (Photographs and reconstruction drawings: T. Romankiewicz, after Romankiewicz 2011, illus. 214 and illus. 215)



Illus. 6 Masonry patterns built of locally available stone material: a) sandstone: Hillock of Burroughston, Shapinsay, Orkney Islands; b) schist: Druim An Duin, North Knapdale, Argyll and Bute; c) gneiss: Dun Troddan, Glenelg, Highland; d) gneiss: Dun Borve, Barvas, Lewis, Western Isles; e) basalt: Dun Hallin, Duirinish, Skye, Highland; f) sandstone: Clachtoll, Assynt, Sutherland, Highland (Photographs: T. Romankiewicz)

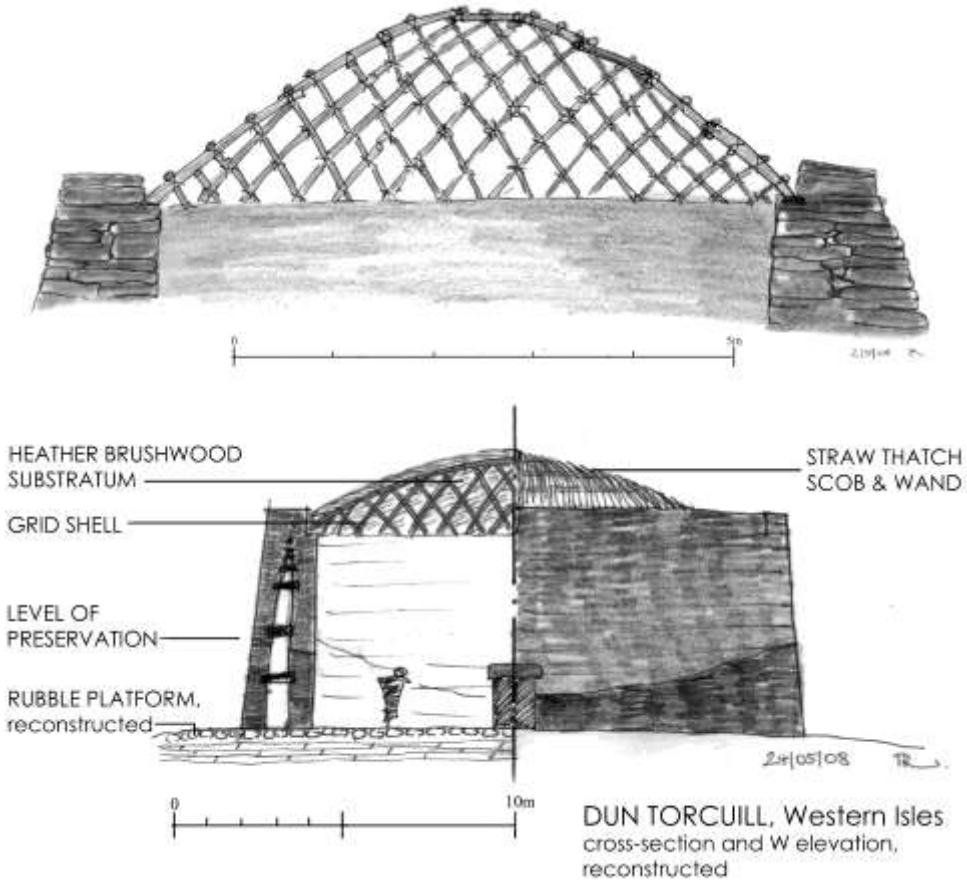


Illus. 7 Diagram showing direct correspondence between wall thickness of brochs and specific building stone (n = 113). Walls built of soft sandstone types are the thickest, about 5 m on average and more; most basalt or gneiss walls are almost 2m thinner on average (after Romankiewicz 2011, illus. A.76-a)



Illus. 8

Diagram showing average internal diameters of brochs analysed per region: the smallest internal diameters appear in the most exposed regions with unfavourable conditions for substantial tree growth. The internal diameter defines the span of roof timbers or wooden floor beams, which is the determining factor for their dimensions (after Romankiewicz 2011, illus. 75)



Illus. 9 Roof reconstructions: the gridshell roof construction consists of small timbers, *c.* 5 cm in diameter and less than 3 m long and could have been constructed from locally managed trees; *above*: roof construction detail; *below*: section through Dun Torcuill, North Uist, Western Isles (Reconstruction drawings: T. Romankiewicz)