

## HANDOUT 1

### Principles of Archaeological Excavation

### Suggested Reading and Bibliography

Ashmore, Wendy, and Robert J. Sharer

2009 **Discovering Our Past: A Brief Introduction to Archaeology.** 5<sup>th</sup> ed. McGraw-Hill Higher Education, New York.

Barker, Philip

1997 **Techniques of Archaeological Excavation.** 3<sup>rd</sup> ed. Routledge, Inc., New York.

Bass, William M.

2005 **Human Osteology: A Laboratory and Field Manual.** 5<sup>th</sup> ed. Special Publications Series #2, Missouri Archaeological Society, Springfield.

Birkeland, Peter W.

1999 **Soils and Geomorphology.** 3<sup>rd</sup> ed. Oxford University Press, New York.

Burke, Heather, Claire Smith, and Larry J. Zimmerman

2009 **The Archaeologist's Field Handbook: North American Edition.** AltaMira Press, Lanham, Maryland.

Carmichael, David L., Robert Lafferty, and Brian Leigh Molyneaux

2003 **Excavation.** Archaeologist's Toolkit Volume 3. AltaMira Press, Lanham, Maryland.

Cassells, E. Steve

1997 **The Archaeology of Colorado.** Revised ed. Johnson Books, Boulder.

Clark, Anthony

1997 **Seeing Beneath the Soil: Prospecting Methods in Archaeology.** B. T. Batsford Ltd., London, UK.

Conyers, Lawrence B.

2012 **Interpreting Ground-Penetrating Radar for Archaeology.** Left Coast Press, Walnut Creek, California.

- Conyers, Lawrence B., and Dean Goodman  
1997 **Ground-Penetrating Radar: An Introduction for Archaeologists.**  
AltaMira Press, Walnut Creek, California.
- Dibble, Harold L., Shannon P. McPherron, and Barbara Roth  
2002 **Virtual Dig: A Simulated Archaeological Excavation of a Middle Paleolithic Site in France.** 2<sup>nd</sup> ed. Mayfield Publishing Co., Mountain View, California. [workbook and CD-ROM]
- Dibble, Harold L., Curtis W. Marean, and Shannon P. McPherron  
2007 The Use of Barcodes in Excavation Projects: Examples from Mossel Bay (South Africa) and Roc de Marsal (France). **The SAA Archaeological Record** 7(1):33–38.
- Dillon, Brian D. (editor)  
1993 **Practical Archaeology: Field and Laboratory Techniques and Archaeological Logistics.** 3<sup>rd</sup> ed. UCLA Institute of Archaeology, Archaeological Research Tools No 2. Los Angeles, California.
- Dincauze, Dena F.  
2000 **Environmental Archaeology: Principles and Practice.** Cambridge University Press, New York.
- Fagan, Brian M.  
2009 **In The Beginning: An Introduction to Archaeology.** 12<sup>th</sup> ed. Prentice Hall, Upper Saddle River, New Jersey.
- Gilbert, B. Miles  
2003 **Mammalian Osteology.** Reprint ed. Special Publications Series #3. Missouri Archaeological Society, Springfield.
- Goldberg, Paul, Vance T. Holliday, and C. Reid Ferring (editors)  
2001 **Earth Sciences and Archaeology.** Kluwer Academic/Plenum Publishers, New York.
- Greene, Kevin, and Tom Moore  
2010 **Archaeology: An Introduction.** 5<sup>th</sup> ed. Routledge, New York.
- Harris, Edward C.  
1989 **Principles of Archaeological Stratigraphy.** 2<sup>nd</sup> ed. Academic Press, New York.

Henry, Donald O.

- 1980 The Role of the Research Design in Conservation Archaeology.  
**Southwestern Lore** 46(4):10–13.

Hester, Thomas R., Harry J. Shafer, and Kenneth L. Feder

- 2008 **Field Methods in Archaeology**. 7<sup>th</sup> ed. Karp Mitaspain and Left Coast Press, Walnut Creek, California.

Holliday, Vance T. (editor)

- 1992 **Soils in Archaeology: Landscape Evolution and Human Occupation**. Smithsonian Institution Press, Washington, D.C.

Jol, Harry M. (editor)

- 2009 **Ground Penetrating Radar Theory and Applications**. Elsevier Science, Oxford, UK.

Kipfer, Barbara Ann

- 2000 compiler. **Encyclopedic Dictionary of Archaeology**. Kluwer Academic/Plenum Publishers, New York.

- 2006 **The Archaeologist's Fieldwork Companion**. Blackwell Publishing, Malden, Massachusetts.

Koch, Adrienne, and William Peden (editors)

- 1998 **The Life and Selected Writings of Thomas Jefferson**. The Modern Library, Random House, New York.

Maschner, Herbert D. G., and Christopher Chippindale (editors)

- 2005 **Handbook of Archaeological Methods**. AltaMira Press, Lanham, Maryland.

McMillon, Bill

- 1991 **The Archaeology Handbook: A Field Manual and Resource Guide**. John Wiley & Sons, New York.

Munsell Color Company

- 2009 **Munsell Soil Color Charts**. Revised ed. Munsell Color Company, X-Rite America, Grand Rapids, Michigan.

- Nickens, Paul R.  
1980 Regional Research Design Development in Cultural Resource Management: Problems and Prospects. **Southwestern Lore** 46(3):23–30.
- Nöel Hume, Ivor  
1975 **Historical Archaeology**. W.W. Norton & Co., New York.
- Orton, Clive  
2000 **Sampling in Archaeology**. Cambridge Manuals in Archaeology. Cambridge University Press, New York.
- Peregrine, Peter N.  
2015 **Archaeological Research: A Brief Introduction**. 2<sup>nd</sup> ed. Left Coast Press, Walnut Creek, California.
- Poirier, David A., and Kenneth L. Feder (editors)  
2001 **Dangerous Places: Health, Safety, and Archaeology**. Bergin & Garvey, Westport, Connecticut.
- Renfrew, Colin, and Paul Bahn  
2008 **Archaeology: Theories, Methods and Practice**. 5<sup>th</sup> ed. Thames & Hudson, New York.
- Roskams, Steve  
2001 **Excavation**. Cambridge Manuals in Archaeology. Cambridge University Press, New York.
- Schiffer, Michael B.  
2002 **Formation Processes of the Archaeological Record**. University of Utah Press, Salt Lake City.
- Scollar, Irwin, A. Tabbagh, A. Hesse, and I. Herzog  
2009 **Archaeological Prospecting and Remote Sensing**. 2<sup>nd</sup> ed. Topics in Remote Sensing No. 2. Cambridge University Press, Cambridge, UK.
- Scott, Douglas D., and Paul R. Nickens  
1991 Nonintrusive Site Evaluation and Stabilization Techniques for Archaeological Resources. **The Public Historian** 13(3):85–96.

Sease, Catherine

1994 **A Conservation Manual for the Field Archaeologist.** 3<sup>rd</sup> ed. UCLA Institute of Archaeology, Archaeological Research Tools, Vol. 4. Los Angeles, California.

Seddon, Matthew T., Heidi Roberts, and Richard V. N. Ahlstrom

2011 **Archaeology in 3D: Deciphering Buried Sites in the Western U.S.** The SAA Press, Washington, DC.

Stein, Julie K., and William R. Farrand (editors)

2001 **Sediments in Archaeological Context.** University of Utah Press, Salt Lake City.

Stewart, R. Michael

2010 **Archaeology: Basic Field Methods.** Paperback ed. Kendall/Hunt Publishing Co., Dubuque, Iowa.

Wendorf, Fred

2008 **Desert Days: My Life as a Field Archaeologist.** Southern Methodist University Press, Dallas.

Wheeler, Sir Mortimer

2004 **Archaeology from the Earth.** Munshirm Manoharlal Publishers, New Delhi, India.

Willey, Gordon R., and Jeremy A. Sabloff

1995 **A History of American Archaeology.** 3<sup>rd</sup> ed. W.H. Freeman & Co., New York.

Wiseman, James R., and Farouk El-Baz (editors)

2007 **Remote Sensing in Archaeology.** Interdisciplinary Contributions to Archaeology. Springer, New York.

**HANDOUT 2 – GLOSSARY**

Aeolian = the process of sediments being deposited by wind, e.g., dune sand and loess; also, “eolian.”

Airborne Synthetic Aperture Radar (AirSAR) = remote sensing technology in which a radar antenna attached to an aircraft emits a series of pulses as it travels, the signals from which are combined in analysis. The combination gives a result as if the pulses had all been made simultaneously from a very large antenna, effectively creating a “synthetic aperture” much larger than the length of the antenna. The current resolution is about 10 cm, with experimental SAR providing the promise of sub-millimeter resolution.

Alidade = mapping instrument used in conjunction with a plane table; a telescope and vertical scale mounted on a straight-edged base; lacks a circular scale and compass, and does not attach to tripod; not used for grid set-up.

Alluvial = the process of sediments being deposited by streams or running water, such as is represented in a river terrace; “alluvium” is the type of sediment deposited by alluvial means.

Ancillary Sample = any material sample collected in fieldwork other than artifacts; e.g., soil, pollen, flotation, radiocarbon, dendro samples, etc.

apgs = above present ground surface, describing an elevation measurement for provenience documentation; e.g., a local datum may be established 15 cm apgs (centimeters above present ground surface)

Auger = a large soil-boring tool (6–8" diameters typically) with a screw-like bit mounted on a hand- or motor-powered axle, used to dig round test holes in non-rocky soils; smearing of the hole walls does not allow for easy reading of the natural or cultural stratigraphy.

Backhoe = a tractor typically having a wide shovel mounted in front (front-end loader) and a narrower digging bucket in the rear (the backhoe); the latter tool is often used to dig deep test trenches in the early stages of an excavation.

Balk = a narrow strip of soil left unexcavated between grid units to preserve evidence of the natural and cultural stratigraphy; see “strat block.”

Baseline = primary north-south and east-west axes of an excavation grid, from which subsequent grid units are measured and labeled.

bd = below datum (local or primary), describing a depth measurement for convenience; e.g., an artifact may be located 35 cmbd (centimeters below datum)

bgs = below ground surface; see *bd*.

bpgs = below present ground surface; see *bd*.

Bioturbation = disturbance of a soil or sediment deposit by living plants or animals, such as tree root penetration and rodent burrowing.

Chaining Pin = often used in place of wooden stakes; colored metal pin at least 12" long with a loop at the top for attaching string; marks grid corners.

Colluvial = the process of sediments being transported down a slope largely by gravity, where they accumulate as "colluvium"; e.g., slope wash and talus deposits.

Color Infrared (CIR) Aerial Photography = remote sensing technology using infrared film or digital infrared equipment; archaeological features may be detected by vegetation differences highlighted in infrared wavelengths.

Component = a cultural deposit at a single archaeological site representative of a local culture, usually including more than one individual "occupation" or level; most sites have multiple components, often difficult to separate.

Cross-section = vertical view of a feature or structure achieved by digging half of it at a time, or by trenching; usually done to draw a profile.

Cultural Fill = soil containing artifacts, features and/or organic materials and stains from cultural activity; soil specialists call a heavily-stained version of this an "Anthrosol."

Datum = a semi-permanent to permanent reference point set in the ground at a site that is used for surface mapping and/or excavation grid set-up.

Declination = the horizontal angle, expressed in degrees east or west, between true north and magnetic north; in Colorado, magnetic north is now east of true north; the declination used in setting up a grid or drawing a map must be specified when the grid or map is oriented to true north.

Dip = a provenience measurement on an artifact, determining the degree of slope of an artifact as measured down from the horizontal plane.

Ecofact = any collected plant or animal material not intentionally modified into an artifact, such as seeds and bone fragments; a.k.a. “biofact.”

Electrical Resistivity Tomography (ERT) = a.k.a., electrical resistivity imaging (ERI), a geophysical remote sensing technology for detecting buried features from electrical measurements made at the surface, or by electrodes placed in the ground. Basically, ERT is a direct current method.

Eolian = see *Aeolian*.

E.U. = “excavation unit”; see *Test Pit*.

Feature = any non-portable object used or made by people; e.g., a firepit, cabin foundation, masonry room, bedrock metate, rock art, cairn, soil stain, etc.

Field Specimen = “F.S.”; any object, artifact or material sample collected during an archaeological project; the location must be documented on a catalog sheet, often called an F.S. Log.

Flotation = a sample of soil collected for the purpose of extraction of botanical remains, via a process of submerging the soil in water and stirring until the organic content “floats” to the surface for removal.

G.P.S. = Global Positioning System, a global navigation satellite system originally developed by the U. S. Department of Defense, now widely used in civilian navigation and mapping applications. A network of 24–32 satellites transmits precise radio wave signals, which allow GPS receivers to determine their current location (as well as the time and their velocity, the latter not of much interest for archaeologists). On a survey, archaeologists most often use inexpensive GPS receivers to pinpoint the locations of sites and IFs on topographic maps with an error factor of 5–10 m. More precise “sub-meter” mapping requires augmentation methods such as Differential GPS (DGPS)



that uses a network of fixed, ground-based reference stations to broadcast the difference between positions indicated by the satellites and the known fixed positions. Far more expensive, DGPS is more typically used in excavation projects than in archaeological survey.

Grid = a coordinate system of labeled, contiguous squares set up on the surface of an archaeological site, allowing for the accurate measurement of horizontal locations in an excavation (or surface collection).

Ground-penetrating Radar (GPR) = remote sensing technology for detecting and/or mapping buried features up to 5 m or more below surface by reflected radar waves, generated in pulses from a surface antenna.

In Situ = literally, “in place”; finding one or more artifacts in their exact spot within a cultural deposit, most often achieved using smaller hand tools.

Interferometric Synthetic Aperture Radar (InSAR) = remote sensing technology for detecting and/or mapping buried features, using two or more radar images to identify features expressed as maps of surface deformation or digital elevation; the method works by measuring the differences in the phase of the waves returning to the satellite or aircraft.

Krotovina = a former animal burrow in a soil horizon—often filled with organic matter or material from another horizon; these are common disturbances in Colorado soils that must be documented in notes and soil profiles.

Level = 1) a vertical section of soil excavated in arbitrary or natural intervals; or 2) a mapping instrument (“Dumpy” level) with very few moving parts mainly used to measure elevations; more complex levels may also have a horizontal scale usable for grid set-up on relatively gentle terrain.

Light Detection and Ranging (LIDAR) = remote sensing technology that measures properties of scattered light to find range and/or other information of a target, most commonly using laser pulses. Similar to radar technology (see GPR above), which uses radio waves instead of light, the distance from surface to a buried feature is determined by measuring the time delay between transmission of a pulse and detection of the reflected signal.

Line Level = a tiny leveling tool that attaches to a string, for establishing horizontal lines in order to measure vertical locations and to set up profile lines.

Living Surface = any excavated surface which has evidence of past human activity within a confined vertical section; may be a floor within a structure, a trampled area of soil, a concentration of flat-lying artifacts without evidence for trampling, etc.

Loess = a deposit of silt and fine sand deposited by the wind; commonly accumulates at the end of glacial cycles, as represented on the Colorado plains and on Mesa Verde.

Metal Detector = portable remote sensing technology using electromagnetic induction to detect metal. Because almost no metal was used by prehistoric cultures in Colorado, the technology is used mainly on historical archaeological sites.

Micromammal = bones of small, mostly intrusive, mammals such as mice and voles; because these animals have very specific habitat needs, their presence is helpful in reconstructing past environments. The bones of other small vertebrates (e.g., shrews, lizards) are similarly helpful. Because their skeletal remains are so small and fragile, their recovery requires careful work.

Munsell Charts = book containing colored chips with specific reference numbers and color names, for describing soil or pigment colors.

Optical Aerial Photography = remote sensing technology using standard visible wavelength film or digital photographs taken at varying altitudes to detect and/or map archaeological sites. The discovery of some sites is made possible by contrasts in vegetation (“crop marks”) or soil between the site areas and the adjacent unmodified landscape.

Overburden = accumulation of culturally sterile soil on top of an archaeological deposit; often removed by heavy equipment after a site has been tested.

Palimpsest = a written document, typically on vellum or parchment, that has been written upon several times, often with remnants of earlier, imperfectly erased writing still visible. In archaeological usage, the term refers to a sequence of very thin cultural strata whose contents are difficult to separate from each other.

Ped = field term for a single clump of soil, the shape of which defines its structure.

Pedology = the study of the formation, morphology, and classification of soils.

Plan Map = shows details of a feature or structure in “overhead” view; includes maps of site surface and excavation grid.

Plane Table = a flat, rectangular wooden board that attaches to a tripod and to which a large piece of graph paper is fastened; used in conjunction with an alidade that is set on the plane table for site mapping.

Plumb Bob = a usually conical piece of metal attached to a string, for establishing a true vertical or placing a tripod directly above a datum or grid point; sometimes called a “plummet.”

Profile = a map showing a vertical “side view” section of a soil exposure or a feature.

Proton Magnetometer = a.k.a. proton precession magnetometer (PPM), is a remote sensing technology that measures tiny variations in Earth’s magnetic field caused by ferrous concentrations (such as iron artifacts) in the soil, thermo-remanent magnetism of fired clays, and differences in the magnetic susceptibility of culturally-disturbed soils.

Provenance = location of the origin of an artifact or material; e.g., a flake of obsidian derived from the El Rechuelos, NM source or a ceramic trade jar made in the White Mountains tract, Arizona.

Provenience = horizontal and vertical location of an artifact or feature, in reference to a datum, grid corner or other geographic landmark.

Research Design = a “plan of attack” written prior to an archaeological survey or excavation; provides a project focus and research orientation, as well as a practical statement on how the work will be accomplished.

Residual = pertaining to those sediment accumulations that result from in situ weathering of local bedrock; minimal or no transport is involved in this process.

Seriation = a relative dating technique; the arrangement of data into series by some consistent principle of ordering (usually time-ordering); uses the frequency of artifact types in time and space to determine the chronological placement of a given assemblage of artifacts (especially pottery).

Spaceborne Imaging Radar (SIR) = remote sensing technology using radar carried on satellites or the space shuttle to detect and/or map large-scale landscape phenomena including (potentially) culturally modified settings. Data are available either in a strip image of a swath up to hundreds of kilometers long, or in single frame images of a data segment. Radar imagery is generated using one or more antennas: X-band (3 cm wavelength), C-band (5.8 cm wavelength), and L-band (23.5 cm wavelength).

Stabilization = maintaining the physical integrity of an artifact using a chemical solvent or emulsion; or retarding the deterioration of a structure or site deposit by various construction techniques such as rip-rap, fabric or metal mesh, repointing or relaying masonry, etc.

Stadia Rod = a scaled telescoping pole used to determine vertical elevations and distances; used in conjunction with alidades, transits, theodolites, etc.

Strat Block = a column of soil left unexcavated in an archaeological site as evidence of the natural and cultural stratigraphy; often used in the Southwest.

Stratigraphy = the study of the natural and cultural sequence of soil levels (“strata”) in an archaeological or geological site; described in a soil profile.

Strike = a provenience measurement on an artifact, determining the direction of dip (see *Dip*), as measured in degrees of azimuth (0°–360°).

Synthetic Aperture Radar (SAR) = see *Airborne Synthetic Aperture Radar (AirSAR)*.

Test Pit = a square-shaped unit excavated in formal arbitrary or natural levels for determining the depth and character of buried cultural remains (often abbreviated T.P., or T.U. for test unit; grid squares are often called excavation units: “E.U.” or “X.U.”).

T.P. = “test pit”, above.

Theodolite = a mapping instrument similar to, but simpler than, a transit; a short telescope mounted on a tripod, not used with a plane table; has no exposed verniers (graduated scale to measure angles), no compass, no clamps, & no tangent screws (adjustments for slow motion change to horizontal axis); like a transit, readings must be recorded in a log.

Thermal Infrared Multispectral Scanner (TIMS) = remote sensing technology using thermal infrared spectroscopy (TIR spectroscopy), mainly in airborne and space-borne applications. Thermal infrared spectroscopy measures the radiation emitted from a volume or surface, specifically wavelengths in the range 8.2–12.2  $\mu\text{m}$ . The method gives an accurate measure of spectral radiance or brightness temperature of the earth's surface, such as the surface temperature of vegetated areas that are cooler than adjacent barren areas. Thus, detection of cultural landscapes is somewhat comparable to the observation of “crop marks” in *Optical Aerial Photography*, above.

Total Station = very accurate, distance-measuring electronic transit; exceeds performance of both the theodolite and older transit models in its ability to measure very fine angular and distance divisions (the latter via EDM laser), internal programming for trigonometric functions, and set-up for computer linkage.

Trackhoe = heavy tractor with large trenching/digging bucket mounted on the front, wider than the rear bucket on a backhoe and used for similar testing purposes on archaeological sites.

Transit = complex mapping instrument; a telescope mounted to a horizontal axis (thence to a tripod), for measuring horizontal and vertical angles as well as distances; must be leveled, and used with a stadia rod; readings should be recorded in the field in a log book.

Trench = a linear excavation dug by hand or with a backhoe, for long vertical exposures of site stratigraphy; described in one or more soil profiles.

Triangulation = locating the position in geographic space of an artifact, feature or site by taking distance and direction measurements from two or more known points; also used to set up a test pit using two tape measures extended from two previously established pit corners.

T.U. = “test unit”; see *Test Pit*.

Water Screen = enhanced material recovery technique using fine-mesh screen (e.g., 1/8" or finer “window” screen) in conjunction with flowing water to dissolve and remove encasing sediments; often used with saturated or clayey soils, or to recover tinier artifacts of bone, stone, etc.

Witness Block = a section of soil left unexcavated in an archaeological site as evidence of the natural and cultural stratigraphy; see *Strat Block*.

X.U. = “excavation unit”; see *Test Pit*.