

Forensic Anthropology—Theory and Practice

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Forensic Anthropology as a Subdiscipline

Forensic science is the study and practice of the application of science to the purpose of law. Theoretically, forensic anthropology is the application of anthropological methods and techniques to the resolution of legal problems. In practice, with some exceptions, forensic anthropology is the recognition and analysis of hominid anatomical structures, primarily for the purpose of personal identification of unknown human remains (11).

The associated research is concerned with the characteristics of both soft and hard tissues of human remains, and the methodological techniques which have been developed contribute to the determination of sex, race, age, stature, muscularity, hair analyses, body fluid typing, anomalies, non-metric traits, discriminant trait analyses, and the blood-grouping of bone. The research is

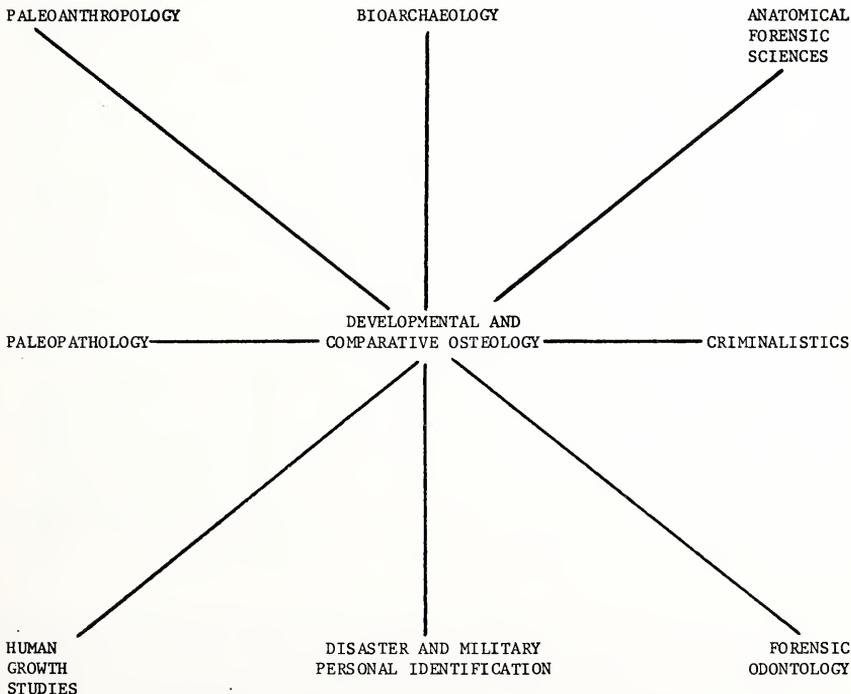


FIGURE 1. *The relationships between developmental and comparative osteology and the disciplines which utilize the basic concepts of osteology.*

further concerned with the analyses of structural modification of both soft and hard tissues of human remains as induced by decomposition vectors, wounds and pathology, animal marks, bone changes in salt water, plant activity on bones, the impact of the environment on bones, and other related investigations which help to reconstruct the history of the remains.

Regardless of the research interests, the applied skills, or the specialization titles of the forensic anthropologist—physical anthropologist, bioanthropologist, bioarchaeologist, human paleontologist, criminalistician, or mass disaster expert, that is, some form of identification specialist who works with human remains—one must accept the fact that the recognition and analysis of human teeth and bones are basic to forensic anthropology—and to the anatomical forensic sciences in general. It is essential that the practitioner of forensic anthropology—whatever the parent discipline may be—have ample competence in the fields of general human skeletal and dental anatomy and be fairly well acquainted with the up-to-date techniques of anthropological osteology.

Comparative human osteology is the core discipline which provides functional data for at least eight areas of anthropological interest, as follows: human growth studies; paleopathology; paleoanthropology; bioarchaeology; the anatomical forensic sciences; criminalistics; forensic odontology; and disaster and military personal identification (see Fig. 1). The latter will be of major concern in the discussion which follows, but throughout the discussion the importance of anthropological osteology will be stressed.

An Example of a Job Description

An example of the role of the forensic anthropologist in disaster and military identification is outlined in the job description for the physical anthropologist (5) employed in the U. S. Army Central Identification Laboratory (CILTHAI), formerly located in Sattahip, Thailand, during the recent military conflict in Southeast Asia (1, 2, 3, 4, 10).

The physical (forensic) anthropologist receives general administrative supervision from the Chief, Central Identification Laboratory, who assigns the overall responsibilities and discusses the major projects, field trips, and problems which affect established policy or those requiring additional personnel or equipment. The work of the anthropologist is conducted independently, with only occasional outside professional consultation, and the completed identification work is normally accepted as final. The laboratory findings of the anthropologist and his co-workers are reviewed for effectiveness, results, and conformance with established policy.

The major duties are to serve as a physical (forensic) anthropologist with responsibility for conducting anthropological studies and investigations oriented toward establishing the positive identification of skeletal remains of allied war dead and civil disaster victims recovered in Southeast Asia. The anthropologist applies a technical knowledge of physical (forensic) anthropology primarily involving such fields as osteology, anatomy, anthropometry, race, age, and sex determination, and related areas.

The physical (forensic) anthropologist plans and conducts investigations to achieve, if possible, the resolution of the identity of casualties. He obtains and reviews the reports from authorities and other sources throughout Southeast Asia, including casualty reports, health and dental records, X-ray transparencies, eye-witness accounts, after-action reports, statements of incident, aircraft manifests, fingerprint and footprint records, and other associated data required for subsequent matching with the laboratory findings—acts which may lead to the identification of each casualty. Further, the anthropologist conducts the background research of recovered but incomplete remains, missing-in-action personnel, and killed-in-action but body-not-recovered personnel by means of a thorough analysis of laboratory case files, alpha rosters, grid locator cards, and the Bright Light Identification Parameters. Utilizing this acquired information, the anthropologist then associates the recovered skeletal remains with the proper casualty, or group of casualties, and determines if partial or minimal recoveries of remains actually represent portions of previously recovered incomplete remains or if the remains present represent the only recoverable portions of a casualty not previously recovered.

The anthropologist performs laboratory examinations by processing and studying each skeletal and semiskeletal set of complete or fragmentary remains to determine sex, race, dentition, age, stature, muscularity, hair color, anomalies, malformations, deformations, healed fractures, old injuries, amputations, and the markers of bone disease. He also supervises the preparation of the dental charts which reflect the extraction and restoration patterns, together with their spacings, inclinations, rotations, versions, overlappings, types of occlusion, degrees of abrasion, impactions, and the presence of supernumerary teeth and prosthetic devices.

The anthropologist attempts to recognize and reassemble the small fragmentary skeletal portions that are splintered by trauma or burning. The majority of the remains received in the laboratory will have suffered extreme trauma or calcination as the result of explosions, air crashes, projectile impact, or other factors leading to tissue damage and dismemberment. The anthropologist utilizes his working knowledge of anthropometry and its proper instruments, techniques, and land-marks to obtain raw data, which is then translated into objective measurements and meaningful indices.

Administratively, the anthropologist consolidates the collective investigative evidence with the laboratory findings so as to achieve positive identification of the individual set of remains. He supervises the preparation of a variety of anatomical, skeletal, and dental charts, and he identifies the reconstituted individual remains by matching the anthropological findings with all of the available data. He then prepares comprehensive Certificates of Identity and supplementary anthropological reports, which include case histories leading up to recovery, detailed descriptions of the remains, comparisons with the records available for the casualty, summaries of the facts and circumstances of the individual case, data which eliminate all of the other associated casualties, discussions of discrepancies considered and discounted, and evaluations of all relevant factors, thus concluding with a concise decision—that is, an

anthropological opinion in a format that is scientifically sound for presentation in any court of law. The anthropologist also performs other duties as assigned (1, 2, 3, 4, 5, 10).

In spite of the intricacy and complexity of the above job description, the entire procedure may be summarized in the form of primary and secondary goals to be held and acted upon by the physical (forensic) anthropologist and his co-workers in the laboratory: (a) establish the uniqueness of the remains, that is, reduce commingling to zero; (b) identify the remains, that is, establish the correct location of the former living individual in the social matrix of his or her family, community, and society; (c) improve current techniques and develop new methods for more efficiency and reliability in the establishment of the above primary goals; (d) increase information in all areas of knowledge relevant to the above primary goals; and (e) provide a sound legal basis for the scientific and circumstantial findings.

Laboratory Procedure

In addition to the recognition of the primary and secondary goals of the laboratory personnel as indicated above, laboratory procedure is an important consideration. As data are being revealed, ascertained, and recorded, the sequence for assessing the anthropometric data from skeletal human remains is very important. The recommended sequence has been discussed by Krogman (6, 7) and Stewart (8, 9) and with slight modification takes the form of a series of interrogative statements, as follows:

1. Is it bone?
2. Is it hominid (human) bone?
3. What bones are present?
4. Are sets of remains commingled?
5. Is the individual male or female?
6. What is the race or ethnicity?
7. What is the nature of the dentition?
8. What is the age at the time of death?
9. What is the height or stature?
10. What anomalies or abnormalities are visible?
11. What is the osteological evidence of the cause of death?

Sequence of the assessment of data is important because the determination of some of the characteristics is dependent upon prior knowledge of other characteristics (11).

Segregating commingled human remains also requires set procedures. When remains are received in the laboratory, there are no records of (a) the exact locations or (b) the positional relationships of the recovered bones as they may have been arranged at, or in, the site of the recovery. However, one must assume that the collecting and packaging of the recovered bones was not done randomly, but reflects to some extent the proximity of the bones, one to another, at the site of the recovery. Therefore, the packages containing the bones represent an initial, but tentative, segregation. It is for this reason, then, that the

contents of each package must be kept separate from the items in other packages from the same site during the initial stages of the segregation process.

After the bones have been cleaned, and washed only if necessary, the entire set of bones in each package should be arranged on the laboratory table so that each bone occupies its normal relative position to the other bones of a supine human skeleton. This procedure provides an early visual awareness of the skeletal parts which make up the contents of each package. It also provides a quick revelation of the presence of the bones of animals other than human. At this stage of the procedure the minimum number of individuals represented in each commingled package can be assessed by counting the multiple identical skeletal portions.

If there are no objections to marking the bones, each bone on each table (each table bearing the contents of one package) should be marked with an identifying mark indicating the table (that is, the original package) upon which it presently resides. This assures the worker that any skeletal portion can always be returned to its original table (package) if the need arises. The markings on the bones also permit the subsequent construction of a descriptive narrative of the procedural activities which occurred during the segregation and reconstruction of each set of remains, if such a document is requested.

As the segregation of the commingled remains progresses, it is important that the worker realize that a skeletal part should not be removed from its original position to a new position—that is, from one table to another—unless there is a valid and accountable reason for doing so. In other words, the parts which arrived in the laboratory in a single package are assumed to belong to one individual unless some discrepancy is observed. The usual osteological discrepancies which necessitate the relocating of skeletal parts are as follows:

1. Duplication of anatomical parts;
2. Improper articulation with other related anatomical parts;
3. Improper matching of bilaterally symmetrical parts;
4. Incompatibility of size in relation to other anatomical parts; and,
5. Incompatibility of surface anatomy when compared with other bones of the set.

The worker may develop other reasons for relocating anatomical parts—for instance, evidence of similar trauma on closely associated bones or the fitting of bone fragments to distantly removed bones—but it must be stressed that in each instance there should be ample justification for making such changes.

Basic Skills Required of an Identification Specialist

Throughout the above discussion the reader has been made aware of the basic skills required of identification specialists and, more specifically, forensic anthropologists. These skills may be summarized as follows:

1. Thorough knowledge of human surface anatomy;
2. Familiarity with procedures for chemical analyses of body fluids;
3. Thorough knowledge of the skeletal anatomy of the human organism;
4. Thorough knowledge of the dental anatomy of the human organism;

5. Familiarity with the concept of variability and its manifestations in human populations;
6. Familiarity with the methods and techniques used in obtaining and assessing anthropometric and anthroposcopic data;
7. Thorough knowledge of the effect of trauma and heat on flesh-covered, semiskeletal, or skeletal remains;
8. Knowledge of types of tissue associated with non-skeletal remains;
9. Familiarity with procedures for systematically segregating commingled flesh-covered and semiskeletal remains;
10. Thorough knowledge of fragmentary skeletal human remains;
11. Familiarity with procedures for systematically segregating commingled skeletal remains; and,
12. Knowledge of the role and function of the forensic anthropologist as an expert witness.

In summary, the processes of personal identification demand the matching of complex physical characteristics as revealed by the remains with the record of an individual who manifested these complex characteristics in life. The forensic anthropologist, as a result of training, research, and field experiences, must be well equipped to perform most of the tasks required in the processes of personal identification but must also be prepared to work in close cooperation with experts and technicians in other disciplines in order to fulfill the role which is prescribed for the forensic anthropologist.

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