

*C. P. Warren,<sup>1</sup> M.A.*

## Personal Identification of Human Remains: An Overview

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Personal identification of human remains, as a science and as an art, occurs in a variety of sociocultural contexts. Unknown remains resulting from accidents and homicides occupy the attention of identification specialists in criminalistics, and unknowns resulting from military engagements and mass disasters are the focus of identification specialists in both military and civilian agencies. Each group of specialists has, within its respective identification agency, its own techniques and methods for establishing identity, and each group has its own criteria with which to verify identification. The purpose and functions of personal identification also vary within the context of the investigative agencies, but all identification specialists, regardless of their agency affiliation, are oriented toward establishing an individuality that can be validated by comparison with supporting social data.

### **Problem**

Technically, personal identification of human remains requires the matching of selected physical characteristics ascertained from the remains with information about these physical characteristics that is a matter of social record. Several methods are presently used to establish personal identification of flesh-covered, semiskeletal, and skeletal human remains (see Tables 1 and 2), and additional skills are applied in the segregation of commingled remains. The information generally sought during the laboratory examination of the various types of remains is that constellation of data which is usually a matter of official documentation, that is, sex, race, fingerprints, dentition, age, stature, muscularity, hair color, anomalies, tattoos and scars, the cause of death, and other unusual data that might help to make an individual of the remains (see Table 3).

Some of these procedures routinely used by identification specialists have a high degree of reliability in the determination of the information sought, and some of these modes are extremely unreliable. Further, the research data describing and supporting these established techniques are scattered throughout the scientific literature, and some of them are recorded in the reports of physical anthropologists, forensic odontologists, forensic scientists, osteologists, coroners, medical examiners, pathologists, and police laboratory technicians.

The official records bearing the data of the physical characteristics of the individual are also an integral part of the identification process. Military and police records are the most comprehensive; other types of records frequently used in the identification process—insurance application, driver's license, clinic record, passport, and so forth—are very poor sources of information for accurately identifying human remains.

In summary, the identification specialist is concerned with two basic problems: (1) the determination of the physical characteristics of the living individual from the remains and

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<sup>1</sup>Associate professor of anthropology, Department of Anthropology, University of Illinois at Chicago Circle, Chicago, Ill. 60680.

TABLE 1—*Anthropometric and anthroposcopic techniques applicable to personal identification.*

Characteristic	Flesh-Covered Remains	Semiskeletal Remains	Skeletal Remains	Commingled Remains
1. Facial photographs	X	...	...	...
2. Fingerprints	X	...	...	...
3. Sex	X	X	X	...
4. Ethnicity or race	X	X(?)	X	...
5. Age	X(?)	X(?)	X	...
6. Height or stature	X	X	X	...
7. Weight	X	...	...	...
8. Hair color and type	X	X(?)	X(?)	...
9. Muscularity	X	...	...	...
10. Tattoos, scars, and marks	X	...	...	...
11. Teeth	X	X	X	...
12. Blood and body fluid typing	X	X(?)	X(?)	...
13. Radiography	X	X	X	...
14. Malformations and deformations	X	X(?)	X	...
15. Healed fractures	...	...	X	...
16. Wounds or injuries	X	X(?)	X(?)	...
17. Craniofacial superimposition	...	...	X	...
18. Fluorescent light	...	...	...	X

TABLE 2—*Anthropometric and anthroposcopic data available from selected regions of the human skeleton.*

Characteristic	Cranium and Mandible	Teeth	Vertebral Column	Ribs, Sternum, Clavicle, and Scapula	Pelvis	Appendicular Long Bones
1. Sex	X	...	...	X	X	X
2. Ethnicity or race	X	X	...	...	...	...
3. Age	...	X	X	X	X	X
4. Stature	...	...	...	...	...	X
5. Malformations	X	X	X	X	X	X
6. Deformations	X	X	X	X	X	X
7. Healed fractures	X	...	X	X	X	X
8. Old injuries	X	X	X	X	X	X
9. Amputations	...	...	...	...	...	X
10. Extractions	...	X	...	...	...	...
11. Restorations	...	X	...	...	...	...
12. Supernumeraries	...	X	...	...	...	...
13. Mutilations	...	X	...	...	...	...
14. Evulsions	...	X	...	...	...	...
15. Trepanning	X	...	...	...	...	...
16. Bone disease	X	X	X	X	X	X

(2) the acquisition of significant social records reporting the physical characteristics of the possible individual (or individuals) the remains may represent. If the results of (1) and (2) match, the individual is presumed to be identified. It is this matching of data that has been obtained from disparate sources that is the goal of every identification specialist. Therefore, the sources and reliability of these data in the identification process should be of utmost concern to the identification specialist.

TABLE 3—*Summary of physical characteristics used in personal identification that are usually a matter of record.*

Data Obtained from Remains	Characteristic	Data Obtained from Record
X.....	sex	..... X
X.....	race	..... X
X.....	fingerprints	..... X
X.....	dentition	..... X
X.....	age	..... X
X.....	stature	..... X
X.....	muscularity	..... X
X.....	hair color	..... X
X.....	anomalies	..... X
X.....	tattoos and scars	..... X
X.....	cause of death	..... X
X.....	other unusual data	..... X

### Discussion

Personal identification of human remains is an activity that occurs during three sets of distinctive but not mutually exclusive processes: personal identification as an aspect of criminalistics, including the identifications made by coroners and medical examiners [1-6]; personal identification in mass disasters [7,8]; and personal identification of military personnel during war and peacetime [9-14]. The processes range from simple visual observations to complex laboratory procedures, and the techniques employed vary from personal recognition to fingerprinting to chemical analysis of body fluids. However, the technique or set of techniques employed by the identifying agent is always completely dependent on the biological condition of the remains and the physical condition of the artifacts associated with the remains. To cite several examples:

1. A nude body that has suffered no trauma or decomposition may be viewed by a relative or an associate and the identification established by personal recognition of the facial and body features (a method frequently employed by coroners, medical examiners, and police officials).

2. A fully clothed body that has been burned to the extent that the facial features and fingerprints are obliterated may be identified by papers or other artifacts in the pockets of the unburned portions of the clothing (a method that is used after plane crashes accompanied by fire).

3. A severely traumatized body—the result of an auto, bus, or plane accident—may be reconstructed physically to provide the details of sex, race, age, stature, dentition, and other physical characteristics, and this set of physical traits may be used to physically differentiate this particular traumatized individual from the other traumatized victims of the same accident and to match the physical characteristics of this individual with the characteristics of an individual known, or suspected to be, a passenger on the vehicle.

4. Fragments of skeletal remains, including teeth, found in a remote grave may also be used to reconstruct some of the physical characteristics of the unknown individual, and, again, these physical characteristics may be used for comparison with the physical characteristics of persons reported as missing.

The last example is one of the principal techniques used during military identification, especially after considerable time has passed between the time of burial and the time of recovery.

Events similar to those described take place nationally and internationally with increasing frequency in the laboratories of coroners, medical examiners, police technicians, forensic dentists, and military identification specialists, and the loci of such events range from well-equipped laboratories to airplane hangars that have been converted into temporary morgues. Descriptions of these events and the procedures followed by the professionals and technicians engaged in the work of personal identification are reported occasionally in journals, technical reports, and other forms of scientific and technical literature, and serious efforts have been made to collect these basic source materials and organize them into a comprehensive bibliography [15, pp. 137-154].

An expert who is trying to establish individuality has a wide range of sources for guidance when attempting to obtain the bits and pieces of evidence that make up the constellation of data, which is then compared with the data on record. Apart from personal recognition [16, 17], the identification specialist has photographs, fingerprints [18, 19], palm prints [20], and footprints for comparison. In addition, sex, race, age, and stature can be assessed from appropriate anatomical structures [7, 15, 21-26]. The human dentition and the evidence of extractions, restorations, supernumeraries, mutilations, evulsions, and genetic markers all provide unique forms of evidence [27-34]. Furthermore, typing of blood and body fluid provides additional discriminants, as do human bones and the observations of malformations, deformations, healed fractures, old injuries, and amputations, plus the manifestations of bone disease, surgery, and trepanning [35]. If one adds to this list the special techniques of human paleontology and bioarchaeology [36-43], it is quite evident that an extensive and impressive array of methods is available to the identification specialist while developing one aspect of the identification process.

Unfortunately, the available literature that describes the processes applicable to the resolution of the problems of personal identification is remarkably devoid of theory. Several sources provide exceptionally good articles that describe the specific techniques that can be employed to obtain data used to describe the physical characteristics of the unknown individual, but the theory underlying the techniques of personal identification has been neglected by both scholars and technicians. An exception to this observation may be found in an article by Dahlberg [30], which discusses dental statistics in relation to probability and certitude.

But the data generated by the application of the techniques mentioned above represent only one side of the comparison process. The other side of the comparison process relies on two major sets of data: (1) the physical data concerning the individual, which are a matter of record, and (2) the social data, which are also a matter of record. Both the physical data and the social data that are a matter of record are accumulated and recorded during a series of events in the life cycle of every individual, beginning with the birth certificate. This basic documentation is followed by records of school registration; doctors' or dentists' records; job applications and work records; insurance applications; driver's licenses; identification cards; arrest records; records of military, civil service, or security positions; military or civilian clinic or hospital records; passports; and, finally, the death certificate.

To reiterate, the documentary evidence reflecting all of these recorded events and summary materials contains both physical and social data pertaining to the individual. The physical data provide an indexing of sex, race or ethnicity, age, height, weight, hair color, eye color, body build, scars, unusual characteristics, visible distinguishing marks, fingerprints, photographs, X-rays, blood type, and so forth, plus the details of medical and dental examinations, including autopsy findings. The social data consist of a variety of items as follows: name, date and place of birth, names of father and mother (if known),

social security number, identification card numbers, aliases, education record, work record, military record, political record, police record, family medical history, marital status, religion, name of next-of-kin, and the relationship of the next-of-kin to the deceased.

The above lists of physical and social data—data that are unevenly available for comparison purposes—are by no means complete, but the purpose of listing the items in this manner is to emphasize that there are many variables under consideration during the identification process, even though the remains and the physical-social record may be incomplete. It follows, then, that a situation that requires the comparison of a number of variables of uneven value also requires some theory, or set of theories, as to how these variables should be weighted as they are compared, one against the other, in the matching process that leads to personal identification. It also follows that if credibility is to be accorded to the identification of human remains by identification specialists of any genre, the techniques employed by the specialists must be standardized and the criteria necessary for an unquestionable and verifiable identification must be established and monitored, either by a supervisory law enforcement agency, or an organization of qualified scientists, or some union of the two.

At this point it must be emphasized that if there are no physical-social data concerning the deceased that are a matter of record, then no personal identification can be established. The process requires the matching of items of the available physical characteristics and the information inherent in the associated artifacts (personal effects) of the individual in question with the physical-social data that have been documented periodically during the life span of the deceased. If there is social resistance against the efforts of agencies to accumulate physical-social data (invasion of privacy, or freedom from documentation), or if there is a systematic destruction of the physical-social data (to make space for more records, or to reduce the costs of document storage), then the personal identification process is jeopardized. These factors should also be of concern to supervisory law enforcement agencies and to scientists who function as identification specialists, because access to the physical-social records of the individual to be identified is as important as the biophysiological techniques used to reconstruct the physical characteristics of the individual to be identified. 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. Thus, both sides of the identification-matching process should be of concern to all agencies involved in the identification of human remains.

### **Recommendations**

Systematic resolution of the various aspects of the problems as discussed involves seven major areas of investigation:

- (1) examination of the literary sources of the methods describing the manner in which data are obtained from the remains and the associated artifacts;
- (2) assessment of the validity and reliability of the reported methods used to obtain the physical and artifactual data;
- (3) evaluation of the sources of documentary materials that report the physical characteristics of the individual as accumulated during the life span;
- (4) development of a theory or set of theories of personal identification;
- (5) surveys of the prevailing methods of personal identification as they are presently practiced on local and national levels;
- (6) surveys of the educational institutions, laboratories, and identification agencies of the nation to ascertain where the forensic sciences are taught and to assess the dimensions and curriculum content of the personal identification component of these programs; and

(7) establishment of guidelines for standardization of the methods used in the personal identification process.

### Method

The reports of the established and unproven techniques that are scattered throughout the literature should be gathered, reviewed, analyzed, evaluated, and standardized, at least to the level of an annotated bibliography, so that any identification technician may find an adequate description of the most applicable methods available and then put them to use. The above effort would generate two products for the identification of human remains: (1) a comprehensive and annotated bibliography of laboratory techniques and (2) a source book of anthropometric and anthroposcopic techniques.

The associated literature concerning the use of official records that ostensibly bear the data of the physical characteristics of the individual to be identified should also be researched. The results of this effort should produce a source book of loci of physical-social information, including civilian sources, military agencies, and governmental agencies.

An additional task should be the assessment of contemporary procedures of personal identification as they are practiced in the laboratories of identification specialists throughout the country. This information might be garnered by developing an appropriate questionnaire designed to inquire about the standard and special identification procedures and reliability checks as they are practiced in the variety of identification laboratories on a day-to-day basis. This activity should accumulate data that eventually might lead to the standardization of procedures by all identification agencies, and the effort might also provide a number of case studies on which a theory of personal identification might be built.

Another task should be to survey the colleges, universities, medical schools, professional schools, and technical laboratories to determine (1) where courses in the forensic sciences and forensic anthropology are being taught, (2) what particular courses are being offered that train personnel in the methods of personal identification, and (3) how specialists on all levels might participate in the programs offered and thus improve their skills. A nucleus of this phase of the proposed project has already been formed as one section of the American Academy of Forensic Sciences [44].

The results of these activities would allow for the development of criteria necessary for an unquestionable and verifiable personal identification system, and these criteria could be established and monitored by a supervisory law enforcement agency or a professional scientific group. The effort would also provide the basis for the subsequent collection, storage, and retrieval of the physical-social data used for purposes of personal identification of human remains. Further, it would provide the nucleus of a data bank from which a national clearinghouse of information having to do with the methods of personal identification might be developed. Data accumulated in such a project would provide any umbrella law enforcement agency or professional scientific group with information that, if distributed nationally, would help to upgrade the skills of all professional and semiprofessional individuals who desire additional training or sources in this aspect of the forensic sciences. Such an effort would also help to establish a network of academically oriented scholars and field professionals and thus provide a means of interaction between the academicians and the applied scientists concerned with the problems of personal identification. Furthermore, it might lead to the development of evaluation methods for application to all activities directly and indirectly related to the processes of identification of human remains. Information collected during a project of this type would also provide a directory of universities, colleges, technical schools, and public and private agencies that provide instruction in the processes of personal identification.

Finally, in view of the social, economic, and political importance of the accurate personal identification of human remains, the activity, wherever it occurs, warrants the use of high-

quality, objective, and up-to-date scientific techniques, but this ideal situation cannot be approached without research, education, and supervision.

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Address requests for reprints or additional information to  
 Charles P. Warren  
 Department of Anthropology  
 University of Illinois at Chicago Circle  
 Box 4348  
 Chicago, Ill. 60680