

Book Review

GROUND-PENETRATING RADAR FOR ARCHAEOLOGY

Lawrence B. Conyers. AltaMira Press, Walnut Creek, California, 2004. £24.99. 203pp. ISBN 0-759-10773-4.

Since its publication 9 years ago, Conyers and Goodman's original guide to ground-penetrating Radar (GPR) in archaeology has served as a good introduction for geophysicists working not only in archaeology but also in other disciplines. Lawrence Conyers has now written an updated version, *Ground-penetrating Radar for Archaeology*.

The stated aim of this book is 'to introduce all types of archaeological researchers to the power of GPR and to inform and guide all those who hope to use or have already used these techniques in their work.' As such, it is imbued with Professor Conyers' considerable enthusiasm for the technique, particularly in the opening chapters.

The book opens with a brief review of archaeological geophysics, primarily concentrating on GPR, before dealing in more detail with the history and use of the technique. The chapter on GPR theory and practice is a good distillation of many years of practical field experience and deals with many of the practical problems encountered sooner or later by those who use GPR regularly. Recent developments that could usefully have been mentioned include the use of 4GHz antennae in the investigation of archaeological structures such as mosaics and standing buildings. Also several GPR systems have the capability to record GPS data simultaneously with the GPR output, which can assist greatly where rectilinear grids are impractical.

The section dealing with equipment and types of acquisition software carries a North American bias (perhaps inevitably) and leans somewhat towards the problems encountered using unscreened antennae. The mechanics of velocity analysis and the theory behind the methods illustrated are covered well, leading to the conclusion that field-based tests of velocity are generally superior to other methods. This is followed by a very good guide to post-acquisition processing, including the potential drawbacks and a warning against overprocessing of data. My one

reserve with this section is that time-based gain is treated primarily as a pre-acquisition process although it commonly forms part of post-acquisition data processing.

The chapter on interpretation of GPR data deals with two-dimensional data, amplitude slices derived from three-dimensional data sets and the importance of computer modelling, and is well illustrated with practical examples. Finally, the concluding chapter, although being positive about the potential of GPR applied to archaeology, does not oversell the technique and most admirably recommends learning from the results of unsuccessful surveys. A summary table of the feasibility of using GPR for detecting and mapping different archaeological features is included, with an interesting challenge to professional colleagues to expand on this in the future.

This is not a book for a beginner, as Professor Conyers himself asserts. It goes beyond the basic knowledge necessary for most archaeologists and is entirely suitable for the GPR practitioner specializing in or with an interest in archaeology. Archaeologists who use the book to gain an understanding of GPR will benefit immensely from the practical experience that it conveys.

That said, there are a few unfortunate minor inaccuracies in the text. The 'theoretical' antenna frequency distribution illustrated is not so much theoretical as the real response in a clean environment, i.e. with no reflectors. The peak and nulling effect shown in the subsequent figure is due to the number of reflectors detected by the antenna rather than the antenna design.

It is also not entirely true to suggest that bow-tie antennae have been superseded: in general bow-ties have been modified although there are new antenna designs being introduced as well.

Finally, two separate near-field effects have been conflated. The near-field effect described by the author does not result in 'a region of little or few reflections'. It means that the mathematics of wave propagation and specifically the signal strength is not the same as in the far field and a correction may be needed, in particular if comparing real with modelled data. The near-field effect, which results in a reduction of reflections, is due to the geometry of the separation of the transmit and

receive antennae and typically affects a lesser depth, equivalent to half the antenna separation.

One other matter briefly referred to but which could be usefully expanded is licensing issues. In fairness to the author anything drafted before this book was published would have been likely to have been superseded by now since there have been a number of recent developments on this front. The situation is also complicated by different licensing regimes in North America and Europe. Archaeological GPR practitioners do need to know where to seek the most recent advice.

These points should not detract greatly from the overall usefulness of an otherwise excellent summary of the application of ground-penetrating radar to archaeology. The book is based on solid experience, covers its basic ground well and includes good practical examples.

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