Geoarchaeology of Aboriginal Landscapes in Semi-Arid Australia. Simon J. Holdaway and Patricia C. Fanning. 2014. CSIRO, Collingwood. 224 pp., color, ISBN 978-0-64310-894-3, $70 (AU) (paperback).

The subject of this monograph will be familiar to anyone who has followed the prolific and influential publications of Holdaway, Fanning and their students on the archaeology of arid Western New South Wales (Australia), which no doubt have been core readings for several generations of students around the world studying geoarchaeology and stone artifact analysis. The authors use Holocene-aged surface scatters of stone artifacts and hearth contexts to investigate why Aboriginal people were "so successful in dealing with the ecology of Australia." The monograph is organized into six chapters, with the first two detailing the motivation and general approach, the third discussing preservation, exposure, and visibility of the surface archaeology, the fourth reviewing the chronology of the landscape and archaeology, the fifth on stone artifacts and mobility, and the final chapter synthesizing the results. The organization of the book indicates the distinctive nonsite or siteless archaeology approach: the authors reject the classical functionalist and typological approaches (e.g., site types, assemblage types, artifact types) common in much of the literature on hunter-gatherer archaeology. To challenge such an entrenched way of thinking requires a substantial weight of well-organized evidence, which is an effective summary of this monograph. While the nonsite approach allows for stimulating new ways of investigating archaeological landscapes, it may have some cultural resource management archaeologists struggling to use the methods presented in this monograph in their mitigation work, where they need simple rubrics for defining site boundaries in order to manage them, and often do not have the time for the intensive landscape sampling and *in situ* artifact recording described in the monograph. The field data collection methods are carefully described and reflect the distinctive nonsite approach, but specific details of the timing, duration, or person-hours spent on field data collection are not provided.

The chapter on preservation, exposure, and visibility is motivated by a concern that the contents and distribution of archaeological sites are substantially dependent on local landform history, and only before those details are securely understood can behavioral interpretations be made. They make extensive use of linear regression to investigate relationships between artifact size and elevation to determine if artifact size-sorting has occurred due to surface water flow. They find little evidence of substantial lateral disturbance of the surface scatters, no doubt a reassuring result for others working in similar landscapes. One of the more interesting results from this chapter is the identification of different spatial patterns in quartz and silcrete artifacts, which the authors interpret as a result of different periods of artifact deposition. A key piece of evidence supporting this claim is the different slope values on the regression lines for artifact class count versus total artifact count for each raw material. This approach was adapted from Shott (2008) and presented in the monograph in such a clear and practical way that it deserves a wide uptake. A few minor statistical details in this chapter were a little confusing, for example, no confidence intervals are reported, several tables reporting Fisher's exact test results had columns of *P*-values where all of the values were greater than one (perhaps due to a column labeling error, or an exotic implementation of the test that gives nonstandard output). In several places, correlation statistics are interpreted a "significant and positive" because the *P*-value is less than 0.05, but with little regard to the coefficient of determination values (i.e., r^2), which are often less than 0.1. This means that the practical, substantive influence of the predictor, for example, ground surface type, is very minor in accounting for variance in the dependent variable (e.g., the number of artifacts), in many cases explaining less than 10% of the observed variation.

The main findings of the chapter on chronology will surprise few archaeologists familiar with Australian desert archaeology because of the authors' previous publications demonstrating discontinuities of occupation during the Holocene. The main surprise in the monograph is the absence of discussion of the implications for broader narratives of Australian archaeology, such as intensification and population increase in the mid-to-late Holocene. This chapter presents radiocarbon ages from heat-retainer hearth remains and optically stimulated luminescence (OSL) ages from sediments underlying artifact scatters and hearths. Perhaps the most intriguing and practical part of this chapter is the use of Bayesian statistical analysis to identify if a set of hearths is best interpreted as a single phase of activity or if there are gaps in their ages of construction. The authors show that gaps exist at several locations, which will no doubt raise questions among readers about whether similar gaps exist in their data set, and promote the regular use of OSL and radiocarbon

dating as tools for understanding surface scatters and hearth contexts. Unfortunately, the software used by the authors to compute the Bayes Factors was not available at the time this review was prepared, and the text is too brief to allow the reader to implement the method at another service such as OxCal or BCal (neither compute Bayes Factors in their usual operations). With some effort I was able to compute pseudo-Bayes Factors for the authors' data using OxCal, and reproduced some of their results. The reliance on defunct software and underspecification of method are regrettable and limit the usefulness of this chapter.

In the chapter on stone artifacts and mobility, we see the authors' resolve to eschew typological methods weaken slightly, with up to eight types of cores and nine types of retouched artifacts recorded. Noteworthy, aspects of the stone artifact analysis include a focus on core volume (using a spheroid geometry, which seems appropriate but this is not demonstrated), surface area, and cortex amounts, and an absence of reduction indices for the retouched artifacts. Retouched artifacts make up a small proportion of the assemblages, but are still often >100 pieces, so credible comparisons would seem to be possible. The omission of more detailed analysis of retouch attributes is at odds with much current hunter-gather stone artifact research that uses retouch data to address questions about resource management and risk minimization. The volume-surface area-cortex measurements are used to determine there has been a net inflow or outflow of flakes from the scatters, as a proxy for mobility. The dominant raw materials are quartz, silcrete, and quartzite, and the authors find that despite the difference in abundance and size of nodules of each raw material type, they were treated in largely similar ways to facilitate mobility over sedentism. There is a brief observation that the results accord with Kuhn's (1994) "person provisioning" model, and a note that this interpretation is at odds with "others previously recorded and published in Australia." The reader is directed to a detailed treatment of these claims in the authors' previously published work, which diminishes the impact of this chapter.

The synthesis chapter addresses some behavioral questions and makes a case that the locations studied represent a palimpsest of discontinuous visits for short periods, and were not occupation sites where a wide range of activities occurred. These claims are thoroughly supported by the preceding chapters, but given that their primary explanatory foils for the movement of stone are studies published in the 1980s (e.g., Gould, 1980), this discussion seems disengaged from current scholarship on foragers in arid regions on general, and Australian archaeology in particular where similar interpretations are not uncommon from more mainstream functionalist analyses. The authors acknowledge that their general approach is dependent on analogies and uniformitarian assumptions about landscape processes. This emphasis on the role of geomorphic processes is one the key original contributions of this monograph—it is a robust demonstration of how productive and substantial a research project can be when it is motivated by geoarchaeological investigations of site formation processes. This approach is equally interested in the absence of people on the landscape, as well as their presence, giving meaning to artifacts found between traditionally defined site areas, and to artifacts missing from the surface scatters. This is an important and valuable shift in emphasis that leads to a richer appreciation of how Aboriginal people experienced the landscape.

Readers who have been following the work of Holdaway and Fanning over the last two decades might question whether their library should purchase the monograph when there is already compelling and rigorous presentations of many of their findings in numerous journal articles. This raises the broader question of the role of scholarly monographs in archaeology, especially in more empirical parts of the discipline such as geoarchaeology where journal articles are the primary mode of scholarly communication. Part of the answer in this case is a tradeoff between evidential detail (a strength of this monograph) and contextualization and interpretation (strengths of the authors' journal articles). Even so, this monograph presents only summaries of the data, and the reader is limited in how much they can explore the data with new approaches and statistical methods, or combine with their own data. This contrasts with archaeological monographs published in the past that aimed to be a complete compendium of a research project, where in many cases it was possible to present all the raw data upon which the substantive findings depended. Modern archaeology is complex to the point where it is impractical to include pages of raw data, or even media such as DVDs, with monographs to share the raw data with other researchers. The solution here is to deposit the data in an open format (e.g., a file format not dependent on a specific program) at an on-line data repository that issues persistent URLs that can be cited in the monograph. Most universities have their own repositories, and there are several commercial services dedicated to archiving archaeological data (e.g., tDAR, Open Context, The Archaeology Data Service). Providing the raw data in this way permits computational reproducibility that might lead the work to have greater impact and reuse, and certainly give it a richer empirical foundation (Kintigh, 2006). Holdaway and Fanning no doubt have more to write about on their Fowlers Gap research (they mention computer simulations as one future direction), and I look forward to one of their future papers including an announcement of

the public availability of all the raw data that underlie the rich and persuasive analysis presented in this monograph.

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Published online in Wiley Online Library (wileyonlinelibrary.com).
doi 10.1002/gea.21522

