Texas Notes on Precolumbian Art, Writing, and Culture

No. 42 February 1993

Bones and Epigraphy: The Accurate Versus the Fictitious?

by Javier Urcid

Recent comments on a purported discrepancy in the age at death given by osteological analysis and epigraphic decipherment of Maya inscriptions imply that aging methods in physical anthropology are precise and thus unquestionable, whereas those from epigraphic evidence must be the result of scribal manipulation of "history".

Joyce Marcus, in two recent publications has stated that:

"An awareness of this practice of backdating [in the inscriptions] may help us to solve one of the major (if little discussed) problems with Propeller Shield of Palenque: the disparity between his claimed age and his presumed skeleton. The hieroglyphic inscription on his sarcophagus lid claims that he died in A.D. 683 at the age of eighty. Yet, the skeleton in the sarcophagus, on the basis of a study of suture closings and other standard physical anthropological measures of age, is that of a man between forty and fifty years of age (Davalos Y Romano 1973) or perhaps even barely forty when he died" (Ruz 1977: 293) (Marcus 1992a: 235).

"First of all, the Mexican archaeologist Alberto Ruz, who discovered Lord Shield's tomb, had the ruler's skeleton aged and sexed by physical anthropologists on two occasions, with identical results.

* The Texas Notes are an running series of commentaries and small reports on Precolumbian art, writing, and culture published for the purpose of quick, limited distribution among interested scholars and students working in the field. The series is published by CHAAAC, the Center of the History and Art of Ancient American Culture of the Art Department of the University of Texas at Austin. Funds for reproduction and distribution of complementary copies are provided by the John D. Murchison Professorship in Art, currently held by Linda Schele. Submissions will be accepted from contributors working in all disciplines and concerning any Precolumbian cultural tradition or its descendant traditions. Contributions may be submitted by anyone working in the field, but they may not exceed ten pages, including references. Any of the major word processors may be used, but final text must be submitted in the IBM format, although any IBM disk size is acceptable. All illustrations must be provided at the finished scale in either line or stippled drawings suitable for scanning. The publisher takes no responsibility for copy editing and the authors must clear all copyright permissions before submission of a manuscript. The editor reserves the right to reject submissions if they are deemed inappropriate or incorrectly prepared. Style conventions should follow Chicago Style B and text should be single column and formatted to conform with the paragraph, sub-titling, and other features of this note. Ventura Desktop Publisher will be used to format the text into this layout, which will then be printed on a Hewett-Packard Laserjet III. A master copy of the recent notes will be put on file at Kinko's at the beginning of each semester and can be ordered from Kinko's Copies, 2901-C Medical Arts St., Austin, Texas 78705 (512-476-3242; FAX 512-476-2371).

The skeleton is that of a man approximately 40 years of age" (Marcus 1992b: 345).

"We should even be skeptical of prehispanic rulers who lived to eighty; in chapter 10 we saw at least one major discrepancy between the age at death according to osteology, and the age at death according to a scribe" (Marcus 1992b: 444)

The skeletal remains inside the sarcophagus at the Temple of the Inscriptions at Palenque were indeed examined twice. The first study was published in 1954. It was done by two physical anthropologists, Felipe Davalos Hurtado and Arturo Romano. According to their determination, the individual was 40 or 50 years old at the time of death. Marcus's statement that the aging was based on the study of cranial suture closure and other standard methods is a fair guess. Unfortunately, nowhere in the preliminary report of Davalos and Romano is there a discussion of the criteria that were used to reach the age assessment.

The second analysis was done by two biologists, Balcorta and Villalobos. However, their original report has not been published, only an excerpt by Ruz Lhuillier (1977). The method used in the second examination is said to be based on "histological examination of a small fragment of the cranial cavity". The cranial cavity in skeletal remains is an empty space, so Ruz must have meant "a fragment of the cranium". The report also states that, since "there is uniform mineralization indicating an active and stable osseous metabolic state, one can say that we are dealing with a post-pubertal individual with a skeletal age within the fourth decade of life" (Ruz 1977:293). An histological method aimed at measuring the degree of mineralization is not a standard method of skeletal aging; in fact, it does not appear in any specialized physical anthropology manual. If it was a technique in the process of being developed, the premises on which it is based and the parameters that were used to make it applicable to archaeological remains remain to be assessed. The statement quoted above implies that the method was useful in distinguishing between pre- and post-pubertal remains, suggesting that its degree of resolution to determine a precise adult age was minimal. The histological technique conducted by Balcorta and Villalobos was certainly not that of microscopic study of cortical remodeling. This aging method, which is the most accurate one available today, was developed in 1965 (Kerley 1965). Subsequent authors have refined the parameters for counting osteons, osteon fragments, percentage of lamellar bone, and non-Haversian canals, using long bones only (Ahlqvist and Damsten 1969; Singh and Gunberg 1970; Kerley and Ubelaker 1978). The parameters for cranial bone have not been established yet (Ubelaker, personal communication).

In summary, the published information concerning the estimated age of the skeleton of Pacal does not make explicit the methods and the criteria on which such an assessment was based, something that is now becoming a "standard" requirement in reporting osteological analyses. Even if the methods and criteria were to be made explicit, the main point of these comments is that, contrary to Marcus's undertones, aging methods in physical anthropology are mostly "relative" and limited for deriving the age of very old individuals.

The most commonly used aging methods have been developed by documenting changes on a morphological trait or set of traits. The observed changes are placed in a continuum **by using a control population with members of known age.** Since the control population is by definition a contemporary one (that is, one for which data on age at death is available from documentary evidence), it is necessary to estimate any source of variability likely to exist between the unknown and the recent population furnishing the controlled data. It derives from this that any set of standards derived for an archaeological sample do not necessarily apply to another archaeological sample. Thus, comparisons like those argued by Ruz Lhuillier are incorrect. For instance, he proposes that since analysis of other Native-American populations (as represented by ossuaries from eastern United States) have not yielded ages older than 65 years, then no single individual from the ancient Maya population could have attained an older age than that (Ruz 1977:288-289). In other words, Ruz postulates that aging of Maya prehispanic skeletons should be "fairly consistent" with age estimates derived from other populations simply because they all come from the american continent. Such a position did not take into account the fact that the compared populations

were subjected to different environmental variables, had different subsistence practices, social organizations, nutritional levels, and immunological resistance to disease, to name a few factors. In hierarchical societies, internal population differences could also be substantial.

When dealing with archaeological samples from Mesoamerica, there is one main problem. No standards derived from the study of contemporary Mesoamerican populations are available (to my knowledge, only those for calculating stature (Genoves 1967). Those that are frequently applied were generated from the study of modern north american populations (whites, blacks, or racially mixed groups with the same occupational status, like cadavers from USA soldiers who died in the Korean war). In addition to this drawback, and one that is applicable to any skeletal population, is that the averages of life spans tend to underestimate old ages. And this is not because of error on the part of the observer, but simply because of inherent limitations in the aging methods. Since there is at least a consensus regarding Pacal's gender and broader developmental category, I shall review here those methods that apply to adult male remains, focusing on their weaknesses:

Macroscopic methods

a) Morphological changes in pubic symphysis.

Several standards have been developed for aging the morphology of the pubic symphysis (Todd 1920; McKern and Stewart 1957). Recent studies, however, have concluded that the male symphyseal face is not a reliable indicator for ages above 40 (Suchey et al 1986).

b) Morphological changes in auricular surface.

This method was developed by Lovejoy et al. (1985). The regular changes that the auricular surface undergoes were classed in 8 components. The age category for the last component can discriminate ages of only 60+.

c) Cranial suture closure.

Even as early as 1924 it was recognized that "individual variability in progress of suture union makes it unwise to depend too much upon the stage as an age marker" (Todd and Lyon 1924:383). A subsequent study confirmed that "progress of suture closure has only a very general relationship with age" (McKern and Stewart 1957). Standards for palatine sutures (Mann et al. 19xx) have been developed but can be used only as a general guide. Refinements to cranial suture standards by Meindl and Lovejoy (1985) attain discrimination of old age of a maximum of 70-75 years, with ectocranial and endocranial means of 56 and 51 years respectively.

d) Degenerative changes in joint surfaces.

Studies with controlled collections show a general correlation between degree of bone lipping (osteophytosis) and age, "but also a high degree of variability that limits the usefulness of this feature for aging single individuals" (Ubelaker 1989:85).

e) Resorption of cancellous bone.

This method requires X-rays, and although regular changes have been detected, the degree of medullary expansion provides only a general indication of age (Schranz 1959).

f) Remodeling of sternal rib ends.

This technique, developed by Iscan, Loth, and Wright (1984), is based on regular progression of changes in the sternal ends of ribs. The last phase in the standard for aging males can discriminate old ages of only 65+. Additional studies suggests that remodeling of sternal rib ends are population specific (Iscan, Loth, and Wright 1987).

g) Dental attrition.

The amount of dental wear vary greatly among populations and even individuals within the same population because of differences in diet, occlusion, or use of teeth as tools. Thus, this method is relative to specific factors affecting a given population. By documenting the extent of dental wear in relation to the timing of tooth eruption, a rate of wear can be generated. Applying this rate to the amount of wear may permit general estimation of age (Miles 1978).

Microscopic methods

a) Cortical remodeling in Long Bones.

This method can discriminate much older ages than macroscopic techniques, but requires the destruction of bone and specialized equipment. As mentioned before, it is based on the microscopic counts of osteons and other bone structures.

b) Dental microstructure

This is another destructive technique, and is good for discriminating ages ranging between 2 and 69 years (Gustafson 1950).

Conclusions

To conclude, it is obvious that macroscopic methods are based on changes that can begin well before the natural death of an individual. Therefore they are of limited applicability to age old and senile persons. Also, multifactorial aging using results of several criteria combined is much more accurate than reliance on any single age indicator. Despite the condition of Pacal's remains, it might be feasible to apply all macroscopic methods. The age assessment of this particular individual should also be made in the context of a larger skeletal sample from Palenque.

Microscopic methods can age older individuals with a greater degree of accuracy, but require destruction of bone. Cortical remodeling is the most viable method to resolve the issue of Pacal's age. Although Davalos and Romano state that the remains were treated with diluted ducco, this substance does not affect the technique as long as periosteal bone remains intact.

References

Ahlqvist and Damsten

1969 A Modification of Kerley's Method for the Microscopic Determination of Age in Human Bone. *Journal of Forensic Sciences* 14(2):205-212.

Dávalos Hurtado, Eusebio, and Arturo Romano

1954 Estudio preliminar de los restos osteológicos en la tumba del templo de las inscripciones, Palenque. *Anales del Instituto Nacional de Antropología e Historia* pp. 107-8. INAH-SEP, Mexico. (Reprinted in Ruz 1973).

Genoves, Santiago

1967 Proportionality of the Long Bones and their Relation to Stature among Mesoamericans. *American Journal of Physical Anthropology* 26(1):67-77.

Gustafson, Gosta

1950 Age Determinations on Teeth. *Journal of the American Dental Association* 41:45-54.

Iscan, M. Yasar, S.R. Loth, and R.K. Wright

1984 Age Estimation from the Rib by Phase Analysis: White Males. *Journal of Forensic Sciences* 29:1094-1104.

1987 Racial Variation in the Sternal Extremity of the Rib and its Effect on Age Determination. *Journal of Forensic Sciences* 32:452-466.

Kerley, Ellis, R.

1965 The Microscopic Determination of Age in Human Bone. *American Journal of Physical Anthropology* 23(2):149-163.

Kerley, E.R., and D.H. Ubelaker

1978 Revisions in the Microscopic Method of Estimating Age at Death in Human Cortical Bone. *Journal of Forensic Sciences* 14(2):205-212

Lovejoy, C. Owen et al.

1985 Chronological Metamorphosis of the Auricular Surface of the Ilium: A New Method for the Determination of Adult Skeletal Age at Death. *American Journal of Physical Anthropology* 68:15-28.

Marcus Joyce

1992a Royal Families, Royal Texts: Examples from the Zapotec and Maya. In *Mesoamerican Elites: An Archaeological Assessment*, edited by Diane Z. Chase and Arlen F. Chase, pp. 221-241. University of Oklahoma Press, Norman.

1992b *Mesoamerican Writing Systems: Propaganda, Myth, and History in Four Ancient Civilizations.* Princeton University Press, Princeton.

McKern, T.W, and T.D. Stewart

1957 Skeletal Age Changes in Young American Males. *Headquarters, Quartermaster Research and Developmental Command, Technical Report EP-45.* Natick, Mass.

Meindl, R.S., and C. Owen Lovejoy
1985 Ectocranial Suture Closure: A Revised Method for the Determination of Skeletal Age at Death Based on the Lateral-anterior Sutures. *American Journal of Physical Anthropology* 68:57-66.

Miles, A.E.W
1978 Teeth as an Indicator of Age in Man. In *Development, Function, and Evolution of Teeth*, edited by P.M. Butler and K.A. Joysey, pp. 455-464. Academic Press, New York.

Ruz Lhuillier, Alberto
1973 *El Templo de las Inscripciones, Palenque.* Colección Científica 7. INAH, Mexico.
1977 Gerontocracy at Palenque? In *Social Process in Maya Prehistory: Studies in Honour of Sir J. Eric S. Thompson*, edited by Norman Hammond, pp.287-295. Academic Press, London.

Schranz, D.
1959 Age Determinations from the Internal Structure of the Humerus. *American Journal of Physical Anthropology* 17(4):273-278.

Singh, I.J., and D.L. Gunberg
1970 Estimation of Age at Death in Human Males from Quantitative Histology of Bone Fragments. *American Journal of Physical Anthropology* 30(3):373-381.

Suchey, Judy M., et al.
1986 Evaluation of the Todd and McKern-Stewart Methods for Aging the Male Os Pubis. In *Forensic Osteology*, edited by K.J. Reichs, pp. 33-67. Charles C. Thomas, Springfield.

Todd, T.W.
1920 Age Changes in the Pubic Bone: I, the Male White Pubis. *American Journal of Physical Anthropology* 3(3):285-334.

Todd, T.W, and D.W. Lyon
1924 Endocranial Suture Closure: Its Progress and Age Relationship. Part I, Adult Males of White Stock. *American Journal of Physical Anthropology* 7(3):325-384.

Ubelaker, Douglas H.
1989 Human Skeletal Remains: Excavation, Analysis, Interpretation. *Manuals on Archaeology 2*. Second edition. Taraxacum, Washington.