

## BOOK REVIEW

Douglas H. Ubelaker,<sup>1</sup> Ph.D.

### Review of: *Virtual Reconstruction: A Primer in Computer-Assisted Paleontology and Biomedicine*

---

**REFERENCE:** Zollikofer CPE, Ponce de León MS. *Virtual reconstruction: A primer in computer-assisted paleontology and biomedicine*. Hoboken, NJ: John Wiley & Sons, Inc., 2005.

From digital photography to sophisticated reconstructions and simulations, most forensic scientists deal with computer-assisted visualization on a regular basis. This informative and well-written book presents basic methodology along with the underlying concepts regarding three-dimensional data handling as directed toward applications in the biomedical sciences. Although interesting application examples are included, the thrust of the volume is directed toward an understanding of the complex language and concepts underlying the applications. The book is aimed at biomedical scientists and computer specialists who are interested in the "how" of virtual applications to problems and issues in the sciences.

The volume explores the entire process involved in virtual imagery. This includes capturing virtual data from physical objects, interaction with the virtual images, reconstruction, simulation, quantification issues, and the production of three-dimensional hard copies from virtual data. Issues are examined regarding data acquisition, processing, graphical representation, interactive manipulation, and morphometric analysis.

The authors note that except for security concerns, users of e-mail primarily are concerned with the message product, not with the "how" of message transmittal. In contrast, users of three-dimensional virtual products need to understand the underlying concepts to facilitate proper interpretation and use. Forensic scientists will find in this volume discussion of the operational processes for the complex issues involved. Application examples mostly consist of fossils in paleoanthropology and paleontology and biomedical case studies involving maxillofacial surgery. However, facial reproduction is included as well, with its obvious applications in forensic science. Discussion is directed more toward supporting academic concepts rather than specific products and imaging techniques.

In presenting this material, the authors have chosen a four-layer strategy. Academic foundation is delivered first, with the useful organization of posing problems or questions originating in biomedical science and then tracing the computer science involved all the way to the proposed solutions. "Boxes" appear along the way providing case studies, additional detail, or schematic explanations of the concepts discussed in the text. Appendices supple-

ment the above, offering more detail in a more traditional format. Finally, a companion internet site ([www.wiley.com/go/virtualreconstruction](http://www.wiley.com/go/virtualreconstruction)) is available with dynamic and interactive visualization and useful links to additional, supportive information.

Following the first chapter overview of aspects of reconstruction, chapters 2 and 3 provide in-depth discussion and general principles of data acquisition and processing, including both two-dimensional and three-dimensional approaches, surface scanners, and computed tomography (CT). Clear discussion is provided for the complex terminology involved. The authors skillfully take the reader through the world of bits, bytes, pixels, chips, and voxels, not only clearly defining the terms, but also showing how they relate to the process.

Chapters 4 and 5 explain how data processing is used to create data structures and the operational basis behind virtual reality and scientific visualization. Technical applications of virtual reconstructions are also discussed.

Chapters 6 and 7 explore reconstruction techniques, including applications to incomplete, fragmentary and distorted specimens and the conversion of the resulting images to three-dimensional physical products. This section is of special interest to forensic anthropologists, pathologists, odontologists and other forensic scientists who deal with fragmentary and taphonomically compromised remains recovered from forensic contexts.

The final section on morphometry presents a sophisticated and detailed discussion of statistical approaches to the analysis of virtual data. These techniques already are employed in forensic science, and this chapter provides the reader with solid information to understand the concepts involved.

This timely and well-written volume will be of most interest to those who deal extensively with virtual applications in their research and casework. However, most forensic scientists would benefit from the information presented as the concepts and applications relate so broadly to various aspects of our work. Virtual reconstruction represents a growing area of interest within biomedicine and forensic science. This volume helps us to understand the academic principles involved and visualize the potential additional applications.

<sup>1</sup> Department of Anthropology, National Museum of Natural History, Smithsonian Institution, Washington, DC.