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Luedtke: *An Archaeologist's Guide to Chert and Flint: Archaeological Research Tools 7*

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An Archaeologist's Guide to Chert and Flint: Archaeological Research Tools 7. Barbara E. Luedtke, Institute of Archaeology, University of California, Los Angeles, 1992, 172 pages, 2 appendices, bibliography, glossary, index, \$18.75 (paper).

Reviewed by:

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The author observes the importance of chert artifacts to prehistoric archaeology: stone tools were used for at least two and half million years; during that time, chert was the single most important raw material. Because of its durability, it often is the only survivor informing of human behavior and technology. Archaeologists know that chert varies in color, durability, and workability, yet relatively little is known about the causes of variability, and there are few objective criteria for describing it. Luedtke's goals are to systematically describe and synthesize what is known about the physical properties of chert, state what is not known, identify lines of future research, and, in so doing, create a basic reference useful to archaeologists.

Chapter 1 introduces the book and lays out its organization. Luedtke wisely chooses to emphasize the breadth of the topic, eschewing

mathematical formulae and technical jargon from nonarchaeological disciplines. Those who need the math, chemistry, crystallography, etc., can consult the bibliography. As for terminology, the author is concerned with creating a consistent vocabulary for archaeological lithic studies, one which we are well advised to embrace and build on. The rest of the book is organized around the various properties of chert. Chert is defined in Chapter 2; its genesis is discussed in Chapter 3; chapters 4, 5, and 6 describe, respectively, its chemical, visual, and mechanical properties. Chapter 7 is devoted to physical changes caused by weathering and thermal alteration. Chapter 8 is a summary, and identifies important areas for additional research. Appendix A outlines the procedures for source analysis, and suggests how to build a chert data base. Appendix B contains the descriptions and chemical characteristics of the chert sources used in examples throughout the book.

The equal emphasis of flint and chert in the title is somewhat misleading. The reader discovers at the beginning of Chapter 2 that, following American geological usage, flint is subsumed under the term "chert," referring to "all sedimentary rocks composed primarily of microcrystalline quartz, including flint, chalcedony, agate, jasper, hornstone, novaculite and several varieties of semiprecious gems" (p. 5). Nevertheless, European colleagues will be gratified to see that flint receives its share of attention.

Chert is discussed as a rock type, emphasizing its composition as a silica (silicon dioxide) mineral. Its structure is elucidated by taking the reader on a sub-microscopic tour of a chert nodule, pausing to examine the landscape at increasing magnifications (powers of 10) until we confront the silicon atom. At 10,000 x, the individual quartz grains are visible, packed tightly together into a mass of interlocking polygonal grains with common faces.

Different forms of silica (gel, opal-A, opal-CT, chalcedony, micro- and macrocrystal-

line quartz) can precipitate from low temperature solutions in various contexts: sedimentary, metamorphic, and volcanic rocks, in oceans or lakes, or on land. But chert usually forms in more than one step (diagenesis), depending on context. For this reason, it is too much to expect coverage of every variety; Luedtke presents several case studies (English Chalk flint, Monterey chert, Pennsylvania jasper, agate, silicified wood, and Magadi-type chert), illustrating a wide range of cherts with different origins.

The discussion of chert chemistry in Chapter 4 focuses on chemical variability between different cherts and among samples from the same source. Luedtke presents data showing the range of variation for 20 elements among several types of rock including chert. Appendix B compares chemical values from a variety of chert sources in the Great Lakes region and elsewhere in the world. These data allow one to specify whether a particular element in a specific sample is relatively high or low compared to samples in the data base. The remainder of the chapter is devoted to discussion of within-source variability, using the case studies introduced previously.

Chapter 5 explores variation in the visual properties of chert: color, translucence, luster, texture, and structure. Replacement, fracturing, brecciation, and diagenesis all affect the structure and visible appearance of chert. Moreover, all these vary in different degrees, depending on the magnification used. Luedtke suggests that visual properties, gathered at all available scales, tell much about a particular chert and its history.

Chapter 6, reviewing material that has been widely published, is likely to be the most familiar to archaeologists. It concerns the variables that affect the way chert breaks, including isotropy, strength, elasticity, and hardness. Luedtke discusses the importance of microcracks to the initiation and propagation of controlled fractures, and suggests why moisture content affects the strength of some cherts. She

presents a chart in which samples of quartz, several types of chert, and obsidian are ranked by Callahan grade (subjective "workability"), along with measured mechanical properties for each sample. Although there are numerous gaps, the data seem to be patterned. As one interested in anything that will lead to an objective proxy for toolstone utility, I agree with Luedtke that further research along these lines is needed.

Chapter 7 considers the effects of natural forces, as well as heat-treatment, that alter the properties of chert. It is widely known that heating chert can change its color, luster, and, most importantly, can decrease its strength, making it easier to work. The change in luster is due to a change in the fracture pattern. After heating, fractures propagate through, rather than around, the grains; the resulting fracture surface is smooth and more reflective, hence exhibiting greater luster. The author compares "silica fusion" and "microflaw" models, both of which attempt to account for this phenomenon. Although the high melting point of silica minerals argues against fusion, the models are not mutually exclusive, and neither has been tested adequately.

Luedtke sums up in Chapter 8. She began the research for this book hoping to find simple and objective ways to measure properties of chert, to find correlations between some of those properties, and to discover which properties were key to archaeological problems. At the end, she finds that, although she did not accomplish all these goals, she made a good start in defining the problems, and she shows how certain lines of inquiry may bear future fruit.

I should comment on certain matters for which the editor and publisher bear responsibility. This is a nicely made book with good paper and well glued cover and spine. The figures are clear; the four electron micrographs (pp. 74-75) are among the best I have seen. The text, however, would be more readable set in larger

type with smaller margins. There are several typos, and a garbled line (the latter in the first paragraph of Appendix A). I could not interpret Tables 4.3 and 4.4 without considerable attention to the text; better labels and captions would have fixed this.

Nevertheless, these are minor problems. Any archaeologist with more than a passing interest in lithic tools and technology should have this relatively slender, but information-packed, thought-provoking volume; the price is certainly right!



The Cahuilla Landscape: The Santa Rosa and San Jacinto Mountains. Lowell John Bean, Sylvia Brakke Vane, and Jackson Young, with contributions by Bern Schwenn. Ballena Press Anthropological Papers No. 37, 1991, 116 pp., 15 figs., 11 maps, \$14.95 (paper).

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This compendium is a must for every anthropologist, archaeologist, historian, and geographer who works in the past or present territory of the Cahuilla people. Originally published in 1981 for the Bureau of Land Management (BLM) Desert Planning Staff, this revised version was released to coincide with the establishment of the Santa Rosa Mountains National Scenic Area. The authors combine references to Cahuilla placenames and ethnogeography from Patencio (1943), Strong (1929), and Gifford (1918), the unpublished field notes of C. Hart Merriam, their own extensive files, and input from living Cahuilla elders. The critical

evaluation of placenames and their modern correlates would not have been possible without the long lasting and on-going relationship between the authors and the Cahuilla people.

A new preface by Russell Kaldenberg, BLM Indio Resource Area Manager, and Richard Milanovich, Agua Caliente Band of Cahuilla Tribal Chairman, stresses the cooperative efforts of the BLM, the Agua Caliente and Morongo Band of Cahuilla Indians, local government entities, and numerous nature and cultural resource advocacy groups who have been active in preserving heritage values. A very important introduction highlights the uses of this study for cultural resource management. The authors emphasize that not only habitation sites are important and can be identified in this report, but more esoteric sites also need to be treated. These include power places, ritual sites, trails, resource collection areas, endangered species habitats, sacred springs and water sources, places associated with myths and songs, and trading and visiting localities. The authors maintain that Native American consultation still remains crucial to identifying such resources for modern management considerations. They still complain of the incomplete data for the Cahuilla even though this is a corpus of information that would be envied by other California researchers for its size and richness of detail. The plethora of placenames and associated information for the Cahuilla provides some measure of how little traditional ethnogeography is preserved for the heavily missionized coastal areas of California.

The Cahuilla Landscape proceeds from the general to the specific. The ethnographic summary in Chapter 4 provides a brief review of Cahuilla ethnohistory. The most valuable sections summarize Cahuilla experiences in the late 19th and 20th centuries, bringing their traditional concepts of geography and placenames up to the present. Recent archaeological and ethnohistoric studies will require that those sections dealing with early periods be updated.