BOOK REVIEW

Toward a Behavioral Ecology of Lithic Technology: Cases from Paleoindian Archaeology by Todd A. Surovell. 280 pp., 10 b/w photos, 66 illustrations, 2 maps, 20 tables, Preface, Index, References Cited. University of Arizona Press, 2009. $60.00 (Cloth). ISBN 978-0-8165-2810-3.

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This book is an exercise in the application of formal optimality models (behavioral ecology models) to stone tool and debitage technology. For the most part, the mathematical modeling is tested with late Paleoindian (Folsom) data from the northern Plains. The book is well written and easily moves back and forth from archaeological data to mathematical models to technological theory and assumptions. The author makes it easy to agree with his approaches and his conclusions. This is a must read for serious archaeological practitioners of lithic technological analysis.

The book begins with a background chapter on the three primary fields of study that are being melded: behavioral ecology, lithic technological organization, and formal model building. This is a simple and effective introduction to the book. The introductory chapter is followed by an overview chapter on the data set used for the study. The author pulls together the basics of what is known about Folsom (including Goshen) in the northern Plains and briefly describes the site contexts from which the data are gathered. Even though he focuses upon five site components for the Folsom period (Barger Gulch, Upper Twin Mountain, Krmpotich, Agate Basin, and Carter/Kerr McGee), he reviews Folsom in a more general context from both the northern and southern Plains, covering time, space, technology, and mobility. These first two chapters lay the framework for the remainder of the study.

The next chapter is introduced as a general study on inferences of human forager mobility and site occupation span. Here a great deal of effort is put into understanding forager (particularly early Holocene forager) mobility and what that might look like in the archaeological record. The author introduces modeling in this chapter, focusing upon a formal model of "mean per capita site occupation." This is a critical chapter because much of the later modeling compares his derived occupation span indices to other aspects of technology. Surovell

emphasizes (and models) the relationship between transported tools and debitage as an important piece of site occupation span. In this chapter he tests site occupation span with data from Richard Gould's excavations at Puntutjarpa rockshelter in Australia. His tabulated artifact ratios (including local and nonlocal raw materials) are compared against relative moisture data over time to support indices of site occupation span.

The next chapter (chapter 4) builds upon the results from his site occupation span inferences and attempts to segregate, or at least to recognize differences, between multiple short-term occupation sites and single long-term occupation sites. He models this with artifact density data and his derived occupation span index (OSI) and then later simulates Folsom occupation span. I'll come back to this later in the review but the reader needs to look at this chapter in some detail because it is the basis for how the author deals with the palimpsest issue for archaeological site occupation and reoccupation.

Borrowing from the federal budget deficit (and surplus) partitioned by U.S. presidents from Kennedy to G. W. Bush, Surovell introduces the reader to commodity surplus. His modeling specifically points to lithic raw material use and surplus. He goes back to the Puntutjarpa rockshelter data to show how raw material surplus relates to occupation span. These are then applied to the Folsom data set. Ultimately, this chapter shows that larger surpluses of lithic raw material are expected with longer site occupation spans, and that larger surpluses are expected as costs for embedded procurement are decreased. To my knowledge these are relatively new generalizations about lithic raw material expectations for archaeological sites. I look forward to other researchers testing these generalizations against specific contexts.

Chapters 6 and 7 explore and model the previously derived site expectations with stone tool types and debitage, respectively. I don't want to give up all of the secrets discovered in these chapters after formally modeling tools and debitage. However, Surovell determines some interesting and important aspects of stone tool technology as a result of pushing his modeling forward. For instance, bifaces and flake blanks are often the items transported during residential mobility and cores are seldom transported, and retouch on tools decreases as site occupation span increases.

The book closes with a chapter that touches upon aspects of Paleoindian archaeology and the benefits of formal modeling for lithic technology and for archaeology in general. Surovell makes it perfectly clear that he feels archaeology needs to embrace formal modeling before it can be counted as a truly scientific discipline.

The book is a significant contribution toward understanding lithic technology, and Surovell is to be commended for pulling such a study together in a concise manner. My one criticism of the volume is the degree to which he downplays the value of less formalized models of lithic technology. I agree that formal

models more explicitly detail the components and the relationship of components within a working system. However, such formalized models must also overcome the problems associated with faulty assumptions that less formalized models tend to be plagued with. For instance, Surovell partially supports his interpretation of large single occupation Folsom sites based upon a simulation model based upon a 0.25 ha campsite size within a 50 ha region. On the basis of estimates derived from that model he extrapolates the potential of Folsom sites to overlap over the 800-year Folsom period. Given these parameters of the model, Surovell notes that even large sites such as Hell Gap would have a low probability of having overlapping occupations. However, his extrapolation is based upon the assumption that a 50 ha region is occupied once every fifty years. Why couldn't the region be occupied every thirty, twenty, or ten years, or every year? The fifty-year reoccupation span is an assumption, and if untrue, would ultimately produce spurious results about Folsom site occupation span. If Folsom site occupation span is incorrect, then further aspects of Folsom lithic technology (such as raw material surplus) may also be incorrect. Both formal and less formal models must deal with faulty assumptions.

Also, less formalized models in archaeology were, and still are, a prerequisite to building formalized models. For instance, many of the simple assumptions and associations used in model building in this book are based upon less formalized models of lithic technology. How do we know that platform faceting, dulling, and lipping are more prevalent on bifacial reduction flakes than on non-bifacial reduction flakes? These kinds of knowledge were derived from less formalized models. My simple point here is that there is room in lithic technological research for a diversity of scientific study. Formalized mathematical modeling is certainly helpful and will open new doors toward understanding the meaning of lithic artifacts. However, less formalized mathematical modeling will continue to contribute to our understanding of lithic technology as well. Overall, this book is a significant contribution to lithic technological investigations, and I predict that archaeological researchers will use the expectations derived from this book to guide important future investigations.