

ANTHROPOLOGY 4115/5115: LITHIC ANALYSIS I

Time: W 4-6:30

Place: Anthropology 140

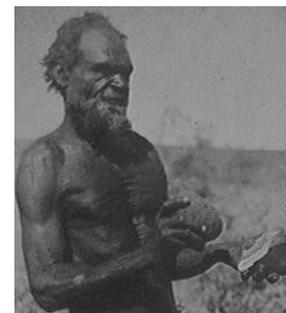
Instructor: R. Kelly

Office Hours: TWR 9:30 - noon, or by appointment, Anthropology Building 273

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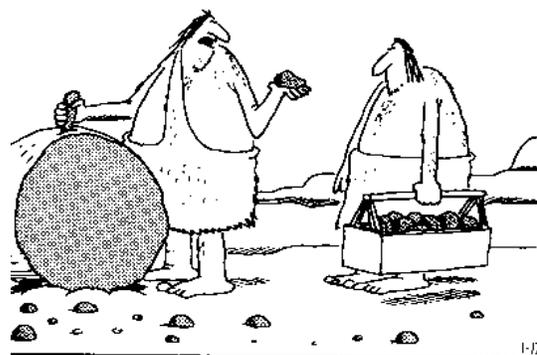


Text: Andrefsky, *Lithics: Macroscopic Approaches to Analysis*; plus readings to be made available electronically.

Stones cannot be tamed
to the end they will look at us
with a calm very clear eye
—Milosz, *The Stone*

This course has three objectives: (1) to give you a basic understanding of and experience in the hands-on collection of data from lithics, (2) the analysis of those data, and (3) the ways archaeologists use to think about and interpret prehistoric technology. Chipped stone tools and waste flakes are the most abundant archaeological remains; this is especially true for hunter-gatherer cultures, and for the most ancient of these, stone tools comprise the entire prehistoric record. Any archaeologist of hunter-gatherers, therefore, must familiarize him or herself with the analysis of stone tools. We will do this through practice with flintknapping, experimentation, reading, and practice with data collection. This course will focus on chipped stone rather than groundstone tools, and some topics, e.g., blood residue, use-wear, sourcing analysis, trade, specialist production will not be covered or only covered briefly.

The emphasis will be on the stone tool technology of hunting and gathering peoples and on the practical issues involved in the analysis of debitage (waste flakes) and tools from archaeological sites. This is not a flintknapping course, although students will be introduced to flintknapping in the course's beginning and are expected to continue to practice on their own throughout the course. Most of the course will be devoted to an overview of the various kinds of information that can be gleaned from stone tools and debitage, including technological reconstruction and



"So what's this? I asked for a hammer! A hammer!
This is a crescent wrench! ... Well, maybe it's
a hammer. ... Damn these stone tools."

use-wear analysis. Several areas will command our attention: using stone tools to solve anthropological problems, the effects of raw material variability, the analysis of waste flakes, typology and measurement issues.

Flintknapping. Students are expected to participate in flintknapping. This is an *inherently dangerous activity* involving the production of many, sharp small bits of stone and glass. Stone tool raw material, antler batons and flakers, hammerstones, carpenter's goggles, and leather hand patches will be provided. *The use of protective eyewear is strongly recommended; also you should do all flintknapping outside to avoid breathing silica dust.* Dress accordingly on the first two sessions of the course as we will be doing our flintknapping outside. Protective eyewear can be purchased at the UW bookstore for \$3-4.

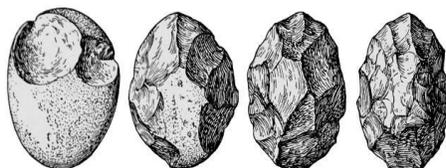
Course Requirements:

Two exams, 20% each. Because of our limited class time this semester (we only meet once a week and there are two conferences that will interrupt the class), exams will be take-home. They will consist of some essay questions and short answer. In addition, there is a practicum element that will be arranged for each exam; students will have to arrange a time to meet with me to complete that aspect of the exam (this part of the exam will not take long). Exams will be e-mailed out on Wednesday, and must be returned by 5 PM on Friday (i.e., you have about 48 hours for them). Graduate exams are somewhat longer and are graded in accordance with their lofty status in life. Exams should be typed and proof-read; they should be e-mailed back to me (as WORD files, not a pdf).

Final project/paper, 40%; a project/paper of the student's own design—I can also suggest a topic to you (see below). These can take the form of analysis of an archaeological or experimental assemblage; they also be a literature review of some aspect of lithic analysis (though I prefer papers that entail data collection and analysis). It is imperative that everyone decide on a topic and begin working on it soon. To this end, each student must make an appointment with me quickly to discuss potential topics. There are no specific limits on paper length, although you should never go beyond 40 pages (including text, bibliography, tables, figures); I would expect that most papers would be considerably shorter. The papers must be done professionally, typed, proofread, and with illustrations as needed. Please use the American Antiquity style guide and bibliographic format. I can go over this with you if you'd like. Your project should be essentially completed by Nov. 19.

In class presentation, 10%; each student will report on his/her project in the last week+ of class. I will invite others in the department to attend and will set time limits (once I see how many students are in the course). Your presentation should be a polished conference-style presentation using visuals. Computer and projector will be provided.

Class participation, 10%; subjective, and based on my impression of whether the student has done and thought about the readings. Graduate students may be asked to give summaries of assigned readings.



Potential Paper Topics

(you are NOT limited to one of these; these are merely suggestions)

1. Standard lithic analysis of existing data set from an archaeological site (I can give suggestions, and I have some assemblages just begging to be studied).
2. Why should we record which side of a flake is up in an excavation?
3. Flake Measurement accuracy/replicability
4. Collection of time data on stone tool production or use
5. Wyoming raw material identification
6. How do we know if a few broken rocks in a site are stone tools—or just fortuitously broken rocks?
7. projectile point typology (there are various issues that can be considered here)
8. What are the parameters of use of a class of stone tools (e.g., on what kinds of material can very fine drills be used)?

Readings: There is a great deal written on stone tools and debitage. I've tried to keep the required readings down to a reasonable amount. The recommended readings are, obviously, not required (but they are recommended).

Course Schedule:

1. 8/27 Introduction and flintknapping workshop (we will be outside)
2. 9/3 More flintknapping, and world overview of stone tool technology (students should be discussing projects with Kelly through separate appointments)
3. 9/10 Thinking about Technology, raw materials
4. 9/17 Raw Materials, debitage data collection
- 9/21 Sunday, field trip to Spanish Diggings quarry (not required)
5. 9/24 Debitage Data Collection
First exam handed out. Due: Friday 9/27 by 5 PM.
6. 10/1 NO CLASS: Plains conference (lots of time to work on projects this week and next; students should schedule conference with Kelly to discuss project progress)
7. 10/8 NO CLASS: Great Basin Conference
8. 10/15 Stone tool typology
9. 10/22 Analyzing assemblages (artifact refitting, MANA, cumulative curves, mass analysis, size/diversity)
10. 10/29 Analyzing assemblages continued
11. 11/5 To be announced
12. 11/12 Performance Characteristics: projectile points, flake utility
13. 11/19 A return to thinking about technology (might start project presentations) Second exam handed out. Due Friday 11/20 by 5 PM
14. 11/26 NO CLASS (Thanksgiving)
15. 12/3 Project presentations

Week 1

Andrefsky, chapters 1 and 2

Binford, L.R., and J.F. O'Connell

1984 An Alyawara day: the stone quarry. *Journal of Anthropological Research* 40: 406-432.

Week 2

Andrefsky, chapter 4

Week 3

Binford, L.R.

1979 Organization and formation processes: looking at curated technologies. *Journal of Anthropological Research* 35: 255-272.

Kelly, R.L

1988 The three sides of a biface. *American Antiquity* 53: 717-734.

Nelson, M.

1991 The study of technological organization. In *Archaeological method and theory* vol. 3, edited by M.B. Schiffer, pp. 57-100. University of Arizona, Tucson.

Week 4-5

Andrefsky, chapter 3, 5-6

Quarrying, raw materials:

Carambelas, K.R., and R.G. Elston

1992 Between a rock and a hard clay: opalite extraction from subsurface deposits at the Tosawihi quarries, northern Nevada. Paper presented at the 57th Annual Meeting of the Society for American Archaeology, Pittsburgh, PA.

Reher, C.A.

1991 Large scale lithic quarries and regional transport systems on the High Plains of eastern Wyoming: Spanish Diggings revisited. In *Raw Material Economies among Prehistoric Hunter-Gatherers*, edited by A. Montet-White and S. Holen, pp. 251-284. University of Kansas Publications in Anthropology 19.

Cooper, C.

2002 A study of the morphological changes in Tiger chert resulting from heat treatment. *Lithic Technology* 27: 153-160.

Dibble, H.

1991 Local raw material exploitation and its effects on lower and middle paleolithic assemblage variability. In *Raw Material Economies among Prehistoric Hunter-Gatherers*, edited by A. Montet-White and S. Holen, pp. 33-47. University of Kansas Publications in Anthropology 19.

Debitage data collection and analysis:

Andrefsky, W.A.

2001 Emerging Directions in Debitage Analysis. In *Lithic Debitage Context, Form, Meaning*, edited by W.A. Andrefsky, pp. 2-14. Salt Lake City, University of Utah Press.

Carr, P.J., and A.P. Bradbury

2001 Flake Debris Analysis, Levels of Production, and the Organization of Technology. In *Lithic Debitage Context, Form, Meaning*, edited by W.A. Andrefsky, pp. 126-146. Salt Lake City, University of Utah Press.

Bradbury, A.P., and P.J. Carr

1995 Flake typologies and alternative approaches: an experimental assessment. *Lithic Technology* 20: 100-115.

Larson, M.L., and J. Finley

2004 Seeing the forest but missing the trees: production sequences and multiple linear regression. In C. Hall and M.L. Larson, eds., *Aggregate Analysis in Chipped Stone*, pp. 95 – 112. Salt Lake City, University of Utah Press.

Week 6 No Class, Plains Conference

Week 7 No Class, Great Basin Conference

Week 8

Andrefsky, chap 7

Flenniken, J.J., and P.J. Wilke

1989 Typology, technology, and chronology of Great Basin dart points. *American Anthropologist* 91: 149-158.

Dibble, H.

1987 The interpretation of Middle Paleolithic scraper morphology. *American Antiquity* 52: 109-117.

Thomas, D.H.

1981 How to Classify the Projectile Points from Monitor Valley, Nevada. *Journal of California and Great Basin Anthropology* 3:7-43.

Weedman, Kathryn.

2002 On the spur of the moment: Effects of age and experience on hafted stone scraper morphology. *American Antiquity* 67: 731-744.

Week 9-10

Andrefsky, chapter 8

Hall, C.

2004 Evaluating Prehistoric hunter-gatherer mobility, land-use, and technological organization strategies using minimum analytical nodule analysis. In C. Hall and M.L. Larson, eds., *Aggregate Analysis in Chipped Stone*, pp. 139 – 155. Salt Lake City, University of Utah Press.

Morrow, T.M.

1996 Lithic refitting and archaeological site formation processes: a case study from the Twin Ditch Site, Greene County, Illinois. In *Stone Tools: Theoretical Insights into Human Prehistory*, edited by G.H. Odell, pp. 345-376. Plenum, New York.

Kelly, R.L.

2007 *Mustang Shelter: Test Excavation of a Rockshelter in the Stillwater Mountains, Western Nevada*. Nevada Bureau of Land Management Cultural Resource Series 18. Available on CD with data tables, and on-line:

http://www.blm.gov/nv/st/en/prog/more_programs/cultural_resources/reports.html.

Laughlin, J. and R. L. Kelly

2007 Experimental Analysis of the Practical Limits of Lithic Refitting. *Lithic Technology*.

Week 11: TBA

Week 12

Schiffer, M.B., and J.M. Skibo

- 1997 The explanation of artifact variability. *American Antiquity* 62: 27-50.
- Nelson, M.
- 1997 Projectile points: form, function and design. In *Projectile Technology*, edited by H. Knecht, pp. 371-384. Plenum, New York
- Christenson, A.L.
- 1997 Side-notched and Unnotched Arrowpoints: Assessing Functional Differences. In *Projectile Technology*, edited by H. Knecht, pp. 121-142. Plenum, New York.
- Cheshier, J. and R. L. Kelly
- 2006 Projectile Point Shape and Durability: The Effects of Thickness:Length. *American Antiquity* 71: 353-363.
- Prasciunas, M.
- 2007 Bifacial Cores and Flake Production Efficiency: An Experimental Test of Technological Assumptions. *American Antiquity* 72: 334-348.

Week 13

- Bettinger, R. L., B. Winterhalder and R. McElreath
- 2006 A simple model of technological intensification. *Journal of Archaeological Science* 33: 538-545.
- Ugan, A., J. Bright, and A. Rogers
- 2003 When is technology worth the trouble? *Journal of Archaeological Research* 30: 1315-1329.
- Bright, J., A. Ugan, and L. Hunsaker
- 2001 The effect of handling time on subsistence technology. *World Archaeology* 34: 164-181.
- Pfaffenberger, B.
- 1992 Social Anthropology of Technology. *Annual Review of Anthropology* 21: 491-516.

Week 14 (No Class, Thanksgiving)

Week 15: Class Presentations

Recommended Readings

Overviews, flintknapping basics

Odell, G.H.

2000 Stone Tool Research at the End of the Millenium: Procurement and Technology. *Journal of Archaeological Research* 8: 269-331.

2001 Stone Tool Research at the End of the Millenium: Classification, Function, and Behavior. *Journal of Archaeological Research* 9: 45-100.

Wilmsen, E.S.

1968 Lithic Analysis in Paleoanthropology. *Science* 161-982-987.

Cotterell, B. and J. Kamminga

1987 The formation of flakes. *American Antiquity* 52: 675-708.

Crabtree, D.

1972 An introduction to flintworking. *Occasional papers of the Idaho State University Museum* 8.

Callahan, E.

1979 The basics of biface manufacture in the eastern fluted point tradition. *Archaeology of Eastern North America* 7: 1-180.

Flenniken, J.J., and J.P. White

1985 Australian Flaked Stone Tools: A technological perspective. *Records of the Australian Museum* 36: 131-151.

Holmes, W.H.

1894 *Natural History of Flaked Stone Implements*. Memoirs of the International Congress of Anthropology, edited by C.S. Wake, pp. 120-139. Chicago.

Speth, J.D.

1972 Mechanical basis of percussion flaking. *American Antiquity* 37: 37-60.

Swanson, E. (ed.)

1975 *Lithic Technology: Making and Using Stone Tools*. Mouton, The Hague.

Luedtke, B.

1992 *An Archaeologist's Guide to Chert and Flint*. UCLA Institute of Archaeology.

Quarrying

Ericson, J.E., and B.A. Purdy (eds.)

1984 *Prehistoric Quarries and Lithic Production*. Cambridge University Press, Cambridge.

Luedtke, B.L.

1984 Lithic material demand and quarry production. In *Prehistoric Quarries and Lithic Production*, edited by J. Ericson and B.A. Purdy, pp. 65-76. Cambridge University Press, Cambridge.

Holmes, W.H.

1891 Aboriginal Novaculae Quarries in Garland County, Arkansas. *American Anthropologist* 4: 313-316.

Bloomer, W.W., K. Ataman, E. Ingbar, and M.W. Moore

1992 Bifaces. In *Archaeological Investigations at Tosawihi, A Great Basin Quarry*, edited by R.G. Elston and C. Raven, pp. 81-131. Intermountain Research Report to the BLM, Elko District, Nevada.

Vehik, S.(ed.)

1985 *Lithic Resource Procurement: Proceedings from the Second Conference on Prehistoric Chert Exploitation*. Southern Illinois University Center for Archaeological Investigations, Occasional Paper No. 4.

Bamforth, D.

1992 Quarries in Context: a regional perspective on lithic procurement. In *Stone tool procurement, production, and distribution in California prehistory*, edited by J. Arnold. Perspectives in California Archaeology Vol. 2, pp. 131-154. Institute of Archaeology, UCLA.

Purdy, B.A.

1984 Quarry studies: technological and chronological significance. In *Prehistoric quarries and lithic production*, edited by J.E. Ericson and B.A. Purdy, pp. 119-127. Cambridge University Press, Cambridge.

Ethnographic Accounts

Gould, R.A., and S. Saggers

1985 Lithic procurement in central Australia; A closer look at Binford's idea of embeddedness in archaeology. *American Antiquity* 50: 117-136.

Oswalt, W.H.

1973 *Habitat and Technology*. Holt, Rinehart and Winston, New York.

Hampton, O.W.

1999 *Culture of Stone: Sacred and Profane Uses of Stone among the Dani*. College Station, Texas A&M Press.

Jones, R., and N. White

1988 Point blank: stone tool manufacture at the Ngilipitji Quarry, Arnhem Land, 1981. In *Archaeology with Ethnography: An Australian Perspective*, edited by B. Meehan and R. Jones, pp. 51-87. Australian National University, Canberra.

Miller, Jr., T.O.

1979 Stonework of the Xeta Indians of Brazil. In *Lithic Use-Wear Analysis*, edited by B. Hayden, pp. 401-407. Academic Press, New York.

Gould, R.

1980 *Living Archaeology*. Cambridge University Press, Cambridge.

Hayden, B.

1977 Stone Tool Functions in the Western Desert. In *Stone Tools as Cultural Markers*, edited by R.V.S. Wright, pp. 178-188. Australian Institute of Aboriginal Studies, Canberra.

1979 *Paleolithic Reflections: Lithic Technology of the Australian Western Desert*. Canberra, Australian Institute of Aboriginal Studies.

Hayden, B., and M. Nelson

1981 The use of chipped lithic material in the contemporary Maya Highlands. *American Antiquity* 46: 885-898.

Binford, L.R.

1986 An Alyawara day: making men's knives and beyond. *American Antiquity* 51: 547-562.

Binford, L.R.

1977 Forty-seven Trips. In *Stone Tools as Cultural Markers*, edited by R.V.S. Wright, pp. 24-36. Australian Institute of Aboriginal Studies, Canberra.

Ellis, C.

- 1997 Factors influencing the use of stone projectile tips: an ethnographic perspective. In *Projectile Technology*, edited by H. Knecht, pp. 37-78. Plenum, New York.
- Gallagher, J.P.
1977 Contemporary stone tools in Ethiopia: implications for archeology. *Journal of Field Archaeology* 4: 407-414.
- Gould, R., D. Koster, and A. Sontz
1971 The lithic assemblage of the Western Desert aborigines. *American Antiquity* 36: 149-169.
- Hayden, B. (ed.)
1987 *Lithic Studies Among the Contemporary Highland Maya*. University of Arizona Press, Tucson.
- Sillitoe, P.
1982 The lithic technology of a Papua New Guinea Highland People. *The Artefact* 7: 19-38.
- Tindale, N.
1985 Australian Aboriginal Techniques of pressure-flaking stone implements: some personal observations. In *Stone tool analysis: essays in honor of Don E. Crabtree*, edited by M.G. Plew, J.C. Woods, and M. Pavesic, pp. 1-34.. University of New Mexico Press, Albuquerque.
- Watson, V.D.
1995 Simple and significant: stone tool production in highland New Guinea. *Lithic Technology* 20(2): 89-99.

Stone tool making methods

- Amick, D. (ed.)
1999 *Folsom Lithic Technology: Explorations in Structure and Variation*. International Monographs in Prehistory Archaeological Series 12. Ann Arbor.
- Crabtree, D.E.
1966 A Stoneworkers Approach to Analyzing and Replicating the Lindenmeier Folsom. *Tebawa* 9: 3-39.
- Rosen, S.A.
1997 *Lithics After the Stone Age: A Handbook of Stone Tools from the Levant*. Altamira Press, Walnut Creek, CA.
- Boldurian, A.T.
1990 *Lithic Technology at the Mitchell Locality of Blackwater Draw: A Stratified Folsom Site in Eastern New Mexico*. Plains Anthropologist Memoir 24.
- Bordaz, J.
1970 *Tools of the Old and New Stone Age*. Natural History Press, Garden City.
- Bradley, B.A.
1982 Flaked stone technology and typology. In *The Agate Basin Site: A Record of the Paleoindian Occupation of the Northwestern High Plains*, edited G. Frison and D. Stanford, pp. 181-208. Academic Press, New York.
- Frison, G.A., and B. Bradley
1980 *Folsom tools and technology at the Hanson Site, Wyoming*. University of New Mexico Press, Albuquerque.
- Frison, G., and B. Bradley
1999 *The Fenn Cache: Clovis Weapons and Tools*. One Horse Land and Cattle Co., Santa Fe.

- Clark, J.
1982 Manufacture of Mesoamerican prismatic blades: an alternative technique. *American Antiquity* 47: 355-376.
- Collins, M.
1999 *Clovis Blade Technology*. University of Texas Press. Austin.
- Schick, K.D., and N. Toth
1993 *Making Silent Stones Speak*. Simon & Schuster, New York.
- Tabarev, A.
1997 Paleolithic edge-shaped microcores and experiments with pocket devices. *Lithic Technology* 22: 139-149.
- Kuhn, S.
1995 *Mousterian Lithic Technology: An Ecological Perspective*. Princeton University Press, Princeton. (Chapter 2).
- Allchin, B.
1966 *The Stone-Tipped Arrow*. Phoenix House, London.

Organization of technology

- Nash, S.E.
1996 Is curation a useful heuristic? In *Stone Tools: Theoretical Insights into Human Prehistory*, edited by G.H. Odell, pp. 81-100. Plenum, New York.
- Kuhn, S.
1994 A formal approach to the design and assembly of transported toolkits. *American Antiquity* 59: 426-442.
- Elston, R.G.
1990 A Cost-Benefit Model of Lithic Assemblage Variability. In *The Archaeology of James Creek Shelter*, edited by R.G. Elston and E.F. Budy, pp. 153-163. University of Utah Anthropological Papers 115. University of Utah, Salt Lake City.
- Shott, M.
1986 Technological organization and settlement mobility: an ethnographic examination. *Journal of Anthropological Research* 42: 15-51.
- Kuhn, S.
1991 "Unpacking" reduction: lithic raw material economy in the Mousterian of west-central Italy. *Journal of Anthropological Archaeology* 10: 76-106.
- Sellet, F.
1993 Chaîne Opératoire: the concept and its applications. *Lithic Technology* 1:106-112.
- Grace, R.
1998 The Chaîne Opératoire approach to lithic analysis.
<http://www.hf.uio.no/iakk/roger/lithic/opchainpaper.html>
- Hughes, R.F.
1998 On Reliability, Validity, and Scale in Obsidian Sourcing Research. In *Unit Issues in Archaeology: Measuring Time, Space, and Material*, edited by A.F. Ramenofsky and A. Steffen, pp. 103-114. University of Utah Press, Salt Lake City.
- Ingbar, E.E.

- 1994 Lithic material selection and technological organization. In *The Organization of North American Prehistoric Chipped Stone Technologies*, edited by P.J. Carr, pp. 45-56. International Monographs in Prehistory Archaeological Series 7.
- Amick, D.
- 1999 Raw Material Variation in Folsom Stone Tool Assemblages and the Division of Labor in Hunter-Gatherer Societies. In *Folsom Lithic Technology*, edited by D. Amick, pp. 169-187. International Monographs in Prehistory Archaeological Series 12. Ann Arbor.
- Amick, D.
- 1995 Raw Material Selection Patterns among Paleoindian Tools from the Black Rock Desert, Nevada. *Current Research in the Pleistocene* 12: 55-57.
- Basgall, M.E.
- 2000 Patterns of Toolstone Use in Late-Pleistocene/Early-Holocene Assemblages of the Mojave Desert. *Current Research in the Pleistocene* 17: 4-6.
- Beck, C., and G.T. Jones
- 1990 Toolstone Selection and Lithic Technology in Early Great Basin Prehistory. *Journal of Field Archaeology* 17: 283-299.
- Wenzel, K.E., and P.H. Shelley
- 2001 What Put the Small in the Arctic Small Tool Tradition: Raw Material Constraints on Lithic Technology at the Mosquito Lake Site, Alaska. In *Lithic Debitage Context, Form, Meaning*, edited by W.A. Andrefsky, pp. 106-125. Salt Lake City, University of Utah Press.
- Andrefsky, W.
- 1994 The Geological Occurrence of Lithic Material and Stone Tool Production Strategies. *Geoarchaeology* 9: 345-362.
- Jones, G.T., C. Beck, and E. Jones
- 1997 Source Provenance of Andesite Artifacts using Non-Destructive XRF Analysis. *Journal of Archaeological Science* 24: 929-943.

Heat Treatment

- Ahler, S.A.
- 1983 Heat Treatment of Knife River Flint. *Lithic Technology* 12: 1-8.
- Bleed, P., and M. Meier
- 1980 An Objective Test of the Effects of Heat Treatment on Flakeable Stone. *American Antiquity* 45: 502-507.
- Borradaile, G.J., S.A. Kissin, J.D. Stewart, W.A. Ross, and T. Werner
- 1993 Magnetic and Optical Methods for Detecting the Heat Treatment of Chert. *Journal of Archaeological Science* 20: 57-66.
- Collins, M.B., and J.M. Fenwick
- 1974 Heat Treating of Chert: Methods of Interpretation and Their Application. *Plains Anthropologist* 19: 134-145.
- Cooper, C.
- 2002 A study of the morphological changes in Tiger chert resulting from heat treatment. *Lithic Technology* 27: 153-160.
- Crabtree, D.E. and R.B. Butler
- 1964 Notes on Experiments in Flintknapping. 1: Heat Treatment of Silica Materials. *Tebiwā*

- 7:1-6.
- Domanski, M., and J. Webb
 1992 Effect of Heat Treatment on Siliceous Rocks Used in Prehistoric Lithic Technology. *Journal of Archaeological Science* 19: 601-614.
- Dunnell, R., P.T. McCutcheon, M. Ikeya, and S. Toyoda
 1994 Heat treatment of Mill Creek cherts in Missouri. *Journal of Archaeological Science* 21: 79-90.
- Gregg, M.I., and R.J. Grybush
 1976 Thermally Altered Siliceous Stone from Prehistoric Contexts: Unintentional vs. Intentional Alteration. *American Antiquity* 41: 189-192.
- Griffiths, D.R. C.A. Bergman, C.J. Clayton, K. Ohnuma, G.V. Robins, and N.J. Seeley
 1986 Experimental Investigations of the Heat Treatment of Flint. In *The Human Use of Flint and Chert*, edited by G. de G. Sieveking and M.H. Newcomer, pp. 43-52. Cambridge University Press, New York.
- Hester, T.R.
 1972 Ethnographic Evidence for the Thermal Alteration of Siliceous Stone. *Tebiwa* 12: 63-65.
- Mandeville, M.D.
 1973 A Consideration of the Thermal Pretreatment of Chert. *Plains Anthropologist* 19: 146-148.
- Olausson, D.S. and L. Larsson
 1982 Testing for the Presence of Thermal Pretreatment of Flint in the Mesolithic and Neolithic of Sweden. *Journal of Archaeological Science* 9: 275-285.
- Patterson, L.W.
 1995 Thermal Damage of Chert. *Lithic Technology* 20: 72-80.
- Price, T.D., S. Chappell, and D.J. Ives
 1982 Thermal Alteration of Mesolithic Assemblages. *Proceedings of the Prehistoric Society* 48: 467-485.
- Purdy, B.A.
 1974 Investigations Concerning the Thermal Alteration of Silica Minerals: An Archaeological Approach *Tebiwa* 17: 37-66.
- Rick, J.W.
 1978 *Heat Altered Cherts of the Lower Illinois Valley: An Experimental Study in Prehistoric Technology*. Prehistoric Records 2. Northwestern University Archaeological Program, Evanston.
- Rick, J., and S. Chappell
 1983 Thermal alteration of silica materials in technological and functional perspective. *Lithic Technology* 12: 69-80.
- Schindler, D., Hatch, J., Hay, C., and R. Bradt
 1982 Aboriginal thermal alteration of a central Pennsylvania jasper: analytical and behavioral implications. *American Antiquity* 47: 526-544.
- O'Connell, J.F.
 1977 Aspects of variation in central Australian lithic assemblages. In *Stone Tools as Cultural Markers*, edited by R.V.S. Wright, pp. 269-281. Australian Institute of Aboriginal Studies, Canberra.
- Bamforth, D.

1990 Settlement, raw material and lithic procurement in the central Mojave Desert. *Journal of Anthropological Archaeology* 9: 70-104.

Close, A.

1999 Distance and decay: An Uneasy Relationship. *Antiquity* 73: 24-32.

Newman, J.

1994 The effects of distance on lithic material reduction technology. *Journal of Field Archaeology* 21: 491-501.

Debitage Analysis

Bradbury, A.P., and P.J. Carr

1999 Examining stage and continuum models of flake debris analysis: An experimental approach. *Journal of Archaeological Science* 26: 105-116.

Ahler, S.

1989 Mass analysis of flaking debris: studying the forest rather than the tree. In *Alternative Approaches to Lithic Analysis*, edited by D.O. Henry and G.H. Odell. Archaeological Papers of the American Anthropological Association 1: 85-118. (Portions of this can be skimmed)

Larson, M.L., and M. Kornfeld

1997 Chipped stone nodules: theory, method and examples. *Lithic Technology* 22(1): 4-18

Sullivan, A.P., and K.C. Rozen

1985 Debitage analysis and archaeological interpretation. *American Antiquity* 50: 755-779.

Shott, M.

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