

## Foro de Discusión

# The Dynamic Interface of Bioarchaeology and Forensic Anthropology

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### ABSTRACT

The disciplines of bioarchaeology and forensic anthropology pursue somewhat different goals but they share considerable methodology and basic scientific information. Experience and research in each of these endeavors enhances the practice of the other. The symbiotic and dynamic relationship of these academic areas greatly improves the quality of the applications of each. The shared information impacts in positive ways all areas of both fields, but is especially important in several key components. Within bioarchaeology, information from forensic practice is vital to the proper interpretation of traumatic and other alterations, especially in the assessment of the timing (*antemortem*, *perimortem*, *postmortem*) of the event producing the alteration. Within forensic anthropology, data gleaned from the practice of bioarchaeology augment techniques of detection, recovery and assessment of the *postmortem* interval and taphonomic factors that may be involved. Currently, both fields are experiencing a surge in professional activity and student interest, as well as a rapid increase in published research, casework and technology. While the volume of available information presents challenges, practitioners in each field need to remain cognizant of professional activity and research results in the other.

**Keywords:** Bioarchaeology; Forensic Anthropology; Trauma.

Although the goals and foci of bioarchaeology and forensic anthropology are somewhat different, shared methodology and lessons learned strengthen both endeavors. Knowledge gleaned from the excavation and analysis of human remains from ancient contexts is needed to properly recover and interpret forensic cases. In turn, forensic casework, especially information retrieved from positive identification and circumstances of death and injury enable more accurate analysis of remains from the ancient past. Although some methodology is specific to each field, many techniques are essential components of both. Professional activity in bioarchaeology and forensic anthropology has stimulated considerable new research that has enhanced all applications.

Throughout my professional career I have worked actively in both bioarchaeology and forensic anthropology. This long-term experience has revealed to me the dynamic and evolving nature of both endeavors and the symbiotic relationship between them.

In forensic casework, methodology employed in the search and recovery of human remains is largely derived from bioarchaeology and the more general field of archaeology. In analysis, the forensic anthropologist must utilize knowledge gained through bioarchaeological research to distinguish remains of medicolegal interest from those derived from more ancient contexts. A key component of trauma interpretation involves recognition of *postmortem* taphonomic alterations. Skill in recognition of taphonomic factors is derived from research exposure to archaeologically-recovered remains from multiple time periods and environmental contexts.

In bioarchaeological endeavors, many areas have been enhanced through forensic experience. The most obvious example is trauma interpretation which relies almost exclusively on methodology derived from forensic casework and research. However, most other areas of bioarchaeological practice have benefited as well.

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This essay explores the dynamic, symbiotic relationship of bioarchaeology and forensic anthropology in considerable detail, drawing extensively from my experience and research. Throughout my career, I have attempted to maintain a balance among the primary foci of bioarchaeology research, forensic casework and methodology research. Most of my forensic casework involves criminal cases at the request of the FBI headquarters in Washington, DC between 1978 and 2013. More recently, I have become increasingly involved in international human rights cases, especially in Latin America. Issues presented by this casework have stimulated many of my research initiatives. Products of this research have benefitted both forensic casework and bioarchaeological applications.

### **Detection**

Most modern methods for the search and detection of human remains are rooted in traditional archaeological approaches. Terrain topography, vegetation patterns, surface features, and pit outlines are important factors in both disciplines (Cheetham and Hanson 2009). Search methods of aerial photography, surface examination, ground penetrating radar, electromagnetic approaches, soil-resistivity, probing, coring and systematic excavation also characterize both endeavors (Holland and Connell 2009).

Forensic archaeologists and forensic anthropologists with training in archaeological techniques have proven to be uniquely qualified to conduct or participate in recovery missions involving human remains. Skill in archaeological methods of survey and excavation sets forensic anthropologists apart from other crime scene investigators and law enforcement officials. With increasing frequency, those with training in archaeology are involved in recovery missions in criminal cases, mass disasters (Sledzik 2009) and searches for victims of human rights abuse.

While methodology in bioarchaeology provides the foundation for forensic searches and recovery efforts, information gained in the latter also benefits the former. Forensic efforts frequently focus on unique sites and environments that call for special application and innovation. Scenes such as the aftermath of structure fires, building collapse, wildfires, deep and shallow water, house crawl spaces and basements, septic tanks, wells, cisterns and mine shafts offer special challenges. Forensic anthropologists have devised unique approaches to these problems that also augment traditional archaeological techniques.

For example, following political strife in Cyprus, many victims were placed in wells. While these wells vary in structure and depth, recovery has called for

special approaches that enable documentation and recovery but also address safety concerns (Ceker and Stevens 2015).

### **Species Recognition**

Workers in both bioarchaeology and forensic anthropology frequently need to identify the human status of recovered materials. When bones and teeth are generally intact, this task is relatively easy through direct morphological assessment or with the use of comparative skeletal collections when necessary (Mulhern 2009). Such identification becomes challenging when evidence is fragmentary and/or altered by heat or environmental factors.

With increasing frequency, the identification of small particles has become an issue in forensic anthropology. In many cases and scenes, it can be extremely important to demonstrate the presence or absence of human fragments when relatively intact skeletons are not recovered. These issues emerge in criminal cases in which apparent attempts have been made to remove the victim from the crime scene, perhaps leaving behind fragments. Since positive identification through DNA analysis can be made from fragmentary evidence (Baker 2009), it is critical to recover small fragments and determine their human status. This need has led to research aimed at facilitating such identifications.

Scanning electron microscopy/energy dispersive spectroscopy (SEM/EDS) represents one such technique (Ubelaker *et al.* 2002). A tiny sample of the recovered fragment can reveal a microscopic image diagnostic of bones or teeth. In addition, analysis yields spectra indicating what elements are present and in what proportions. Comparison of these spectra to those within a database of known materials representing most of the materials likely to be confused with bones or teeth clearly reveals if bones or teeth are present. The technique will not determine human status, but will recognize the calcium and phosphorus structure of bones or teeth and distinguish them from other materials commonly found at scenes.

If a bone or tooth is present, various options are available to assess human status. Histology can provide useful perspective since bone histological patterns vary throughout the animal kingdom (Mulhern 2009). The presence of plexiform bone or complex banding patterns can be diagnostic of non-human bone (Mulhern and Ubelaker 2001). Unfortunately, it is difficult to diagnose human status from histological patterns since the human pattern is shared with some non-human animals.

Human diagnosis of small particles can be accomplished through molecular analysis (Baker,

2009) or protein radioimmunoassay (pRIA). The latter approach involves a double phase antibody reaction test utilizing species-specific antibodies formulated in the laboratory (Ubelaker *et al.* 2004). The second phase of testing includes a radioactive marker allowing the results to be quantified. This test can be conducted on very small samples leaving sufficient quantities for human DNA testing if necessary. Protein radioimmunoassay analysis will determine human status and also the non-human species present.

Research investigations leading to the techniques described above were driven largely by issues presented by routine forensic casework. These techniques have greatly augmented our ability to recognize if small particles represent bone or tooth and if so, to determine species. Of course, these methods also can be used in bioarchaeology in the many analysis situations when small particles are involved.

### **Antiquity**

Accurate dating of human remains represents an important issue in both bioarchaeology and forensic anthropology. The issue is especially problematic in the latter field. In forensic casework, it is critical to know if recovered remains date from the recent periods of medicolegal interest. If so, accurate estimates of the date of death can greatly enhance investigative efforts. Research and casework experience have documented the unfortunate difficulty of estimating the *postmortem* interval from morphological evidence alone. Many variables such as temperature, rainfall, seasonality, soil chemistry, individual constitution, burial depth, mortuary treatment and type of container, clothing or wrapping can influence the extent and type of *postmortem* alterations (Forbes and Nugent 2009). Moisture and anaerobic conditions can lead to adipocere formation (Ubelaker and Zarenko 2011), while extreme aridity can promote mummification and unusual soft tissue preservation. Surface exposure to arthropods, birds and mammals can lead to very rapid skeletonization. While research in decay facilities has improved interpretation, especially when degree days are considered (Forbes and Nugent 2009), interpretation of the time since death of skeletonized remains is problematic from morphological evidence alone.

In bioarchaeology, for many years radiocarbon dating has provided a reliable method for absolute dating of human remains. Through direct analysis of the skeletons themselves or from associated organic materials, radiocarbon dating provides the temporal framework that enables sophisticated research in bioarchaeology.

We used to believe that radiocarbon dating was largely irrelevant in forensic applications since in the

few recent decades of medicolegal interest very little radiocarbon decay occurs. However, the elevated levels of atmospheric/food chain radiocarbon in the modern period (after about 1953) provide the very tools needed to assess the death date and perhaps even the birth date for individuals who died in the last few decades (Ubelaker 2014a). Atmospheric testing of thermonuclear devices from 1950 to about 1963 unleashed huge quantities of artificial carbon-14 into the atmosphere. These values peaked in the early to mid-1960's and have subsequently gradually reduced following international test-ban treaties and cessation of such testing. Through the food chain, these modern elevated values have been incorporated into the tissues of all organisms living during this modern period (Ubelaker and Parra 2011). Thus, if radiocarbon analysis of the tissues of a recovered decedent reveals the bomb-curve elevated values, the analysis demonstrates that the person lived and died during those years. Analysis of different tissues of the same individual can reveal both the death date, and possibly the birth date in consideration of age at death (Ubelaker *et al.* 2006).

This game-changing addition to the forensic science tool-kit in assessing death date derives directly from experience in bioarchaeology and traditional radiocarbon dating. As a result, forensic science laboratories and radiocarbon facilities remain alert to this novel use of the modern atmospheric bomb-curve data.

### **Biological Profile**

Age at death, sex, living stature and ancestry comprise the biological profile that lies at the heart of both bioarchaeological and forensic anthropological analyses. In bioarchaeology, accurate estimations of these attributes form the framework for more complex assessments of health, mortuary practices, bio-social associations and many other dimensions of the research on past populations. In forensic anthropology, these same features are used in comparisons with information known about missing persons and to search for prospects for identification. Advances in the common methodologies shared by both applications reflect efforts in both disciplines (Zapico and Ubelaker 2013a, b). New databases are possible due to growing international collections of the skeletal remains of known, documented individuals (Ubelaker 2014b).

The goals of ancestry information are somewhat different in the two disciplines. In bioarchaeology, ancestry assessment relates to studies of biological distance, migration patterns and population relationships. In forensic anthropology, ancestry also can provide evidence of individual migration/origin but usually it is needed to link with personal identification

efforts (Sauer and Wankmiller 2009). Although these goals slightly depart from one another, much of the methodology and scientific foundation is the same.

### **Taphonomy**

In the contexts of bioarchaeology and forensic anthropology the word taphonomy is nearly synonymous with the processes of *postmortem* change and understanding the complex influencing factors (Nawrocki 2009). Much of the scientific foundation for such knowledge stems from studies of bioarchaeology and the inherent examination of remains found in a myriad of contexts from diverse time periods and geographical regions. It is largely through activity in bioarchaeology that we understand what can happen to human remains after death, especially the long term effects on the human skeleton. Some information also has been gleaned from forensic casework experience and original research stimulated by problems encountered in casework (Haglund and Sorg 2002, 2006).

In forensic anthropology, assessment of taphonomic conditions helps to assess time since death, as discussed above. In addition, such alterations often provide clues regarding the *postmortem* history of recovered remains. Reconstruction of aspects of the *postmortem* history can prove vital in assessing criminal activity and/or determining environmentally-linked events that occurred between death and discovery. Many recovered skeletons reveal the weathering, surface exfoliation, sun bleaching, coloration changes, cracking, flaking and splintering associated with long-term environmental exposure (Nawrocki 2009). Others may present environmentally-specific botanical or zoological remnants indicating location or treatment distinct from that associated with the site of recovery.

Observations of taphonomic factors can prove important in assessing *postmortem* history and complexity in both bioarchaeology and forensic anthropology. In a bioarchaeology study of large secondary ossuary deposits of human remains from the mid-Atlantic area of the United States, T. D. Stewart (1992) reported finding mud-dauber cocoons inside crania of the buried remains. This suggested to Stewart that after death and prior to burial in the ossuary, these individuals had likely been placed in charnel houses or similar above-ground structures where they would be accessible to the nest-building wasps. Taphonomic evidence suggested complexity and a multi-stage mortuary procedure that culminated in ossuary burial.

In 1984, a skeleton was found within an unused cistern near an airport in Omaha, Nebraska. Subsequently, it was positively identified through odontological study of dental records as representing

a 19 year old female who had been reported missing in the area in 1975. The skull presented multiple taphonomic indicators that helped to determine the nature and sequence of *postmortem* events. Much of the facial area including the maxilla and mandible displayed extensive areas of bone loss and alteration suggesting that a highly corrosive agent had been applied to the facial area at or about the time of death. The pattern of destruction was displayed on both the maxilla and mandible suggesting that these bones were articulated when the destruction occurred. When the skeleton was eventually recovered in the cistern the mandible had been separated from the cranium, indicating that the destruction must have taken place prior to the separation (Ubelaker and Sperber 1988).

In addition, circular whitened areas were located on the ectocranial surface of the cranial vault. These areas lacked the bone destruction observed in those discussed above likely produced by the corrosive agent. It appeared the whitened areas on the cranial vault were indeed *postmortem* and were produced by restricted sun exposure created by light passing through holes in the cistern cover and gradually bleaching the exposed areas of the cranium (Ubelaker and Sperber 1988). Court testimony and analysis indicated that death likely had occurred at a party the victim attended that was organized by Hell's Angels of the Omaha area. After her death, an attempt had been made to disfigure the face using a caustic substance, likely with the goal of preventing identification. Subsequently, the body was deposited in the cistern where it remained for nearly nine years prior to discovery.

Taphonomic observations have become routine in both bioarchaeological and forensic investigations and analyses. The evidence in both applications is highly diverse and calls for an understanding and application of many areas of science. The shared information from these investigations strengthens both disciplines.

### **Identification**

In forensic anthropology, much of the information gained and discussed above targets personal identification. Analysis produces information about the recovered individual that narrows the search of missing persons and produces candidates for identification. Positive identification results when unique features are observed that are common to both the recovered remains and a particular missing person. By definition, the features utilized for personal identification must be among those known about the missing person. The biological profile discussed above is almost universally useful in the identification process because sex, age at death, approximate stature and ancestry are usually known and documented features of missing persons.

The biological profile is of great utility in investigation but in an open universe of missing persons, it will not provide the degree of uniqueness needed for positive identification.

When positive identification is made by forensic anthropologists the evidence is usually radiographic, supplemented with information from the biological profile and other observations. Radiographs taken for medical purposes frequently reveal unique features of bones and teeth that may be compared with those of recovered remains. Positive identification results when features are shared between remains and *antemortem* records of a missing person and when the uniqueness of those features can be demonstrated.

Research and casework in forensic anthropology has clarified, and to some degree quantified the process of identification. The extent of uniqueness of the evidence examined separates positive identification from the less certain categories of putative or possible identification. When shared features are discovered, the questions must be asked: how unique are these features and what is the probability that another person also could share these features? Although recent research has advanced understanding and quantification of this issue, interpretation remains largely experienced-based.

In bioarchaeology, identification issues emerge primarily in historical cases in which individual identity is important. Although the modern forensic legal context is absent in such cases, the scientific basis for identification is the same. The same questions must be asked and satisfactorily answered.

Facial approximation represents one tool that is available with regard to identification efforts. This technique consists of estimating values for the soft tissues covering bones of the skull and attempting to produce a likeness of the facial appearance of the individual represented. In the forensic context, it is used not for direct identification but to visually reach out to the public searching for leads. If recovered remains are recent and identification has not been achieved through traditional analysis, the technique may be employed to remind the public that remains have been found of someone with this general appearance (Stephan 2009).

The technique of facial approximation remains a combination of art and science but through research, the science aspect of it has strengthened. In recent years, we have learned a great deal about the relationship of facial soft tissues with the underlying bone. In particular, research has helped define eye placement and nose morphology in relation to bone structure. The process also has been enhanced with more sophisticated computerized approaches and mathematical analyses (Stephan 2009).

In bioarchaeology, facial approximation is utilized primarily as a visual expression to accompany biological analysis. Estimations of facial appearances add a useful dimension to analysis, especially public presentations. Reconstructions also are utilized in museum displays. Facial approximations utilized in this context should not be confused with the actual evidence of ancestry. They can portray suspected appearance and ancestry but the actual evidence is embedded in the remains themselves.

### Trauma

Proper interpretation of trauma represents an important component of both bioarchaeology and forensic anthropology. In bioarchaeology, it provides evidence of violence, accidental death, morbidity and mortality and can be linked with features of the biological profile and archaeological information to reveal key aspects of the society represented (Verano *et al.* 2000; Tung 2012). In forensic anthropology, trauma interpretation reveals evidence of past injury useful for identification, as well as *perimortem* alterations that may link to cause and manner of death determinations (Cunha and Pinheiro 2009; Loe 2009).

In all analyses of trauma, timing of injury must be established utilizing sound scientific information. *Perimortem* trauma refers to injury sustained at or about the time of death. *Antemortem* trauma refers to injury sustained during the life of the individual with evidence of healing. Both of these categories must be distinguished from *postmortem* damage and alterations.

Evidence of remodeling defines the *antemortem* category in anthropological investigation (Cunha and Pinheiro 2009). Any evidence of bone remodeling associated with bone trauma indicates that the individual survived the traumatic event. The extent of remodeling defines the period of time of post-injury survival.

*Postmortem* damage can be assessed by the nature of bone breakage, coloration patterns or patterns of alterations characteristic of known *postmortem* agents. Sun exposure, animal chewing, root growth and other *postmortem* factors produce recognized patterns of damage.

The important *perimortem* category refers to alterations representing injury at or around the time of death (Loe 2009). Usually, the skeletal evidence alone will not allow a determination that injury caused death. The term *perimortem* indicates that no evidence of *antemortem* remodeling is present and clear evidence of a *postmortem* event is also lacking.

The scientific basis of trauma interpretation in both bioarchaeology and forensic anthropology stems from

casework and research in the latter. Knowledge gained through identified cases and well-constructed research published in the forensic anthropology literature has greatly augmented the scientific foundation of trauma interpretation.

### CONCLUSIONS

The intellectual connection between bioarchaeology and forensic anthropology remains strong and dynamic. Both fields maintain research and applications that are unique to each while sharing a considerable common methodology that continues to strengthen. Activity in each field benefits the other as well. The influence of bioarchaeology on forensic anthropology is especially marked in detection, recovery, and assessments of antiquity and taphonomy. The impact of activity in forensic anthropology on bioarchaeology is noted in species recognition, establishment of the biological profile, identification and especially trauma assessment.

Clearly practitioners in each field need to be cognizant of professional activity in the other. Forensic anthropologists need experience and training in bioarchaeology. Bioarchaeologists need to read the forensic anthropology literature and incorporate the results into their interpretations. Of course many colleagues work in both fields and are strengthened by the scope of that collective experience. The interplay of bioarchaeology and forensic anthropology is complex, dynamic and continually evolving. The applications are distinct, however the fields share common methodology, databases, surging academic interest and significant impact on other areas of science.

### REFERENCES CITED

- Baker, L.  
2009 Biomolecular Applications. In *Handbook of Forensic Anthropology and Archaeology*, edited by S. Blau & D. H. Ubelaker, pp. 322-334. Left Coast Press, Walnut Creek, California.
- Ceker, D. & W. D. Stevens  
2015 Recovery of Missing Persons in Cyprus: Heavy Equipment Methods and Techniques for Complex Well Excavations. *Journal of Forensic Sciences*. Doi: 10.1111/1556-4029.12854.
- Cheetham, P. N. & I. Hanson  
2009 Excavation and Recovery in Forensic Archaeological Investigations. In *Handbook of Forensic Anthropology and Archaeology*, edited by S. Blau & D. H. Ubelaker, pp. 141-149. Left Coast Press, Walnut Creek, California.
- Cunha, E. & J. Pinheiro  
2009 Antemortem Trauma. In *Handbook of Forensic Anthropology and Archaeology*, edited by S. Blau & D. H. Ubelaker, pp. 246-262. Left Coast Press, Walnut Creek, California.
- Forbes, S. & K. Nugent  
2009 Dating of Anthropological Skeletal Remains of Forensic Interest. In *Handbook of Forensic Anthropology and Archaeology*, edited by S. Blau & D. H. Ubelaker, pp. 164-173. Left Coast Press, Walnut Creek, California.
- Haglund, W. D. & M. H. Sorg (editors)  
2002 *Advances in Forensic Taphonomy: Method, Theory, and Archaeological Perspectives*. CRC Press, Boca Raton.  
2006 *Forensic Taphonomy: The Postmortem Fate of Human Remains*. CRC Press, Boca Raton.
- Holland, T. D. & S. V. Connell  
2009 The Search for and Detection of Human Remains. In *Handbook of Forensic Anthropology and Archaeology*, edited by S. Blau & D. H. Ubelaker, pp. 129-140. Left Coast Press, Walnut Creek, California.
- Loe, L.  
2009 Perimortem Trauma. In *Handbook of Forensic Anthropology and Archaeology*, edited by S. Blau & D. H. Ubelaker, pp. 263-283. Left Coast Press, Walnut Creek, California.
- Mulhern, D. M.  
2009 Differentiating Human from Nonhuman Skeletal Remains. In *Handbook of Forensic Anthropology and Archaeology*, edited by S. Blau & D. H. Ubelaker, pp. 153-163. Left Coast Press, Walnut Creek, California.
- Mulhern, D. M. & D. H. Ubelaker  
2001 Differences in Osteon Banding Between Human and Nonhuman Bone. *Journal of Forensic Sciences* 46 (2): 220-222.
- Nawrocki, S. P.  
2009 Forensic Taphonomy. In *Handbook of Forensic Anthropology and Archaeology*, edited by S. Blau & D. H. Ubelaker, pp. 284-294. Left Coast Press, Walnut Creek, California.
- Sauer, N. J. & J. C. Wankmiller  
2009 The Assessment of Ancestry and the Concept of Race. In *Handbook of Forensic Anthropology and Archaeology*, edited by S. Blau & D. H. Ubelaker, pp. 187-200. Left Coast Press, Walnut Creek, California.
- Sledzik, P.S.  
2009 Forensic Anthropology in Disaster Response. In *Handbook of Forensic Anthropology and Archaeology*, edited by S. Blau & D. H. Ubelaker, pp. 374-387. Left Coast Press, Walnut Creek, California.

- Stephan, C. N.  
2009 Craniofacial Identification: Techniques of Facial Approximation and Craniofacial Superimposition. In *Handbook of Forensic Anthropology and Archaeology*, edited by S. Blau & D. H. Ubelaker, pp. 304-321. Left Coast Press, Walnut Creek, California.
- Stewart, T. D.  
1992 Archeological Exploration of Patawomeke: The Indian Town Site (44St2) Ancestral to the One (44St1) Visited in 1608 by Captain John Smith. *Smithsonian Contributions to Anthropology* 36.
- Tung, T. A.  
2012 *Violence, Ritual, and the Wari Empire*. University Press of Florida, Gainesville, Florida.
- Ubelaker, D. H.  
2014a Radiocarbon Analysis of Human Remains: A Review of Forensic Applications. *Journal of Forensic Sciences* 59 (6): 1466-1472.  
2014b Osteology Reference Collections. In *Encyclopedia of Global Archaeology*, Vol. 4, edited by C. Smith, pp. 5632-5641. Springer, New York.
- Ubelaker, D. H. & R. C. Parra  
2011 Radiocarbon analysis of dental enamel and bone to evaluate date of birth and death: Perspective from the southern hemisphere. *Forensic Science International* 208: 103-107.
- Ubelaker, D. H. & N. D. Sperber  
1988 Alterations in Human Bones and Teeth as a Result of Restricted Sun Exposure and Contact with Corrosive Agents. *Journal of Forensic Sciences* 33 (2): 540-548.
- Ubelaker, D. H. & K. M. Zarenko  
2011 Adipocere: What is known after over two centuries of research. *Forensic Science International* 208: 167-172.
- Ubelaker, D. H., B. A. Buchholz & J. E. B. Stewart  
2006 Analysis of Artificial Radiocarbon in Different Skeletal and Dental Tissue Types to Evaluate Date of Death. *Journal of Forensic Sciences* 51 (3): 484-488.
- Ubelaker, D. H., J. M. Lowenstein & D. G. Hood  
2004 Use of Solid-Phase Double-Antibody Radioimmunoassay to Identify Species from Small Skeletal Fragments. *Journal of Forensic Sciences* 49 (5): 924-929.
- Ubelaker, D. H., D. C. Ward, V. S. Braz & J. Stewart  
2002 The Use of SEM/EDS Analysis to Distinguish Dental and Osseous Tissue from other Materials. *Journal of Forensic Sciences* 47 (5): 940-943.
- Verano, J. W., L. S. Anderson & R. Franco  
2000 Foot Amputation by the Moche of Ancient Peru: Osteological Evidence and Archaeological Context. *International Journal of Osteoarchaeology* 10: 177-188.
- Zapico, S. C. & D. H. Ubelaker  
2013a Applications of physiological bases of ageing to forensic sciences. Estimation of age-at-death. *Ageing Research Reviews* 12: 605-617.  
2013b mtDNA mutations and their role in aging, diseases and forensic sciences. *Aging and Disease* 4 (6): 364-380.





## Comentario I: Implicaciones de la interfaz bioarqueología y antropología forense

César Sanabria Medina

Cuando recibí la amable invitación a comentar el artículo titulado “*The Dynamic Interface of Bioarchaeology and Forensic Anthropology*” o “La interfaz dinámica de Bioarqueología y Antropología Forense”, escrito por el doctor Douglas Ubelaker, lo primero que me llamó la atención, antes de dar inicio en profundidad a la lectura y por razones que explicaré en párrafos posteriores, fue analizar dos términos utilizados por él a lo largo del documento: *interface* y *simbiosis* que, como se podrá ver, permean, más allá de toda duda razonable, a una tercera y gigantesca área, las Ciencias Forenses.

El primer término, *interface*: su traducción al idioma castellano es interfaz, que significa genéricamente conectar o unir dos o más puntos de contacto; su uso puede tener ligeras variaciones según la disciplina y el contexto en que se utilice. Según la Real Academia Española, *interfaz* es la voz inglesa *interface*, que significa, en informática, “conexión física y funcional entre dos aparatos o sistemas independientes”, y se ha adaptado al español en la forma *interfaz*. Asimismo, en el idioma inglés, el término *interface* equivale a superficie de contacto y es utilizado en informática para referirse a la conexión funcional entre dos sistemas o dispositivos de cualquier tipo dando una comunicación entre distintos niveles.

El segundo término, *simbiosis*: según la Real Academia Española, es un vocablo utilizado en Biología para mostrar la asociación de individuos, animales o vegetales, de diferentes especies, sobre todo si los simbioses sacan provecho de la vida en común<sup>1</sup>.

Los citados vocablos –y de hecho, todo el manuscrito– resaltan que ambas disciplinas –*bioarqueología* y *antropología forense*– están íntimamente conectadas y se aprovechan entre sí, tanto para lograr sus objetivos como para optimizar sus metodologías, técnicas y procedimientos; adicionalmente, ello ratifica el consenso de los profesionales que nos desempeñamos en estos dos campos, en el sentido de la infalible necesidad de la interdisciplinariedad para responder exitosamente a los interrogantes que se generan en la cotidianidad de cada disciplina.

El uso de las expresiones *interfaz* y *simbiosis* trae ineludiblemente a colación la cotidianidad de un campo disciplinar macro llamado Ciencias Forenses, cuya

metodología de trabajo, técnicas utilizadas y objetivos que persigue la convierten, junto con la bioarqueología y la antropología forense, en un tercer simbiote, para conformar, por decirlo así, una dinámica *trilogía interdisciplinar*. Viéndola en contexto, esta resuelve interrogantes inherentes al ser humano; en el primer caso, a humanos del pasado, y en el segundo y el tercero, a humanos del presente que fallecieron en contextos violentos.

Algo que resulta aún más interesante es que los simbioses de dicha trilogía –además de compartir en general metodologías y técnicas– también lo han hecho con su principal objeto de estudio –esto es, los cadáveres– desde sus propios contextos temporales.

En razón a esta simbiosis que acertadamente plantea Ubelaker y que interpretamos como una “receta clave” para el éxito común, son quizás las Ciencias Forenses, dada su interdisciplinariedad, la que en última instancia obtendrían mayor beneficio científico de la bioarqueología y la antropología forense; por un lado, en la búsqueda y recuperación del cuerpo en contextos judiciales, y por el otro, durante la *necropsia*, *autopsia médico-legal* o *autopsy* (por su traducción al idioma inglés), que es un procedimiento eminentemente multidisciplinario mediante el cual se busca aclarar las circunstancias de tiempo, modo y lugar, entre otras, en que ocurrió la muerte de una persona fallecida en un contexto violento o que se presume de serlo.

La necropsia médico-legal es un procedimiento que atañe directamente a las Ciencias Forenses y es probablemente el clásico ejemplo de la *interfaz* y *simbiosis* planteadas por Ubelaker, particularmente en aquellas que examinan los llamados casos complejos<sup>2</sup>, que frecuentemente presentan esqueletización, carbonización, desmembración, avanzada descomposición y otros cambios físicos de origen natural o intencional; no solamente por el diagnóstico que realizan los antropólogos forenses, sino también por el obtenido de disciplinas tales como la medicina, la radiología, la genética y la odontología. Asimismo, la interfaz que se genera durante la necropsia es de alto impacto para las sociedades humanas contemporáneas, tanto en el contexto netamente jurídico de la investigación de la muerte como en el marco de las investigaciones sobre violaciones a los derechos humanos e infracciones al

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derecho internacional humanitario, ya que dicho procedimiento genera en su fase final un producto llamado *protocolo de necropsia, informe pericial de necropsia* o *autopsy report* (por su traducción al idioma inglés). En tal sentido, el rol de este informe en la investigación médico-legal de las muertes es fundamental, en la medida en que los datos que presenta se convierten en buena parte del acervo o carga probatoria de los procesos penales en los que se investiga y juzga a sindicados de haber incurrido en conductas punibles, como el homicidio, desaparición forzada de personas, tortura y otros tratos crueles e inhumanos, entre otras.

Anteriormente hacíamos referencia a la temporalidad, cronología o contexto en que son utilizados los resultados de los estudios que realizan los simbioses aquí tratados. El primero, es decir, la bioarqueología, suele ser principalmente empleado como recurso para obtener evidencias físicas de sociedades pretéritas, lo que indudablemente ha enriquecido el conocimiento biosocial que se tiene de estas. Tal como lo indica Ubelaker, sus técnicas y metodología enriquecen a la antropología forense, *ergo*, a las Ciencias Forenses y a la investigación judicial, que a su vez se benefician –durante la fase de búsqueda y recuperación de cuerpos sepultados en fosas clandestinas– a partir de la aplicación de técnicas arqueológicas forenses provenientes de la arqueología tradicional, modificadas por los efectos de nuevas técnicas en las que se combina el uso de modernos instrumentos y por supuesto, la experiencia forense adquirida a escala internacional (e.g., Naciones Unidas, 1991: 20-25). Así se promueven las buenas prácticas para la adecuada recuperación y análisis forense de cuerpos provenientes de fosas clandestinas, que en su mayoría corresponden a casos de personas reportadas como desaparecidas.

### EL PERFIL BIOLÓGICO

Indica Ubelaker que uno de los tópicos comunes a la bioarqueología y la antropología forense lo constituye el perfil biológico (sexo, ancestro, edad biológica y talla). Ambas disciplinas desarrollan este diagnóstico como base para extenderse a tópicos más complejos, como los estudios biodemográficos, para el caso de la bioantropología, y la identificación forense de cadáveres en el caso de la antropología forense.

Los aspectos biodemográficos permiten dar cuenta del estado de salud/enfermedad de poblaciones pretéritas, de variables relacionadas con sus procesos de migración y problemáticas afines; asimismo, la antropología forense, al cumplir un rol fundamental en el proceso de identificación forense de cadáveres, debe abordar y superar la problemática de la variabilidad poblacional que permea a las poblaciones modernas. Ubelaker resalta el crecimiento internacional que han

tenido las colecciones óseas humanas de individuos conocidos, en la medida que proporcionan nuevas bases de datos. Esto, en última instancia, equivale a que cada vez existen más argumentos científicos para establecer con mayor nivel de certeza el perfil biológico a partir de los datos que van generando los estudios de muestras poblacionales conocidas, que poco a poco establecerán estándares que equivalen a la frecuencia de diversos rasgos en cada población. Lo dicho ha sido referido por diferentes autores (Ferreira *et al.* 2004; Isaza *et al.* 2011; Salceda *et al.* 2009; Guerrero *et al.* 2015; Guzmán y Sanabria-Medina 2015; González *et al.* 2016; Sanabria-Medina *et al.* 2016). Esta metodología de trabajo evitará que se repitan situaciones en las que el diagnóstico del perfil biológico emitido por los antropólogos forenses es cuestionado por la defensa (Kimmerle y Jantz 2008; Ubelaker 2008), discusión muy oportuna a propósito del caso latinoamericano, donde hay una creciente toma de conciencia acerca de las limitaciones que conlleva la aplicación, de forma universal, de estándares creados a partir de colecciones óseas de referencia –extranjeras– en la identificación de cadáveres en el ámbito forense y arqueológico (Salceda *et al.* 2009; Isaza y Monsalve 2011; Ferreira *et al.* 2014; Sanabria y Osorio 2015); ya que al ser aplicados indiscriminadamente en cadáveres diferentes –en términos biológicos, cronológicos y geográficos– a la de los esqueletos estudiados, generan resultados inadecuados y poco fiables para el proceso de identificación forense, debido a la variabilidad biológica existente entre el grupo poblacional que proporciona los estándares y el grupo al que pertenece el individuo que se debe identificar.

### REFERENCIAS CITADAS

- Ferreira, M. T., R. Vicente, D. Navega, D. Gonçalves, F. Curate, E. Cunha  
2014 A new forensic collection housed at the University of Coimbra, Portugal: The 21st century identified skeletal collection. *Forensic Science International* 245C:202.e1-202.e5. doi: 10.1016/j.forsciint.2014.09.021.
- González, C. G., Sanabria-Medina, C. y L. Báez  
2016 Estimation of stature by cephalometric dimensions in skeletonized bodies: study from a sample modern Colombians skeletal remains. *Forensic Science International* 258 (2016) 101.e1–101.e6. <http://dx.doi.org/10.1016/j.forsciint.2015.10.016>
- Guerrero, J. M., L. H. Rodríguez, W. Martínez y C. Sanabria-Medina  
2015 Osteometric sorting of skeletal elements from a sample of modern Colombians: a pilot study. *International Journal of Legal Medicine*. doi10.1007/s00414-015-1142-1

- Guzmán, A. y C. Sanabria-Medina  
2015 The origin and development of forensic anthropology and archaeology in Colombia. In *Handbook of Forensic Archaeology and Anthropology*, editado por S. Blau and D. H. Ubelaker, pp. 75-93, Left Coast Press, California.
- Isaza, J. y V. T. Monsalve  
2011 Características biológicas de la colección osteológica de referencia de la Universidad de Antioquia. *Boletín de Antropología* 25 (42): 287-302.
- Kimmerle, E. H. y R. L. Jantz  
2008 La Variación como Evidencia: Introducción a un Simposio sobre Identificación Humana Internacional. *Journal of Forensic Sciences* 53 (3). doi: 10.1111/J.1556-4029.2008.00707.X
- Naciones Unidas  
1991 Protocolo Modelo de Exhumación y Análisis de Restos Óseos. *Manual sobre la prevención e investigación eficaces de las ejecuciones extralegales, arbitrarias o sumarias*, Naciones Unidas, pp. 20-25, Nueva York.
- Salceda, S. A., B. Desántolo, R. G. Mancuso, M. Plischuk, G. Prat y A. M. Inda  
2009 Integración y conservación de la colección osteológica "Profesor Doctor Rómulo Lambre": avances y problemáticas. *Revista Argentina de Antropología Biológica* 11 (1): 133-141.
- Sanabria-Medina, C. y R. H. Osorio  
2015 Ciencias forenses y antropología forense en el postconflicto colombiano. *Revista Criminalidad, Policía Nacional* 57 (3): 119-134.
- Sanabria-Medina, C., C. G. González, R. H. Osorio y J. M. Guerrero  
2016 Contemporary Colombian Skeletal Reference Collection: A Resource for the Development of Population Specific Standards. *Forensic Science International* <http://dx.doi.org/doi:10.1016/j.forsciint.2016.06.020>
- Ubelaker, D. H.  
2008 Problemas de la Aplicación Global de la Metodología Antropológica Forense. *Journal of Forensic Sciences* 53 (3) doi: 10.1111/J.1556-4029.2008.00717.X

## NOTAS

- 1.- <http://www.rae.es/search/node/simbiosis>
- 2.- El Instituto Nacional de Medicina Legal y Ciencias Forenses de Colombia definió a un "cadáver complejo" como "aquel cadáver que presenta alteraciones intencionales con el fin de obstaculizar su identificación, ocultar o enmascarar lesiones, ocultar el cuerpo y/o descartarlo en condiciones que retarden o impidan su hallazgo y por consiguiente la investigación judicial. Igualmente, todas las muertes en las cuales se investigue o sospeche tortura, actividad sexual asociada y/o maltrato infantil, las muertes ocurridas en custodia y las muertes en combate o enfrentamiento armado".



## Commentary 2: Does a focus on commonalities obscure critical differences?

Chelsey Juarez

In his article, "The Dynamic Interface of Bioarcheology and Forensic Anthropology", Ubelaker strives to emphasize the symbiotic relationship between two closely related fields. The piece focuses on several areas of practice, and analysis, wherein the overlap between fields has created a mutually beneficial relationship resulting in the sharing of methodologies (e.g., recovery techniques) or the advancement of research and analysis (e.g., trauma analysis). The discussion and examples encourage students and practitioners alike to actively engage in both fields by reading the literature and understanding the importance of these shared contributions.

Beyond merit, there are also important reminders from his illustrations especially from the view point of the science and practice of forensic anthropology, which draws its methods from a variety of disciplines (e.g., DiGangi and Moore 2013). For example, in his discussion on the detection of remains or gravesites, Ubelaker rightly points out that the majority of the methods currently utilized in the field, taught in classrooms, and in short courses are archaeological techniques (e.g., Dirkmaat 2012). He further adds, it is this archaeological based training and the ability to augment it in the field as needed that sets forensic anthropologists apart from other crime scene investigators. This area of overlap highlights a necessary lesson for forensic anthropologists. Namely that, in order to be effective in the field, forensic anthropologists should be trained in archaeological field techniques by qualified archaeologists, while simultaneously understanding the unique requirements of forensic anthropological excavation including time, and legal constraints on crime scene investigation.

In his discussion on the determination of antiquity, Ubelaker again highlights how the transfer of analytical techniques in this case, radiocarbon analysis/ bomb curve detection, developed in bioarcheology/ archaeology/geophysics have been demonstrated to have forensic applications in the determination of the postmortem interval. The postmortem interval is one of the most difficult areas of analysis in forensic anthropological case work. This example highlights an active research push in forensic anthropology toward

the incorporation of objective chemical analysis in PMI assessment.

Since the thrust of this piece is the dynamic and mutually beneficial nature of the overlapping methodologies, Ubelaker spends little time on the distinctions in the fields. For example, in his discussion on the flow of knowledge from forensic anthropology to bioarcheology the analysis suffers from oversimplification that obscures the utility of forensic methods in bioarchaeological contexts. Research in forensic anthropology on establishing the biological profile is mentioned as an area that has impacted bioarcheology. While there are certainly examples of this (e.g., Hens *et al.* 2000; Raxter *et al.* 2006; Giannecchini and Moggi-Cecchi 2008), methods generated to analyze components of the biological profile are often population specific (e.g., stature equations) and are not appropriate for use in a bioarchaeological context (Genoves 1967; Bidmos 2008; Ross and Kimmerle 2010; Sutphin and Ross 2011). Also important to note is the lack of discussion on the systematic process of standardization that has been occurring in forensic anthropology over the past seven years. Since the publication of the 2009 NAS report, Strengthening Forensic Science in the United States, a Path Forward, forensic anthropology has focused on standardization at every level from education to casework (Committee on Identifying the Needs of the Forensic Science Community National Research Council of the National Academy of Sciences 2009; Scientific Working Group for Forensic Anthropology 2012; Bunch and Stoppacher 2015). To this end, the scientific working group for forensic anthropology (SWGANTH) initiated in 2008, has developed several documents on best practices in the discipline (Scientific Working Group for Anthropology 2012). What is critical here is that the process of standardization that is currently a central component of the metamorphosis of forensic anthropology, is the process of distinction. Essentially, for the past seven years, many hours of work have been dedicated to determining who should practice forensic anthropology and under what title, what methods should be used, how case reports should be written, and what type of training is acceptable. We are now well past the planning phase and into the implementation phase. In

the face of this movement, it seems that highlighting areas of overlap without discussing clear boundaries is slightly misleading. To state that bioarcheology and forensic anthropology are related and have a mutually beneficial relationship is certainly true, but there are limits to that relationship and the boundaries are as important as the symbiosis.

### REFERENCES CITED

- Bidmos, M. A.  
2008 Stature Reconstruction Using Fragmentary Femora in South Africans of European Descent. *Journal of Forensic Sciences* 53: 1044-1048.
- Bunch, A. W. & R. Stoppacher  
2015 The Forensic Anthropology Report: A Proposed Format Based on the National Association of Medical Examiners Performance Standards. *Medical Research Archives* 2.
- DiGangi, E. A. & M. K. Moore  
2013 *Research methods in human skeletal biology*. Academic Press, Oxford.
- Dirkmaat, D.  
2012 *A companion to forensic anthropology*. Wiley-Blackwell, Malden.
- Genoves, S.  
1967 Proportionality of the long bones and their relation to stature among Mesoamericans. *American Journal of Physical Anthropology* 26 (1): 67-77.
- Giannecchini, M. & J. Moggi-Cecchi  
2008 Stature in archaeological sample from central Italy: methodological issues and diachronic changes. *American Journal of Physical Anthropology* 135 (3): 284-292.
- Hens, S. M., L. W. Konigsberg & W. L. Jungers  
2000 Estimating stature in fossil hominids which regression model and reference sample to use? *Journal of Human Evolution* 38 (6): 767-784.
- Committee on Identifying the Needs of the Forensic Science Community National Research Council of the National Academy of Sciences  
2009 *Strengthening Forensic Science in the United States: A Path Forward*. The National Academies Press, Washington.
- Raxter, M. H., B. M. Auerback & C. B. Ruff  
2006 Revision of the Fully technique for estimating statures. *American Journal of Physical Anthropology* 130 (3): 374-384.
- Ross, A. H. & E. H. Kimmerle  
2010 Contribution of quantitative methods in forensic anthropology: A new era. In *Handbook of Forensic Anthropology and Archaeology*, edited by S. Blau & D. Ubelaker, pp. 479-489. Left Coast Press, Walnut Creek.
- Scientific Working Group for Forensic Anthropology  
2012 (SWGANTH) website. [www.swganth.org](http://www.swganth.org)
- Sutphin, R. & A. H. Ross  
2011 Juvenile stature estimation: A Chilean perspective. In *The Juvenile Skeleton in Forensic Abuse Investigations*, edited by A. H. Ross & S. Abel, pp. 167-177. Springer, New York.

## Commentary 3: Integrating Bioarchaeology and Forensic Anthropology

John W. Verano

Douglas Ubelaker provides an excellent review of the intersection of two fields that are closely related in methodology and objectives, and that have evolved in recent decades in a symbiotic manner. Scientific methods and advances in each field complement one another, and as Ubelaker emphasizes, practitioners in each of these disciplines need to be familiar with the research and publications of both.

Some specific areas in which one specialty has contributed to the other are highlighted by Ubelaker, such as the contributions of bioarchaeologists to excavation methods and the interpretation of taphonomic alterations to bone (see also Buikstra and Beck 2006), although forensic anthropologists have made significant advances in taphonomic studies as well (Haglund and Sorg 1997, 2002). Forensic anthropologists for their part have made important contributions to methods for identifying and interpreting skeletal trauma, both through case studies and experimental research on bone fracture mechanics (Berryman and Symes 1998; Kimmerle and Baraybar 2008; Passalacqua and Fenton 2012; Wedel and Galloway 2014).

As Ubelaker notes, forensic anthropologists often focus on individual decedents while bioarchaeologists typically work with population samples, although there are exceptions, such as bioarchaeologists who study the occupants of elite tombs or the remains of individuals who appear to be "outliers" of some kind (Eeckhout and Owens 2008; Stodder *et al.* 2012), and forensic anthropologists who specialize in mass fatality events (Sledzik 2009, cited by Ubelaker) and human rights violations (Steadman and Haglund 2005). Despite differences in focus and specific research questions, methods used to identify and characterize human remains are similar in all of these cases.

In his review, Ubelaker highlights a number of recent advances in the analysis of human remains that have emerged from issues such as the need to identify human bone from small fragments and to estimate the chronological age of skeletal remains of potential forensic significance. In fact, Ubelaker has been a lead investigator in these areas, developing and improving methods for the microscopic and chemical characterization of human bone, as well as the use of hydrogen bomb-derived radiocarbon in estimating

the date of birth and death in recent forensic cases. Despite his recent focus on forensic anthropology, it should be noted that Ubelaker has also made significant contributions to the bioarchaeology of prehistoric Ecuador, and thus serves as a model himself for the utility of integrating research in the fields of forensic anthropology and bioarchaeology.

### REFERENCES CITED

- Berryman, H. & S. A. Symes  
1998 Recognizing Gunshot and Blunt Cranial Trauma Through Fracture Interpretation. In *Forensic Osteology: Advances in the Identification of Human Remains, Second Edition*, edited by Kathleen Reichs, pp. 333-352. Charles C. Thomas, Springfield.
- Buikstra, Jane E. & L. A. Beck  
2006 *Bioarchaeology: The Contextual Analysis of Human Remains*. Academic Press, Amsterdam.
- Eeckhout, P. & L. S. Owens  
2008 Human Sacrifice at Pachacamac. *Latin American Antiquity* 19 (4): 375-398.
- Haglund, W. D. & M. H. Sorg (editors)  
1997 *Forensic taphonomy: the postmortem fate of human remains*. CRC Press, Boca Raton.  
2002 *Advances in forensic taphonomy: method, theory, and archaeological perspectives*, CRC Press, Boca Raton.
- Kimmerle, E. H. & J. P. Baraybar  
2008 *Skeletal Trauma: Identification of Injuries Resulting from Human Rights Abuse and Armed Conflict*. CRC Press, Boca Raton.
- Passalacqua, N. V. & T. W. Fenton  
2012 Developments in Skeletal Trauma: Blunt-Force Trauma. In *A Companion to Forensic Anthropology*, edited by D. Dirkmaat, pp. 400-411. Blackwell Companions to Anthropology. Wiley-Blackwell, Malden.
- Steadman, D. W. & W. D. Haglund  
2005 The scope of anthropological contributions to human rights investigations. *Journal of Forensic Sciences* 50 (1): 23-30.

Stodder, A. L. Wiener, A. M. Palkovich & C. S. Larsen  
2012 *The bioarchaeology of individuals*. University Press  
of Florida, Gainesville.

Wedel, V. L. & A. Galloway  
2014 *Broken Bones: Anthropological Analysis of Blunt  
Force Trauma*. 2nd Ed. Charles C. Thomas, Springfield.



## Comentario 4: Aplicaciones de la antropología, semejanzas, diferencias e intersecciones

Luis Fondebrider

El Dr. Ubelaker presenta en este artículo una breve pero excelente introducción sobre estas dos aplicaciones de la antropología, sus interfaces y especificidades.

Su larga trayectoria en los campos de la bioarqueología y de la antropología forense, con acceso a casos de diversa índole, lo ubican en una inmejorable posición para brindar un panorama amplio pero preciso de las metodologías empleadas, pero al mismo tiempo de los recientes avances, como lo son la datación o la excavación de sitios complejos como pozos.

Por otra parte, logra describir en forma dinámica una transición que no siempre es fácil de lograr, esto es, pasar de trabajar en casos históricos o prehistóricos

a casos modernos, en los que el contexto es totalmente diferente.

Por otra parte, hubiera sido deseable que hubiese un mayor desarrollo en el artículo de las implicancias y consecuencias de la tarea en ambos ámbitos. Una, relacionada con la academia, la investigación y el debate entre pares; la otra, relacionada con la justicia, el debate pericial con otras disciplinas forenses y las consecuencias que tiene un informe forense, totalmente diferentes de las que produce un artículo académico.

En resumen, el artículo brinda una breve pero completa introducción sobre dos campos de aplicación de la antropología, que se necesitan y se nutren uno del otro.



## Comment 5: A forensic anthropologist can be a bioarchaeologist, but should a bioarchaeologist be a forensic anthropologist?

Ann H. Ross

The paper by Ubelaker presents the close relationship between the sub-disciplines of bioarchaeology and forensic anthropology. He presents six areas of synergy including detection, species recognition, antiquity, biological profile, taphonomy, and trauma. For species identification he focuses on technological advances such as SEM, molecular analysis, protein radioimmunoassay to name a few. While these techniques could be applied in a bioarchaeological context I do not see these widely used in species identification in this framework as these techniques are cost prohibitive and the identification of a small fragment would add little information to a broad population structure level. However, species identification is an integral aspect of what we do in both realms. The synergy between the two sub-disciplines lies with expert training in zooarchaeology and comparative osteology. For example, our laboratory (NC State University Forensic Analysis Laboratory) we have had several forensic cases of extremely fragmented remains where expertise in both zooarchaeology and comparative osteology have been critical in the segregation and identification of human and non-human remains. Even in this scenario most law enforcement agencies would find these modern technologies cost prohibitive. Ubelaker was instrumental in introducing forensic anthropology to radiocarbon (carbon-14) dating for the purpose of ascertaining the antiquity of the remains in a forensic context, which is generally within 50 years in most jurisdictions (Ubelaker 2001; Ubelaker and Houck 2002; Ubelaker *et al.* 2006; Ubelaker and Parra 2011). Fournier and Ross (2013) argued that this technique should be adopted as part of the standard forensic tool kit after applying it on several cases of questionable antiquity both in the United States and on potential human rights related cases in Republic of Panama.

Before addressing the subsequent areas it would be prudent to examine the definition of bioarchaeology, which appears has different meanings dependent upon who is applying it (Goldstein 2006). Larsen (2006) views bioarchaeology as an interdisciplinary endeavor that address problem oriented research of quality of life, behavior and lifestyle, biological relatedness, and population history of past populations. The synergy

between forensic anthropology and bioarchaeology has been identified by many who used different terms such as *life history* (Krogman), *osteobiography* (Saul), and *social biology* (Angel) (Buikstra 2006). Bioarchaeology as coined by Buikstra (1977) is driven by questions of paleodemography, ancestry, behavior, and health in a biocultural adaptive perspective. Ubelaker (2014) in the Encyclopedia of Global Archaeology states that skeletal biology is used synonymously with bioarchaeology. However, DiGangi and Moore (2013) define skeletal biology as the study of the biology of the human skeleton without a temporal prescription. For researchers who straddle forensic anthropology (contemporary remains in a medicolegal context from the perspective of the individual) and bioarchaeology (human skeleton[s] from archaeological sites) the commonality lies within skeletal biology. A forensic anthropologist cannot be a good forensic anthropologist without first being a skeletal biologist. Knowledge of the population is crucial in making inferences about the individual. Likewise, you cannot make inferences about past lifeways without knowledge of skeletal biology and methodologies developed from documented skeletal samples.

For the remaining sections of Ubelaker's manuscript the biological profile, taphonomy, identification, and trauma, the lens used is very different depending upon whether you are examining a forensic case or archaeological remains. A forensic case requires the use of exacting language as the forensic case report will become part of the legal documentation. Forensic anthropology no longer only deals with skeletal remains. The majority of the caseload for our laboratory, for example, is toolmark examination from bone on fleshed bodies and the side-by-side comparison of radiographs for identification. Forensic anthropology is restricted by stringent legal requirements. Thus, the forensic case report is a factual presentation of the evidence without speculation. Whereas interpretation of archaeological remains can be more organic as there are no legal ramifications. In fact, credentialing has become a large component of forensic anthropology (e.g., American Board of Forensic Anthropology and several international certifications such as certifications by the Forensic Anthropology Society of Europe, British

Association for Forensic Anthropology, etc.). A case in point is the 2015 case of *Gore v. Commonwealth of Virginia* where Douglas Owsley presented biased testimony and grossly over stepped his expertise by providing opinions beyond his expertise and professional competence. His report was riddled with falsehoods and junk science that was biased and misguided. This is a very dangerous tenet. In this case, the Judge ruled that the prosecution did not provide enough evidence that the Gore's killed their infant son (Ross and Juarez 2016). The infant did show evidence of neglect, however. Dr. Owsley is a bioarchaeologist (he is not Board certified, he is not a member of the American Academy of Forensic Sciences or any other forensic society) his testimony in this case could have had a significant detrimental effect on the lives of the defendants. When one considers what is at stake when working in death investigations, and I am talking about our ability to identify the dead and testify in homicide trials where people's lives may be dependent upon our casework and research, the need for solid practicing engaged forensic scientists is obvious.

#### REFERENCES CITED

- Buikstra, J.  
1977 Biocultural Dimensions of Archaeological Study: A Regional Perspective. In *Biocultural Adaptation in Prehistoric America*, edited by R. Blakely and Southern Anthropological Society, pp. 67-84. University of Georgia Press, Athens.
- Buikstra, J.  
2006 A Historical Introduction. In *Bioarchaeology. The Contextual Analysis of Human Remains*, edited by J. Buikstra and L. Beck, pp. 7-20. Elsevier, Boston.
- DiGangi, E. & M. Moore  
2013 *Research Methods in Human Skeletal Biology*. Academic Press, Waltham.
- Fournier, N. & A. Ross  
2013 Radiocarbon Dating: Implications for Establishing a Forensic Context. *Forensic Science Policy & Management* 4: 96-104.
- Goldstein, L.  
2006 Mortuary Analysis and Bioarchaeology. In *Bioarchaeology the Contextual Analysis of Human Remains*, edited by J. Buikstra and L. Beck., pp. 375-388. Academic Press, San Diego.
- Larsen, C. S.  
2006 The Changing Face of Bioarchaeology: An Interdisciplinary Science. In *Bioarchaeology. The Contextual Analysis of Human Remains*, edited by J. Buikstra and L. Beck, pp. 359-374. Academic Press, San Diego.
- Ross, A. & C. Juarez  
2016 Skeletal and Radiological Manifestations of Child Abuse: Implications for the Study of Past Populations. *Clinical Anatomy*. doi: 10.1002/ca.22683.
- Ubelaker, D.  
2001. Artificial Radiocarbon as an Indicator of Recent Origin of Organic Remains in Forensic Cases. *Journal of Forensic Sciences* 46: 1285-1287.  
2014 Skeletal Biology: Definition. In *Encyclopedia of Global Archaeology*, edited by C. Smith, pp. 6721-6722. Springer, New York.
- Ubelaker, D. H. & M. Houk  
2002. Using Radiocarbon Dating and Paleontological Extraction Techniques in the Analysis of a Human Skull in an Unusual Context. *Forensic Science Communications*. In <https://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/oct2002/ubelaker.htm> (August 1, 2013).
- Ubelaker, D. & R. Parra  
2011. Radiocarbon Analysis of Dental Enamel and Bone to Evaluate Date of Birth and Death: Perspective from the Southern Hemisphere. *Forensic Science International* 208: 103-107.
- Ubelaker, D. B. Buchholz & J. Stewart  
2006. Analysis of Artificial Radiocarbon in Different Skeletal and Dental Tissue Types to Evaluate Date of Death. *Journal of Forensic Sciences* 51: 484-488.