

Interpreting Ground-penetrating Radar for Archaeology. LAWRENCE B. CONYERS. 2012. Left Coast Press, Walnut Creek, California. 220 pp. \$99.00 (hardback), \$49.95 (eBook), ISBN 978-1-61132-216-3.

Reviewed by Kenneth L. Kvamme, University of Arkansas

North American archaeology saw early interest in ground-penetrating radar and produced several of its key practitioners, including the author of *Interpreting Ground-penetrating Radar for Archaeology*. In several ways GPR is more complicated than other geophysical techniques with more cumbersome instrumentation, more parameters to consider, and it yields data that are truly three-dimensional. The last places a heavier burden on data processing because horizontal plan maps of the subsurface may be generated at multiple depths (in contrast to most other methods) as well as in the vertical plane to produce profile views of subsurface features and stratigraphy. Additional complications arise because, as Conyers (p. 15) observes, "anyone looking at GPR images without an understanding of what goes into producing them cannot possibly see their scientific meaning, but only their interesting shapes and colors—the realm of art. Only a comprehension of the many variables that go into processing radar reflections in the ground and processing them into images will allow accurate or even a marginally useful interpretation of the final products."

Fortunately, with recent software advances, Conyers (p. 13) admits that "GPR users are now capable of routinely producing potentially usable products from their GPR data, but all of us still struggle with what those images have to tell us about the interesting buried features we are studying." This statement establishes the purpose of this volume: it offer examples, lessons, advice, and admonitions about how to *interpret* GPR data gathered in archaeological contexts. Consequently, this is not a textbook summarizing GPR method and theory. Rather, this volume reviews successes, failures, and revelations from some 600 case studies that Conyers and his students have worked on for more than two decades. Over 200 color illustrations, mostly of GPR imagery from these case studies, help us to understand the interpretive process and testify to the volume's high quality.

Interpreting Ground-penetrating Radar for Archaeology begins with an introductory chapter setting out its purpose, followed by a necessary chapter on GPR method and theory. Chapter 3 summarizes Conyers' personal history in GPR interpretation, which parallels software developments because so much depends on the quality of data processing and resultant imagery. The remaining nine chapters, aside from conclusions, address three topical areas.

Chapters 4-6 examine various "complexities" that affect GPR interpretations. These include, in Chapter 4, such geological complexities as strata within sand dunes, bedrock issues, freshwater lake bottom sediments, and surveys in volcanic deposits. Chapter 5, examining cultural complexities, looks at the effects of modern constructions on GPR results including pipes and rebar, earth moving, different surface types (plowed fields, modern pavements), and background noise from radio and mobile phones. Chapter 6, more theoretical, investigates signal attenuation and prospecting depth as a function of unique geological and environmental conditions.

The next four chapters focus on GPR in specific archaeological contexts. Chapter 7 examines detection of features common to historic archaeological sites, including cellars and basements, middens, walls, floors, and former gardens. Particularly welcome is Chapter 8, which considers the problem of locating graves. GPR is proving to be one of the most reliable methods

for their detection. Conyers actually dissects GPR profiles over typical graves showing void spaces, collapsed caskets, burial shafts, metal reflections, and many other related features in historic and prehistoric contexts. Chapter 9, on prehistoric sites, investigates detection of house floors, pits, hearths, walls, former roads, shell mounds, canals, and special problems common to rock shelters. Chapter 10 examines the importance of air pockets or voids as the source of radar reflections that reveal such varied features as tunnels, arches, crypts, caves or even lava tubes.

The remaining chapters take a different turn. In Chapter 11 Conyers (p. 183) laments that GPR is generally employed only as a prospecting tool to locate buried cultural materials and features. Too few realize its potential for investigating human organization, site structure, uses of space, or to "test hypotheses about the human past in ways not otherwise possible." Enlightenment is offered with several case studies. Chapter 12 gives sage council on miscommunications and unrealistic expectations about GPR in archaeological collaborations, and most GPR work is collaborative.

Conyers relates (p. 183) that "until more anthropologically trained geophysicists begin to understand the utility of GPR, the interpretive tools presented in this book will remain underutilized." In my view, *Interpreting Ground-penetrating Radar for Archaeology* is essential to anyone working with the technology. It not only addresses many pressing interpretive problems, it gives good advice and is a great read, with many interesting and even funny stories of Conyers' many exploits around the globe.