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RECENT ADVANCES IN FORENSIC ANTHROPOLOGY

Abstract: Forensic Anthropology is a dynamic field that continues to evolve with new research and augmented experience through case applications. The primary components of forensic anthropology (recovery, determination of human status, age at death, sex, ancestry, stature, and time since death, identification and assessment of evidence of foul play) all have advanced in recent years. The nature of this advancement reflects sustained research initiatives, growing numbers of scholars involved in the field, professionalization and the close link between forensic anthropology and the larger academic field of physical anthropology.

Introduction

In early 2009, the National Academies of Science in Washington D.C. released a lengthy report “Strengthening Forensic Science in the United States: A Path Forward” that critically examined the scientific basis and practice of forensic science. Although many areas of forensic science were targeted in this report, especially those involving pattern analysis, forensic anthropology received little attention. Since forensic anthropology currently enjoys considerable exposure in the forensic arena, the minimal treatment received likely does not reflect lack of awareness of the discipline. More likely it indicates that being a comparatively recent development in forensic science, forensic anthropology maintains close ties with the broader academic field of physical anthropology and a strong research base. Many practicing forensic anthropologists hold academic positions in universities and museums. Most fledgling forensic anthropologists entering the field arrive with fresh academic degrees rather than on the job training. This strong academic base to the field ensures vitality and dynamic growth. Such growth is sustained in all of the major components of the field, although expressed in diverse ways.

Recovery

Recovery initiatives have been aided greatly by innovations in high technology. In particular, ground penetrating radar and electromagnetic approaches have proven their

worth in applications in some contexts. As this equipment evolves in sophistication, applications are enhanced but context largely drives the selection of survey and testing methodology. Ultimately, the classic archeological approaches usually are called for.

Major advancement in recovery efforts results from the increasing inclusion of forensic anthropologists, especially those trained in archeological techniques. With increasing frequency, forensic anthropologists are participating not only in recovery of potential criminal cases but also in situations involving mass casualties and investigations of human rights. Such inclusion greatly augments the quality of data recovered at scenes and improves the eventual interpretations that follow. Recovery efforts in human rights investigations represent a major new growth area in forensic anthropology. Those anthropologists with long-term participation in such efforts have developed unique skills and experience that translate into job opportunities and significant contributions to the overall projects.

Human or Not

Although qualified anthropologists can make most determinations of human status of recovered remains easily from morphological indicators, fragmentary and otherwise compromised evidence can be challenging. New techniques, driven by problems encountered in casework, have greatly augmented this endeavor. Databases developed using scanning electron microscopy/energy dispersive spectroscopy enable small particles of bone and tooth to be distinguished from other materials. Histological techniques, employing microscopic analysis, allow recognition of non-human bone patterns. Molecular analysis and a technique known as protein radio immunoassay (pRIA) not only can determine human/non-human status but also can determine what non-human animal is present if it is important to do so.

Age at Death

Advances in methodology in age at death assessment are driven by the general age status of the specimen, the material available for analysis and a growing appreciation of the nature of human variation in the aging process. Assessment of dental development continues to be the method of choice for immature individuals if teeth are present and can be identified. In their absence, bone size and morphology provide critical information, especially epiphyseal closure in older immature individuals. Research has demonstrated that attention must be given to sex differences and population variation in the aging process. The roles of nutrition, morbidity, genetics and other factors contribute to human variation in the aging process and their impact must be assessed in the various aging systems. Such assessment flows from the development of new collections and databases of individuals of known age at death in different regions of the world. Such diversity of research sampling contributes to greater understanding of population variation in the aging process and assists in sorting out the complex factors involved.

Sex

Research continues to provide diverse approaches to the estimation of sex from human remains. The methods of choice are largely shaped by what material is available for study. Of course, molecular approaches are now available to determine sex if sufficient DNA can be recovered and amplified. Techniques involving assessment of the pelvis remain the most accurate for sex estimation in adults. Sex estimation in immature remains continues to be problematic, especially for the very young.

Ancestry

Recent progress in assessment of ancestry is terminological. Word choice is important in this area of forensic anthropology since words such as “race” and “ancestry” mean different things to different people and can evoke strong individual reactions. Increasingly, anthropologists recognize the social dimensions of such assessments, especially in regards to the categories utilized and the dynamics of self-identification. Both metric and non-metric methodological approaches are available and continue to be improved through research. This area of forensic anthropology remains strongly dependent on studies of well-documented remains from different regions of the world. Fortunately such collections and studies are growing in frequency. Although new emerging data on human variation in bone and tooth morphology strengthen interpretations of ancestry, they also define the limits of what can be reported and the probabilities involved.

Stature

Although some recent research has strengthened methodological approaches to stature estimation, most progress relates to new databases that document population variation in body proportions. Applications have brought new attention to the accuracy of so-called “known” statures among the missing. These studies note the difference between measured stature among the living and the more common “estimated” stature that dominates records of missing persons.

Time Since Death

Research and case experience have documented the many variables involved in postmortem change in human remains. Although much has been learned about the impact of seasonality, exposure to insects and foraging mammals and birds, ground water, soil pH and many other factors, the major lesson is that it is very difficult to estimate time since death using morphological indicators alone. Although regional patterns can be discussed, the exceptions are numerous and sometimes extreme.

Recent research has called attention to the value of radiocarbon analysis, with special reference to the bomb-curve to determine approximate time since death

and even approximate birth date. Atmospheric testing of thermonuclear devices from the 1950's through the 1960's produced high levels of atmospheric artificial radiocarbon, which, through the food chain have been incorporated into the bones and teeth of individuals living in that period of time. While levels have diminished since international test ban treaties were in place, they remain today above their 1950 levels. Thus if radiocarbon analysis detects modern high levels in human remains, it means the person was alive during the bomb-curve period. This determination alone represents a major advancement in assessing if recovered remains are of medico-legal significance. Careful analysis of particular tissues can offer more detail on both the death date and even the birth date for some individuals who were alive after 1950.

Identification

Identifications within forensic anthropology primarily result from comparisons of antemortem and postmortem radiographs that reveal unique details of skeletal and dental anatomy. Anthropologists are challenged to distinguish presumptive from positive identifications and to properly assess the probabilities and error rates involved. Advances in this area consist of growing awareness of the importance of the above stated issues and new research that seeks to document aspects of the related probabilities. Novel research aimed at testing expert judgment on radiographic comparison has provided useful information needed to validate identification approaches. The limits of identification procedures in forensic anthropology also are challenged as some expertise overlaps that found in odontology and forensic pathology.

Evidence of Foul Play

Progress in this area of forensic anthropology continues to be driven by growing case experience supplemented with experimental research. Evaluations are enhanced by increased knowledge about taphonomic factors, natural variation in anatomical structure and antemortem conditions. Key research targets minimal remodeling indicators to more tightly define the perimortem window. Considerable recent research has clarified issues of perimortem trauma, especially details of sharp force trauma and thermal alterations.

Conclusions

The above discussion provides ample evidence of the research and experience dynamic that feeds the sustained growth and maturity of the field of forensic anthropology. Growing numbers of highly qualified students are attracted to this endeavor, ensuring the continued growth and quality of the science. As suggested by the comparative lack of attention focused on forensic anthropology in the report by the National Academies of Science, the field remains firmly wed to the larger field of physical anthropology and nourished by rich research initiatives.