CONFRONTING SCALE IN ARCHAEOLOGY

Issues of Theory and Practice
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He form’d a line and a plummet  
To divide the Abyss beneath;  
He form’d a dividing rule;  
He formed scales to weigh,  
He formed massy weights;  
He formed a brazen quadrant;  
He formed golden compasses,  
And began to explore the Abyss;  
And he planted a garden of fruits.

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Acknowledgements

This collection of papers is loosely based on a session at TAG 2000 (Theoretical Archaeology Group) at Oxford University. We would like to thank all of the contributors for their patience and understanding during the gestation and production of this volume. We hope the final result has been worth the wait. We would also like to thank Teresa Krauss of Springer for her support and encouragement.
Archaeological analysis operates on a continuum of scale from the microscopic analysis of a single artifact to regional interpretations of cultural adaptations over thousands of years. A common assumption is that shifting from one scale to another in space and time is a seamless process. Scale in this sense is invisible, a mere mathematical abstraction. Yet, issues of scale exist at the fundamental level of archaeological interpretation. The traditional analytical debate in archaeology — between advocates of the so-called ‘‘processual’’ and ‘‘postprocessual’’ approaches — ranges around the question of scales of reasoning. At the one extreme, remote observation and the ability to interpret events and processes over vast reaches of time and space are possible, because the analysis concerns the hoped-for elucidation of general cultural processes; at the other, they are not, as both analyst and subject are isolated in their own subjectivities. Analysts occupying the middle ground often advocate a ‘‘multidimensional’’ or ‘‘holistic’’ approach, which involves multiple scales of analysis and interpretation.

As the battleground tends to be the degree to which specific datasets and analytical processes justify the interpretations put forth, archaeologists rarely address issues relating to the profound shifts in the scale of visualization necessary in all approaches to the past. And why should they? Ignoring scale is the concession archaeology makes to interpretation. After all, is it not ludicrous to imagine that we can understand actual cultural life from rubbish and ruins? This problem is exacerbated by the rise of computer-based visualization and analysis technologies such as remote sensing, geographical information systems (GIS) and virtual reality (VR). Researchers are now able to resolve and interpret their data at multiple scales almost effortlessly — a seduction so persuasive that the entire issue of scale is simply, and commonly, ignored.

However, scale has a direct impact on archaeology’s vision of the past. The common experience of scale by both the subjects of archaeological research and archaeologists relates to space, time and social position. As humans in the lived-in world, we are middle-sized objects and develop our knowledge up and down through the cosmos from this position. By nature, we oversee things and relationships that are smaller than us and use imaginative and technological means to encompass the larger-scale world that we cannot see directly. As for time, the essential problem is that time simply passes, and past time only exists for all practical purposes in the material traces (data) of its action. We are left with the profound problem of recognizing, and reconstituting, masses of data as portions of
time (as if time occupies space). Finally, scale as a human phenomenon is culturally constructed. This is simply to recognize that the positions we adopt in life relate to our positions within a society and culture. This clearly affects our perceptions of things and situations and the way we act on, with or through these phenomena. We can therefore interpret cultural production – whether artifacts or archaeological studies – as acts within social (political) discourse at scales related to cultural, rather than natural, dynamics.

To complicate the question further, archaeological analysis has two general referents: the culture of production and the culture of interpretation. The challenge of the archaeologist is to understand the dynamics of scale that entered into production and to account for these in interpretation.

The goal of *Confronting Scale in Archaeology* is to illustrate the workings of scale in the production of culture and its analysis. Befitting its scope, the book brings together scholars from Europe and North America to express their own opinions about this seminal issue. Mindful of the diverse cultural and intellectual traditions represented, we have retained the spellings and word usages consistent with each contributor’s cultural milieu. We asked each author to address key questions crucial to multidimensional research into the past for all archaeologists, whether they work with conventional analytical techniques or with computer-based visualization tools:

- How does scale influence our perception of space and time?
- Is an understanding of scale socially, or culturally, constructed? If so, how can we recognize and decipher past meaningful scales of living through the present material record?
- What are the problems and implications of moving between scales? Are scales of meaning different to scales of data and how do we make connections? Are the claims for seamless transitions between scales justified?
- If the production and analysis of material culture have different scales of reference, or even multiple scales of reference, how can we integrate data into the broader interpretive form of a landscape?

By facing the issues of scale head-on in an explicit theoretical discourse, the authors gathered here explore processes of understanding data, the design, conduct and interpretation of surface surveys and excavations, and the nature of past and present human perceptions and uses of the environment. We hope that their insights will enhance archaeology’s ceaseless exploration of space, time and culture.

Gary Lock
Brian Molyneaux
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Introduction:
Confronting Scale

GARY LOCK AND BRIAN L. MOLYNEAUX

Scale is a slippery concept, one that is sometimes easy to define but often difficult to grasp. In the practice of archaeology, there is much equivocation about scale, as it is at the same time a concept, a lived experience and an analytical framework. If they think about it at all, archaeologists most often treat scale as a sort of geometrical given that they can manipulate at will and without cost in analysis and interpretation. This is unfortunate. In taking scale for granted, archaeologists rarely expose its complexities and therefore overlook its crucial role in the process of representing the past.

The dictionary definition of scale includes terms such as ‘‘a graduated series’’, ‘‘a system of relative values or correspondences’’ and ‘‘a ratio of representation or relative extent’’. The sense here is one of scale being relational, of only making sense as a measure of proportion among other assumably more concrete phenomena. Most explorations of scale in archaeology, with some converging interests in the disciplines of geography and ecology, have focused on scale as a quantification issue, or at least an issue concerning things that are in some way quantifiable. This understanding of scale as ‘‘analytical scale’’ (Mathieu and Scott, 2004a) is obviously important as it feeds into the process of archaeology’s basic tasks: collection, classification and interpretation. Yet, there is much more to scale than this. Archaeology is not a remote laboratory pastime – it is a human task responding to a seemingly innate curiosity about history and a human construction of past events, meanings and processes from the traces that are left. Archaeologists deal implicitly with this qualitative and phenomenological aspect of scale every time they ponder the passing of time and the transformation of space.

The essence of the problem of scale relates to the human desire to overcome the perceptual limitations of our middle-sized world. In Chapter 1 of this book, Alan Costall explores the importance of us understanding the material world in relation to our ‘‘body-scale’’. His emphasis is on affordances, the action-possibilities of objects that can only make sense in relation to an agent. Since our physical and conceptual systems have developed at this bodily scale, there is no guarantee that we can understand relationships in the larger and smaller worlds that these days
technology allows us to visit or construct (see Cherniak, 1986). We may lack the physiological capacity and experience to understand these alien worlds, seeing them more as isolated forms than as analogous environments with their own dynamic networks of relations.

This is not simply a practical issue. Every shift from ordinary human experience requires a leap of faith. Ancient hunters pursuing game or navigating through unfamiliar territory seized the opportunity to climb hills and mountains in order to see a greater expanse, prospects that many of their societies also associated with the sacred. This duality of perception and belief suggests that the visualization of the cosmos, the apprehension of the world beyond human space and time that underpins and validates religions, is also, rather humbly, an issue of scale. Indeed, while Galileo Galilei (AD1564–1642) perfected the telescope in 1609 in part so that the military could ‘‘discover at a much greater distance than usual the hulls and sails of the enemy’’ (extract of a letter, in Van Helden, 1989), he soon fell foul of the Catholic Church and was eventually imprisoned after promoting astronomical discoveries that supported the Copernican heliocentric view of the universe. The ability to transcend the limitations of human scale seemed too close to the omniscience of God.

Those landscapes beyond direct sight, aided or unaided, and those we cannot grasp in a single view, require imaginative styles of visualization. Traditionally, people relied mainly on what geographers describe as cognitive or mental maps – spatial schema that all humans use to navigate through cultural and natural landscapes. Today we have a range of additional aids, from old-fashioned paper maps to computer-based geographical information systems (GIS). The problem is that no representation, however detailed, captures an appropriately scaled ‘‘reality’’. This is not simply an issue of the nature and density of information crammed into a frame and flattened into two dimensions: early in the twentieth century, artists such as Picasso, Braque and Duchamps explored the problem of pictorial representation, which, in essence, is the mapping of very small scale moments into spatial constructs that are frozen in time. In the past, such static, map-like transformations of reality very likely contributed to the development of archaeology’s concepts of site and culture, which similarly represent diffuse, dynamic and multi-dimensional phenomena as bounded constructs (Molyneaux, 1991).

Turning to archaeology, the essence of the scale issue is the confrontation between the archaeologist and the array of information identified as archaeological, from material objects encountered directly to the host of representations in different media at different degrees of removal from the physical environment. Consider, for example, the difference in engagement between artifacts capable of being held in the hand and those too large or too small. We obviously find it difficult to conceive of these outsized things as artifacts: we give the larger ones different names, such as features or structures, and we treat the smaller ones, tiny flake residue from tool manufacture, for example, as subjects of somewhat arcane specialties. Similarly, we have a better understanding of local environments – the places we can explore in an hour or two – than regions that may require a lifetime to cover.

The movement from material information to processed data to knowledge requires an enormous scalar compression, in time and space, leading first to texts
and ultimately to the most extreme departure from actuality: the timeline. This oddly compelling heuristic allows us to avoid the fact that while we may have little to say about vast reaches of human history we can represent its existence in a seemingly authoritative way through the piecing together of bits of evidence at different scales. If we compressed space to the same extent, maps of the earth would be limited to views of a bluish globe in the solar system! Temporal scales are generally less considered and discussed than spatial scale and in Chapter 2, Chris Gosden and Karola Kirsanow show why that is so. Archaeological evidence contains within it complex ‘nested durations’ that range from the detailed intimate moments of an individual’s life, such as eating a meal or breaking a pot, to the global discussions of issues such as the origins of hunting. Using a series of case-studies they illustrate the qualitative and quantitative dimensions of time which are brought into contention through the range of analytical techniques now available including the chemical analysis of human remains, scientific dating and traditional artifact studies. Well preserved remains, such as the Ötztal ice-man, provide biographical information about the first and final few years of his life through teeth and bone isotopic analysis, his final meal through intestinal contents, as well as positioning him in the wider flux of temporal developments established through radiocarbon dating and artifact typologies. These are nested durations, from moments to millennia.

The lure of perceptual overviews is their greater scope, which seems to facilitate understanding, as one is extending, rather than supplanting, vision and experience. Yet, even these have issues of scale. The Cree use of scapulimancy exemplifies this subtle problem. The Cree, hunters and gatherers in the boreal forests of central and eastern Canada, have a recurring dilemma when they set out to hunt: where in their vast territory is the game? A traditional Cree solution is divination: a hunter scrapes the flesh from the shoulder blade of a moose, caribou or other animal and holds it in the fire, which causes it to craze or crack, and then reads the patterns as a map directing the group to its quarry. In modern times, would he not be better served if he had a map that marked the highest potential areas or, even better, if he could fly over the hunting grounds and spot the game from the air? He would certainly be more successful. By using scapulimancy over time, however, Cree hunters carry out a random form of resource exploitation that decreases the chance of overhunting any one place.

This process has some troubling implications in matters of scale. First, the fact that we think we may know a better way to find game – because of our access to larger scales of view – makes no difference to the Cree, as their magic works; and second, given the evident success of Cree hunting techniques in maintaining stable game populations, our ability to perceive a large territory from the sky and maximize our potential for hunting success may not be as good a solution on the ground as reading cracks in a burnt bone! Indeed, the divinatory solution for the Cree may be a pragmatic approach that emerged through long practical experience – a good instance of magic and religion as useful tools. The lesson is this: we may be pleased and intrigued by the knowledge we gain in the overview, but it may not be particularly useful in practice.
Transforming scale makes a difference in getting facts right, but of course there are no absolute facts, only facts in certain contexts and situations that are mutable and endlessly variable. We can deal with the facts at hand more easily because we can deal with them directly. For everything else the connections that make up our perception and understanding of worlds at other scales are tentative, speculative – and subject to the vicissitudes of the imagination!

CONSIDERATIONS OF SCALE

The explicit discussion, and by implication the theorization, of scale is not recent in archaeology. One of the early doyens of quantitative archaeology, Albert Spaulding, equated scale with "dimensions" and proposed the triad of time, space and form that is still generally accepted today (Spaulding, 1960). Here Spaulding was referring to analytical scale and to material form, whether the tiny attributes of a ceramic thin section seen through the microscope or the regional extent of a "culture" as represented by the distribution map of artefact assemblages. Spaulding’s discussion raised issues of lasting interest despite being couched in the language of emerging quantification that characterized the time – the idea of correlation along two or more dimensions. Do large forms (e.g., settlement patterns) automatically fit with large spaces and long time periods, do small forms (e.g., a particular type of pot) always correlate with a small area and short time span? The conclusion at the time was that no necessary correlation existed between these dimensions, no 1:1 relationship, and this emphasis on the complexity and subtlety of trying to understand scale continues today.

In one of the most recent discussions of analytical scale, social form appears as a fourth dimension, shifting interest to whether the context of study involves an individual, group, community or "society" (Mathieu and Scott, 2004b:2). Not surprisingly, geographers have been actively interested in matters of scale for a long time, and their theoretical concerns are equally relevant to archaeology (Sheppard and McMaster, 2004). In a seminal paper, Haggett (1965) identifies the three scale "problems" that challenge geographical (and archaeological) research. The first problem, scale coverage, arises because the potential scope of geography, the surface of the earth, is so large that recording and understanding its variability is an enormous task. Second, geographical studies, including fieldwork, are restricted to relatively small areas, so linking them can be difficult. Indeed, to what extent is it possible to extrapolate interpretations at one scale to other scales or understand large areas from sets of small-scale data? Finally, there is the issue of standardization, which is concerned with the merging and integration of various types of geographical data from a range of environments into a coherent form.

Trevor Harris, a geographer, explores these and other issues in Chapter 3 and shows their continuing relevance to both geography and archaeology. The problems of moving between scales are highlighted through the exposition of ecological fallacy and, in particular, through the Modifiable Areal Unit Problem (MAUP). This is concerned with "the imposition of artificial units of spatial reporting on contiguous geographical phenomena" and is of obvious interest to archaeologists as
we go about our normal business of categorizing space into ‘‘sites’’. As Harris points out it is now forty years since Haggett raised these issues and accused many geographers of ‘‘working in happy or perverse oblivion to the problems that scale brings’’. How many archaeologists, we wonder, give consideration to the MAUP when carrying out spatial analysis of any kind?

Essential to any constructive discussion of scale is terminology, an area of some confusion at the analytical level that geographers, but few archaeologists, have taken up vigorously. There is a somewhat tense semantic standoff between the two disciplines. Geographers focus on the ratio or ‘‘representative fraction’’ of a scale, and so maintain that ‘‘small-scale’’ refers to a large area (the fraction is a smaller number) and ‘‘large-scale’’ to small areas (the fraction is a larger number). On the contrary, archaeologists tend to take the common view that ‘‘small-scale’’ refers to relatively small things and ‘‘large-scale’’ to relatively large things. These oppositions are further complicated by the use of terms derived from the optical measure of resolution, such as ‘‘coarse’’ and ‘‘fine’’ grain or scale, and areal categories such as ‘‘small-’’ and ‘‘broad-scale’’. Underlying such terms are notions of relative correspondence (Quattrochi, 1993) and, as indicated above, the important analytical elements of extent and resolution (Mathieu and Scott, 2004b). Spatial and temporal extent is the size of the area or the span of time under study whereas resolution is the smallest unit or object of study within that range. These definitions are relatively straightforward, especially in digital visualization technologies such as GIS and remote sensing where an image has a maximum extent and resolution relates to the density of pixels. In fact, with more and more archaeology becoming GIS-based, and focused at the regional scale, extent and resolution are becoming routine issues of quantification, subsumed within the technicalities of the application and somewhat automated. There is a danger that through this soft technological determinism archaeologists are losing sight of scale as a fundamental concept with a theoretical basis that has implications for interpretation.

The real challenge is trying to expose the connections between the relational scales inherent in past behaviour and the relational scales structured into the analytical and interpretative procedures that attempt to understand that behaviour – for example, in the analysis of the breaking of a pot and its placement in the fill of a pit, which was a common practice in the British Iron Age. The person carrying out that action would have made a series of temporal and spatial connections, perhaps consciously and sub-consciously, a mixture of secular and ritual traditions and practices linked to a network of other individuals and groups both near and far in time and space, both known and known-about. We archaeologists attempt to expose and understand the multi-scalar relations and transformations inherent in that act through analytical scale. By structuring and collecting data within analytical and interpretative frameworks we attempt to identify and explain the multi-scalar patterns implicated in that single action – sherds within a pit, pits within a settlement, settlements within a landscape, the relationship between individual and regional religious and ritual practices in the Iron Age (Daly and Lock, 2004).

Crucially, as we carry out these tasks, scale also mediates our labour, depending on the circumstances of our choosing to select, analyse and interpret a particular phenomenon within the institution defined as ‘‘archaeology’’. The impact of our
intervention is an important aspect of scale as it is used here, as an emotional, intellectual, analytical, mystical, cultural tool. As H. Martin Wobst emphasizes in Chapter 4, we need to understand that scale is not a benign phenomenon but an active instrument in the making and changing of a society in which, as he says, ‘‘the people, the scales, and the discourses about and among them are forever in flux and unresolved’’.

This blurring of boundaries between the ‘‘concept of scale’’ and the ‘‘methodology of scale’’ as played out in an archaeological context through the ‘‘scale of then as lived’’ and the ‘‘scale of now as worked’’, is the central theme of this introduction and of this collection of papers. We are not removed from variations of scale, viewing our pots and projectile points as networks of relations in social and environmental settings; we define and are defined by this scalar relationship as we manipulate our point of view, actually and symbolically, to achieve our own desired ends. In Chapter 5, Brian L. Molyneaux explores the relationship between the physical and perceptual experiences of scale shared across time, space and culture between ancient hunter–gatherers and a modern-day archaeologist at Devils Tower, Wyoming, in the United States. The sheer fact that on the evidence of material cultural and literary and oral traditions, humans may have similar reactions to large-scale physical landmarks such as Devils Tower and use these features in similar ways, strongly suggests that we may gain access to otherwise impenetrable ideological realms by analysing the physical landscape in terms of the perceptions and actions it affords. The implication is that the study of mutuality in environmental experience brings us closer to a multi-dimensional archaeological approach grounded in traditional empirical analysis.

While an understanding of spatial scale and its effects is crucial, it does not then follow that scalar approaches are exercises in the management of spatial perspectives. Simon Holdaway and LuAnn Wandsnider write in Chapter 12 about the ‘‘remarkably under-theorized’’ concepts of time and temporal scales in archaeology, which fail to deal with the often-overlooked fact that archaeological deposits are poly-temporal in nature and require analytical methods commensurate with what are highly complex artifact palimpsests formed by cultural activity at varying scales.

The complexities of scalar relationships discussed above suggest that we need to rethink the methodological procedures involved in the most fundamental archaeological activity – fieldwork. At the operational and organizational levels, fieldwork is multi-scalar, ranging from the excavation of small exploratory trenches which invite questions of individual past actions to the regional surveying of landscapes which are concerned with questions of social organization and relations. Yet, even the most taken for granted mechanics of fieldwork have implications for scale, as shown in Chapter 8 where Gill Hey discusses the impact of evaluation strategies on evidence and interpretation. The results are worrying and suggest not only that we devise evaluation strategies to find more evidence of what we already know about, but also that there is a distinct lack of connection between the interpretative scale of landscape and the data-collecting scale of excavation. Thomas Yarrow takes an anthropological view of excavation in Chapter 6 and explores the relationship between scale and perspective. By following the excavation of flint.
number 68176 he interrogates the practices and processes that generate the sense of shifting scale as different perspectives are “brought into vision”. As we move from the flint in the ground to its representation as one of many points on a site plan so the “same” object moves through different scales of interpretation and invites different questions to be asked of it. Will Banks exploits an even wider range of archaeological scales in Chapter 7, as he discusses use–wear on the microscopic landscapes of Upper Palaeolithic tools in order to interpret regional sequences of resource exploitation at the site of Solutré, in hills along the Saône River valley in south-central France. Given the potential contribution of use-wear analysis in the interpretation of regional cultural adaptations, does its persistence as a specialized sideline outside the archaeological mainstream relate to the fact that ordinary archaeology operates at the scale of things within human grasp?

The influence of familiar scale in archaeological theory and practice becomes even more problematic when we use the shape- and scale-shifting technology, GIS. As GIS is a profoundly spatial discipline, its rapid adoption and adaptation to meet a range of archaeological needs is not surprising, and while the focus of this volume is not on GIS, many of the papers incorporate GIS in view of its significance as an inherently scale-based technology. In Chapter 3, Trevor Harris details the scale implications of GIS use as a technical and interpretative device, noting some spatial problems that pre-date GIS but are inherent within its use. One of the perceived strengths of GIS is that it is “multi-scalar” although, as Trevor points out, being able to easily move between scales of data and interpretation does not necessarily mean that the implications of doing this are always understood.

In Chapter 9, Larry Zimmerman and Joe Artz caution against the uncritical adoption of GIS to solve archaeological problems because of its ability to characterize landforms with a scale and precision heretofore impossible. In a comparison of settlement behaviour at a complex of Central Plains earthlodges in western Iowa in the United States with a much more sophisticated GIS model constructed 25 years later, they found that modelling at an increasingly finer scale (nearly 1:1) with precise landform variables including elevation, slope and aspect did not accomplish any more in terms of understanding cultural processes than the earlier, coarser-grained approach. More significantly, the GIS was not able to address the cultural meanings of the landscape to its inhabitants, an issue that marks the schism between modern and post-modern archaeology.

Malcolm Ridges presents an example in Chapter 10 of how GIS-based multi-scalar analysis can be integrated within interpretative understandings when such issues of scale are made explicit. Looking at two different aspects of Aboriginal interactions with landscape, rock-art and trading routes, Malcolm compares the results from a region and two sub-regions within it. The complexity and subtlety of the differences in spatial patterns suggest different levels of social behaviour and relations.

Scales of spatial patterning and their interpretation is also the focus of the work of Andrew Bevan and James Connolly presented in Chapter 14. Here the emphasis is on the methodology and spatial statistics in particular, with the demonstration of Ripley’s $K$ function as a tool designed to be multi-scalar. Andrew and James emphasize the importance of a “reflexive approach” to spatial statistics to move
us beyond the rigidity of traditional methods such as Nearest Neighbour Analysis. Also at the regional scale but not concerned with point patterning at all is Graham Fairclough’s contribution, Chapter 13. Historic Landscape Characterization (HLC), as Graham describes, is, in fact, intentionally devoid of points and focuses on polygons of land that conjoin to create regional representations of land-use. Underlying this approach is a complex web of scalar understandings, including spatial, temporal, perceptual and social, that feeds into the concept of “landscape”. Some of these define the HLC methodology while another group of scale-issues arise from HLC projects, these include selectivity, detail/generalization, interpretation, applications, affordances and management. The interaction between the qualitative scales of perception and the quantitative scales of measurement and recording ensures that HLC is not a mechanical and objective application of GIS technology.

Several of the papers in this volume refer to the distinction between “absolute scale” and “relative scale” (Quattrochi, 1993). The accepted difference is that between an actual distance, shape or other phenomenon defined within a Euclidean-based system and a relative scale based on some form of functional and meaningful relationship. This parallels our distinction between analytical scale, which is more likely to be based within a framework of absolute co-ordinates, distances and differences, and lived scale, which is inherently relational. Humans are situated in the material world: places, features and things are in front or behind, near or far, reachable within an hour’s walk or not. The quantified framework as imposed by an absolute scale is limited in range, heavily reduced in the density of information, and artificial – except as an environment that the analyst occupies (Molyneaux, 1991, 1997). Another term sometimes used in geography is “characteristic scale”, the spatial and temporal intervals at which an analyst can best detect and understand the processes and patterns under study. This is similar to Crumley’s (1995) “effective scale” at which patterns are best identified and meaning inferred. Again, these terms and concepts relate to analytical scale, attempts by observers to structure their analysis according to what they conceive as the most effective and efficient way.

Of course, analysts have not focused entirely on scale as a fixed entity, as any meaningful linkage to the world requires a fluid concept of a kind that warrants terms such as “multi-scalar” and “multiple-scaled spatio-temporal” phenomena. Indeed, while Haggett (1965) invokes the problems of scale-linkage and standardization mentioned above, he accepts that geographers (and archaeologists) collect and analyse data at a range of different scales. How we conduct such multi-scalar research is at the heart of understanding and working with scale and raises several issues that many of the papers within this volume address.

In the geographical and ecological literature, analysts often use concepts of “hierarchy”, and even a formal Hierarchy Theory, in conjunction with considerations of scale (Turner et al., 2001). For analytical scale in archaeological analysis, this can be a useful device, although it resonates rather too closely with a systems-based approach to sit comfortably within current postmodernist (in archaeology, post-processual) thinking. The conception of phenomena in a hierarchy of levels of organization imposes a particular and rather remote kind of order on worldly chaos. To understand a complex multi-scalar situation, the analyst must identify individual
phenomena at a particular time-space scale and investigate how they relate to each other and combine to influence phenomena at lower and higher scales. A crucial, and very problematic, aspect of this approach is the assumption that phenomena at a higher level are the background against which lower-level phenomena operate — analysts typically describe this higher level as the “context” of the lower-level phenomena. Returning to our example of Iron Age pot breaking, sherds within an individual pit, in this view, occur within the regional patterning of ritual deposition. Viewed another way, as the phenomenon at one scale (regional patterning) is a logical description, or “consequence”, of numerous instances of a phenomenon at a lower level (the placing of a shattered pot in a pit), one understands the individual act in terms of the phenomenon at the higher scale.

Carrying out data collection with the dynamics of scale in mind requires new approaches, in order to overcome the constraints of traditional hierarchical methods. For Oskar Burger and Lawrence C. Todd, in Chapter 15, the challenge of a research design and sampling strategy is to identify at what scale individual phenomena best resolve, and what kind of data collection is appropriate, given that spatial and temporal phenomena are scale-dependent. Their solution is a multi-scale model derived from landscape ecology that takes the scalar variability of archaeological deposits and processes into account, and so better adapts the essential task of data collection to real world situations.

More recent considerations of similar issues centre on the concept of agency and the relationship between individuals, groups and “society” — agency being a recent term applied to a long-standing approach in various fields that focuses on the situational analysis of individuals in natural and cultural environments. These approaches depart substantially from observer-based studies using an analytical scale as they treat the “hierarchy” of social life as relational. Life exists in situations, rather than processes, and in situations, individuals assess group intentions and develop strategies that eventuate social goals (Molyneaux, 1991). Dobres (2000) identifies “analytical scale” as the purview of research, the recognition and analysis of patterns, and “conceptual or phenomenological scale” as the world of human interactions in daily life. The micro-scale dynamics of the everyday contribute to macro-scale phenomena, such as social reproduction and cultural change, that we are interested in as analysts. According to Dobres (2000:133) conceptual scale is made up of “tangible and intangible structures that create the fluid parameters within which agents live”; this merges the material world and the social world as passed on through social norms, culture and tradition. Both of these realms are infinitely multi-scalar and also in a recursive relationship with individuals, so that people are created through their material and social worlds while at the same time creating those worlds. In this human-centred view there is a constant transformation between social structure (society) and the individual, but it is the material world and material things that enable us as individuals and social groups to create this cultural theatre and ensure its persistence, and effect, at temporal scales longer than is humanly possible (Gosden, 1994).

In Chapter 16, Vuk Trifkovic critiques these “archaeologies of practice” and offers a novel approach to the integration of excavation data and landscape theory by “situating individuals and their bodies within the wider flux of landscape and
meaning” Again, it is the technology of GIS that underlies this work, enabling him to apply the theoretical concepts of taskscape and distributed persons. For Vuk, the classic post-modern tension between a “boundless global world and the body as an irreducible basis for understanding” is a question of scale or perspective. His macro-scale understandings derive from “quality of vision” relating to landmarks at the landscape scale, while at the micro-scale he “explodes the biography of an individual onto the landscape”. He achieves these results through the detailed analysis of skeletal remains including the positioning and orientation of graves in relation to landscape characteristics.

Issues of scale in archaeology ultimately find their way into publication and critical exegesis. Richard Fox in Chapter 11 provides a detailed examination of the sequence of events that make up one of the most famous incidents in the history of the United States: the “Last Stand” of General George Armstrong Custer and his 7th Cavalry at the Battle of the Little Bighorn in eastern Montana Territory in 1876. Using empirical evidence to complement eyewitness accounts (derived from a painstaking archaeological survey of the battlefield, which included mapping the position and articulation of each surviving cartridge case and bullet), he takes to task participants in the thriving literary mythology of the battle. While some legendary versions, fueled more by patriotism than by material evidence, feed off their own generalized discourse, Fox walks us across the short-grass prairie hills overlooking the Little Bighorn River that specifically and precisely led Custer and his men to their deaths.

As these papers all show, there are a series of tensions outlined in this introduction that overlap and merge within the flux of archaeological practice: that between phenomenological scale as lived and analytical scale as observed; that between method and theory; and that between detail and generalization in interpretation. The first section of this book explores these in a series of papers that lay the foundations for the following papers, which are more focused on specific problem areas and applications that bring issues of scale to the fore. While we are not claiming that this volume will provide a “manual” for understanding and working with scale, if such a thing is possible, we do hope that it goes some way to raising issues and lifting the “happy or perverse oblivion” that pervades much archaeological understanding of scale.

REFERENCES
Introduction


SECTION 1

INTRODUCING SCALE:
SPACE, TIME AND SIZE IN
THE PAST AND THE
PRESENT
The world can be analyzed at many levels, from atomic through terrestrial to cosmic. There is physical structure on the scale of millimicrons at one extreme and on the scale of light years at another. But surely the appropriate scale for animals is the intermediate one of millimeters to kilometers, and it is appropriate because the world and the animal are then comparable (Gibson, 1968:22; emphasis added).

In the course of a long career, the American psychologist, James Gibson (1904–1979) attempted to develop an “ecological approach” to psychology and related human sciences that would undermine the many dualisms that have traditionally defined these disciplines and the awkward boundaries between them. These dualisms include: mind vs. body, mind vs. world, individual vs. society, and nature vs. culture.

From the 1950s, Gibson often wrote as though “finding the right scale” would, in itself, be the solution. However, with his later introduction of the concept of “affordances” (Gibson, 1977, 1979, 1982), the issue of scale – though still critical – became subordinated to a new approach to the meanings of things, and to the relation of ourselves and other animals to our worlds.

It is not easy, however, to appreciate the point of Gibson’s proposed solutions. Not only does he take our recognition of the problems largely for granted, but also the solutions he presents often seem much too easy. He goes to great lengths to inform us about the blindingly obvious – for example, that there is a sky above us and a ground beneath us, that we can see ourselves (e.g., our hands, arms, and legs) in the world, and that, to live in that world, we need to act in and upon it (Gibson, 1979). Like the deeply unsatisfying answer of “Forty-two” to the ultimate question of Life, the Universe, and Everything (Adams, 1984:128), Gibson’s homely observations hardly sound like answers to serious problems.

So, first, I need to explain why these problems really are serious, and how they keep blinding us to the “blindingly” obvious.
THE BIFURCATION OF NATURE

The ambitious project of traditional physical science – to explain everything on the basis of a definite set of methods and principles – seemed to be largely achieved at a remarkably early stage. By the seventeenth century, the new science had not only extended beyond the limits of our terrestrial world to the previously quite separate realm of the “heavens” but also to the intimacy of our own bodies, now to be understood in terms of levers, tubes, pumps, and valves. Yet this awesome success was acquired at a serious cost to the human sciences (and indeed the entire western tradition): the radical exclusion of ourselves – now disembodied – from the realm of science.

The supposed inclusiveness of the scheme of physical science was achieved through a rhetorical trick, the claim that the new science covers everything, and so anything it fails to include must, evidently, fall beyond the scientific realm of things. Anything resistant to the methods of the new science could not, therefore, be truly “real,” and hence, had to, instead, be purely subjective. This subjective realm of the unscientific has come to include “secondary qualities” such as colour and warmth, “tertiary qualities” such as meaning and expression, and, in the end, ourselves, the very sanctuary for all of these banished qualities (Lewis, 1964:215).

The exclusion of us from the “physical world” (i.e., the world as described by physics) gave rise to psychophysical dualism, the assumption that mind and matter are “mutually exclusive and utterly antithetic” (Lovejoy, 1929:3). This exclusion of us from the natural order of things gave rise, in turn, to the epistemological dualism of knower and known, and it is this derivative dualism that has been taken to be the pressing problem within Western thought. This secondary problem has been “solved”, to the satisfaction of a surprisingly large number of thoughtful people, through the supposition that “ideas” or some other subjective mediators “forever interpose themselves between the knower and the objects which he would know” (Lovejoy, 1929:3). This line of theorizing persists as the dominant and seemingly inevitable theoretical option within cognitivist psychology and many other human sciences, in the form of the modern “representationalist theory of mind.”

In this chapter, I will be concerned with just two of the many big problems that arise from psychophysical dualism.

1. The alienation of the material. If the material really has to fall on the “far” side of a psychophysical divide, then it is difficult to see how materiality could be seriously included within psychological and social theory. While the disciplines of psychology and sociology, through their unworldliness, have largely “shelved” this problem, archaeologists, given their very method, are surely required to take things more seriously. Admittedly, their engagement with material evidence has not entirely protected them, however, from also opting for representationalism, and this perhaps is because of the second serious problem.

2. The subjectification of culture. Psychophysical dualism also presents serious problems about how to theorize “culture”. Given the dualistic exclusion of us from the natural order of things, where can we “locate” culture other than ultimately on the mental side of the psychophysical
divide? Culture, through guilt by association with us, has to be banished from the ‘‘real’’ world, and subjectivized; it has to be located within a realm of individual or social re-presentations.

THE REVOLTS AGAINST DUALISM

There have been some serious challenges to the dualistic framework of science over many years. Towards the end of the nineteenth century, psychologists such as William James and John Dewey were emphasizing the importance of Darwinian theory as a distinctly different kind of science, one which returned ‘‘the mental’’ to the natural order of things, ‘‘mind and world’’ evolving in mutual relation (James, 1892:4). Radical developments within physical theory, such as relativity theory and quantum theory, have also been cause for searching examination and criticism of ‘‘the metaphysics of modern physical science’’ (Burtt, 1967 [1924]; Koyré, 1965; Whitehead, 1926). As a philosopher, Arthur Bentley, engagingly put it:

Since the ‘‘mental’’ as we have known it in the past was a squeeze-out from Newtonian space, the physicist may be asked to ponder how it can still remain a squeeze-out when the space out of which it was squeezed is no longer there to squeeze it out. (Bentley, 1938:165)

Nevertheless, the separation of the mental and physical, of meaning and materiality, of the world and us, still structures a good deal of current theory in the human sciences, especially within that last outpost of scientism and individualism, modern cognitivist theory. As one of its proponents proudly proclaimed, cognitivism provides us with ‘‘a science of structure and function divorced from material substance’’ (Pylyshyn, 1986:68, emphasis added).

Yet, even when the human sciences, as in social constructivism and postmodernism, try to go their own way, they often manage to retain these traditional dualisms through a failure to engage seriously in an examination of all this seemingly old-fashioned metaphysics. Thus, we find an anthropologist, Roy Ellen (1996:31), having argued for a discursive view of nature to replace a scientistic one – in a book devoted precisely to ‘‘redefining nature’’ – coming to the remarkably traditional conclusion that ‘‘Culture emerges from nature as the symbolic representation of the latter’’. And we have a social constructivist, Stuart Hall, insisting that meaning is confined to the representational realm of symbols:

…we must not confuse the material world, where things and people exist, and the symbolic practices and processes through which representation, meaning and language operate. Constructivists do not deny the existence of the material world. However, it is not the material world which conveys meaning: it is the language system or whatever system we are using to represent our concepts. (Hall, 1997:25)

JAMES GIBSON’S ‘‘ECOLOGICAL APPROACH’’

Let us now look more closely at Gibson’s revolt against dualism. To begin to make sense of his project, we need to be clear that his real target was not epistemological
dualism but the more fundamental dualism of matter and mind that it presupposes. Many critics of Gibson’s “ecological approach” have complained about his dogmatic denial of any role for representations in the explanation of human thought and conduct. Yet Gibson was intensely interested in the question of the historical and material bases of the diverse human practices of representation (Reed, 1991). His objection was to representationalism, and the inherent incapacity of this theoretical approach to address the basic problem of how representations can possibly represent – if we are indeed all entirely enclosed within a realm of representations. As he saw it, the big problem with representationalism is that it simply takes representation for granted, and then pretends to “solve” the profound epistemological problem posed by traditional dualism. Representationalism can be no solution, since, given its assumption of psychophysical dualism, there is no way it could account for how representations represent. How could our mental representations ever connect to the world, if we are always excluded from it?

In fact, Richard Gregory, the psychologist, has somehow managed to make a scientific career out of promoting representationalism while at the same time (for the more astute) giving the whole silly game away:

It used to be thought that perceptions, by vision and touch and so on, can give direct knowledge of objective reality. . . . But, largely through the physiological study of the senses over the last two hundred years, this has become ever more difficult to defend. . . . Ultimately we cannot know directly what is illusion, any more than truth – for we cannot step outside perception to compare experience with objective reality. (Gregory, 1989:94)

Hint: If we are all (including, of course, important scientists, such as Richard Gregory) trapped in a realm of representations and “cognitive assumptions,” where is all this hard objective evidence, apparently supporting this radically subjectivist conclusion, coming from?!

Affordances and the Scale of Meaning

James Gibson, in contrast to most other psychologists, preferred to dissolve, rather than solve, the seemingly intractable problems posed by dualism. Although his concept of affordances was just part of his wider project to undermine the various dualisms of traditional psychological and social theory, this concept is, in my view, his most fundamental contribution to a nondualistic approach to both materiality and culture.

Gibson was seeking to develop alternative descriptions of animals and their environments that would capture their interdependence or “mutuality.”

The words animal and environment make an inseparable pair. Each term implies the other. No animal could exist without an environment surrounding it. Equally, although not so obvious, an environment implies an animal (or at least an organism) to be surrounded. . . . The mutuality of animal and environment is not [however] implied by the physical sciences. (Gibson, 1979:8)

Gibson’s initial attempts to find a way to describe the world in such a way that it is appears compatible with, rather than alien to, the existence of animals focused upon scale.
The world of man and animals consists of matter in the solid, liquid, or gaseous state, organized as an array of surfaces or interfaces between matter in these different states. It is the habitat of an animal. In some respects it is the world studied by ecology. . . . Present day physical science is of little help, since it jumps from crystals to planets and shows no interest in the entities of the world which we can see and feel with our unaided sense organs. . . . (Gibson, 1959:469–470)

Although there are hints of the idea of affordances in his earlier writings, it is only in Gibson’s later work that this concept takes a prominent position (Gibson, 1977, 1979; cf. Gibson, 1950, Ch. 11). Affordances are the meanings of things for our actions, but these meanings are not something we “mentally project” onto objects. They concern the relation between agent and the world.

The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill. The verb to afford is found in the dictionary, but the noun affordance is not. . . . I mean by it something that refers to both the environment and the animal in a way that no existing term does. It implies the complementarity of the animal and the environment. (Gibson, 1979:127)

Now scale continues to figure as an important issue within Gibson’s treatment of affordances, since – along with a host of other factors – it is critically important to what things can mean. What matters, however, is not scale in an absolute and abstracted sense, but scale in relation to the animal. So let us, after all of this talk of history and metaphysics, descend to two concrete examples, such as going up and down stairs, and grasping things.

Clearly, the dimensions of both the risers and treads of the stairs matter critically. Beyond a certain critical point, the stair no longer affords climbing. To ascend a staircase, we need to be able to reach the next step with our foot, and, furthermore, then be able to lift our body so that its weight is centered on that step. Going down stairs is more precarious, since we also need to check that we do not overdo things and end up in a painful fall.

Normally, young children do have serious problems going up and down stairs. In fact, one can find age “norms” in the textbooks on motor development and developmental psychology, where the failure or success to achieve that norm is taken to reflect the intrinsic developmental condition of the child (Gesell et al., 1977). There are striking differences in the age norms for going down as opposed to going up stairs, and also for alternating the feet between steps as opposed to moving one foot forward and then gingerly following through but putting the other foot onto that same step. With the normal staircases that children normally encounter, it is not until they are around the late age of four and a half years that they begin to risk alternating their feet when descending.

However, although the climbability of a staircase is a function of its dimensions, it also depends upon the size of the person in question. People do not come in standard sizes, and, in particular, young children are generally much smaller than adults. Yet these age norms have been based on “normal” sized staircases – stairs, in other words, designed for adults, not children.

It is very curious that in our schools, for example, there are child-sized chairs and tables, but not child-sized stairs. In an inspired study, Josep Roca and his colleagues simply checked to see how children would cope with a scaled-down staircase where the steps were just 10 cm high and 20 cm deep (Roca et al., 1986).