

THE IN SITU ANALYSIS OF HUMAN BURIALS**Shelley R. Saunders***ABSTRACT*

Archaeologists often encounter isolated, stray burials on habitation sites. Recent studies have led to interesting cultural explanations for these burials on Ontario Iroquois sites and it is proposed that we reconsider our methods of observation of human burials *in situ* since careful, discriminating observation is a prerequisite for innovations in theory. Various techniques of data retrieval from *in situ* burials are discussed.

There is an indivisible relationship between observation and theory in scientific knowledge. As one author has put it:

"It is a fundamental error to regard (observation) as an independent means of acquiring information against which hypotheses may be checked, and it is no less misguided to think of hypotheses as subjectively inspired visions that must be compared with the separately acquired, theoretically neutral data revealed by sense " (Harris 1970:291).

Thus, most archaeologists approach their work with a particular problem in mind. Traditionally, though, it is thought that archaeologists follow the inductive method of information retrieval, gathering as much data as possible and drawing generalizations from that data. Unfortunately however, information retrieval sometimes becomes static so that certain types of information are either thought irrelevant to the problem or are simply not considered. The profitable wedding of observation and theory to improve knowledge is only possible with trained, discriminating, theoretically-informed perception developed by continual practice.

As a physical anthropologist, I see the need for a reconsideration of these points in certain aspects of southern Ontario archaeology. Southern Ontario prehistory is a special region since it is the centre for the development and elaboration of the ossuary interment ritual which begins about A.D. 1300 and extends to the period of contact (Wright 1966). A number of valuable contributions to the study of prehistoric populations have come from analyses of Ontario pre-ossuary and ossuary sites. Recently, however, archaeological evidence corroborated by ethnographic accounts has sparked interesting cultural explanations for non-ossuary burial (Kapches 1976). Kapches' work emphasizes the importance of the careful consideration of stray, single burials found on habitation sites. The aim of this paper is to restore or reinforce some of the interest in perceptive analysis and description of any kind of burials found on archaeological sites, especially as they remain *in situ*. Unfortunately, many excavation techniques which should most properly be field techniques have been relegated to the laboratory.

Simply removing the bones for lab analysis destroys many integral facts about the mode of interment and characteristics of the individual. This is why the importance of a large, varied series of photographs of cleaned, undisturbed burials cannot be over-emphasized. Photos provide significant information on burial location, depth, grave type, grave dimensions, burial dimensions, state of bone preservation and particularly anatomical position. Saunders, Knight and Gates (1974) used a large series of photos to help reconstruct burial patterns at the Christian Island site five years after excavation. Finnegan (1976) used photos to analyse and match disarticulated skeletons from a site totally lacking

in field notes. Close-up photos of such structures as teeth, areas of common skeletal variations and specific joint articulations are useful especially if the bones must be left unexcavated or be reinterred.

It is perhaps some of the preconceived and generalized burial classifications which have sometimes helped to smother the search for original interpretations about mortuary practices. The question of the orientation of the bones in the grave is an important one. Simple descriptive terms such as flexed or extended provide the generalizations of burial position but no base from which to derive useful interpretations about the mode of burial. Melbye (1973) has demonstrated how the consideration of individual joint articulations of an *in situ* burial provides valuable insight into mortuary practices. For example, bones described simply as bundle burial mean nothing to the reader but careful observation of articulated joints versus disarticulated provides the evidence for purposeful dismemberment as opposed to a simple, disturbed bundle burial.

If we want to search for regularities in the positioning of the body we should consider the degrees of flexion, extension, abduction, adduction and rotation of each of the major joints (shoulder, elbow, wrist, hip, knee, ankle, neck) rather than a generalized term such as flexed. A flexed burial may have the legs flexed at various degrees, thoracic cage facing forward or to the side, the arms and hands in various positions, etc. In these cases it would benefit the excavator to be aware of the normal range of movement in each joint so as to recognize abnormal positioning. Contorted postures can, of course, suggest violent death, torture victims and/or the onset of rigor mortis at the time of interment. An interesting example of the careful examination of position comes from the Libben site, an early Iroquoian site in northwestern Ohio (Lovejoy, personal communication). Here the position of the foetus found inside the pelvis of an interred female illustrated the likely cause of death of the woman during labour.

The next step before removal of the bones at excavation would be to check for completeness of the skeleton. In many cases there are portions missing because of secondary disturbances or deterioration of the bone. However, at least partial articulations still provide information about burial position. In any case, the excavator must keep in mind the variations in number, size, shape and composition of the bones from the infant to adult period since during life bone is a living, plastic material. In fact, subadult burials have generally been accorded much less attention than adult burials by archaeologists and physical anthropologists alike, a practice that is not warranted. The newborn possesses about 270 bony centres of ossification. As the individual grows some of these centres will fuse and reduce the number slightly. But as growth proceeds, secondary centres appear, creating about 350 centres at puberty. These epiphyses will eventually fuse to the main portion of the bone, until the commonly known number of bones, 206, is achieved in middle age. Further aging and therefore, further bony changes usually continues to reduce the number of separate bones in the body.

As an example, let us look at the humerus. The shaft or diaphysis of the humerus begins its ossification at about the eighth week of foetal life. The head usually makes its appearance before birth, the greater tuberosity in the first year and the lesser tuberosity from 3 to 4 years. These proximal centres coalesce from 3 to 5 years and gradually fuse to the shaft from 17 to 24 years. The capitulum at the distal end of the bone usually appears from 5 months to 2 years, the trochlea from 7 to 10 years, the medial epicondyle from 8 to 11 years. The capitulum, trochlea and lateral epicondyle coalesce from 10 to 15 years and fuse to the shaft from 17 to 18 years. The medial epicondyle fuses last, at an average age of 19 years. Although the appearance of these secondary centres is variable, their presence can help to indicate the age at death of a burial. The most reliable biological criterion for

estimating chronological age from skeletal data is by an assessment of tooth formation or calcification. Tooth calcification is least affected by nutritional deficiencies or disease (Merchant 1973). Physical anthropologists have most often relied on modern standards of tooth eruption to age infants and child burials and standards for the fusion of bone epiphyses to their diaphyses to age adolescents and young adults. Not only should more attention be paid to tooth calcification rather than eruption but also the presence of the epiphyses before fusion provides aging information from the infant to adolescent, particularly where teeth may be missing. The simple presence of secondary centres before their fusion has largely been ignored by those studying archaeological skeletons, because in young and poorly-preserved burials, epiphyses can be virtually unrecognizable unless first identified and catalogued *in situ*.

Although by looking at either tooth calcification or bone ossification and fusion we can only approximate the true chronological age of the skeleton, it is important to compare the two types of biological age, dental and skeletal, to get a gauge of the rate of growth. Here the point should be made that, especially for very young and poorly preserved skeletons, the absence of a centre cannot necessarily be assumed to mean that it had not yet appeared in the individual. But its presence is a reliable record of the skeletal state of development.

Two other facts about ossification and fusion of bone epiphyses are useful. The first is that their order of appearance is genetically determined (Garn 1971). We might use this fact to assess possible genetic relationships between small group burials if a so-called 'early' centre is found to be more developed or fused before a 'late' centre. Secondly, centres which normally fuse at a particular time may remain unfused in much older individuals. Such centres are found on the acromial process of the scapula, costal area of atlas and axis vertebrae, between the posterior spinal arch of two spinal laminae (spina bifida occulta) and at many other sites on the skeleton. These abnormalities or variations in ossification are probably genetically inherited and provide useful characterizations of the individual.

Identifying bones *in situ* has other applications. A number of skeletal variations can only be identified before the bones are excavated. For example, the number of vertebrae in the thoracic, lumbar, sacral and coccygeal parts of the column may vary. The whole column is seen in articulation only in the ground. When there is destruction of bone, each vertebra can only be identified when in articulation. This also applies to infant and sub-adult burials where individual vertebrae are very hard to identify. Knowledge of the identity of the parts of the vertebral column and their possible variations can yield valuable genetic and pathological information about the individual.

Other skeletal anomalies are best determined when the burial is still in the ground. The talus bone of the foot can sometimes have an extra or separate bone at its posterior end, the os trigonum. Actually, the foot often shows many supernumerary ossicles but the os trigonum is one of the more common ones. The separate medial process of the talus usually leaves a notch on the main bone that identifies the presence of the os trigonum when one only has the talus to look at. The actual os is usually missed in excavation but the talus may not be notched when the os trigonum is present. The same can occur with the patella. This bone, which ossifies in the quadriceps tendon is usually notched on its superolateral border by the tendinous attachment of the vastus lateralis muscle. Occasionally, part of the bone may ossify separately, the bipartite patella. But it is sometimes hard to tell whether the bone is just notched or actually bipartite without the actual extra piece of bone often left at excavation. Numerous variations such as these could be valuable genetic indicators in small group burials.

Other supernumerary bones commonly occur throughout the skeleton. Many soft

tissues can calcify as a result of aging or pathological processes. The laryngeal, cricoid or rib cartilages commonly calcify in old age. In many cases, small bones are simply overlooked at excavation, including the hyoid, carpals and phalanges which can show evidence of their own particular pathologies. For example, individual carpal bones are prone to fracture; terminal phalanges demonstrate epidermoid cysts or the initial stages of leprosy. Arteries can calcify due to age and disease processes, as well as tumors, gallstones and just about any soft tissue affected by various diseases. All of these characteristics should be watched for during excavation.

There are many other new techniques of data retrieval which should be considered of possible utility in burial analysis. Grave goods are a special topic in themselves. There is the possibility of preserved soft tissues in the presence of certain metals such as copper (Savage 1975). Burning and cremation, though very destructive, can still yield pertinent information. Buikstra and Goldstein (1973) have shown how cremated skeletal material can be substantially reconstructed. One can determine if the individual was burned in the flesh or as a secondary cremation, the burial position due to the degree of burning of bones, whether certain joints were articulated at the time of cremation and the analysis of some measurements and morphological characteristics. Much of data retrieval can be aided by a careful description at the time of excavation.

The most important information to be obtained from single, stray burials is their demographic parameters, age and sex, which provide the individual with an identity which might help to explain the mode of burial. I have already stated that the dentition is the most reliable aging criterion for subadults. But this does not mean simply eruption times, a very unreliable indicator, since what we are looking at is eruption through the bone which is not comparable to the standards which are based on eruption through the gums of living persons. Therefore, x-rays of the jaws to illustrate calcification may be the most useful piece of data from a subadult burial analysis. Of course, fragmentary burials need not be given up as less informative. Loose teeth can give developmental information. I have already stressed the usefulness of the appearance and development of secondary growth centres. Growth standards have been established for all long bones, femur, humerus, radius, ulna, tibia and fibula. But in addition, there are also Amerindian aging standards for the subadult hip bone, mandible and basal cranial bone (Merchant 1973). The commencement of various stages of fusion of secondary centres facilitates the age estimation of the older child and adolescent.

In the adult, aging is more difficult and variable. At present, the easiest and most reliable aging criterion for adult skeletons is the apparent changes on the surface of the pubic symphysis, the tough fibrocartilaginous joint at the anterior articulation of the two hip bones. However, it is also a joint affected by extensive hormonal changes in the female at the time of pregnancy. For this reason, there are separate aging standards for males and females. The point relevant to this discussion is that the pubic symphysis is often poorly preserved on sites and special attention should be paid to its careful retrieval at excavation. But, there are other well-known methods of aging adult skeletons, including histological sectioning of cortical bone. Nevertheless, this technique is time-consuming and fraught with technical problems. Less reliable methods can still provide useful information, especially for fragmentary burials, if they are used carefully. These include: the degree of tooth wear, cranial suture closure, degrees of degenerative osteoarthritis and the deterioration of the lumbar vertebrae for which standards exist. Finally, there is a new, tested method of aging using the auricular surface, the joint between the hip bone and the sacrum, which shows similar degenerative changes as the pubic symphysis but without the effects from hormonal changes in females (Lovejoy, personal communication). The

importance of this method is that the auricular surface is more often preserved than the pubic symphysis in burials, and therefore, should be given special consideration when excavated.

Determining the sex of an infant or child skeleton is still quite unreliable, but the excavator might bear in mind that careful preservation of the pelvic bones is the best means of providing some assessment of sex. Sexing of adult skeletons can be quite reliable, but again, retrieval of an intact pelvis is the most useful estimator. The assessment of sex from the robusticity characteristics of the cranium and long bones is biased in favour of males (Weiss 1972). The degrees of bone robusticity also vary from population to population, making this assessment very subjective.

In summary, it is the duty of the excavator to initiate the process of careful laboratory-like analysis of human burials. Isolated burials found by accident in habitation areas are common on Ontario Iroquois sites. Often, in these cases, the opportunity does not arise to call in a physical anthropologist to assist in the excavation. Archaeologists have not fully recognized the possible limits of cultural interpretations concerning these burials. Since, in some cases, they must be reinterred, it is doubly important to consider all details of their observation. They can yield unexpected but valuable cultural and biological information. It is the purpose of this paper to enunciate this view and illustrate some of the techniques of improving our knowledge of prehistory.

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