FORENSIC OSTEOLOGY

Second Edition

FORENSIC OSTEOLOGY

Advances in the Identification of Human Remains

Edited by

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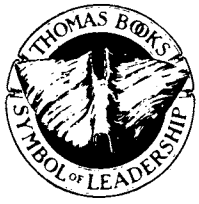
(With Thirty-two Other Contributors)



CHARLES C THOMAS • PUBLISHER, LTD.
Springfield • Illinois • U.S.A.

Published and Distributed Throughout the World by

CHARLES C THOMAS • PUBLISHER, LTD.
2600 South First Street
Springfield, Illinois 62794-9265

ISBN 978-0-398-07876-8 (paper)

Library of Congress Catalog Card Number: 97-24812

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Printed in the United States of America
SC-R-3

Library of Congress Cataloging-in-Publication Data

Forensic osteology : advances in the identification of human remains / edited by Kathleen J. Reichs ; with a foreword by William M. Bass. — 2nd ed.
p. cm.
Includes bibliographical references and index.
ISBN 978-0-398-07876-8 (paper)
1. Forensic anthropology. 2. Forensic osteology. I. Reichs, Kathleen J.
GN69.8.F69 1997
614'.1—dc21 97-24812
CIP

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FOREWORD

The foreword to the first edition of *Forensic Osteology* was written by Dr. Wilton M. Krogman, my doctoral advisor and longtime friend. I was pleased when Dr. Reichs asked me to write the foreword for the second edition. Although Dr. Krogman had many graduate students at both the University of Chicago and the University of Pennsylvania, I have followed Dr. Krogman's footsteps in research and publication in the forensic area more than most of his other students. Krogman and T. Dale Stewart, at the Smithsonian Institution, are viewed now as the founders of Forensic Anthropology. They both saw the beginning of an explosion of interest, research, and publication in the forensic application of osteology.

The phenomenal growth of the Physical Anthropology Section of the American Academy of Forensic Sciences is an excellent example of the scientific acceptance of the techniques in determining age, sex, race (ancestry), and stature estimations in human identification. The knowledge of the Forensic Osteologist is required today in mass disasters, in the identification of political and war dead, and in estimating the length of time since death. Research over the last decade has suggested that some of the criteria based on the study of anatomical collections may not be as appropriate in the identification of skeletal remains of modern populations. Many Forensic Anthropologists are now contributing metric and non-metric data from present cases to the Forensic Data Bank. This allows us to establish a data base on present-day populations.

Reichs has updated her very successful first edition and increased the number of chapters from 16 to 25, again an example of the growth in this area. Authors of three chapters in the first edition have updated their contributions and this edition contains twenty-two new chapters. If this rate of growth continues, the third edition will be almost too large to carry around.

Krogman was pleased to see the publication of the first edition. I am pleased that Dr. Reichs has combined the authors and information for this much expanded second edition.

WILLIAM M. BASS, PH.D., D.A.B.F.A.

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FORENSIC OSTEOLOGY

Part I

INTRODUCTION

INTRODUCTION

KATHLEEN J. REICHS

When *Forensic Osteology: Advances in the Identification of Human Remains* appeared in 1986, forensic anthropology was already firmly established as an important specialty in the medicolegal system. The Physical Anthropology Section of the American Academy of Forensic Sciences had been in existence for fourteen years, the American Board of Forensic Anthropology for nine. It was time to move beyond the basics and discuss advances in a rapidly expanding field.

Since then a decade has passed. As Reichs points out in Part II, Chapter 1, the field of forensic anthropology has undergone enormous growth during that period. The number of physical anthropologists calling themselves forensic anthropologists has increased, as has the number of board-certified practitioners. Average caseloads have increased dramatically.

Even more striking is the way in which forensic anthropology has expanded in scope over the past ten years. This new second edition reflects this. The twenty-five contributions to this volume demonstrate movement beyond the boundaries of the forensic anthropology of a decade ago. In three chapters (Weaver; Suchey and Katz; Gill) the authors update the contributions they made to the 1986 publication. The remaining twenty-two chapters are new. Only seven chapters in this book focus on the traditional techniques of age, sex and ancestry determination. The rest cover more specialized methodologies and discuss expertise considered peripheral just a decade ago.

Part III is devoted to the topic of recovery. In Chapter 2 Haglund discusses the role of the forensic anthropologist at scenes containing human victims, including multiple fatality incidents, fires, and serial murder investigations. He emphasizes the challenges to be met in the recovery of human remains. Using case examples, he demonstrates the importance of proper scene processing.

In Chapter 3 Burns examines the role of the forensic anthropologist in a unique type of recovery situation: death investigative work involving human rights violations. She outlines how the forensic anthropologist joins with other forensic scientists to reveal evidence of mass murder, genocide, torture, summary execution and political "disappearances."

As Murad points out in Chapter 4, not all remains presented to the forensic anthropologist will derive from traditional burial or surface contexts. Due to the growing popularity of cremation in North America, it is likely that the forensic anthropologist will be asked to analyze cremains at some point in his/her career. Murad discusses the cremation process, emphasizing variations that exist within the industry. He summarizes the impact these practices have on human remains, and outlines procedures for the analysis of suspected cremains.

The forensic anthropologist is often asked to determine postmortem interval, or time since death. The chapters in Part IV focus on this topic. In Chapter 5 Sledzik points out that, in the past ten years, controlled studies of decomposition have allowed a more precise approach to the estimation of postmortem interval. He discusses those factors affecting decomposition and provides a practical overview of recent techniques in determining time since death.

Chapter 6, by Sorg, David and Rebmann, bridges Parts III and IV of this volume. The authors describe the investigation of outdoor death scenes in which a search for a decomposed body is undertaken, or in which a decomposed body is found and must be recovered. Their contribution covers the topics of search, recovery, taphonomy, and postmortem interval. The authors provide detailed information on the use of cadaver dogs. They present data on postmortem interval and the condition of remains in the Northeastern United States derived from a twenty-year series of anthropological cases.

In Chapter 7 Rhine and Dawson provide standards for the assessment of time since death under markedly different environmental conditions. They emphasize that the sequence of skeletonization is universal, while the rate is highly variable and dependent upon environmental factors. They provide data on the sequence of skeletonization in the Southwestern United States.

Combined, the chapter by Sorg, David and Rebbman and that by Rhine and Dawson provide a general template for rates of decomposition in both arid and temperate woodland environments. From these data the forensic anthropologist can estimate time since death for a large part of North America.

Part V contains seven chapters focusing on the biological profile. The authors discuss refinements in traditional techniques and describe newly developed methodologies for the estimation of age, sex, and ancestry—the parameters so critical in establishing personal identity.

In Chapter 8 France provides an overview of the morphological and metric approaches to sex estimation from skeletal remains. She emphasizes the latter, bringing together information from a wide range of sources. Regression formulae and other statistics are presented in table format for easy reference.

Weaver has updated and expanded his 1986 contribution on the analysis of fetal remains. In Chapter 9 he outlines the maturation of the human fetus and neonate and discusses criteria for sex and age determination of fetal and neonatal material. He addresses the questions of biological affinity and indicators of life history for individuals in this age category, and provides recommendations for the recovery and analysis of fetal and neonatal remains.

Over a decade ago Suchey, Katz and Brooks took the general scheme of Todd and devised a modified system of pubic age determination using a documented modern sample. In 1986, statistical analysis showed that Todd's phases I, II, and III could be merged into one category, IV and V into another, and VII and VIII into another. The simplified system is called the Suchey-Brooks method. In Chapter 10 Suchey and Katz define the traits used in their pubic aging system, consider the problem of individual variation, and discuss the application of the system to forensic settings.

Histological methods have been used for three decades to estimate age at death. These methods differ in terms of which bone is used, where the sample is taken, and the amount of bone required. Opinions vary as to the accuracy of histological aging. In Chapter 11 Stout discusses factors that affect accuracy in histological age determination. He uses examples to illustrate the application of histological age estimation methods to unknown skeletal remains.

The four most commonly used indicators of subadult age are somatic, sexual, skeletal and dental maturity. Of these, the parameters most frequently used by the forensic anthropologist are skeletal and dental development. The most reliable standards are those derived from large, well-documented sample populations. In Chapter 12 Reichs and Demirjian describe a CD-ROM program with dental data from over 7000 subjects (Montreal Growth Study) and standards for hand/wrist development from over 3000 subjects (Tanner and Whitehouse study). The program contains a data base of cephalometric and anthropometric measurements, and radiographs of dental and skeletal development, thus providing forensic scientists a large archive of data, readily at hand for comparative purposes.

The use of cranial sutures for the estimation of adult age at death has long been controversial. Considerable uncertainty exists with regard to the application, interpretation, and evaluation of error rates of the various methods. In Chapter 13 Nawrocki re-examines the issue of sutural aging by addressing two points. He reports observations on all three sutural systems (endocranial, ectocranial and palatine) simultaneously, and he approaches sutural aging from a statistical perspective. He concludes that estimated ages for adults based on suture closure are not much worse than those derived from other techniques currently employed. His chapter includes equations for predicting age from cranial suture closure.