



DOUGLAS H. UBELAKER

## PIPE WEAR: DENTAL IMPACT OF COLONIAL AMERICAN CULTURE

**ABSTRACT:** *Long-term use of a tobacco pipe can produce distinctive alterations of the teeth. Such alterations have been found in skeletal remains from New World historic period archaeological sites, supporting the archival evidence for pipe smoking at that time. Analysis of 19 human skeletons recovered archaeologically from the Patuxent Point site near Solomons, Maryland (dating from 1658 to the mid-to-late 1680's) revealed seven individuals (four adult males, two adult females and one 13-year-old) with dental pipe wear. Alterations were found on both the left and right sides in the area of the canines and represent some of the most extreme examples reported in literature. The individuals examined were associated with a tobacco plantation, suggesting they were not only involved with the production of tobacco, but the smoking of it as well.*

**KEY WORDS:** *Pipe wear – Teeth – Dental alterations – Colonial America – New World*

Human skeletal remains offer a record not only of the biology of the person represented but aspects of the culture as well. At the general level, skeletal analysis can produce information about past population relationships, that, when correlated with archaeological information, may reveal patterns of migration or admixture influenced by cultural events (Jantz 1994). The study of disease and health indicators on the skeleton may suggest broad patterns of temporal and geographic variation that can be correlated with cultural variables (Cohen, Armelagos 1984, Verano, Ubelaker 1992).

Skeletal remains occasionally also reveal direct evidence of culture. Well-known examples of culturally induced skeletal alterations include cranial deformation and occupation-related changes. At times, these cultural markers can be quite subtle, such as the presence of metatarsophalangeal alterations that indicate a habitual resting or work-related kneeling posture (Ubelaker 1979).

Some of the most dramatic and direct culturally induced alterations found on ancient human remains occur on the dentition. As recently summarized by Milner and Larsen

(1991), such alterations can take the form of intentional filing, chipping, or inlays for decorative purposes (Romero 1970, Ubelaker 1977), intentional ablation (Hrdlička 1940), antemortem drilling (Bennike 1985), products of the use of teeth as tools (Cybulski 1974), work-related occlusal attrition (Larsen 1985), patterns of fracture or chipping (Turner, Cadien, 1969), traumatic loss of teeth (Merbs 1968), general patterns of occlusal attrition, and interproximal grooves (Ubelaker *et al.* 1969). See Milner and Larsen (1991) for a comprehensive discussion and full listing of references on these topics.

### PIPE USE

Unusual patterns of dental occlusal wear can provide clues regarding the placement of objects between the teeth. In particular, the use of a tobacco pipe can produce alterations if the tip is constructed of abrasive material and used over a long period of time. The shape and size of the alterations between the teeth can reveal some information about the



*A Tobacco Drinker, 1623*

FIGURE 1. Drawing of "A Tobacco Drinker, 1623" from Penn, 1902, Frontispiece.

dimensions of the pipe stem utilized, as well as its abrasiveness.

According to Oswald (1975), tobacco smoking in Europe and among American colonists of European origin was derived from the American Indian custom. Thomas Hariot's account of the 1585 Raleigh expedition to North Carolina refers to Indian use of "pipes of clay" (Hariot 1972). Pipe smoking began in England in the 1570s, was common in England by the end of the sixteenth century (Oswald 1975), and was considered a medical practice by many. The first English pipe production company was formed in London in 1619, and was the only company within England and Wales at that time. The London pipes used clay imported mostly from Kent and Dorset and were made in molds (Oswald 1975).

Large quantities of clay pipes were exported from Europe to the colonies of the New World (Blakeman, Riordan 1978). According to Mitchell (1976:84), a local industry of pipe production existed near Nominy Plantation in Virginia in the second half of the 17th century. In the Americas, clay pipes were inexpensive and used by both sexes and all classes of society (Figure 1). For hygienic reasons, they could be reused by simply breaking off the undesirable tip, making the stem progressively shorter. Among the wealthy, pipes were discarded when broken or extensively used (Blakeman, Riordan, 1978).

#### DENTAL EVIDENCE FOR PIPE USE

Although historical records suggest that pipe smoking was common and widespread in colonial America, reports of

dental alterations in remains of Colonial period human skeletons from the Americas are minimal. Blakeman and Riordan (1978), Handler and Lange (1978) and Corruccini *et al.* (1982) report that dental alterations indicative of pipe smoking were found in human remains recovered archaeologically from the Newton plantation in Barbados, West Indies. These remains represent burials of African slaves that date from the seventeenth to nineteenth centuries. Blakeman and Riordan (1978) report that of 92 burials, 17 (23 percent of the adult sample) were found with pipes in association. Fragments of pipes were found in the soil associated with 36 individuals. Handler and Lange (1978) add that in 20 individuals, pipe smoking resulted in a clear pattern of wear on the canine, incisor, and premolar teeth from adults of both sexes. They found evidence of pipe wear on only five of 20 individuals who were buried with whole pipes. This suggested to them either that placement of pipes with some individuals may have been ritualistic or that the pipe wear was too slight to be distinguished from normal occlusal wear. The frequency of individuals with pipe wear was later increased to 25 (Corruccini *et al.* 1982, Handler *et al.* 1982).

Elsewhere in the Caribbean, Mann *et al.* (1987) report finding two individuals with "pipe-stem grooves" in their study of 17 slaves of African ancestry excavated from an eighteenth century cemetery in Montserrat, West Indies. Individual burial descriptions list one "pipe-stem groove" in the left mandibular canine in a 25 to 35 year old (Burial 7). Fourteen of the individuals in the total sample were of age greater than 14 years, suggesting a frequency of alterations within this group of either 7 or 14 percent, depending if one or two individuals were affected.

Cybulski (1988) reports that pipe wear facets were found on human teeth within a sample of fifty, mostly adult male skeletons found in an eighteenth century fortification wall of Quebec City in Canada. The remains likely represented deaths between 1746 and 1747 of Protestant prisoners of war of European ancestry. Analysis suggested the presence of 45 males, three to four females and one immature individual. Twelve male individuals displayed teeth with unusual wear patterns suggesting they were pipe smokers. Cybulski (1988:78) describes the alterations as "when viewed from the front, the occlusal surfaces of adjacent teeth were worn scallop-like and where upper and lower jaws could be articulated the worn teeth produced rounded openings." He found that both left and right sides were involved, although the alterations were usually more pronounced on the right side. Maxillary alterations were concentrated in the anterior teeth, from the central incisors to the first premolars, while those in the mandibular teeth included the more posterior second premolars. The youngest individual with alterations was between 18 and 21 years while the oldest was between 65 and 74 years. Such alterations were not present on the teeth of 29 males and three females, suggesting an overall adult frequency of 27 percent (12/44).





FIGURE 2. Clay tobacco pipe found in association with Burial 15, Patuxent Point Site, Maryland.

Pfeiffer *et al.* (1992) report additional Canadian examples from their analysis of nineteenth century remains from Prospect Hill, a cemetery from Newmarket, Ontario. This Methodist church cemetery sample dated from 1824 or 1827 to 1879 A.D. Of the 77 individuals recovered and studied, 17 were adults with dentitions available for examination. Of these, three males (18 percent) displayed dental evidence for pipe smoking. Two individuals had pipe wear on the left side and one on the right.

In their analysis of human remains from colonial period sites (1618 to 1800 A.D.) in Virginia, Angel and Kelley (1981) report indications of notches worn in the teeth which

FIGURE 3. Pipe wear in left side of dentition of Burial 1, Patuxent Point Site, Maryland.

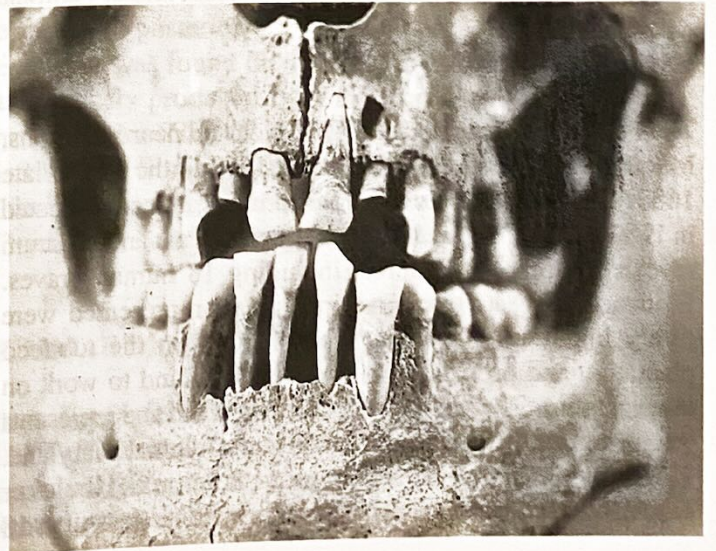


FIGURE 4. Pipe wear in left side of dentition of Burial 2, Patuxent Point Site, Maryland.

they interpret as having been produced by pipe wear. Although these alterations were relatively minor, Angel and Kelley felt that of one family group dating between 1725 and 1750, all males and two of three females showed "signs of smoking clay pipes." Such evidence was lacking in the teeth of those dating from 1770 to 1800 A.D.

In an unpublished manuscript reporting analysis of remains from the early colonial site of Carter's Grove, Virginia, Angel (n.d.) provides some summary statistics of the frequencies of "clay pipe notch wear" in various United States samples. He reports a frequency of 29 percent (6 of 21) among individuals dating from 1619 to 1640 (22 percent of females, 33 percent of males) and 32 percent

FIGURE 5. Pipe wear in dentition of Burial 10, Patuxent Point Site, Maryland.





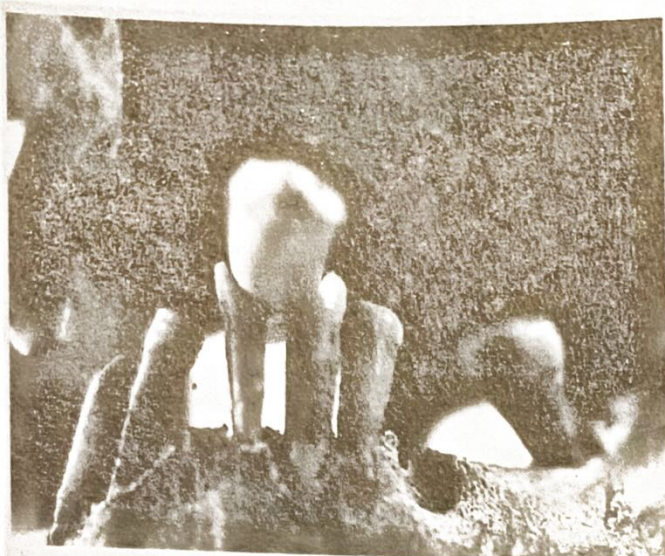


FIGURE 6. Pipe-stem fragment located with pipe wear alteration in dentition of Burial 2, Patuxent Point Site, Maryland.

(9 of 28) for the period 1680 to 1848 (20 percent of females and 35 percent of males).

Verano and Owsley (1991) report pipe wear alterations on the "canines and premolars" from both left and right sides of a male, age 30 to 35 years of European ancestry from the seventeenth century site of Chischiak Watch, York County, Virginia. This burial likely dated between A.D. 1659 and 1675.

Data on pipe wear are also available from analysis (Owsley, Compton 1993, Owsley *et al.* 1990) of human remains from the Jordan's Journey site (44PG302) in Prince George County, Virginia. Human remains were found in excavations of a seventeenth century fortified settlement that dates from about A.D. 1622 to 1635. Of 37 individuals recovered, 32 were of adolescent age or older. Of these, only one displayed clear evidence for pipe smoking, a 25 to 29 year old male (HB 16). Wear facets suggestive of pipe wear were present on the mandibular canines and premolars. This suggests a frequency of 3 percent of all individuals or adults.

## PATUXENT POINT SITE

The Patuxent Point Site (18CV271) located near Solomons, Maryland was occupied from about 1658 to the mid to late 1680s (King 1996). Archaeological excavations conducted in 1989 and 1990 by the Jefferson Patterson Park and Museum revealed numerous features, including 18 human graves. Evidence suggests that most individuals represented were likely indentured servants who worked on the tobacco plantation and probably traveled from England to work on the plantation. The sample was well-preserved and represents the earliest of that size and quality from Colonial Maryland.

Analysis of the 19 recovered skeletons (Ubelaker *et al.* 1996) revealed that nine were immature (less than 18

years) and ten were older than 23 years. Ages ranged from fetus or young infant to an elderly adult. Of the adults for which sex could be estimated reliably, five were female and six were male.

Excavation recovered many artifacts, including large-bore white clay and terra cotta pipe stems with bore diameters of approximately 5/6ths of an inch. One white clay tobacco pipe was found in the hand region of one individual (Figure 2). In addition, seven of the 19 individuals displayed clear evidence of pipe wear. These represented four adult males, two adult females and one 13 year old of undetermined sex.

Two spaces for pipe insertion were found in the area of the left first premolars (Figure 3) and right first premolars of an approximate 24 year old female from Burial 1. Seven teeth were involved and the diameters of the perforations were approximately 10 mm.

The female aged 55 to 60 from Burial 2 displayed one pipe insertion opening in the area of the left first premolar (Figure 4). Three teeth were involved and the perforation diameter was approximately 10 mm.

A 28 to 33 year old male from Burial 8 displayed three pipe insertions in the area of the right lateral incisor, left lateral incisor and the left first premolar. The diameters of the openings were 10 mm, 10 mm, and 8 mm with 15 teeth involved.

A 30 to 35 year old male from Burial 10 displayed three pipe insertions in the areas of the left lateral incisor, right lateral incisor and the left first premolar (Figure 5). Fifteen teeth were involved, with perforation diameters of 10 mm, 10 mm, and 8 mm.

The 13 year old from Burial 13 had two pipe insertions in the area of the left lateral incisor and the right lateral incisor. Both of these had diameters of about 10 mm with eight teeth involved.

A 33 to 38 year old male from Burial 14 displayed two areas of pipe insertion in the vicinity of the right lateral incisor and the left lateral incisor. Nine teeth were involved and the aperture sizes were 10 mm and 8 mm.

The final example originates from a 38 to 45 year old male from Burial 19. Three pipe insertions were found in the area of the right lateral incisor, left lateral incisor and the left first premolar. Ten teeth were involved and aperture diameters were all 10 mm.

Note that an intact clay pipe was found with Burial 18, a 15 to 17 year old male of likely African ancestry. Although this was the only individual found with a clay pipe in association, no evidence of use on the teeth was observed. This suggests that placement of the pipe with the individual was ritualistic or that use had been too minimal to leave evidence on the teeth.

The data presented above indicate that four males, two females, and one approximately 13 year old adolescent used clay tobacco pipes to such an extent that alterations were produced in their dentitions. Of the 16 areas of pipe wear, ten were on the left side and six on the right. Placement of the pipes was either immediately anterior or





FIGURE 7. Extreme pipe wear in area of left maxillary lateral incisor of Burial 10, Patuxent Point Site, Maryland.

posterior to the canines, but those posterior to the canine were mostly on the left side (six out of seven). Aperture size varied from 8 to 10 mm, but 13 of the 16 openings measured 10 mm in diameter.

## DISCUSSION

The individuals represented in this sample likely included indentured servants from England and others who were working on the Maryland tobacco plantation. Evidence of the dominant tobacco cultivation culture can be seen on their teeth. Of 13 individuals in the sample aged 13 or more, 7 showed clear evidence of pipe wear. These seven consisted of both adult males and females, as well as one adolescent aged only 13. Morphological expression of pipe wear in this sample varied from the minimal notching shown in the female from Burial 1 (Figure 3) to the extreme alterations of Burials 2 and 10. The elderly female of Burial 2 displayed antemortem loss of most of the adjacent maxillary dentition, but would have been able to hold a pipe in the notch within her left premolar area. Figure 6 illustrates a pipe stem fragment recovered from the Patuxent Point site in place within the space created between these teeth.

The pipe wear alterations in the anterior dentition of the 30 to 35 year old male from Burial 10 represent extreme examples. One alteration was produced by the loss of the entire crown of the maxillary right lateral incisor. Some wear is visible on the medial border of the right canine and the distal border of the central incisor. Minimal wear on the corresponding area of the mandibular teeth is confined to the occlusal surfaces.

A second area of pipe wear alteration in this individual is located in the area of the left lateral maxillary incisor.

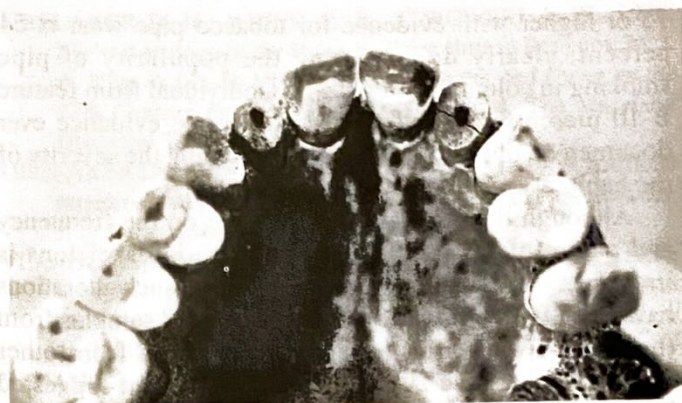


FIGURE 8. Exposure of pulp cavities in maxillary lateral incisors of Burial 10, Patuxent Point Site, Maryland.

Just as with the right lateral incisor, the left lateral incisor crown is destroyed by pipe wear (Figure 7). Also involved are the medial border of the maxillary left canine and the distal border of the maxillary left central incisor. This alteration also involves the mandibular left lateral incisor and the mandibular left canine.

The third area of pipe wear from Burial 10 is smaller than the other two and located in the area of the mandibular left premolars. The affected teeth are the left premolars, the distal half of the mandibular left first premolar, and the mesial half of the mandibular second premolar.

The two anterior alterations were so extreme that the pulp cavities of the maxillary lateral incisors were exposed (Figure 8). Such exposure likely produced the apical abscess associated with the root of the maxillary left lateral incisor. In this case, the rate of tooth loss due to pipe use exceeded the capacity of the tooth to generate secondary dentin, resulting in exposure of the pulp chamber. Clearly, the preferred location for pipe placement in this individual was the left and right maxillary lateral incisor area. Likely, with the loss of the lateral incisor crowns and the discomfort associated with the apical abscess in the area of the left maxillary lateral incisor, the individual shifted pipe position to the more posterior left premolar area. No evidence of pipe wear was found on the right premolars. Dark brown stains, likely produced from tobacco use, were found on the mesial surfaces of the left maxillary and mandibular first molars. Similar stains were found on the teeth of the elderly woman with pipe wear (Burial 2), and the 28-to-33-year-old male with pipe wear from Burial 8.

## SUMMARY

Skeletons from the seventeenth century colonial Maryland site of Patuxent Point present strong evidence for tobacco pipe use among those living and working on the tobacco plantations at that time. The frequency of individuals age



13 or higher with evidence for tobacco pipe wear is 54 percent, clearly documenting the popularity of pipe smoking in colonial America. The individual from feature B-10 presents some of the most extreme evidence ever documented of pipe smoking, documenting the severity of the habit, at least in this individual.

Although the comparative literature on the frequency and nature of pipe wear in colonial period skeletons is irregular and minimal, the data suggest that such alterations have been found throughout colonial period samples from the New World. High frequencies reported from other samples include the 29 percent and 32 percent suggested by Angel for Virginia sites, 27 percent of adults from Quebec City, and 27 percent of all individuals from the Newton sample. The distribution of these alterations frequently includes both left and right sides and both men and women. The Patuxent Point alterations not only suggest a comparatively high frequency, but also provide some of the most extreme examples recorded.

Although seldom reported, evidence for pipe smoking documents an important aspect of past culture and supplements written history on the nature and popularity of this custom. Additional reporting of this feature from other samples may provide a more complete vision of the historic use of tobacco pipes. At the Patuxent Point site in colonial America, the evidence proves that those working long hours on the tobacco plantations also enjoyed the fruits of their labour.

## ACKNOWLEDGMENTS

The author thanks Erica Jones of the Smithsonian Institution for her assistance with manuscript preparation, Jane Beck of the Smithsonian Institution for preparation of the photograph used in *Figure 1* and Julia A. King of the Jefferson Patterson Park and Museum, Maryland for providing the photograph used in *Figure 2* and for making the Patuxent Point sample available for study.

## REFERENCES

- ANGEL J. L., n.d.: Early Colonial Settlers in Virginia at Carter's Grove. Manuscript on file, Department of Anthropology, National Museum of Natural History, Smithsonian Institution.
- ANGEL J. L., KELLEY J. O., 1981: The Armor and Drummond-Harris Sites, Governor's Land, Virginia. Report presented to VRCA and on file, Department of Anthropology, National Museum of Natural History, Smithsonian Institution.
- BENNIKE P., 1985: *Paleopathology of Danish skeletons*. Akademisk Forlag, Copenhagen.
- BLAKEMAN, C. H., Jr., RIORDAN R. V., 1978: Clay pipes from Newton Plantation excavations. In: J. S. Handler and F. W. Lange (Eds.): *Plantation Slavery in Barbados: An Archaeological and Historical Investigation*. Appendix B. Harvard University Press, Cambridge.
- COHEN M. N., ARMELAGOS G. J. (Eds.), 1984: *Paleopathology at the Origins of Agriculture*. Academic Press, New York. 615 pp.
- CORRUCCINI R. S., HANDLER J. S., MUTAW R. J., LANGE F. W., 1982: Osteology of a slave burial population from Barbados, West Indies. *Amer. J. of Phys. Anthropol.* 59:443-459.
- CYBULSKI J. S., 1974: Tooth wear and material culture: Precontact patterns in the Tsimshian area, British Columbia. *Syesis* 7:31-35.
- CYBULSKI J. S., 1988: Skeletons in the walls of Old Quebec. *Northeast Historical Archaeology* 17:61-84.
- HANDLER J. S., LANGE F. W., 1978: *Plantation Slavery in Barbados: An Archaeological and Historical Investigation*. Harvard University Press, Cambridge.
- HANDLER J. S., CORRUCCINI R. S., MUTAW R., 1982: Tooth mutilation in the Caribbean: Evidence from a slave burial population in Barbados. *J. of Hum. Evol.* 11:297-313.
- HARIOT T., 1590 [1972]: *A Briefe and True Report of the New Found Land of Virginia*. Dover, New York.
- HRDLIČKA A., 1940: Ritual ablation of front teeth in Siberia and America. *Smith. Misc. Coll.* 99, 3.
- JANTZ R. L., 1994: The social, historical, and functional dimensions of skeletal variation. In: D. W. Owsley and R. L. Jantz (Eds.): *Skeletal Biology in the Great Plains: Migration, Warfare, Health, and Subsistence*. Pp. 175-176. Smithsonian Institution Press, Washington.
- KING J. A., 1996: The Patuxent Point Site. In: J. A. King and D. H. Ubelaker (Eds.): *Living and Dying on the 17th Century Patuxent Frontier*. Chapter 3. The Maryland Historical Trust Press, Crownsville.
- LARSEN C. S., 1985: Dental modifications and tool use in the western Great Basin. *Amer. J. of Phys. Anthropol.* 67:393-402.
- MANN R. W., MEADOWS L., BASS W. M., WATTERS D. R., 1987: Description of skeletal remains from a Black slave cemetery from Montserrat, West Indies. *Annals of Carnegie Museum* 56:319-336.
- MERBS C. F., 1968: Patterns of activity-induced pathology in a Canadian Inuit population. *Archaeol. Surv. Canada Pap.* 119.
- MILNER G. R., LARSEN C. S., 1991: Teeth as artifacts of human behavior: Intentional mutilation and accidental modification. In: M. A. Kelley and C. S. Larsen (Eds.): *Advances in Dental Anthropology*. Pp. 357-378. Wiley-Liss, New York.
- MITCHELL V., 1976: Decorated brown clay pipebowls from Nominy Plantation: Progress Report. *Quarterly Bulletin, Archeological Society of Virginia* 31,2:83-92.
- OSWALD A., 1975: *Clay Pipes for the Archaeologist*. British Archaeological Reports 14.
- OWSLEY D. W., COMPTON B. E., 1993: An Osteological Investigation of Human Remains from "Jordan's Journey" (Site 44PG302), a 17th Century Fortified Settlement in Prince George County, Virginia. In: D. C. McLearn and L. D. Mouer: *Jordan's Journey II: A Preliminary Report on the 1992 Excavations at Archaeological Sites 44PG302, 44PG303, and 44PG315*. Appendix E. Report prepared for The Virginia Department of Historic Resources.
- OWSLEY D. W., LANPHEAR K. M., COMPTON B. E., 1990: Osteological Examination of Seventeenth Century Burials from Jordan's Point. Report submitted to Virginia Department of Historic Resources and on file in the Department of Anthropology, National Museum of Natural History, Smithsonian Institution, Washington, D.C.
- PENN W. A., 1902: *The Sovereign Herbe, A History of Tobacco*. E. P. Dutton and Co., New York. 326 pp.

- PFEIFFER S., DUDAR J. C., AUSTIN S., 1992: Prospect Hill: Skeletal remains from a 19th-century Methodist Cemetery, Newmarket, Ontario. *Northeast Historical Archaeology* 18:29-48.
- ROMERO J., 1970: Dental mutilation, trephination, and cranial deformation. In: T. D. Stewart (Ed.): *Physical Anthropology, Handbook of Middle American Indians* 9:50-67.
- TURNER C. G., CADIEN J. D., 1969: Dental chipping in Aleuts, Eskimos and Indians. *Amer. J. of Phys. Anthropol.* 31:303-310.
- UBELAKER D. H., 1977: Drilled human teeth from the coast of Ecuador. *J. of the Washington Academy of Sciences* 67, 2:83-85.
- UBELAKER D. H., 1979: Skeletal evidence for kneeling in prehistoric Ecuador. *Amer. J. of Phys. Anthropol.* 51, 4:679-685.
- UBELAKER D. H., JONES E. B., TUROWSKI A. W., 1996: Skeletal biology of the Patuxent Point Human Remains. In: J. A. King and D. H. Ubelaker (Eds.): *Living and Dying on the 17th Century Patuxent Frontier*. Chapter 4. The Maryland Historical Trust Press, Crownsville.
- UBELAKER D. H., PHENICE T. W., BASS W. M., 1969: Artificial interproximal grooving of the teeth in American Indians. *Amer. J. of Phys. Anthropol.* 30, 1:145-150.
- VERANO J. W., OWSLEY D. W., 1991: Using osteological research in archaeology: Examination of a 17th-century burial from Chischiak Watch, York County, Virginia. *Notes on Virginia* 36:35-38.
- VERANO J. W., UBELAKER D. H. (Eds.), 1992: *Disease and Demography in the Americas*. Smithsonian Institution Press, Washington. 294 pp.

Prof. Dr. Douglas H. Ubelaker  
Department of Anthropology  
National Museum of Natural History  
Smithsonian Institution  
Washington, DC 20560  
USA