Building Centenary and Silver Jubilee Series: 55

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by

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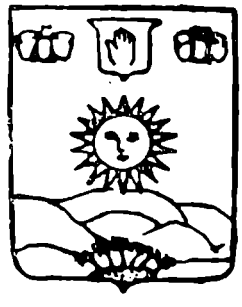

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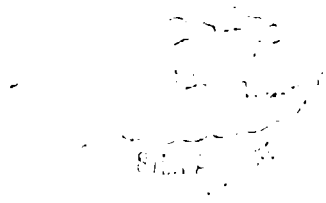

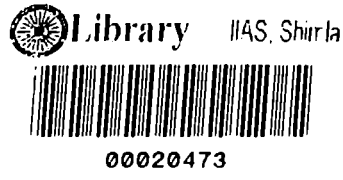

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FOREWORD

On the 15th of October 1964 the Deccan College celebrates the centenary of its main Building, and curiously enough this period coincides with the Silver Jubilee of the Postgraduate and Research Institute which, as successor to the Deccan College, started functioning from 17th August 1939 when members of the teaching faculty reported on duty. When I suggested to members of our faculty the novel idea that the centenary should be celebrated by the publication of a hundred monographs representing the research carried on under the auspices of the Deccan College in its several departments, they readily accepted the suggestion. These contributions are from present and past faculty members and research scholars of the Deccan College, giving a cross-section of the manifold research that it has sponsored during the past twenty-five years. From small beginnings in 1939 the Deccan College has now grown into a well developed and developing Research Institute and become a national centre in so far as Linguistics, Archæology and Ancient Indian History, and Anthropology and Sociology are concerned. Its international status is attested by the location of the Indian Institute of German Studies (jointly sponsored by Deccan College and the Goethe Institute of Munich), the American Institute of Indian Studies and a branch of the Ecole Francaise d'Extreme-Orient in the campus of the Deccan College. The century of monographs not only symbolises the centenary of the original building and the silver jubilee of the Research Institute, but also the new spirit of critical enquiry and the promise of more to come.

7th March, 1964 S. M. KATRE.

FOREWORD

This monograph describes in detail all the adult human skeletal remains found at Nevasa, District Ahmednagar, Maharashtra, during the excavations conducted by the Institute between 1954 and 1961.

Originally it was to form a part of the larger monograph on the horizontal excavations at Nevasa conducted by Dr. S. B. Deo and Dr. Z. D. Ansari under my guidance during the years 1959-61. Since it would take some time to prepare the larger monograph, it was decided to publish this monograph which Dr. K. A. R. Kennedy and Dr. K. C. Malhotra had submitted to us two years ago.

Naturally the monograph had to be edited, and some relevant information added in order to make it self-explanatory. However, before this could be done, I left for Central Europe and the press, owing to a misunderstanding, composed the matter sent to them for an estimate of costs. Important information was thus left out.

In all 94 burials were found between 1954-1961. These are spread over a large area, some 80,000 sq. ft., or a grid of 205 squares, each square being 20ft. by 20 ft., making it very clear that in the Chalcolithic times, the area was both a habitation-cum-cemetery. One square alone contained 17 burials. This feature has been noticed at all the Chalcolithic-Neolithic sites in the Deccan and South India (Maharashtra, Mysore, Andhra, Madras) and outside India in Western Asia, whereas in all the Harappan cities, the Cemetery was always at some distance away from the main living area.

The authors come to a significant conclusion, viz. that the series from the Harappa R37 Cemetery shows the most striking incidence of metrical and morphological parallels with the Nevasa specimens (p. 120). This becomes all the more significant for we now know that at Kalibangan, an important Harappan site in Rajasthan, besides extended burial in specially made pits, sometimes lined with bricks, four pot burials in circular pits, have been noticed, though in none of these pots any skeletal material has been found ("Indian Archæology — A Review", 1965, p. 72). Thus there is survival, or a continuation, both of physical types and burial practices from Harappan to the end of the Chalcolithic times, that is for a period stretching from about 2,500 B.C. to 1,000 B.C. This is an important conclusion, though we should note the striking differences in material culture of the Harappans, and the Nevasians, for instance.

The second important conclusion the authors draw, though very cautiously, is the phenotype similarities to the Nevasian skeletons can be traced not among the present urban and village populations, but among the tribal peoples, particularly among the Bhils and Gonds (p. 120). This similarity

seems to support, they think, the hypothesis based on linguistic and other evidence that the earlier aboriginal peoples were driven to the hills and forests by the later ancestors of the present-day urbanized people (shall we say, Sanskrit-speaking?). This is indeed a very far-reaching conclusion, and cannot be accepted without much more proof. Here it may be observed that while palæo-anthropology shows some resemblance between the primitive and Chalcolithic physical types, other aspects of material culture, particularly pottery shapes and designs, indicate contact between India and Western Asia. Though this contact theory again cannot be pressed too much, without further evidence from Western Pakistan, Rajasthan and the Panjab, still it is possible that a part of the Chalcolithic population was derived from Iran (Allchin, "Piklihal Excavations," p. 127) or was influenced by ideas emanating from the advanced civilizations of Western Asia (Wheeler, Sir Mortimer, "Civilizations of the Indus Valley and Beyond", p. 61).

In this connexion we should note that among the animal bones in the Neolithic deposits at Hallur, District Dharwar, Dr. Alur has noticed horse bones. At the moment he is also examining bones from other Chalcolithic sites. If everywhere, or at many more sites, the horse appears in about 2,000-1,200 B.C., then the connexion with Iran would gain additional support.

Thus, the subject is full of possibilities and more positive light can be shed on it, if reports of the excavations at Daimabad, T. Narsipur, Rajar Dhibi, Mirzapur, Lothal, Kalibangan etc. are published in a foreseeable future. Meanwhile, we are thankful to Dr. Kenneth Kennedy and Dr. Kailash Chandra Malhotra for their prompt report, and only regret the delay in publishing it.

Nevasa, in fact all the Neolithic-Chalcolithic sites in the Deccan, raise an important sociological question. Everywhere, the dead, children as well as the adults, were buried in earthen pots or otherwise within the habitation, very often under the floor of the house. These burials were not very deep. Naturally one is curious to know whether it was possible for the surviving occupants to continue to stay in the same house or did they leave the house permanently or for some time? For at one place, we plotted no less than 17 burials (in an area measuring 20′ x 20′). Unless these burials were executed at the same time, the whole ground must have given an uneven surface, on which it would be ordinarily difficult to move about. Secondly, the occupants must not have cherished hopes and fears about the spirit of the dead haunting them, as among the Navajo Indians who like to hang the head of the dead ancestor in the house, after treating the skull and face by a special process, which preserves the hair and skin intact.

—H. D. SANKALIA

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INTRODUCTION

This report is an anthropometric and comparative analysis of the human skeletal remains recovered from the Chalcolithic and Indo-Roman occupation levels at Nevasa. The village of Nevasa is situated on the banks of the Pravara river in Ahmadnagar District, Maharashtra (19 degrees 34 minutes North Latitude and 74 degrees 54 minutes East Longitude). This region was first recognized as promising for the archaeologist by Shri M. N. DESHPANDE of the Department of Archaeology, Government of India, Western Circle. Later, during their survey of sites in the Pravara valley, Drs. H. D. SANKALIA and I. KARVE visited Nevasa and selected the Ladmod mound on the southern bank of the river as a site for future excavation. Work commenced in the field season of 1954-1955 under the direction of Dr. SANKALIA with the assistance of Dr. S. B. DEO, Dr. Z. D. ANSARI, and students of Deccan College, Poona. There was a second season of excavation during 1955-1956.

By 1956 some thirty urn burials and one earth burial had been recovered from the Chalcolithic deposits of the Ladmod mound, a cultural horizon which has been dated as *circa* 1500 to 1000 B.C.[1] All of the skeletons found were those of children, save for the single adult which was encased in a large storage jar-Specimen No. 10. A comprehensive report of these two seasons of excavation was published in 1960: *From History to Prehistory at Nevasa,* 1954-56[2]. Appendix I of this report— "The Urn Burials from Nevasa"[3]— is concerned with the anthropometric study of the human remains which was undertaken by Dr. SOPHIE EHRHARDT. This scholar has described in some detail the physical character of the adult Specimen No. 10, but apart from a listing of the immature skeletons no analysis of their bones has been included in the Appendix.

Subsequent excavations at Nevasa in 1959-1960[4] and 1960-1961[5] unearthed more human skeletons. Of the sixty-six burials found during the course of the

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[1] SANKALIA, H. D., DEO, S. B., *From History to Prehistory at Nevasa: Report on the Excavations and Explorations in and Around Nevasa 1954-56,* Chronology, 64-70, Poona, 1960; *Indian Archæology—A Review,* 5-9, New Delhi, 1954-1955; *Indian Archæology—A Review,* 8-11, New Delhi, 1955-1956.

[2] SANKALIA, H. D., DEO, S. B., ANSARI, Z. D., EHRHARDT, S., *From History to Prehistory at Nevasa: Report on the Excavations and Explorations in and Around Nevasa 1954-56,* Poona, 1960.

[3] EHRHARDT, S., The Urn Burials from Nevasa, *From History to Prehistory at Nevasa: Report on the Excavations and Explorations in and Around Nevasa 1954-56,* 506-522, Poona, 1960.

[4] *Indian Archaeology- A Review,* 25-28, New Delhi, 1959-1960.

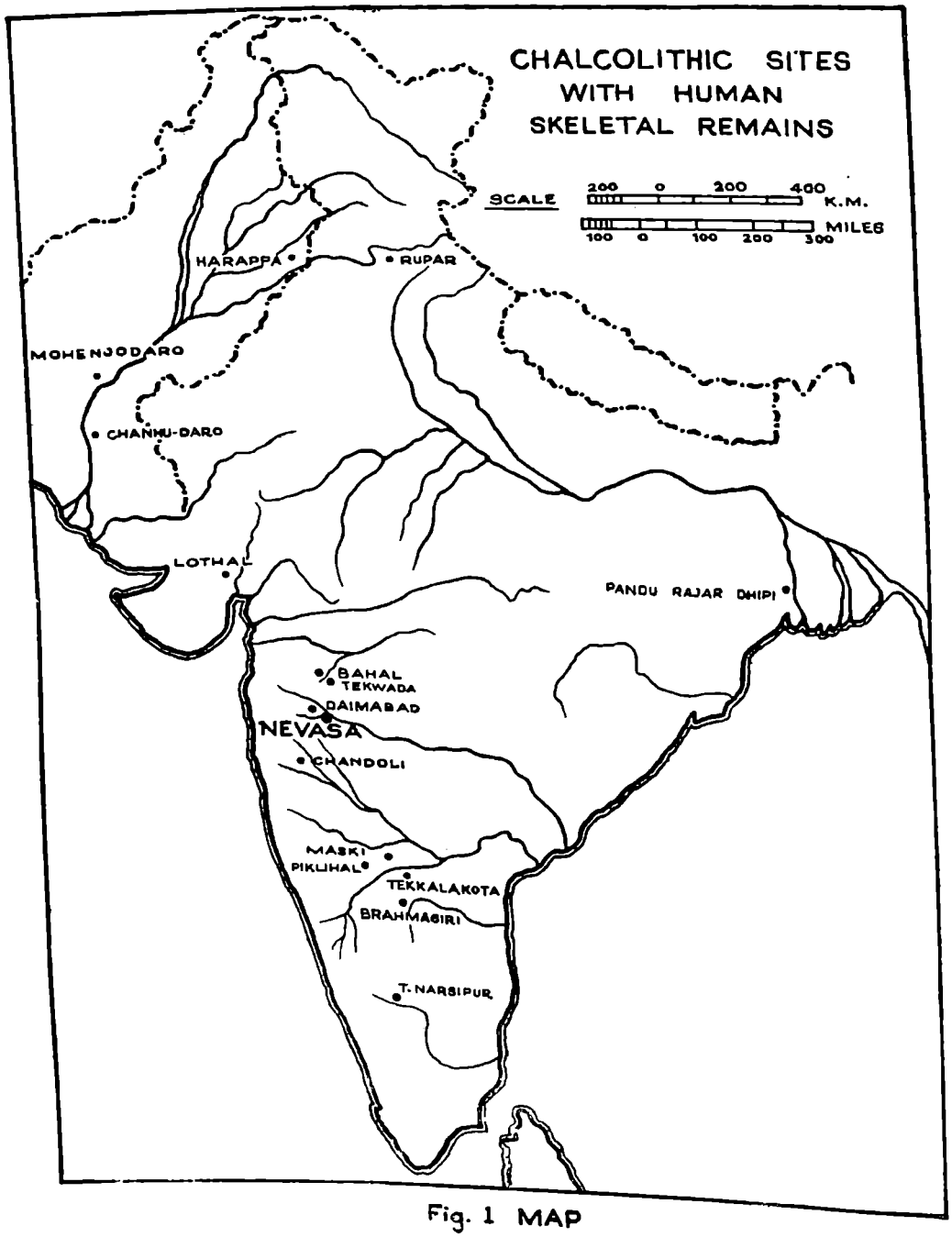
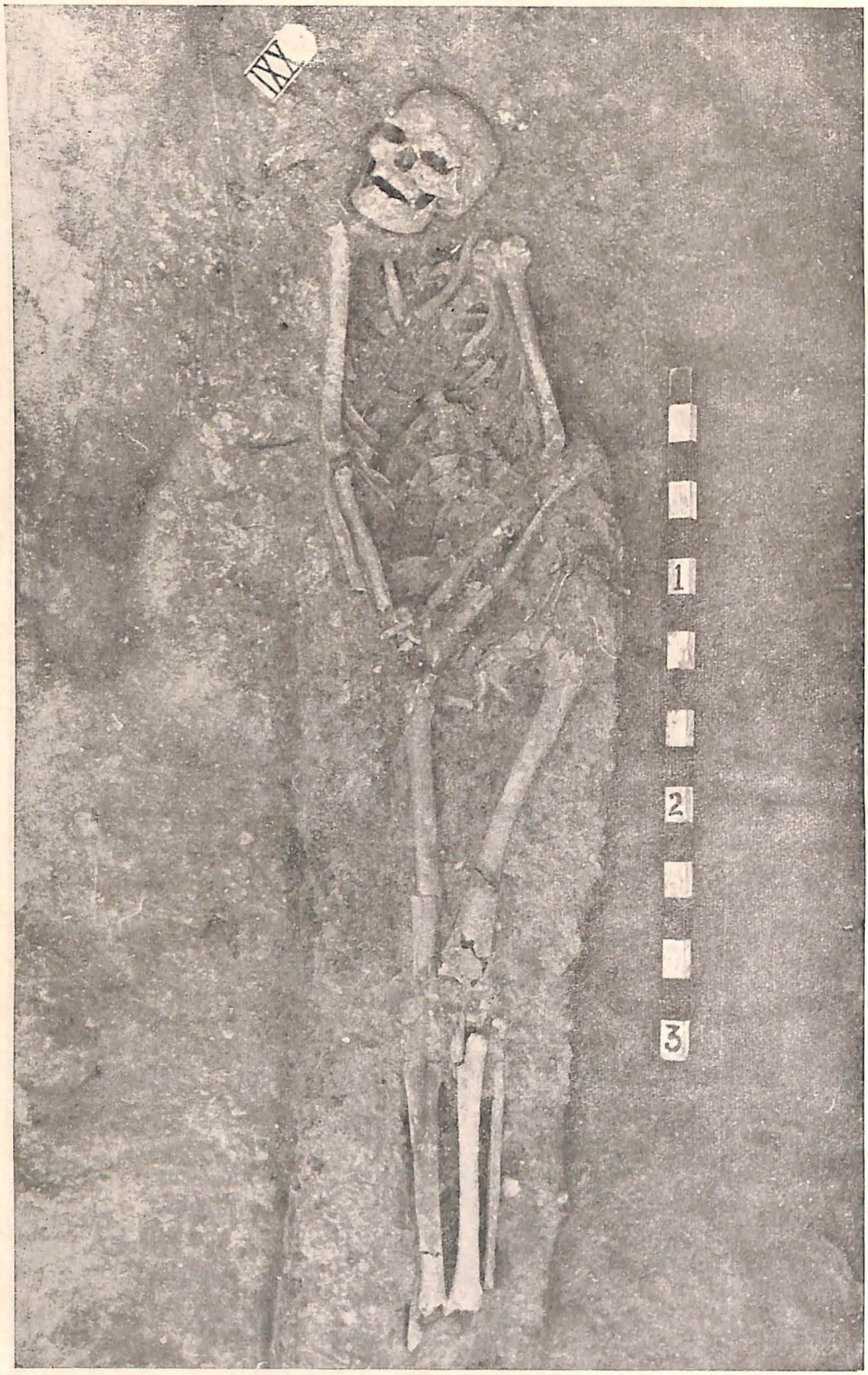

CHALCOLITHIC SITES
WITH HUMAN
SKELETAL REMAINS
SCALE
200 0 200 400 K.M.
100 0 100 200 300 MILES
HARAPPA
RUPAR
MOHENJODARO
CHANHU-DARO
LOTHAL
PANDU RAJAR DHIPI
BAHAL
TEKWADA
DAIMABAD
NEVASA
CHANDOLI
MASKI
PIKLIHAL
TEKKALAKOTA
BRAHMAGIRI
T. NARSIPUR

Fig. 1 MAP

PHOTOGRAPH 1
Specimen No. 18. Skeleton in situ.



PHOTOGRAPH 2
Specimen No. 21. Skeleton in situ.

third excavation all but three were the remains of immature individuals. Two of the adults—Specimens Nos. 18 (Photograph 1) and 21 (Photograph 2)—were lifted from the Chalcolithic deposits. The third adult—Specimen No. 49—came from the Indo-Roman horizon, an Early Historic period which has been dated as *circa* 50 B.C. to 200 A.D. at Nevasa[6]. These interments were found as an extended burial with funerary goods, as an urn burial without funerary goods, and as an extended burial without funerary goods, respectively. During the most recent excavation at Nevasa some thirty-four additional burials were found. Although the finding of an adult skeleton had been reported, it is now recognized that this was a sub-adult specimen as are the other thirty-three interments.

In the anthropometric analysis which follows the authors describe all of the adult skeletons found at Nevasa thus far. Therefore Specimen No. 10, already discussed by Dr. Ehrhardt, is reexamined by us for the purpose of presenting a more complete study of the ancient inhabitants of Nevasa. Differences of observation and interpretation which we encounter between Dr. Ehrhardt's and our study of Specimen No. 10 are rarely of more than minor importance, but, where we feel discrepancies exist, we have favored our own data in the text and Tables which follow. Three immature specimens have been included in our report, but our attention is directed only to the permanent teeth of their mixed dentitions. These are Specimen No. 19, an urn burial from the Chalcolithic deposits of the 1959-1960 expedition, and Specimens Nos. 72 and 72a, two skeletons described as "... a pair of grown-up boys" in the notice of the excavations of 1960-1961[7]. Although the Indo-Roman skeleton is outside the cultural and chronological context of the Chalcolithic specimens treated in this analysis, the inclusion of its material and morphological data is relevant towards an understanding of post-Chalcolithic phenotypic patterns at Nevasa.

Nevasa is one of several Chalcolithic sites on the Subcontinent from which human skeletal remains have been recovered (Figure 1). But few of these collections have been studied by physical anthropologists. Among the anthropometric analysis published can be mentioned those concerned with specimens from Brahmagiri[8], Chandoli[9], Chanhu-daro[10], the several cemeteries of

[5] *Indian Archaeology- A Review,* 19-21, New Delhi, 1960-1961.

[6] SANKALIA, H. D., DEO, S. B., *From History to Prehistory at Nevasa: Report on the Excavations and Explorations in and Around Nevasa 1954-56,* Chronology, 64-70, Poona, 1960.

[7] *Indian Archaeology- A Review,* 19-21, New Delhi, 1960-1961.

[8] SARKAR, S. S., Human Remains from Brahmagiri, *Bulletin of the Department of Anthropology,* 9.1.5-26, Calcutta, 1960.

[9] MALHOTRA, K. C., The Chandoli Skull, *Link,* Nov. 24, 41, New Delhi, 1963; Unpublished MSS.

[10] KROGMAN, W. M., SASSMAN, W. H., Skull Found at Chanhu-daro, *Chanhu-daro Excavations* 1935-36, 252-263, New Haven, 1943.

Harappa[11], Lothal[12], Mohenjo-daro[13], Nal[14], Piklihal[15], and Shahi-tump[16]. These reports with others which are long overdue in publication can provide some data towards an understanding of Chalcolithic Man in this part of Southern Asia. It is the hope of the present authors that their report on the Nevasa skeletal series will contribute significantly to this avenue of research.

The authors wish to acknowledge the kind cooperation they have received in the preparation of their paper from Dr. S. M. KATRE, Director of the Deccan College, Poona, and from Dr. H. D. SANKALIA, Professor of Proto-Indian and Ancient Indian History, Deccan College Postgraduate and Research Institute, Poona. Our appreciation is also addressed to Shri S. H. GIRME, Shri Y. S. RASAR, and to Mrs. MARY M. KENNEDY.

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[11] GUPTA, P., DUTTA, P. C., BASU, A., Human Remains from Harappa, Human Skeletal Remains from Harappa, *Memoir of the Anthropological Survey of India,* 9.13-188, Calcutta, 1962; CHATTERJEE, B. K., KUMAR, G. D., *Comparative Study and Racial Analysis of the Human Remains of Indus Valley Civilization with Particular Reference to Harappa, Calcutta,* 1963.

[12] CHATTERJEE, B. K., KUMAR, G. D., Racial Elements in Post-Harappan Skeletal Remains at Lothal, *Anthropology on the March: Recent Studies of Indian Beliefs, Attitudes and Social Institutions,* 104-110, Madras, 1963.

[13] SEWELL, R. B. S., GUHA, B. S., Human Remains, *Mohenjo-daro and the Indus Civilization, Being an Official Account of Archaeological Excavations Carried Out by the Government of India Between the Years 1922 and 1927,* 599-648, London, 1931; SEWELL, R. B. S., BASU, P. C., Report on the Human Remains Excavated at Mohenjo-daro in 1928-29, *Further Excavations at Mohenjo-daro, Being an Official Account of Archaeological Excavations Carried Out by the Government of India Between the Years 1927 and 1931,* 1.613-638, New Delhi, 1938.

[14] SEWELL, R. B. S., GUHA, B. S., Report on the Bones Excavated at Nal, *Excavations in Baluchistan 1925, Sampur Mound, Mastang, and Sohr Damb, Nal Memoir of the Archaeological Survey of India,* 35.56-86, Calcutta, 1929.

[15] AYER, A. A., Report on Human Skeletal Remains Excavated at Piklihal near Mudgal, *Andhra Pradesh Government Archaeological Series,* 1.143-154, Hyderabad, 1960.

[16] SEWELL, R. B. S., GUHA, B. S., Report on a Collection of Bones Made by Sir Aurel Stein in Makran, *Memoir of the Archaeological Survey of India,* 43-191-200, Calcutta, 1931.

PRIMARY LABORATORY DESCRIPTION

Condition of Bones and Teeth

The osseous and dental remains of the seven specimens of the Nevasa series described in this report are indicated in Table I. An examination of the Dioptrographic Diagrams 1 to 10 are useful for a visualization of the present extent and degree of distortion of the specimens.

Specimen No. 10. *Calvaria.* The frontal portion of the vault is missing. The coronal suture can be identified only at the anterior border of the left parietal. A small segment of the frontal bone of the right supraorbital region articulates with the right zygoma and a remnant of the right sphenoid, but it does not have contact with the right parietal. This same fragment extends posteriorly to the inferior border of the right frontal eminence. The right parietal has lost the anterior portion which runs parallel to the squamousal suture just below the temporal line. Along the course of the sagittal suture there is an aperture extending from *pars media* on the lambdoid suture to the region of the right parietal boss. The left parietal is more complete, but has suffered damage at *pars media* on the coronal suture, at *pterion,* and at *asterion.* All that remains of the occipital bone are the triangular segment defined by the lambdoid sutures and the superior occipital torus, the right side of the basi-occipital bone which marks the right anterior border of the foramen magnum, the basi-occipital bone proper, and minute pieces of bone which form part of the right and left jugular processes. A complete right petrous portion of the temporal articulates with a right mastoid process. The latter is broken and the mastoid sinuses are exposed. The left temporal bone retains its zygomatic process, tympanic plate, glenoid fossa, and posterior portion of the petrous bone, but its mastoid process is missing. A fragment of the external basalar portion of the greater wing of the sphenoid articulates with the left squamous portion of the temporal. On this side of the calvaria the squamous portions appears also in the supramastoid region from whence it continues unbroken to *asterion.*

Face. Both zygomae are complete but their borders of articulation with the zygomatic portions of the temporals are broken. The posterior border of the right zygoma is fragmentary also. The sub-nasal region and alveolar border of

TABLE I: BONES AND TEETH IN THE NEVASA SERIES AVAILABLE FOR ANTHROPOMETRIC AND MORPHOLOGICAL ANALYSIS

Specimen No.	10	18	19	21	72	72a	49
Sex	F	F	?	M	?	?	M
Approximate Age	18	20	9	25	10	5	30
Calvaria:							
Frontal	—	+	+	+	+	+	+
Parietal	RL	RL	RL	RL	RL	RL	RL
Occipital	+	+	+	+	+	+	+
Temporal	RL	RL	RL	RL	R	L	RL
Sphenoid	L	R	RL	RL	—	L	—
Face:							
Maxilla	+	+	+	+	—	+	+
Zygoma	RL	RL	RL	RL	R	RL	RL
Nasal	—	—	—	—	—	—	RL
Palatine	—	+	+	—	—	+	+
Mandible:							
Corpus	RL	RL	RL	RL	RL	RL	RL
Ramus	RL	RL	RL	RL	RL	RL	RL
Dentition:							
Maxillary	RL	RL	RL	RL	RL	RL	RL
Mandibular	RL	RL	RL	RL	RL	RL	RL
Trunk:							
Vertebræ	+	+	+	—	+	—	+
Ribs	RL	RL	RL	RL	RL	RL	RL
Sternum	—	—	+	—	—	—	+

Upper Extremity:							
Clavicle	RL	—	RL	—	—	—	RL
Scapula	R	RL	RL	—	R	—	RL
Humerus	RL	RL	RL	RL	R	RL	RL
Radius	RL	RL	RL	RL	RL	R	RL
Ulna	RL	RL	RL	RL	RL	R	RL
Hand Bones	RL	RL	RL	—	RL	—	RL
Lower Extremity:							
Femur	R	RL	RL	RL	RL	R	RL
Tibia	—	RL	RL	RL	RL	R	RL
Fibula	—	RL	RL	RL	RL	R	RL
Foot Bones	—	—	—	—	R	—	RL
Pelvis:							
Sacrum	—	+	+	—	+	—	+
Ilium	—	RL	RL	—	L	R	RL
Ischium	—	RL	RL	—	—	R	RL
Pubis	—	RL	RL	—	—	—	RL

Key:

M = Male

F = Female

— = Absence of a Bone

+ = Presence of a Bone

R = Presence of a Bone on the Right Side

L = Presence of a Bone on the Left Side

the maxilla is well preserved. There is considerable damage to the posterior border of the hard palate across the plane of the first molars. Here fractures affect the alveoli of the third molars and that region of the alveolar arc posterior to these teeth. The maxillary sinuses are exposed as a result of damage to the floor of the orbits, but the periform aperture remains intact. The nasal bones are missing. Of the bones of the orbits, only the right lacrimal and bits of the maxilla and frontal are present.

Mandible. The right corpus is well preserved: the left corpus lacks the entire basalar portion, only the teeth-bearing alveolar borders of the corpus being preserved. The gonia and posterior borders of both rami are missing and the right condyloid process has broken off(Dioptrographic Diagrams 12A-B).

Dentition. All of the teeth are present. The third molars are partially obscured because of their unerupted condition.

Trunk. The body of the fifth cervicle vertebra and thirteen well preserved ribs of both sides of the body constitute what remains of the thoracic skeleton.

Upper Extremity. The right scapula is represented by its coracoid process, portions of the glenoid fossa, and the axillary border which is broken away at a point superior to the inferior angle. The shaft and distal end of the right humerus are complete, but the humeral head and neck are partial. Mid-shaft portions of the left humerus are preserved. The right ulna and right radius are complete, but for the left arm these bones are represented only by mid-shaft portions. Mid-shaft segments of right and left clavicles are also present. Of the carpal bones, the right lunate and right capitate are here. All metacarpal bones of the right hand and some eight phalanges of the left hand are preserved.

Lower Extremity. The right femur is lacking its distal end, and its proximal end is severely damaged. Of the head and neck, only the medial portions are preserved. The greater and lesser trochanters are missing. There are no other bones of the lower extremity available for study.

Specimen No. 18. *Calvaria* (Dioptrographic Diagrams 1-4, 13A-B). The right side of the frontal bone is complete except for orbital portions. These parts of the frontal also absent on the left side of the skull where the degree of damage is more extensive and involves the obliteration of the infra-temporal fossa and the pterionic region. The three longitudinal fractures which extend anteriorly-posteriorly across the frontal bone were formed by the investigators during the reconstruction of this bone in the laboratory, the unrestored frontal being grossly distorted by the circumstances of its burial. The right partietal is complete save for two small apertures at the region of *pars complicata* along the coronal suture and at a point just anterior to the right parietal boss. Similar small apertures perforate the left parietal above the temporal line and along the coronal suture. Other missing parts are at the regions immediately superior to the right and left supramastoid crests. A part of the same extensive aperture that

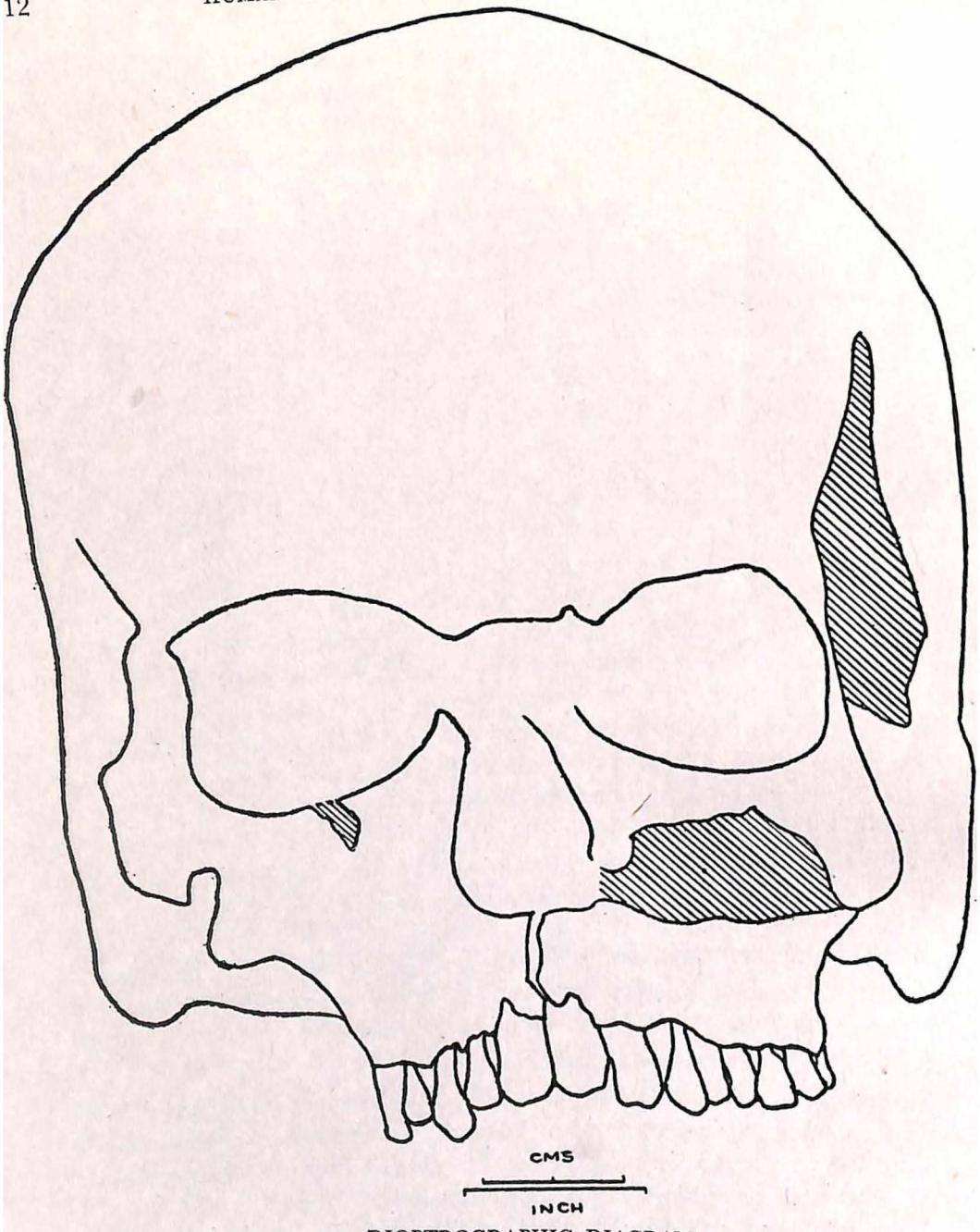
appears along the left lateral border of the frontal continues posteriorly to the junction of the left parietal with the squamous portion of the temporal. The entire basi-occipital region is missing anterior to *opisthion*. On the right side of the cranial base there is a piece of occipital which takes the attachment of the *Rectus capitis lateralis* muscle. The right temporal bone is better preserved than the left temporal, although the former lacks the anterior part of its squamous portion and only the root of its zygomatic portion is present. The squamous portion of the left temporal is represented only by its posterior half. Mastoid, tympanic, and petrous portions of the temporal bones on both sides of the calvarium are heavily abraded. The right sphenoid consists of an external portion of the greater wing from *pterion* and the articulating portion of the right lateral pterygoid plate. The left sphenoid is absent.

Face. The right zygoma is broken at the orbital margin and at a point just anterior to the zygo-temporal suture. This same point of articulation is damaged on the left zygoma which has suffered further damage along its inferior border. The maxilla has been broken away along its orbital margins and in the regions of the canine fossae on both sides of the face. The left border of the periform aperture is incomplete. The hard palate is present but the palatine bone is fragmentary. Alveolar border preservation is fair on the right side of the maxilla, but the alveolar border does not extend posteriorly to a fracture at the alveolus of the right first molar. On the right side of the alveolar border these structures are complete. The nasal bones are limited to mere bits of the superior *nasalia* and the naso-frontal sutures are ill-defined.

Mandible. The mandible is complete except for the loss of the left condylar head. The bone is crushed along the internal surface of the left ramus.

Dentition. Three maxillary teeth have been lost post-mortem: the second and third molars of the right side and the left lateral incisor. The mandibular dentition is complete.

Upper Extremity. All that remain of the scapulae are the right and left glenoid fossae. Spinous and coracoid processes are broken off from these fragments. The right humerus is complete but for the left humerus the proximal portion of the shaft is missing. Both radii are complete. The left radius shows minor damage along the anterior aspect of its distal end. The head of the right ulna is lost. The right ulna is represented by three fragments: a proximal portion, a section of the mid-shaft, and a distal portion with its styloid process. Of the carpal bones, only the right navicular is present. Right metacarpals are limited



DIOPTROGRAPHIC DIAGRAM 1
Specimen No. 18. Calvarium. Norma Frontalis.

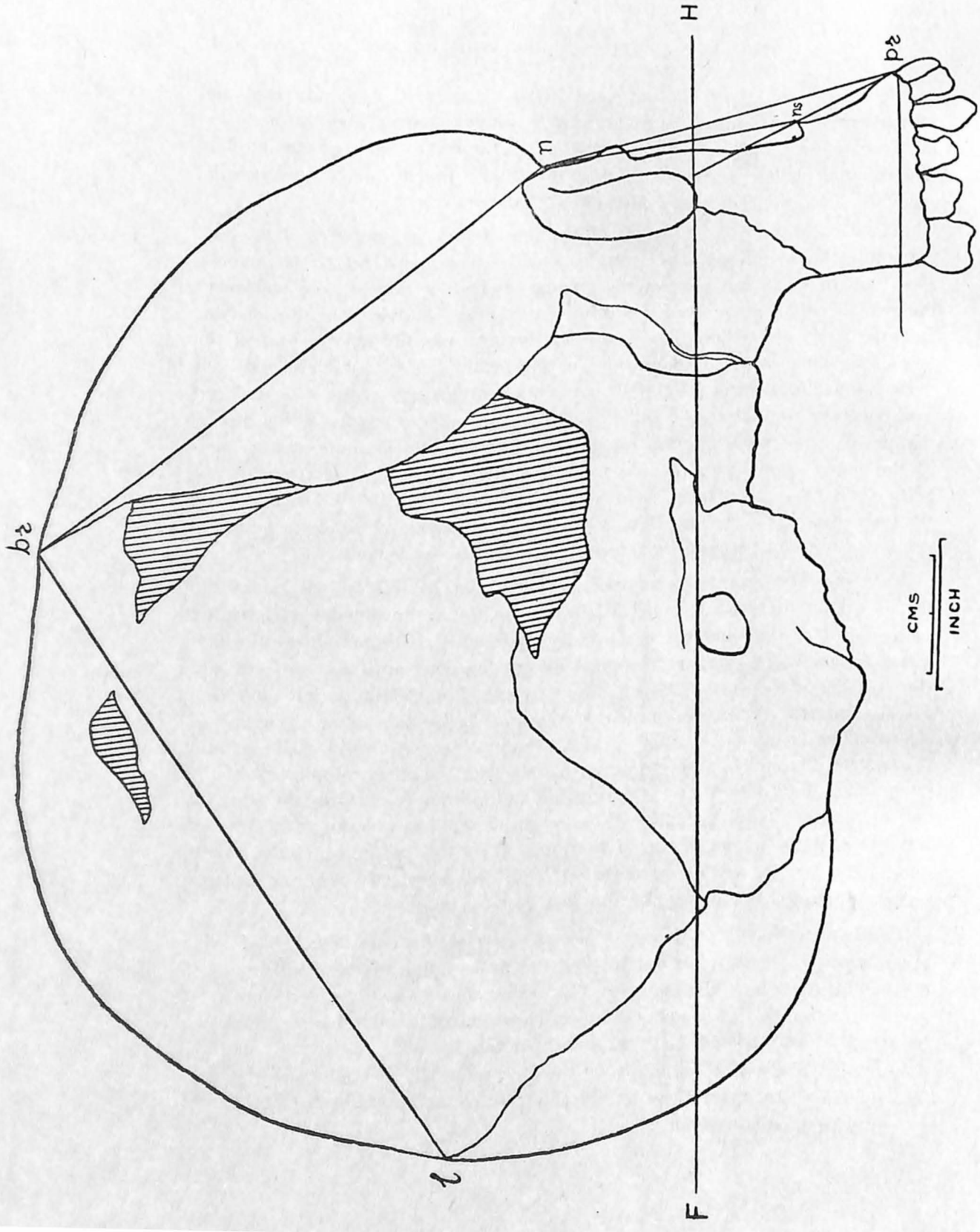
to the second and third. Of the right digits, there are the second, third and fourth proximal phalanges and the second distal phalanx. The bones of the left hand are more complete and consist of all the metacarpals except the first, all proximal phalanges except the first, the third, fourth and fifth medial phalanges, and the fourth and fifth distal phalanges.

Lower Extremity. The shaft of the right femur is complete, but both extremities have suffered severe crushing with subsequent loss of the anterior aspect of the head and most of the greater trochanter, the anterior portion of the medial condyle and posterior portion of the lateral condyle. The intercondylar fossa is barely discernable. While the left femur lacks the inferior rim of the lesser trochanter and medial portions of the head, it is in a better state of preservation. Both epiphyses of the right tibia are missing; at the proximal end at the level of the tuberosity, and at the distal end at the region of the inferior margin of the *Flexor digitorum longus.* The left tibia shows minor impairment of the medial malleolus and the inferior surface which articulates with the body of the talus. A complete right patella is present. The right fibula is missing the medial aspect of its head. The left fibula is in three fragments: a proximal portion, a mid-shaft section, and the distal one-fifth of the bone.

Pelvis. The sacrum is represented only by a left lateral protion of the first sacral vertebra and its attached ala of which only the superior margins are preserved. This fragment extends inferiorly to the superior margin of the first sacral foramen. The ilia are complete except for their auricular surfaces and the portions of the iliac crests superior to them. Both left and right acetabuli are crushed and distorted, the left acetabulum being the better preserved of the two. The superior portion of the right ischium is present and the left ischium is complete. The pubic bones do not articulate with the other components of the innominates due to damage to the superior and inferior rami. Only the superior half of the symphysial surface evident for the left pubis, but the entire face of the symphysis is present in the right pubis. Only the portions of the right innominate can be properly articulated to afford reasonably accurate anthropometric data for Innominate Height and Breadth values.

Specimen No. 19. *Calvaria.* The thinness of the cranial bones of this pre-adolescent specimen has not favored the preservation of the small bones of the basalar portion of the calvaria. The bones of the vault are complete as a result of restoration, but many minute fragments of cranial bones remain to be identified and related to parts already restored.

Face. The two zygomatic bones are complete. The nasals are absent. The maxilla is represented by its alveolar portion and hard palate, but lacks orbital and zygomatic regions.



DIOPTROGRAPHIC DIAGRAM 2
Specimen No. 18. Calvarium. Norma Lateralis.

Mandible. This is complete.

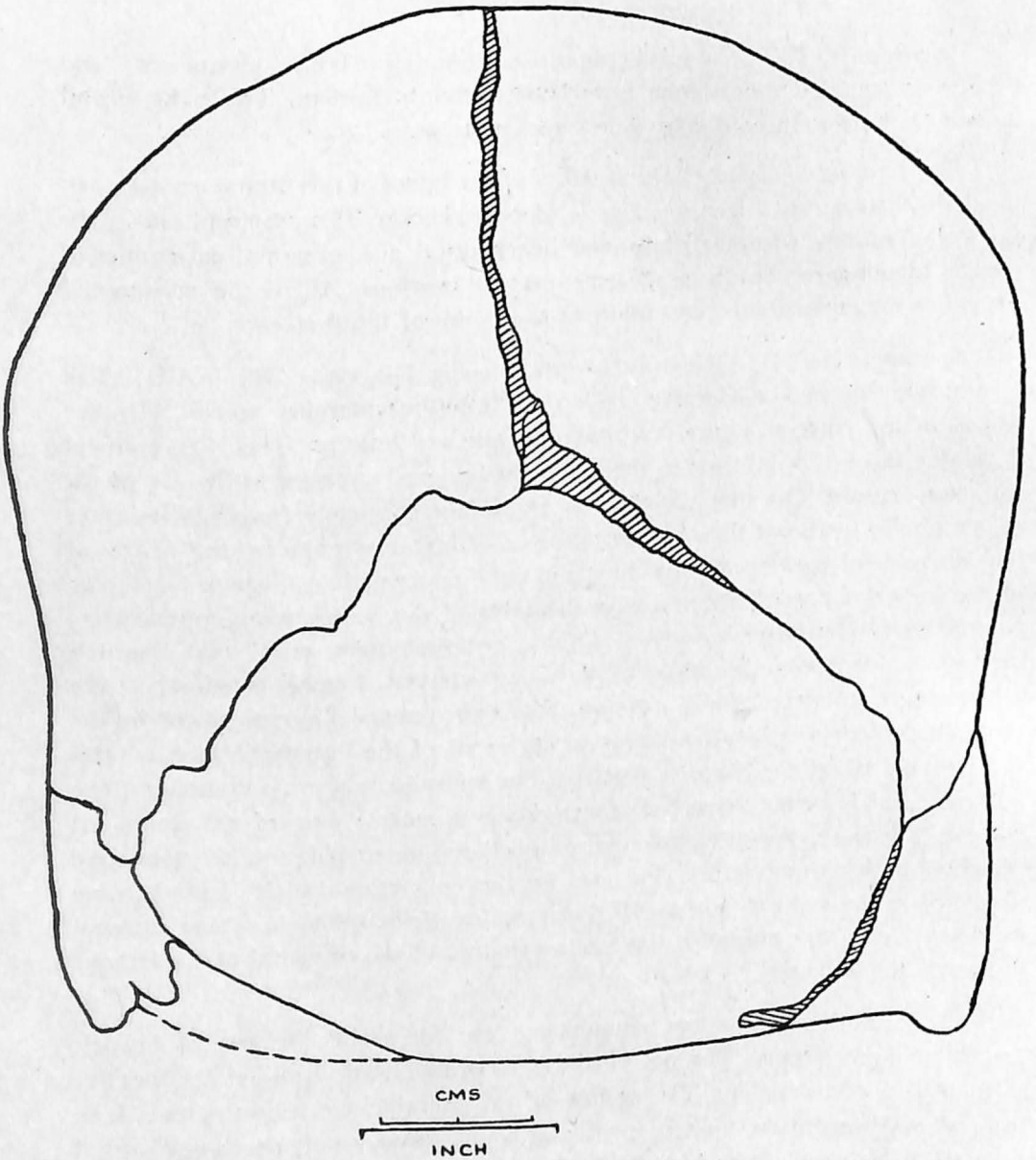
Dentition. This is a mixed dentition containing both permanent and deciduous teeth of which none have been lost ante-mortem. The right second incisor of the mandible has been lost post-mortem.

Post-Cranial Skeleton. The fragility of the bones of this immature specimen preclude their survival in a good state of preservation. The epiphysis are in the process of uniting with the diaphyses, hence distal and proximal extremities of certain long bones constitute separate osseous portions. All of the post-cranial bones are present with the exception of the bones of the feet.

Specimen No. 21. *Calvaria* (Dioptrographic Diagrams 5-6, 14A-B). The frontal bone shows considerable erosion of its sutural margins, especially in the region of the coronal suture. Orbital portions are missing. The right parietal is missing, a portion inferior to the temporal line and superior to the arc of the squamous suture. On the left parietal an aperture extends from the point of origin of the temporal line on this bone to a posterior point at the region of the left parietal eminence. This break is continuous with a Y-shaped aperture in the posterior part of the parietal, the arms of the Y extending superiorly to *lambda* and inferiorly to *asterion*. Of the occipital bone, only that portion superior to *inion* and the adjacent torus is preserved. Lateral terminations are at the sutural convergences of *asterion*. The right temporal is represented by the posterior half of the squamous portion, the root of the zygomatic process, and the lateral half of the petrous portion. The mastoid process is complete. The left temporal is better preserved, for there is a greater part of the squamous present, but the zygomatic and petrous portions are missing. The tympanic plates of both temporals are obscured by the concretion which has become deposited in the auditory meati. All that remains of the sphenoid is that external portion which articulates with the squamous area of the temporal at the basalar region of the calvaria.

Face. Both zygomae are complete except for slight abrasion of the left fronto-zygomatic suture. The maxilla lacks its orbital borders and right posterior portion of the hard palate. The erosion of the supraincisive region gives a false impression of a sub-nasal cleft.The palatine bone is present only as a small medial fragment which articulates with the hard palate of the maxilla.

Mandible. The condyloid processes of both rami and the condylar neck of the left ramus are lost. There is severe breakage at the internal aspect of the ramus on the right side which extends from its juncture with the corpus to the condylar neck. The external surface of this ramus is also fractured but



DIOPTROGRAPHIC DIAGRAM 3
Specimen No. 18. Calvarium. Norma Occipitalis.

restoration has been possible, particularly at the incisive region of the corpus to which this break extends.

Dentition. All of the teeth are present except for the left second molar of the maxilla and the right mandibular canine, of which both were lost antemortem.

Upper Extremity. The right humerus is complete. There is some crushing of its head and slight abrasion of the medial and lateral condyles of the distal end. The head of the left humerus is missing, and the remains of the distal end of the shaft are too fragmentary to merit accurate reconstruction. The right radius is preserved as the proximal half of the shaft; the left radius as the proximal third of the shaft. The right ulna consists of the upper third of the shaft, and its proximal end shows considerable damage. The left ulna is more complete but consists of only its proximal half.

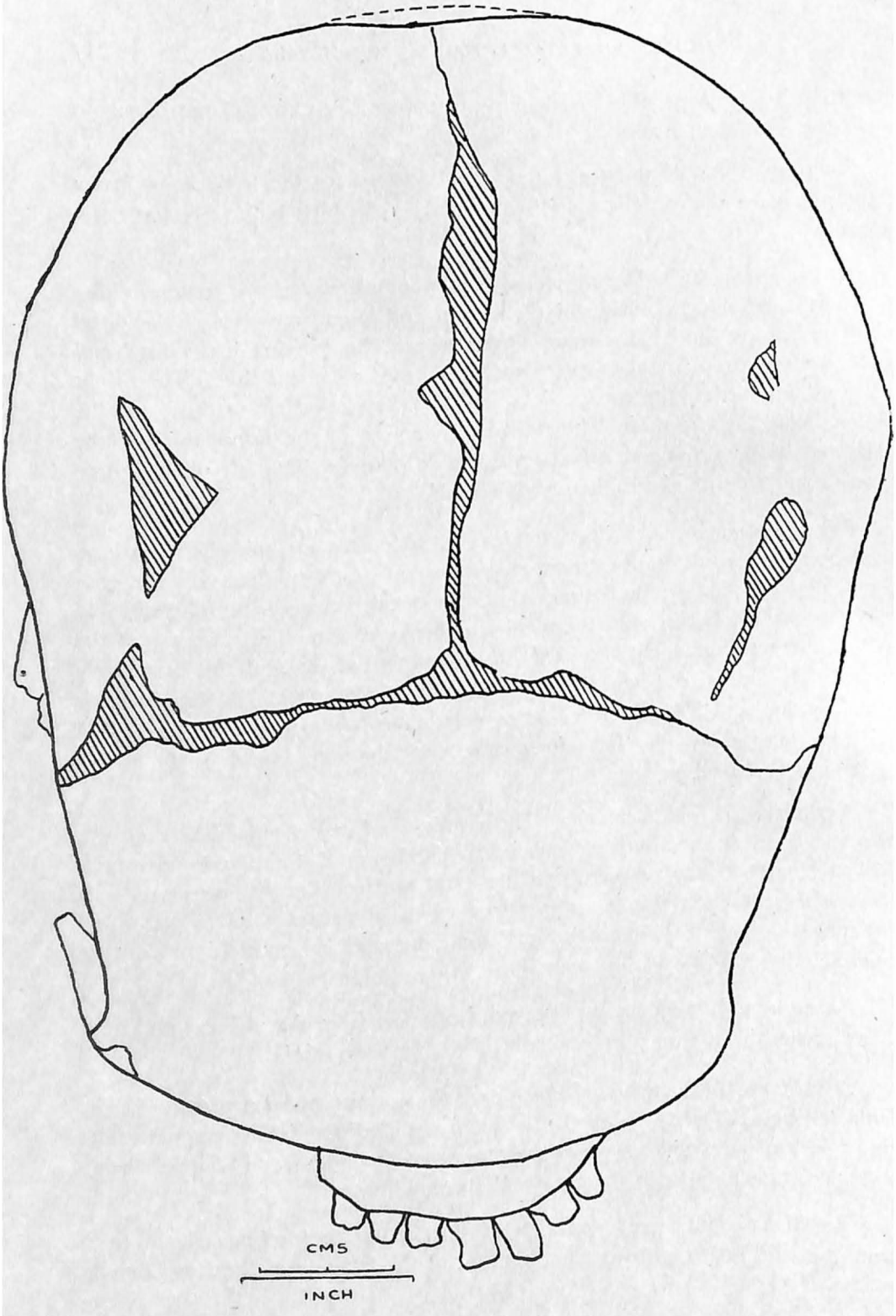
Lower Extremity. All that remains of the femora are mid-shaft portions, breakage commencing at the point of bifurcation of the *linia aspera* for each femur. The right tibia is badly crushed and its distal end is absent. The left tibia lacks its proximal portion but the medial malleolus of the other extremity of the shaft is present. For the right fibula the head is present and this is severely crushed. The lateral condyle of the distal end is incomplete. The left fibula is intact but its head has also received severe damage from crushing. The distal end is lacking the articular facet for contact with the talus as well as the groove for the peroneal tendons.

Specimen No. 72. *Calvaria.* The cranial and post-cranial bones of this immature specimen were not reconstructed. The bones of the calvaria have been crushed but the frontal, parietal and occipital portions are still preserved in a fragmentary condition. Little appears to have been preserved of the temporal and sphenoid bones, although the left squamous and left mastoid process are observable.

Face. A right zygoma is preserved, but apart from the alveolar and hard palate portions of the maxilla the bones of the face are missing.

Mandible. Although grossly distorted, the corpus has been preserved. The right ramus is adhering to the right squamous portion of the temporal. The condyloid and coronoid processes are preserved for both rami, the left being in proper articulation with the corpus of its mandible.

Dentition. The mixed dentition of this immature specimen shows postmortem loss of both permanent first molars on the left side of the face. Among



DIOPTROGRAPHIC DIAGRAM 4
Specimen No. 18. Calvarium. Norma Verticalis.

the missing deciduous teeth are the maxillary canines, the mandibular canines and central incisors. The permanent right lateral incisor of the maxilla and both lateral incisors of the mandible have been lost post-mortem as well. A canine of the permanent dentition of the right side of the maxilla is found adhering to a mass of the cranial bones. This appears to be the tooth of an unidentified specimen, for Specimen No. 72 has not yet erupted its canines nor have its premolars, which would normally precede the canines, undergone eruption.

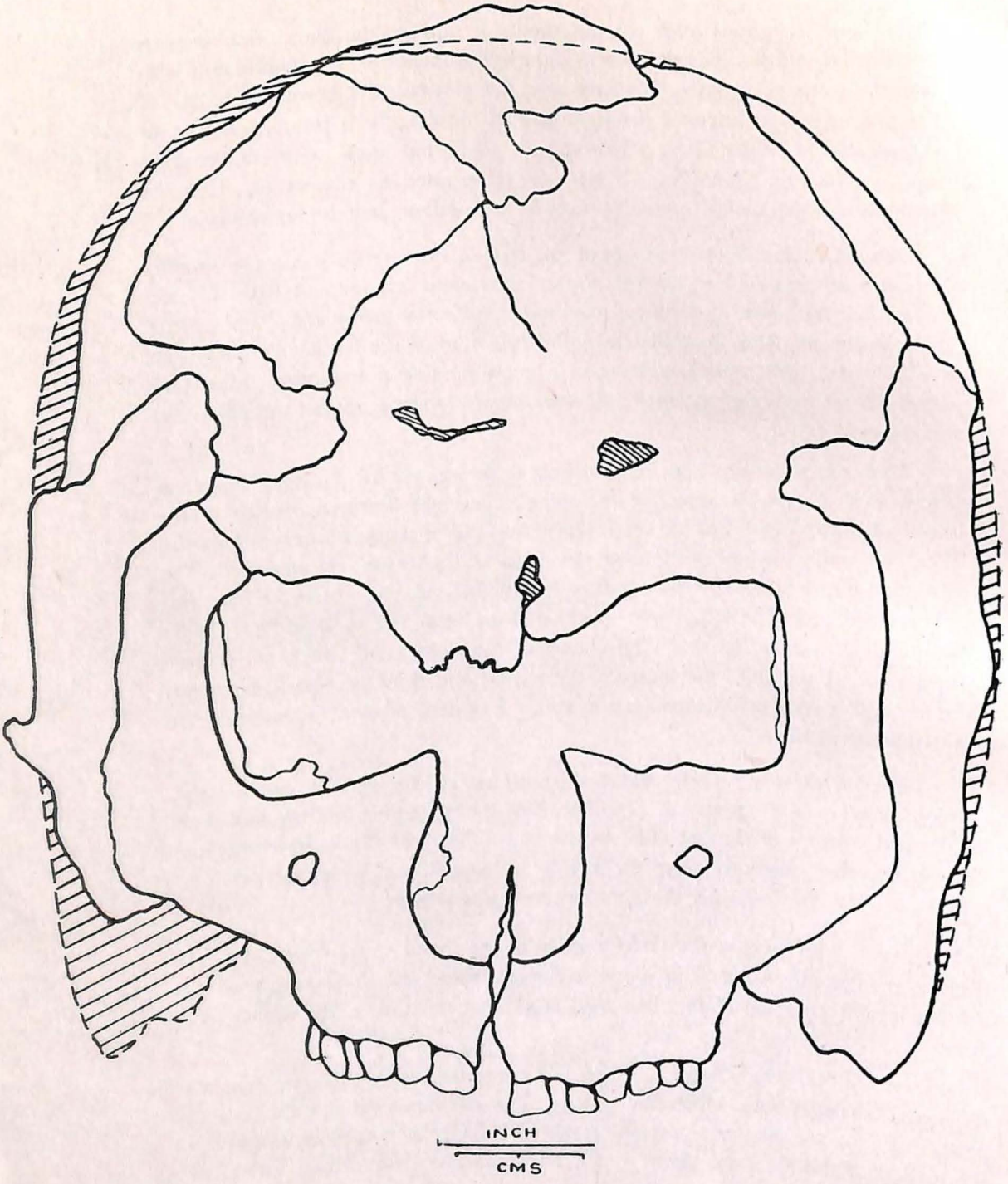
Trunk. The cervical vertebrae are present but for all seven the spinous processes are incomplete. Of four thoracic vertebrae present, all have suffered loss of their transverse and spinous processes. Lumbar vertebrae are absent among these specimens. Ribs from the right and left sides of the bodies of more than one individual are present and are in a good state of preservation. Masses of these ribs are adhering together and their separation was not attempted in the laboratory.

Upper Extremity. The right scapula is recognized by the right acromion process and the lateral aspect of the spine. The right humerus consists of the mid-shaft portion with its distal end. Only the head of the left humerus remains. The heads and proximal portions of the shafts of both radii are preserved. The right ulna is represented by the proximal half with head and a separate fragment of the distal end. The left ulna has retained its head and most of the middle and proximal parts of its shaft. The bones of the right hand which are present are the second and third metacarpals, the second and third proximal phalanges, the first and second middle phalanges, and a fragment of what is probably the third middle phalanx.

Lower Extremity. Only mid-shaft portions of the femora are present. A right patella is well preserved. A mid-shaft of the right tibia and the mid-shaft and distal portions of the left tibia are present. The right fibula is represented by the mid-shaft portions only; the left by mid-shaft and proximal portions. Of the bones of the feet, only the right calcaneous is present.

Pelvis. Fragments of the distal portion of the sacral canal with the sacral cornua are the only parts of this bone which are preserved. A fragment of the left ilium with a section of the iliac crest is all that remains of the innominate bones.

Specimen No. 72a. *Calvaria.* There are associated with this specimen six fragments of cranial bone which may belong to two or more individuals. Among these fragments are smaller pieces of bone which have been reconstructed, but articulation of the six large pieces is not possible. These have been identified



DIOPTROGRAPHIC DIAGRAM 5
Specimen No. 21. Calvarium. Norma Frontalis.

by number as follows: 1a-1b, 2, 3, 4, 5, and 6. Fragment 1a-1b, the largest of the six, consists of the petrous portions and tympanic plate of the left temporal, portions of the mastoid and zygomatic processes of this bone, and an anterior portion of the squamous. Adhering to this temporal bone is that portion of the left parietal adjacent to the squamous suture, the posterior border of the coronal suture, and the asterionic portion of the left parietal to which an occipital segment is attached. Fragment 2 is a frontal bone with a well defined coronal suture border and a medial supraorbital portion. Fragments 3 and 4 are both left parietal bones of two individuals. Fragment 5 is a frontal bone of an individual other than the one whose frontal bone is represented by Fragment 2. Fragment 6 is the squamous portion of a right temporal bone.

Face. The right zygomatic bone is complete, the left being limited to a portion of the maxillo-zygomatic suture. The maxilla is well preserved. The anterior portion of the palatine bone remains, but the posterior portion has broken away.

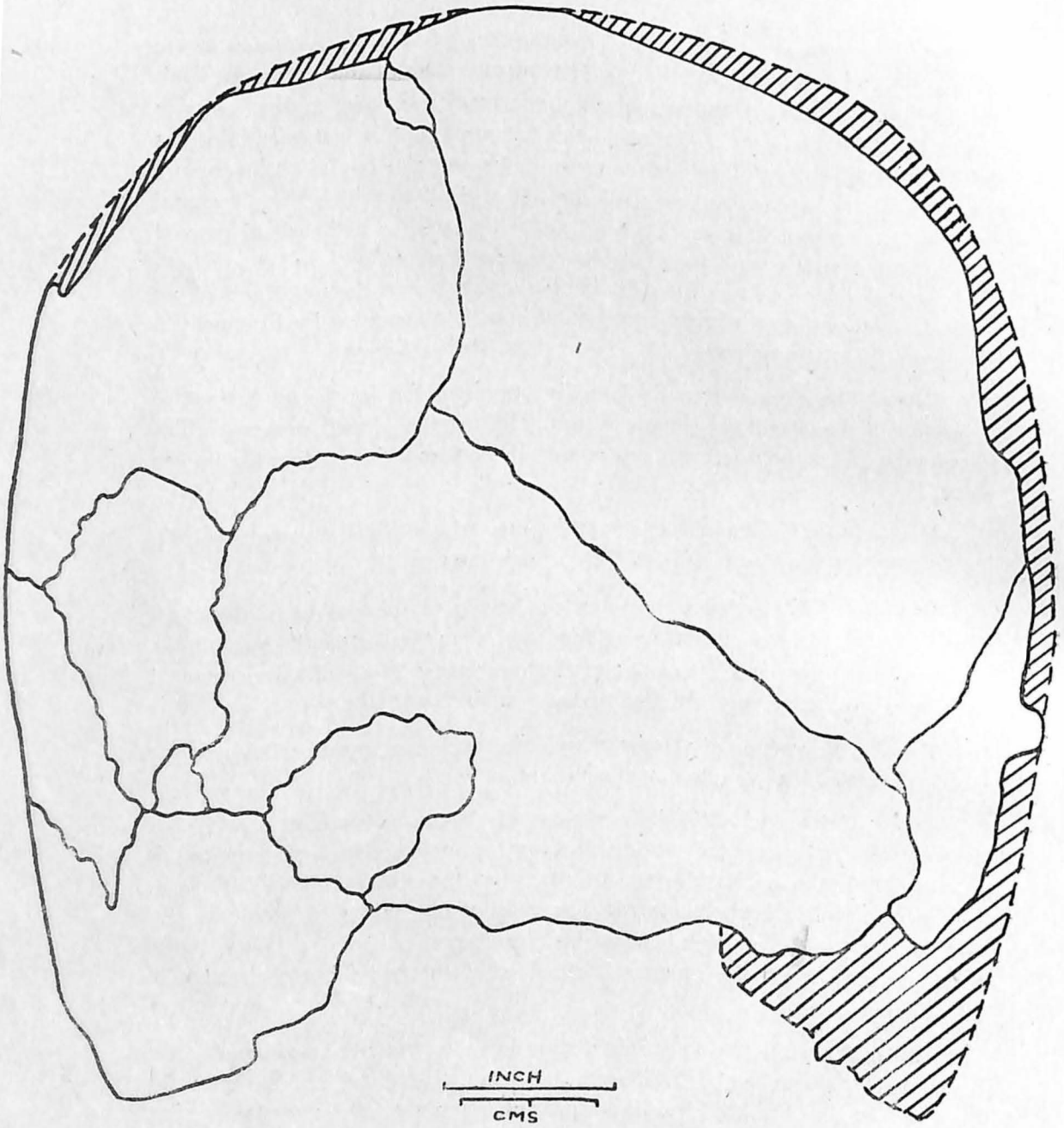
Mandible. The mandible is poorly preserved and the right ramus is lacking its condylar head and apex of the coronoid process.

Dentition. All teeth lost post-mortem belong to the deciduous dentition. These are the incisors of both maxillary and mandibular dentitions and the canines of the upper and left canine of the lower series. None of the permanent teeth have erupted except the first molar.

Trunk. Fragments of vertebrae and ribs of two or more individuals are poorly preserved but complete in their series.

Upper Extremity. Mid-shaft sections of the humeri are preserved. For the right humerus the distal portion showing incomplete epiphysial union is present. The right radius is complete save for the distal end of its shaft. No left radius has been recovered. The right ulna consists of proximal and mid-shaft portions. No left ulna has been recovered. All of the bones of the hand are present for the right and left sides of the body, but their state of preservation is poor.

Lower Extremity. The right femur is well preserved although the incomplete epiphysial union renders the proximal and distal extremities of the shaft very fragile. The left femur is not present. The right tibia is nearly complete but for some damage to its distal end. The medial malleolus is missing. There is no left tibia available for study. The right fibula is in good condition but incomplete epiphysial union has resulted in partial loss of the ends of the bone. The left fibula is not present. The bones of the feet are absent also.



DIOPTROGRAPHIC DIAGRAM 6
Specimen No. 21. Calvarium. Norma Occipitalis.

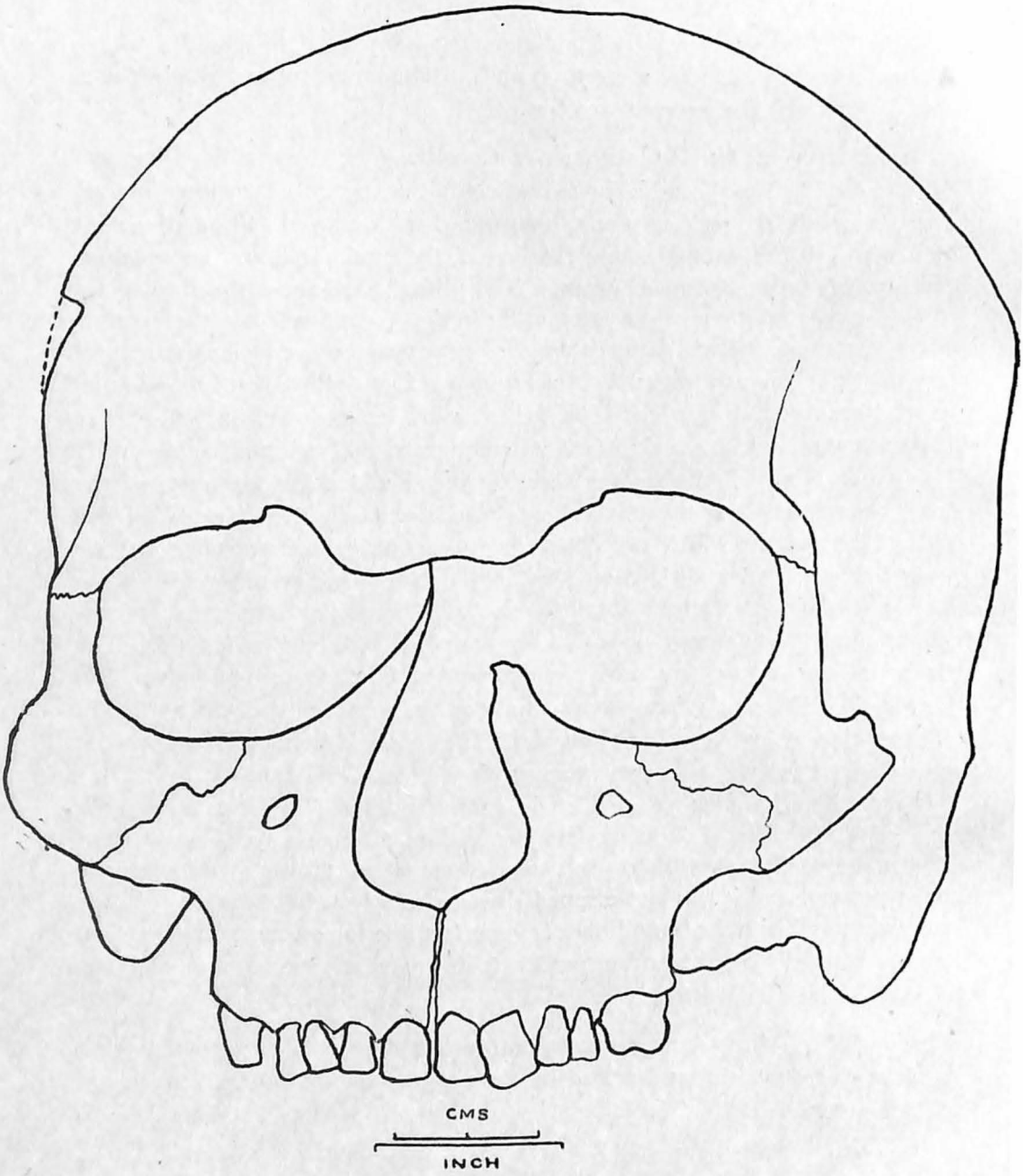
Pelvis. The only remains of the innominates are the right ilium, of which the crest is broken open by a fracture, and an almost complete right ischium. Pubic bones and the sacrum are lost.

Specimen No. 49 (Indo-Roman). *Calvaria* (Dioptrographic Diagrams 7-10, 15A-B). The frontal bone is complete except for the loss of the right parietal region where damage has occurred in conjunction with trauma to the parietal along the line of the coronal suture, an aperture which extends from *pterion* to *bregma*. The orbital portions of the frontal are incomplete, greatest damage centering in the region just posterior to the superior borders of the orbit. Both parietals are well preserved except along the sagittal suture line from *bregma* to the parietal foramina. The right parietal shows some damage in the pterionic region. The basi-occipital region is missing, the break occuring at the level of *opisthion* and extending anteriorly to the facial portion of the skull. The mandibular fossæ are missing, but the basalar parts of the calvaria lateral to these structures have been preserved. The borders of the jugular foramina are still intact. The squamous portions of the temporal are complete except at the right pterionic region. The zygomatic processes are broken posterior to their attachments to the zygomae. The mastoid processes are undamaged, but the tympanic plate is fully preserved only on the left side. The petrous portions of the temporal are represented by their lateral halves. On the right side the carotid foramen can be observed. The left petrous portion is broken at a point just lateral to this region. The sphenoid bones are broken with their splintered fragments compressed into the sub-temporal fossae.

Face. The left zygoma remains in good condition. The right zygoma is broken along the line of the zygo-temporal suture. The maxilla shows erosion of the naso-maxillary border but otherwise is complete. Only the right nasal bone is present, and it has not escaped damage to its medial border. Junction of the right nasal with the frontal bone is imperfect due to post-mortem distortion. The hard palate is present and articulates with a well preserved parietal bone. Only the left pterygoid is present.

Mandible. Minor damage has taken place at the medial surface of the left condyle and the superior and lateral portions of the right condyle. The corpus is well preserved.

Dentition. No teeth have been lost post-mortem. The missing third molars and left second molar of the maxilla and the right third molar of the mandible are due to ante-mortem circumstances. The broken crowns of the maxillary first molars and the mandibular right third molar appear to have been caused by circumstances relating to the burial and excavation.



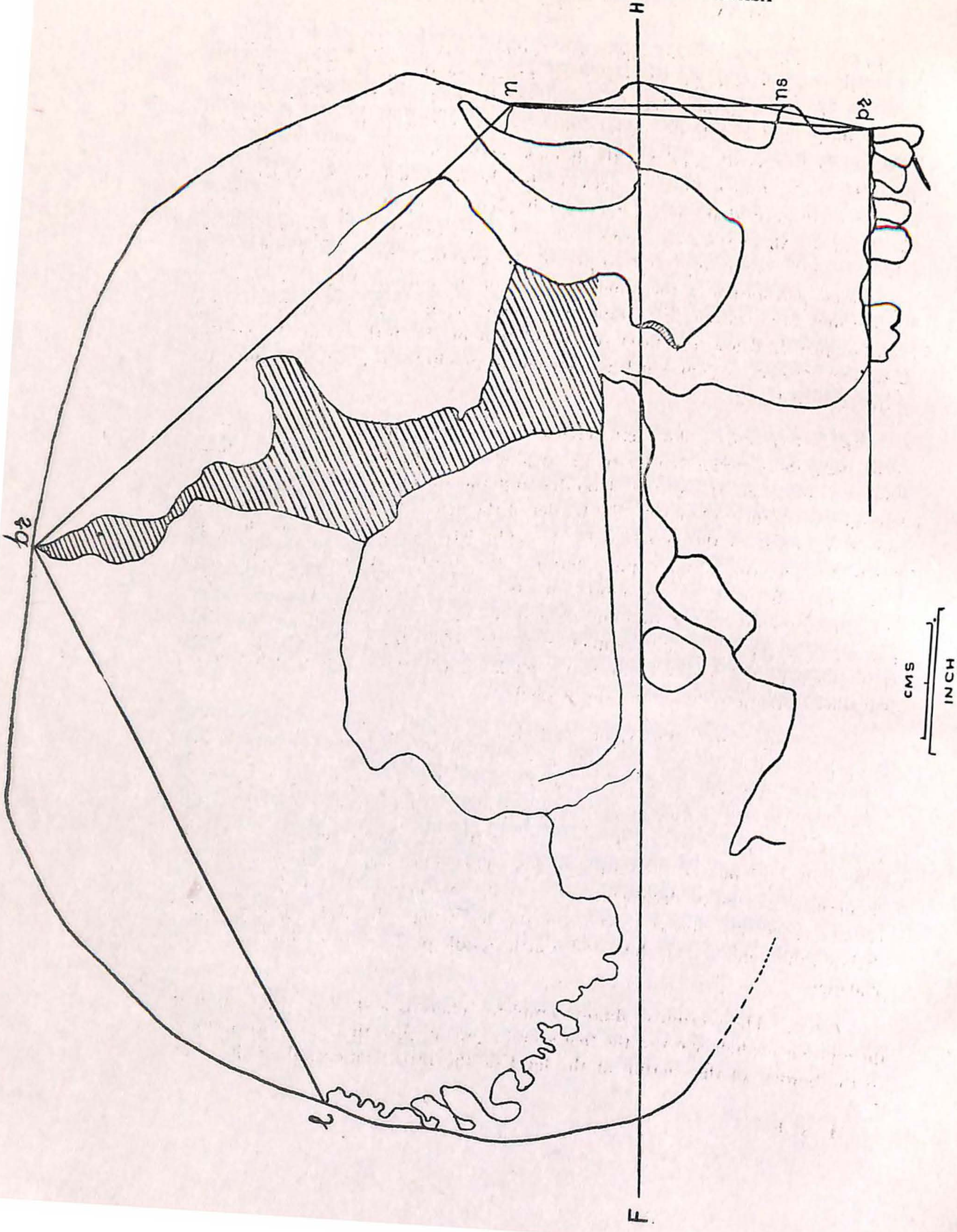
DIOPTROGRAPHIC DIAGRAM 7
Specimen No. 49. Calvarium. Norma Frontalis.

Trunk. The cervical vertebrae are complete save for the missing spine of the fourth cervical and the left transverse process of the axis. The thoracic vertebrae are also complete but have suffered breakage of the spines of their second, third, and fourth members, while the left transvers process is missing from the sixth, seventh, and twelth thoracic vertebrae. The ventral aspect of the body of the fourth thoracic vertebra has been eroded away. Apart from damage to the dorsal border of the fifth lumbar, all of the lumbar vertebrae are complete. All of the ribs are present and their condition of preservation is excellent. The manubrium and corpus of the sternum are complete. There is some minor perforation of the anterior aspect of the corpus. The two bones of the sternum are separate but epiphysial union of the corporal segments has been completed. Below the facet of articulation of the fifth costal the corpus shows some osseous erosion which is sufficient to preclude an accurate estimation of true sternal length.

Upper Extremity. The left clavicle is complete but the right is broken away along the superior border of the medial end. The right scapula shows slight damage along the vertebral border and the region of the superior angle. This damage to the posterior medial border of the acromion process is a continuation of the break at the vertebral border. The left scapula is broken along its vertebral border from a point just inferior to the superior angle to another point lying below the lateral termination of the scapular spine. The right and left bones of the humerus, radius and ulna are in an excellent state of preservation. The bones of the hands are complete with the following exceptions: the right third metacarpal, left second proximal phalanx, left third and fourth middle phalanges, and the right second distal phalanx.

Lower Extremity. The right femur is complete but shows minor damage at the proximal portion of the shaft just inferior to the lesser trochanter. The shaft is fractured but its shape is not distorted. The left femur is missing its lateral condyle and a section of the medial border of the femoral head at the point of junction with the neck. Apart from fractures along the lengths of the shaft, both right and left tibia are complete. The right fibula is complete but the left fibula is lacking its distal end. The patellae are complete. The bones of the feet are excellently preserved save for the following: the right first proximal phalanx, the right second, third and fourth middle phalanx, and all of the distal phalanges.

Pelvis. The sacrum is almost complete. There is a shallow perforation of the anterior medial aspect of the first sacral segment. Also there is minor damage to the borders of the sacrum at the level of the fifth segment. Both ilia show



DIOPTROGRAPHIC DIAGRAM 8
Specimen No. 49. Calvarium. Norma Lateralis.

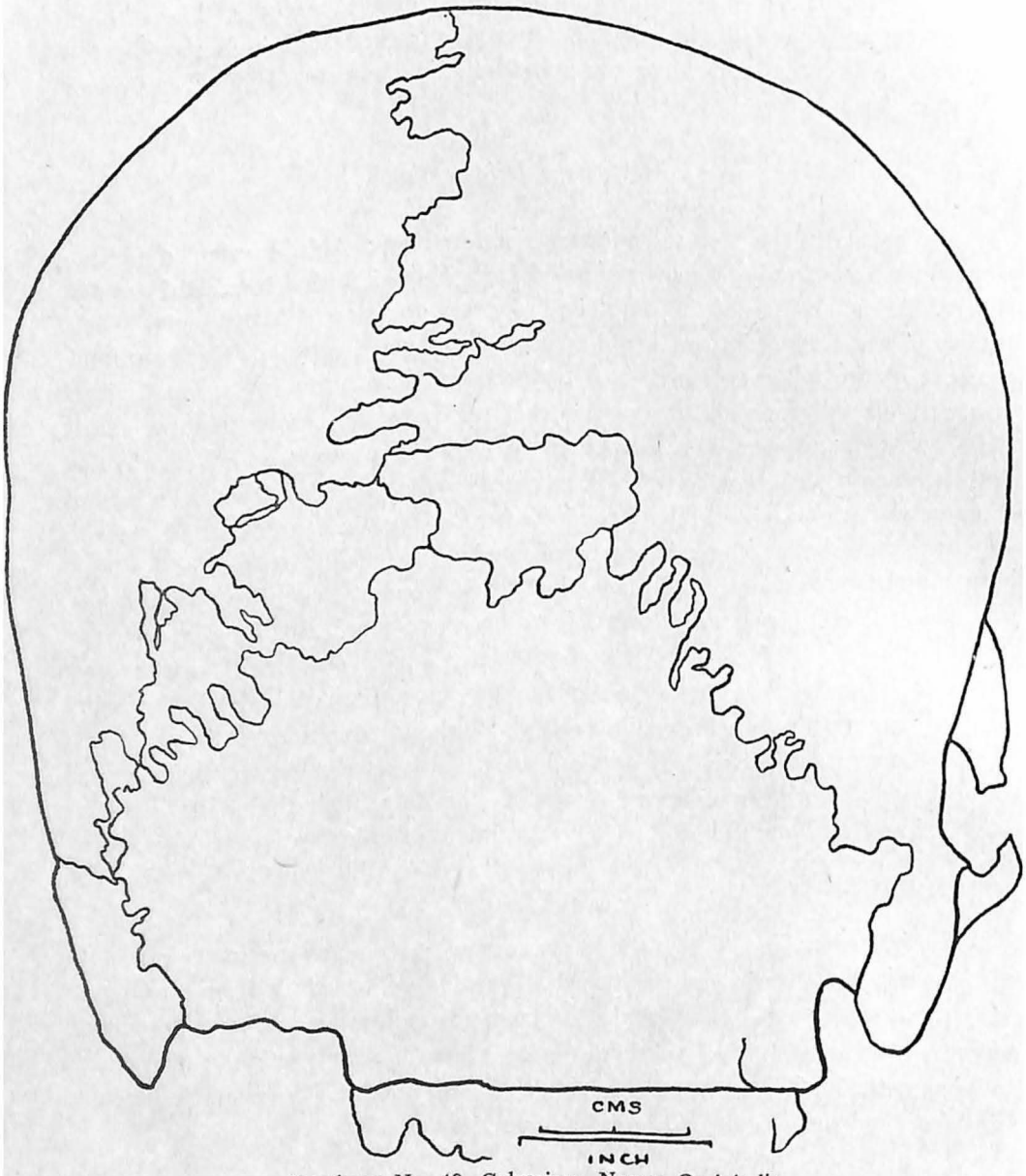
fracturing of their medial surfaces in the region of the arcuate lines. Both acetabulai are fractured. The ischia are well preserved although sharing the damage to the acetabuli. The right pubic bone is complete. The left is broken away at the symphysis.

Post-Mortem Deformation

All crania in the Nevasa series have suffered severe post-mortem deformation. Agencies affecting the warping and fracturing of buried osseous tissue are myriad. Mineralization of the skeletons has served to preserve many bones which under different conditions of burial would disintegrate rapidly. The continual pressure of the soil overburden is a factor which can result in severe damage to semi-fossilized materials, and such would appear to be crucial in these cases. Consequently some reconstruction of this material is a necessary prelude to the anthropometric and morphological analysis. For the bones of the appendicular skeleton, which are paired, reconstruction of the original conformation of skeletal structures may be a relatively uncomplicated task: missing structures for one bone may be reconstructed after examination of relevent structures on the other side of the skeleton, when such parts have been preserved. But for the cranium the utilization of this factor of bilateral symmetry is more complex. In some cases where it is impossible to attain a satisfactory restoration of both sides of the head, measurements and observations must be limited to one side. As the problems of post-mortem deformation of crania in the Nevasa series bear strongly upon an accurate and reasonable interpretation of the data, their discussion in some detail is in order. In no case do the seven specimens examined afford any evidence that ante-mortem cranial deformation was practiced by the Chalcolithic or Indo-Roman Nevasians.

Specimen No. 10. This is the least distorted of the seven specimens examined. The slight depression at the posterior portion of the skull from the right asterionic region to the base of the left parietal eminence has been described earlier by Ehrhardt. There is little distortion of the basalar portion of the skull, and symmetry of the mandibular remains appears normal. The bone fragments are brittle and are coated with a grey concretion.

Specimen No. 18. Viewed superiorly, the cranial vault appears normally symmetrical, but distortion commences at the frontal region. The left side of the frontal projects anteriorly somewhat more than does the right side, a condition which is manifested in a more striking degree upon inspection of the right and left lateral aspects of the skull. This distortion extends to the facial bones, thus giving the left orbit a spheriod conformation. The left border of the



Specimen No. 49. Calvarium. Norma Occipitalis.
DIOPTROGRAPHIC DIAGRAM 9

periform aperture correspondingly projects anterior to the right border of the aperture, as observed by an inspection of the frontal aspect. These disharmonies are confirmed by scrutiny of the basalar portion of the skull. The palate is unnaturally oriented with respect to the rest of the base of the vault and face. A second deformative factor is the elevation of the left mastoid process in relation to the normal position of the right mastoid. This is a projection of the improper positioning of the entire left side of the vault and face. The mandible shows minor degrees of deformation in the rami. The cranial bones of this specimen are firm and show a buffish-white color. Mineralization of the bones is well advanced.

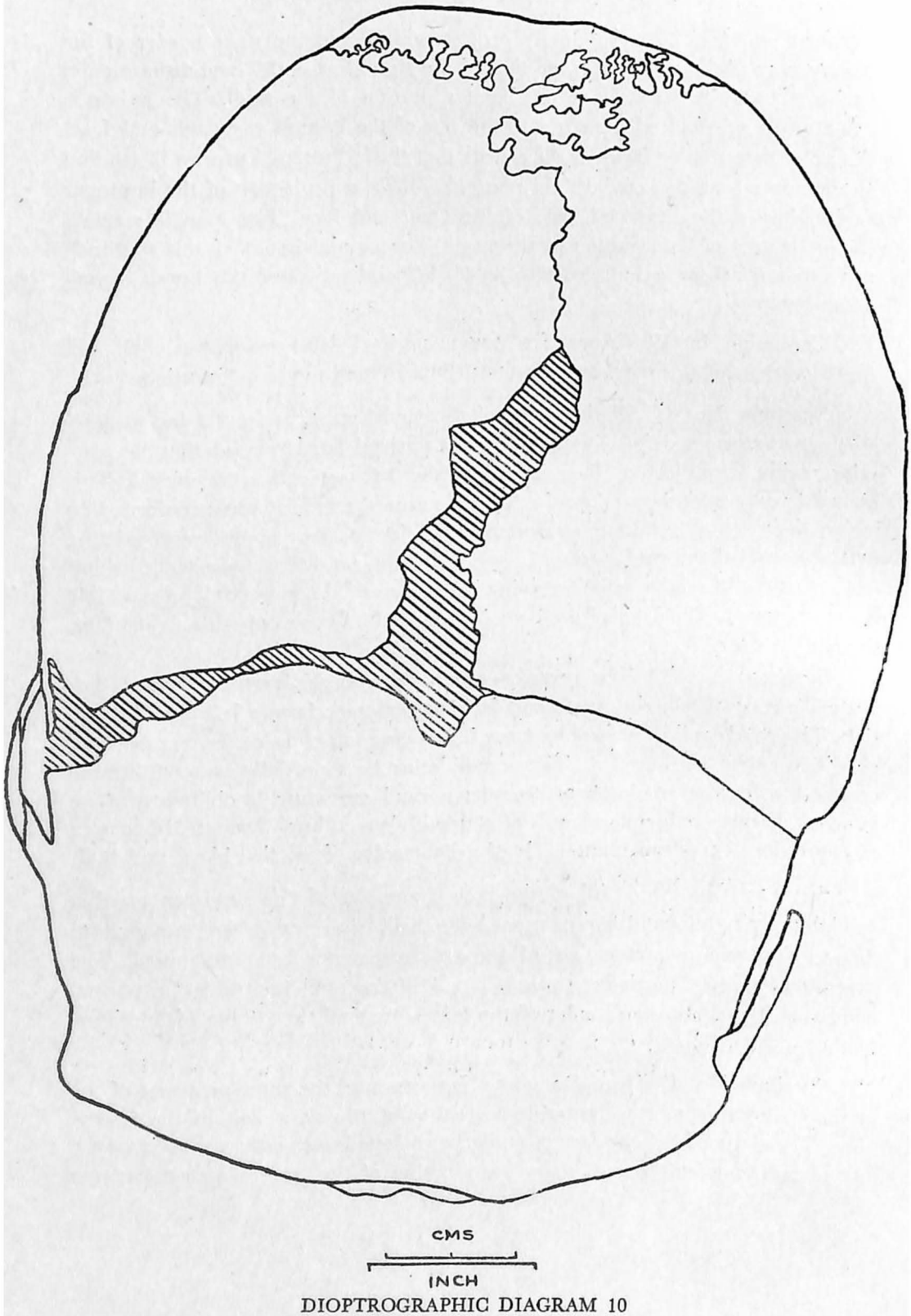
Specimen No. 19. Apart from some parietal deformation the vault and facial portions of this specimen are unaffected by post-mortem distortion.

Specimen No. 21. Of the bones of the vault, only the frontal has escaped severe post-mortem deformation. The right parietal is so warped that its posterior region is projecting laterally while the left parietal is depressed. This gives the vault, upon inspection of its superior aspect, a brachycranic conformation which does not reflect its ante-mortem condition. Consequently most of the measurements of the vault cannot be taken. There is a disharmony in the orbital conformation, the right orbit preserving best the normal condition. The mandible is not deformed. The color of the bone is grey, and it is covered with a calcarious deposit.

Specimen No. 72. The pressure which crushed this cranium into a flat, plate-like mass of adhering vault and facial bones came from a left lateral direction. This cranium was not reconstructed, but cleaning revealed the number and condition of the bones present. The mandible has been partially restored, but the corpus has become so damaged that its normal curvature is obliterated. The bones are heavily mineralized and of a greyish-brown hue. Beneath this patina of concretion the osseous material is of a light color of mottled black and buff.

Specimen No. 72a. All of the bone fragments of this specimen number (which actually represent two or more individuals) have undergone pronounced deformation and reconstruction of the crania has not been attempted. The mandible has been partially restored, but only the rami approach the normal condition. The texture and color of the bones are similar to those of Specimen No. 72.

Specimen No. 49 (Indo-Roman). Inspection of the superior aspect of the vault reveals an abnormal anterior projection of the right half of the frontal bone. The right side of the face is similarly projected anteriorly, as is the palate and alveolar border observed upon examination of the basalar aspect. Because



DIOPTROGRAPHIC DIAGRAM 10
Specimen No. 49. Calvarium. Norma Verticalis.

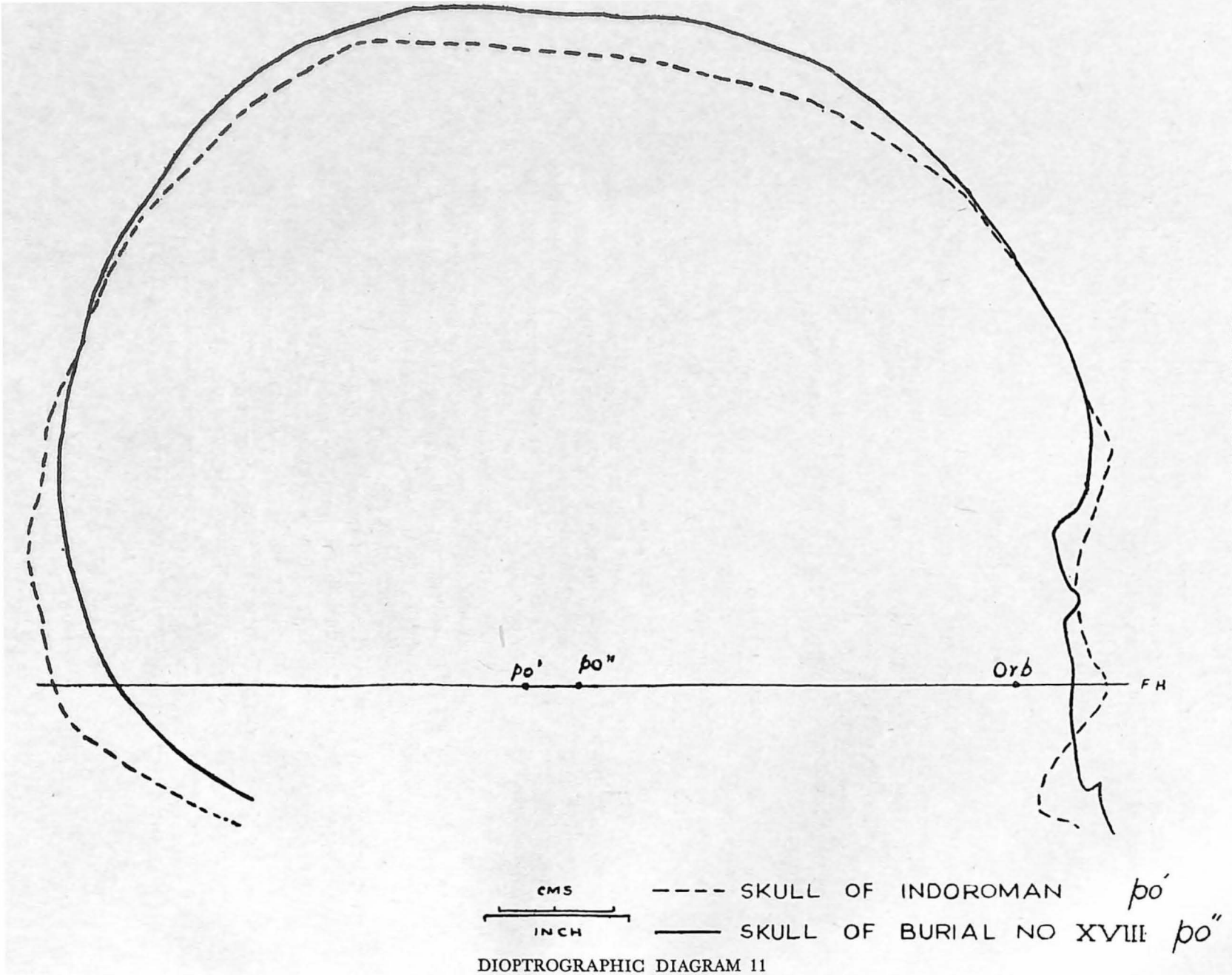
of the normal articulation of the right and left fronto-zygomatic sutures, the face was not reconstructed. For purposes of measurement, the left side of the face was preferred. The mandible is not deformed. The cranial bones of this later inhabitant of Nevasa are very fragile and mineralization has not been initiated. The skull is remarkably light in weight. Its color is the yellowish-brown of unbleached human bone.

Sex Determination

The sexing of the Nevasa specimens is uncertain in several cases as a consequence of the paucity and inferior condition of preservation of those bones most critical in the estimation of the factor. For Specimens Nos. 19, 72, and 72a the immaturity of the individuals themselves precludes a definite determination of their sexes. In the case of the adult specimens, all factors bearing upon this problem have been considered and of these the most salient features are discussed below.

The authors have employed a number of techniques developed by Oetteking[17] for the sexing of osseous remains on the basis of certain mandibular lines and angles. Oetteking observes in mandibles from Prince William Sound, Alaska, that those of males are distinguished from those of females by not only a certain robustness of texture but also by a characteristic shape. The male mandible has a ramus of pronounced erectness in relation to the plane of the corpus. The ramus of the female mandible on the other hand is more reclining, a condition frequently associated with an antero-posterior dilation of the superior portion of the ramus and an anterior distention of the mental process. The female mandible is distinguished by its slenderness and slope. Oetteking has illustrated this sexual dimorphism in diagrams in which a line drawn from pogonion (pg) to condylion superius (cds) reveals that there is greater inclination of this line in female mandibles than in those of males. Where the pogonion-condylion superius line lies superior to the angle formed by the anterior border of the ramus and the superior border of the corpus the mandible is regarded as belonging to a male. When the pogonion-condylion superius line transects the nexus of the angle the mandible is regarded as belonging to a female (Dioptrographic Diagrams 12A, 13A, 14A, 15A). Angular measurements have also been used by Oetteking in his study of the Alaskan material, and the quantitative values that he notes as distinguishing males from females are compared with the angular measurements taken on the Nevasa mandibles

[17] OETTEKING, B., Skeletal Remains from Prince William Sound, Alaska, *American Journal of Physical Anthropology*, 3.1.57-96; 3.2.117-206; 3.3.277-312, Philadelphia, 1945.



DIOPTROGRAPHIC DIAGRAM 11
Specimen Nos. 18 and 49. Calvarium. Norma Lateralis.

(Dioptrographic Diagrams 12B, 13B, 14B, 15B). But while Oetteking's method of using the pogonion-condylion superius line are applicable to the sex determination of the Nevasa series, for the angular measurements the present investigators obtain very different kinds of results. There is similarity in the male-female angular proportions and values for the Nevasa and Prince William Sound series only for the Postero-Basal and Ramus Angles, where the males have the higher values. For the Antero-Basal Angle there are minimal sexual differences, as Oetteking found for his series as well. But for the other angles the Nevasa females have higher values than the males—the reverse of what Oetteking finds for his specimens.

Specimen No. 10. The criteria for identifying this specimen as an adult female have already been given by Ehrhardt. The authors concur with Ehrhardt in the sexing of this specimen as that of a female, an opinion based upon observation of the moderate to slight degree of muscular relief of the vault and face, the small size of the mastoid processes, the small supra-orbital torus, the sharp superior border of the orbit, the inclination of the mandibular rami, and the over-all conformation of the mandible. Oetteking's pogonion-condylion superius line transects the apex of the angle formed by the corpus (Dioptrographic Diagram 12A). The sizes of the teeth and the probable position of the frontal bone which are noted by Ehrhardt are less reliable sex indicators than the other traits discussed above.

Specimen No. 18. The sex of this specimen remains somewhat uncertain. Cranially it would appear to be female. There is a low degree of cresting and the glabella is smooth and rather small. The occipital crests are small and inion is not apparant. The minor degree of muscularity is encountered also in the face where the zygomae are small and gracile. The general size of the skull is small to medium. The form of the chin is median. The pogonion-condylion superius line confirms this sex determination of the specimen (Dioptrographic Diagram 13A). Inspection of the pelvic bones, however, shows that many features fall within the range of variations for males. The small preauricular sulcus and the parallel orientation of the ischia are not what might be expected in a female specimen, although these masculine traits are encountered occasionally in female pelves. The breadth and depth of the sciatic notch is not sufficiently distinctive for an immediate pronouncement of the sex of the specimen. The pelvis is small and exhibits a low degree of muscular robusticity. Damage to the acetabuli and the inferior portions of the innominates precludes a clearer determination of the sex by means of anthroposcopic interpretation. The female characteristics are apparent in the low musculature of the long bones. The *linia aspera* is sub-medium in its size and there is no pilaster.

Specimen No. 19. As a pre-adolescent individual this specimen is difficult to sex. The dentition suggests that its age is between eight to nine years. Examination of the acetabulum of both sides of the innominates reveals that the pubic and ischial bones are commencing their unification with the ilium. This unification is initiated earliest in females, and by the age of twelve or thirteen epiphysial union may be well advanced. There is a later time for this growth change in the male. The advancing unification of these pelvic bones in Specimen No. 19 suggests that its sex may be female.

Specimen No. 21. This specimen is an adult male. This judgment is based upon the pronounced robusticity of the cranial architechture. The glabella is large and the supraorbital tori are also well developed. The wide palate and large over-all size of the vault and face, particularly the massive malars, conform the existence of masculine features in this specimen. The heavy mandible has a bilateral and prominent chin. The pogonion-condylion superius line falls well above the angle formed by the anterior border of the ramus with the superior border of the corpus (Dioptrographic Diagram 14A).

Specimens Nos. 72 and 72a. The determination of the sex of these specimens is not possible due to their immaturity and the loss of those osseous remains which might afford some clue to sex.

Age Determination

In the absence of well preserved pubic bones whose symphysial faces provide the most reliable information about age, the adult specimens in the series are aged according to their degrees of cranial suture closure, condition and eruption of the teeth, and the progress of epiphysial union of certain bones. The latter two methods have been used exclusively in the age determination of the three pre-adolescent specimens.

Specimen No. 10. The problems involved in aging this specimen have been noted by Ehrhardt. This researcher would place the age at time of death between seventeen and twenty-four years with a favoring of an age of twenty years. This is based upon observation of the patent condition of the lambdoid and sagittal sutures of which all parts of the latter begin to close around the twenty-first year, while the asterionic portion of the lambdoid may remain open until the twenty-sixth year. The spheno-occipital sutures at the basalar portion of the skull are patent also. The third molar has not yet fully erupted. A right humerus reveals incomplete epiphysial union of the medial epicondyle and the head of the right radius is still unfused with its diaphysis. The proximal end of the right femur and the acromial process of the right scapula are also incompletely fused to their larger structural components. The present authors of this report

concur with these observations but would place the probable age of this specimen closer to eighteen years on the evidence of the teeth and the progress of epiphysial union and suture closure.

Specimen No. 18. The age of this female specimen is between eighteen and twenty-two years. All of the cranial sutures are patent but this is a direct result of post-mortem trauma, hence they are unsuitable in the estimation of age. The third molars have erupted and they reveal very slight degrees of wear. Attrition of the anterior teeth in mandible and maxilla is pronounced, and this condition also prevails for the upper first molars and premolars, but to a lesser degree. Epiphysial union has been completed for all the long bones.

Specimen No. 19. This pre-adolescent specimen is between eight and nine years of age. The cranial bones are patent, but this condition is in part due to the results of post-mortem damage. The dentition is mixed: permanent and fully erupted first molars, lateral incisors and medial incisors; deciduous first molar, visible but unerupted permanent second molar, canine and premolar teeth. The estimate of nine years minus a few months is confirmed by examination of the progress of epiphysial union in the post-cranial bones which have been preserved. The degree of unification of the pelvic bones in the acetabulum of both sides of the pelvis has been commented upon above.

Specimen No. 21. The age of this male specimen may be estimated as twenty-five plus or minus five years. Cranial sutures are obliterated and their degree of closure cannot be determined. The fully erupted dentition shows slight to moderate wear but with no striking differences in degree of attrition between the anterior and posterior teeth. Epiphysial union of the post-cranial bones is complete.

Specimen No. 72. This pre-adolescent specimen is between nine and ten years of age. The estimation is based upon the degree of epiphysial union of the bones and the eruption of the teeth. The permanent first molar and lateral incisor have erupted. The first and second premolars are about to erupt, but the canines were still developing within their alveoli before the time of death.

Specimen No. 72a. Among these fragments are the youngest specimens of the series. One is that of a child of about five or six years of age. Cranial sutures cannot be observed, but the dentition reveals that the permanent first molars are unerupted. The cusp of this developing tooth can be observed within the alveoli of upper and lower jaws. The age is confirmed by observation of the degree of epiphysial union that has taken place in the post-cranial skeleton.

Specimen No. 49 (Indo-Roman). The age of this male specimen is about thirty years plus or minus five years. The degree of closure of the coronal suture cannot be estimated, but at *pars verticis* on the sagittal suture closure is evident. Closure of sutures at this region is irregular after twenty-nine years of age. Closure is advanced at *pars obelica* and pars *lambdica,* regions which normally complete closure at twenty-three and twenty-nine years respectively. Lambdoid sutures are patent at all portions. The squamous suture of the temporal is commencing closure which would have been completed at the age of thirty-seven. The mastoid-occipital suture is advanced, closure commencing usually at twenty-eight to twenty-nine years. The parieto-mastoid suture is not yet closed, but it commonly does so at the age of thirty-nine. Acceptance of these data for the estimation of age must be tentative, both because of the matter of the reliability of this method and on account of the fragmentary and damaged condition of the specimen itself. Observation of the teeth shows that the third molars have erupted and all but the right mandibular third molar has been lost ante-mortem, the alveoli being completely reabsorbed by fresh bone tissue. Attrition is pronounced for the anterior teeth and moderate for the premolars and molars. Epiphysial union is complete.

SECONDARY LABORATORY DESCRIPTION

Biometrics and Morphology

Measurements and indices of the bones of adult specimens of the Nevasa series are given in Tables I-II, IV-VIII and X. Metrical data for the three immature skeletons—Specimens Nos. 19, 72 and 72a—have been omitted, except in Table X where the measurements and indices of the permanent teeth of all specimens are presented. The methods of measurement used are treated in Appendix C. Although Specimen No. 10 has been described already by Dr. Ehrhardt[18], the present investigators include here data of her report as well as from their own examination of the specimen. Stature estimates for all specimens are based upon the formulae of Pearson[19], Dupertuis and Hadden[20], Trotter and Gleser[21], and Athawale[22], as shown in Table IX. The excessive fragmentation and distortion of the Nevasa specimens are factors which must be contended with in a study of their anthropometry. Restoration methods cannot recreate all of the original features of specimens as badly preserved as the skulls and some of the post-cranial bones of Specimens Nos. 10, 18, and 21. However, while in certain cases it is impossible to attain an accurate restoration for a complete cranium, good restoration of one side might be achieved. Reliable metrical data could then be obtained from this portion. A less difficult problem has been the reconstruction of the better preserved long bones of the post-cranial skeleton. Where a discrepency exists due to damage to one side of the skeleton, a superior state of preservation of the bones of the other side can reveal the pristine nature of the pair. Recognizing the difficulties inherent in the restoration of osseous specimens which have suffered severe damage, the present investigators have

[18] EHRHARDT, S., The Urn Burials from Nevasa, *From History to Prehistory at Nevasa, Report on the Excavation and Explorations in and Around Nevasa 1954-56,* 506-522, Poona, 1962.

[19] PEARSON, K., On the Reconstruction of Stature of Prehistoric Races: Mathematical Contributions to the Theory of Evolution, *Philosophical Transactions of the Royal Society of London,* 192.170-244, London, 1889.

[20] DUPERTUIS, C. W., HADDEN, J. A., On the Reconstruction of Stature from Long Bones, *American Journal of Physical Anthropology,* 9.15-54, Philadelphia, 1951.

[21] TROTTER, M., GLESER, G. C., Estimation of Stature from Long Bones of American Whites and Negroes, *American Journal of Physical Anthropology,* 10.4.463-514, Philadelphia, 1952.

[22] ATHAWALE, M. C., Estimation of Height from Lengths of Forearm Bones: a Study of One Hundred Maharashtrian Male Adults of Ages Between Twenty-five and Thirty Years, *American Journal of Physical Anthropology,* 21.2.105-112, Philadelphia, 1964.

presented that reconstruction which they consider after repeated trials to be the most accurate. The restorative materials used for this series are such that future scholars are not prevented from achieving their own interpretations of how particular structures should be reconstructed.

TABLE II: CRANIAL MEASUREMENTS AND INDICES

Specimen No.	10	18	21	49
Sex	F	F	M	M
Measurements (In Millimeter Units Unless Stated Otherwise)				
Maximum Cranial Length	185	174	—	186
Maximum Cranial Breadth	134	132	—	125
Basion-Bregma Height	134	—	—	—
Auricular-Bregma Height	114	115	—	110
Auricular-Vertex Height	—	123	—	115
Minimum Frontal Diameter	111	92	—	89
Bizygomatic Diameter	125	—	—	122
Bimastoid Diameter	—	126	—	119
Biasterion Diameter	95	106	—	104
Menton-Nasion Height	116	111	105	112
Prosthion-Nasion Height	67	60	64	64
Prosthion-Subnasale Height	21	20	16	22
Nasal Height	47	44	48	46
Nasal Breadth	24	—	25	24
Orbital Height—R	32	30	35	32
L	—	—	—	32
Orbital Breadth—R	40	39	—	35
L	—	—	—	35
Interorbital Breadth	—	19	—	—
Biorbital Breadth	—	91	103	94
External Palate Length	64	64	58	47
External Palate Breadth	—	—	65	64
Internal Palate Length	—	63	54	45
Internal Palate Breadth	23	—	44	39
Depth of Palate at RM2	14	18	11	14
Molar Tooth Row Length—R	43	—	26	—
L	43	25	—	—

Table II (Continued)

Premolar-Molar Tooth Row Length—R	32	—	38	—
L	31	38	—	—
External Palate Arc	164	—	155	138
Transverse Arc	299	295	—	295
Nasion-Opisthion Arc	—	283	—	290
Frontal Curve	—	128	—	130
Frontal Chord	—	109	—	107
Parietal Curve	130.00	134.00	—	143.00
Parietal Chord	119.00	116.00	—	120.00
Maximum Circumference Above Supraorbital Tori	—	494.00	—	518.00
Upper Facial Angle (Degrees)	—	75.00	—	93.00
Nasal Profile Angle (Degrees)	—	79.00	—	91.00
Alveolar Profile Angle (Degrees)	—	63.00	—	101.00
Cranial Quadrilateral (Degrees)	—	95.00	—	107.00
Indices				
Cranial Length—Breadth	72.43	75.86	—	67.21
Basion—Bregma Height—Length	72.43	—	—	—
Auricular—Bregma Height—Length	61.62	66.09	—	59.14
Auricular—Vertex Height—Length	—	70.69	—	61.83
Basion—Bregma Height—Breadth	100.00	—	—	—
Auricular—Bregma Height—Breadth	85.07	87.12	—	88.00
Auricular—Vertex Height—Breadth	—	93.18	—	92.00
Cranial Module	114.33	—	—	—
Total Facial	92.80	—	—	91.80
Upper Facial	53.60	—	—	57.14
Nasal	51.06	—	52.08	52.17
Orbital—R	80.00	76.92	—	91.43
External Palate	—	—	89.23	73.44
Internal Palate	—	—	81.48	110.26

TABLE III: ESTIMATION OF CRANIAL CAPACITY

(Formulæ of Lee & Pearson, 1901)

Specimen No.	10	18	21	49
Sex	F	F	M	M
Height Measurement				
Basion-Bregma	1330.21	—	—	—
Auricular	1346.17	1286.89	—	1301.31
Mean	1338.19	—	—	—

TABLE IV: MANDIBULAR MEASUREMENTS AND INDICES

Specimen No.	10	18	21	49
Sex	F	F	M	M
Measurements				
Condylo-Smyphysial Length	105.00	106.00	—	105.00
Pogonion-Bigonial Length	—	71.00	82.00	77.00
Bigonial Diameter	102.00	102.00	99.00	90.00
Bicondylar Diameter	94.00	110.00	—	112.00
Corpus Length—R	—	85.00	—	84.00
L	—	83.00	92.00	89.00
Molar Tooth Row Length—R	30.00	31.00	27.00	28.00
L	31.00	30.00	30.00	—
Premolar-Molar Tooth Row Length—R	45.00	37.00	42.00	40.00
L	47.00	36.00	43.00	—
Ascending Ramus Height—R	—	55.00	—	63.00
Ascending Ramus Maximum Breadth—R	—	39.00	38.00	39.00
L	42.00	—	—	40.00
Ascending Ramus Minimum Breadth—R	34.00	32.00	—	29.00
L	—	—	—	30.00
Symphysial Height	31.00	32.00	35.00	32.00
Bimental Diameter	20.00	33.00	31.00	30.00

Table IV (Continued)

Mental Foramen Diameter—R (Right to left foramen)	49.00	44.00	47.00	45.00
Chin Angle (Degrees)	78.00	87.00	64.50	65.00
Mento-Basal Angle (Degrees)	72.00	78.00	63.00	56.00
Antero-Basal Angle (Degrees)	87.00	80.50	87.50	81.50
Basal Angle (Degrees)	6.00	9.00	1.50	8.50
Postero-Basal Angle (Degrees)	127.00	132.00	113.00	119.50
Ramus Angle (Degrees)	59.00	52.00	68.00	71.00
Condylo-Coronoid Angle (Degrees)	18.00	17.00	7.50	1.50
Indices				
Mandibular	110.53	104.76	—	93.75
Zygo-Gonial	81.60	—	—	73.77
Fronto-Gonial	108.82	90.20	—	98.89

TABLE V: VERTEBRAL MEASUREMENTS AND LUMBAR INDEX FOR SPECIMEN NO. 49 (INDO-ROMAN)

Measurement		Vertical Ventral	Vertical Dorsal	Cranial Transverse	Caudal Transverse	Cranial Sagittal	Caudal Sagittal	Sagittal Diameter of the Foramen	Transverse Diameter of the Foramen
Vertebra No.									
Cervical	1	14	—	—	—	—	—	28	24
	2	20	—	9	17	11	16	18	22
	3	12	11	20	20	16	16	13	21
	4	12	11	22	18	15	15	13	22
	5	12	12	22	20	14	15	14	22
	6	12	14	25	25	14	14	15	23
	7	15	16	27	27	14	14	16	23
Thoracic	1	17	18	26	29	15	15	19	20
	2	19	18	27	28	15	17	18	20
	3	19	19	28	27	18	20	20	20
	4	—	—	—	—	—	—	20	20
	5	18	19	26	27	22	22	20	20

Table V (Continued)

	6	20	20	27	27	22	24	20	20
	7	20	21	27	27	24	25	21	19
	8	21	22	27	29	26	27	19	19
	9	22	23	28	31	27	27	19	19
	10	22	25	29	34	29	32	10	19
	11	23	26	34	38	30	30	18	20
	12	26	26	37	40	29	30	20	20
Lumbar	1	26	27	39	42	30	30	21	23
	2	25	28	41	46	30	31	21	25
	3	24	28	45	49	32	31	19	23
	4	25	26	47	50	31	31	18	25
	5	28	23	50	51	32	31	22	18

Lumbar Index = 103.13

TABLE VI: MEASUREMENTS AND INDICES OF THE BONES OF THE TRUNK AND UPPER EXTREMITY

Specimen No.	10	18	21	49
Sex	F	F	M	M
Sternum				
Measurements				
Manubrium Height	—	—	—	46.00
Manubrium Breadth	—	—	—	55.00
Corpus Breadth	—	—	—	35.00
Index				
Manubrium Height-Breadth	—	—	—	83.64
Clavicle				
Measurements				
Maximum Length—R	—	—	—	160.00
L	—	—	—	160.00
Mid-Shaft Diameter, Anterior-Posterior—R	—	—	—	10.00
L	—	—	—	10.00

Table VI (Continued)

Mid-Shaft Diameter, Superior-Inferior—R	—	—	—	12.00
L	—	—	—	12.00
Mid-Shaft Circumference—R	—	—	—	39.00
L	—	—	—	40.00
Minimum Shaft Circumference—R	—	—	—	11.00
L	—	—	—	12.00
Sternal Head Diameter—L	—	—	—	24.00
Acromial Head Diameter—R	—	—	—	23.00
L	—	—	—	22.00
Conoid Tubercle Diameter—R	—	—	—	19.00
L	—	—	—	17.00
Internal Angle of Curvature—R (Degrees)	—	—	—	151.50
L	—	—	—	145.00
External Angle of Curvature—R (Degrees)	—	—	—	154.00
L	—	—	—	150.00
Indices				
Length-Minimum Shaft Circumference—R	—	—	—	6.88
L	—	—	—	7.50
Mid-Shaft—R	—	—	—	83.33
L	—	—	—	83.33
Clavicular-Humeral—R	—	—	—	47.58
L	—	—	—	47.75
Scapula				
Measurements				
Morphological Length—R	—	—	—	104.00
L	—	—	—	106.00
Morphological Breadth—R	—	—	—	153.00
L	—	—	—	153.00
Supra-Spinous Fossa Length—R	—	—	—	48.00
L	—	—	—	48.00
Infra-Spinous Fossa Length—R	—	—	—	115.00
L	—	—	—	115.00

Table VI (Continued)

Axillary Border Length—R	—	—	—	146.00
L	—	—	—	145.00
Vertebral Border Length—R	—	—	—	154.00
L	—	—	—	154.00
Superior Border Length—R	—	—	—	48.00
L	—	—	—	60.00
Corocoid Process Length—R	—	—	—	44.00
L	—	—	—	45.00
Corocoid Process Breadth—R	—	—	—	14.00
L	—	—	—	15.00
Acromion Process Length—R	—	—	—	47.00
L	—	—	—	43.00
Acromion Process Breadth—R	—	—	—	22.00
L	—	—	—	23.00
Glenoid Fossa Height—R	—	32.00	—	36.00
L	—	—	—	35.00
Glenoid Fossa Breadth—R	—	22.00	—	28.00
L	—	23.00	—	27.00
Length-Breadth Angle (Degrees)—R	—	—	—	88.50
L	—	—	—	85.50
Supra-Spinous Angle (Degrees)—R	—	—	—	55.50
L	—	—	—	58.50
Infra-Spinous Angle (Degrees)—R	—	—	—	78.50
L	—	—	—	82.50
Axillo-Spinous Angle (Degrees)—R	—	—	—	48.00
L	—	—	—	46.50
Vertebral Border Angle (Degrees)—R	—	—	—	72.00
L	—	—	—	89.50
Axillo-Glenoid Angle (Degrees)—R	—	—	—	126.00
L	—	—	—	135.50
Indices				
Length-Breadth—R	—	—	—	67.97
L	—	—	—	69.28
Supra-Spinous—R	—	—	—	46.15
L	—	—	—	45.28
Infra-Spinous—R	—	—	—	110.58
L	—	—	—	108.49

Table VI (Continued)

Fossorial—R	—	68.75	—	77.78
L	—	—	—	77.14

Humerus

Measurements

Maximum Length—R	320.00	296.00	317.00	342.00
L	—	—	—	335.00
Bicondylar Length—R	—	295.00	316.00	340.00
L	—	—	—	332.00
Head Diameter, Anterior-Posterior—R	—	36.00	—	39.00
L	—	—	—	39.00
Head Diameter, Superior-Inferior—R	—	36.00	—	43.00
L	—	—	—	42.00
Bicondylar Diameter—R	—	53.00	60.00	60.00
L	—	52.00	—	59.00
Mid-Shaft Diameter, Anterior-Posterior—R	19.00	18.00	23.00	20.00
L	—	17.00	22.00	20.00
Mid-Shaft Diameter, Lateral—R	18.00	17.00	23.00	19.00
L	—	18.00	22.00	17.00
Minimum Shaft Circumference—R	60.00	54.00	69.00	57.00
L	—	53.00	65.00	56.00
Condylo-Diaphysial Angle Angle (Degrees)—R	—	87.00	85.00	89.50
L	—	92.00	—	87.50

Indices

Robusticity—R	11.56	11.83	14.52	11.42
L	—	—	—	11.04
Length-Minimum Shaft Circumference—R	18.73	18.27	21.76	13.14
L	—	—	—	10.75
Humero-Femoral—R	—	69.74	—	75.16
L	—	—	—	73.96

Table VI (Continued)

Radius				
Measurements				
Maximum Length—R	245.00	227.00	—	253.00
L	—	229.00	—	250.00
Physiological Length—R	—	225.00	—	239.00
L	—	228.00	—	236.00
Head Diameter, Anterior-Posterior—R	19.00	19.00	23.00	22.00
L	—	19.00	23.00	21.00
Head Diameter, Lateral—R	20.00	18.00	23.00	21.00
L	—	19.00	22.00	21.00
Mid-Shaft Diameter, Anterior-Posterior—R	14.00	10.00	16.00	12.00
L	14.00	13.00	—	11.00
Mid-Shaft Diameter, Lateral—R	11.00	10.00	14.00	15.00
L	10.00	12.00	—	14.00
Minimum Shaft Circumference—R	42.00	37.00	—	38.00
L	40.00	38.00	—	36.00
Collo-Diaphysial Angle (Degrees)—R	—	168.00	173.00	161.00
L	—	169.00	174.00	167.50
Indices				
Curvature—R	—	39.10	—	27.56
L	—	29.18	—	23.07
Length-Minimum Shaft Circumference—R	17.10	16.29	—	15.01
L	—	16.58	—	10.40
Radio-Humeral—R	76.55	76.69	—	74.41
L	—	—	—	71.34
Ulna				
Measurements				
Maximum Length—R	265.00	245.00	—	274.00
L	—	—	—	272.00
Physiological Length—R	—	243.00	—	246.00
L	—	—	—	245.00

Table VI (Continued)

Olecranon Diameter, Anterior-Posterior—R	23.00	22.00	—	21.00
L	—	22.00	27.00	22.00
Olecranon Diameter, Lateral—R	23.00	20.00	—	24.00
L	—	20.00	24.00	24.00
Olecranon Height—R	22.00	26.00	—	24.00
L	—	25.00	22.00	24.00
Mid-Shaft Diameter, Anterior-Posterior—R	13.00	13.00	14.00	11.00
L	13.00	—	16.00	12.00
Mid-Shaft Diameter, Lateral—R	12.00	10.00	14.00	14.00
L	11.00	—	15.00	13.00
Minimum Shaft Circumference—R	42.00	33.00	45.00	34.00
L	40.00	—	48.00	36.00
Joint Axis Angle (Degrees)—R	—	88.00	—	82.50
L	—	—	106.50	71.50
Indices				
Curvature—R	—	12.57	—	13.60
L	—	—	—	16.50
Length-Minimum Shaft Circumference—R	15.48	13.46	—	12.41
L	—	—	—	16.92
Olecranon—R	—	—	—	4.04
L	—	—	—	4.44
Carpal Bones-Navicular				
Measurements				
Length—R	—	—	—	24.00
L	—	23.00	—	25.00
Breadth—R	—	—	—	15.00
L	—	16.00	—	14.00
Triangular				
Measurements				
Length—R	—	—	—	16.00
L	—	—	—	16.00
Breadth—R	—	—	—	13.00
L	—	—	—	12.00

Table VI (Continued)

Hamate

Measurements

Length—R	—	—	—	23.00
L	—	—	—	23.00
Breadth—R	—	—	—	16.00
L	—	—	—	16.00

Capitate

Measurements

Length—R	24.00	—	—	23.00
L	—	—	—	23.00
Breadth—R	14.00	—	—	18.00

Lunate

Measurements

Length—R	26.00	—	—	18.00
L	—	—	—	17.00
Breadth—R	14.00	—	—	17.00
L	—	—	—	17.00

Greater Multangular

Measurements

Length—R	—	—	—	20.00
L	—	—	—	22.00
Breadth—R	—	—	—	15.00
L	—	—	—	16.00

Lesser Multangular

Measurements

Length—R	—	—	—	17.00
L	—	—	—	17.00
Breadth—R	—	—	—	10.00
L	—	—	—	12.00

Table VI (Continued)

Pisiform				
Measurements				
Length—R	—	—	—	14.00
L	—	—	—	10.00
Breadth—R	—	—	—	15.00
L	—	—	—	9.00
Metacarpal Bones				
Length Measurements				
Metacarpal 1				
R	—	—	—	40.00
L	—	—	—	44.00
Metacarpal 2				
R	—	69.00	—	—
L	—	71.00	—	69.00
Metacarpal 3				
R	—	73.00	—	—
L	—	68.00	—	68.00
Metacarpal 4				
R	—	—	—	56.00
L	—	59.00	—	57.00
Metacarpal 5				
R	—	—	—	51.00
L	—	54.00	—	51.00
Phalanges: Row 1 (Proximal)				
Length Measurements				
Phalanx 1				
R	—	—	—	31.00
L	—	—	—	32.00
Phalanx 2				
R	—	45.00	—	40.00
L	—	43.00	—	—
Phalanx 3				
R	—	40.00	—	44.00
L	—	40.00	—	44.00

Table VI (Continued)

Phalanx 4				
R	—	45.00	—	40.00
L	—	40.00	—	32.00
Phalanx 5				
R	—	—	—	31.00
L	—	—	—	30.00
Phalanges: Row 2 (Middle)				
Length Measurements				
Phalanx 1				
R	—	—	—	30.00
L	—	—	—	28.00
Phalanx 2				
R	—	—	—	30.00
L	—	—	—	30.00
Phalanx 3				
R	—	21.00	—	24.00
L	—	23.00	—	—
Phalanx 4				
R	—	—	—	20.00
L	—	23.00	—	—
Phalanx 5				
R	—	—	—	20.00
L	—	19.00	—	19.00
Phalanges: Row 3 (Distal)				
Length Measurements				
Phalanx 2				
R	—	21.00	—	—
L	—	24.00	—	19.00
Phalanx 3				
R	—	—	—	18.00
L	—	—	—	19.00
Phalanx 4				
R	—	—	—	19.00
L	—	19.00	—	19.00
Phalanx 5				
R	—	—	—	20.00
L	—	16.00	—	20.00

TABLE VII: MEASUREMENTS AND INDICES OF THE BONES OF THE LOWER EXTREMITY

Specimen No.	10	18	21	49
Sex	F	F	M	M
Femur				
Measurements				
Maximum Length—R	—	423.00	—	455.00
L	—	418.00	—	453.00
Bicondylar Length—R	—	410.00	—	436.00
L	—	413.00	—	447.00
Maximum Trochanteric Length—R	—	—	—	434.00
L	—	398.00	—	434.00
Physiological Trochanteric Length—R	—	—	—	424.00
L	—	386.00	—	429.00
Head Diameter, Anterior-Posterior—R	—	—	—	42.00
L	—	41.00	—	42.00
Head Diameter, Superior-Inferior—R	—	—	—	43.00
L	—	42.00	—	43.00
Bicondylar Diameter—R	—	—	—	30.00
L	—	68.00	—	32.00
Sub-Trochanteric Diameter, Anterior-Posterior—R	29.00	24.00	34.00	20.00
L	—	22.00	32.00	28.00
Sub-Trochanteric Diameter, Lateral—R	30.00	27.00	30.00	29.00
L	—	29.00	29.00	29.00
Mid-Shaft Diameter, Anterior-Posterior—R	29.00	23.00	34.00	23.00
L	—	24.00	35.00	27.00
Mid-Shaft Diameter, Lateral—R	22.00	23.00	27.00	23.00
L	—	23.00	28.00	23.00
Mid-Shaft Circumference—R	82.00	73.00	99.00	77.00
L	—	74.00	101.00	82.00
Collo-Diaphysial Angle (Degrees)—R	—	132.00	—	130.50
L	—	132.00	—	141.00
Condylo-Diaphysial Angle (Degrees)—R	—	—	—	77.50
L	—	81.00	—	95.00
Indices				
Platymeric—R	96.67	88.89	113.33	68.97
L	—	75.86	110.34	79.31

Table VII (Continued)

Pilastric—R	131.82	100.00	125.93	100.00
L	—	104.35	125.00	117.39
Robusticity—R	—	11.22	—	10.55
L	—	11.37	—	10.04
Tibia				
Measurements				
Lateral Condylo-Malleolar Length—R	—	—	—	382.00
L	—	347.00	—	382.00
Medial Condylo-Malleolar Length—R	—	—	—	382.00
L	—	348.00	—	378.00
Spino-Malleolar Length—R	—	—	—	388.00
L	—	350.00	—	385.00
Nutrient Foramen Diameter, Anterior-Posterior—R	—	31.00	—	28.00
L	—	28.00	27.00	25.00
Nutrient Foramen Diameter, Lateral—R	—	22.00	—	25.00
L	—	21.00	25.00	25.00
Mid-Shaft Diameter, Anterior-Posterior—R	—	25.00	33.00	23.00
L	—	25.00	34.00	22.00
Mid-Shaft Diameter, Lateral—R	—	18.00	22.00	22.00
L	—	19.00	23.00	21.00
Tuberal Diameter, Anterior-Posterior—R	—	43.00	—	33.00
L	—	38.00	43.00	32.00
Tuberal Diameter, Lateral—R	—	39.00	—	29.00
L	—	38.00	28.00	27.00
Minimum Shaft Circumference—R	—	67.00	87.00	70.00
L	—	69.00	83.00	66.00
Indices				
Platycnemic—R	—	70.97	—	89.29
L	—	75.00	92.59	100.00
Length-Minimum Shaft Circumference—R	—	—	—	18.32
L	—	19.88	—	17.27
Tibio-Femoral—R	—	—	—	87.61
L	—	83.82	—	85.45

Table VII (Continued)

Fibula				
Measurements				
Maximum Length—R	—	—	—	377.00
L	—	332.00	—	—
Mid-Shaft Diameter, Anterior-Posterior—R	—	11.00	17.00	13.00
L	—	11.00	16.00	11.00
Mid-Shaft Diameter, Lateral—R	—	11.00	13.00	13.00
L	—	11.00	14.00	13.00
Minimum Shaft Circumference—R	—	32.00	41.00	32.00
L	—	35.00	41.00	27.00
Indices				
Length-Minimum Shaft Circumference—R	—	—	—	8.48
L	—	10.84	—	—
Patella				
Measurements				
Height—R	—	37.00	—	41.00
L	—	—	—	41.00
Breadth—R	—	37.00	—	39.00
L	—	—	—	38.00
Thickness—R	—	18.00	—	20.00
L	—	—	—	19.00
Tarsal Bones-Talus				
Measurements				
Height—R	—	—	—	55.00
L	—	—	—	41.00
Breadth—R	—	—	—	55.00
L	—	—	—	39.00
Calcaneum				
Measurements				
Length—R	—	—	—	75.00
L	—	—	—	75.00

Table VII (Continued)

Maximum Breadth—R	—	—	—	40.00
L	—	—	—	39.00
Minimum Breadth—R	—	—	—	24.00
L	—	—	—	24.00
Height—R	—	—	—	40.00
L	—	—	—	38.00
Cuboid				
Measurements				
Length—R	—	—	—	35.00
L	—	—	—	36.00
Breadth—R	—	—	—	23.00
L	—	—	—	22.00
Navicular				
Measurements				
Length—R	—	—	—	38.00
L	—	—	—	39.00
Breadth—R	—	—	—	23.00
L	—	—	—	24.00
Cuneiform 1				
Measurements				
Length—R	—	—	—	36.00
L	—	—	—	38.00
Breadth—R	—	—	—	24.00
L	—	—	—	24.00
Cuneiform 2				
Measurements				
Length—L	—	—	—	21.00
Breadth—L	—	—	—	16.00
Cuneiform 3				
Measurements				
Length—L	—	—	—	24.00
Breadth—L	—	—	—	22.00

Table VII (Continued)

Metatarsal Bones				
Length Measurements				
Metatarsal 1				
R	—	—	—	62.00
L	—	—	—	63.00
Metatarsal 2				
R	—	—	—	72.00
L	—	—	—	74.00
Metatarsal 3				
R	—	—	—	66.00
L	—	—	—	67.00
Metatarsal 4				
R	—	—	—	66.00
L	—	—	—	67.00
Metatarsal 5				
R	—	—	—	69.00
L	—	—	—	70.00
Phalanges: Row 1 (Proximal)				
Length Measurements				
Phalanx 1				
L	—	—	—	32.00
Phalanx 2				
R	—	—	—	29.00
L	—	—	—	29.00
Phalanx 3				
R	—	—	—	27.00
L	—	—	—	26.00
Phalanx 4				
R	—	—	—	25.00
L	—	—	—	24.00
Phalanx 5				
R	—	—	—	22.00
L	—	—	—	22.00
Phalanges: Row 2 (Middle)				
Length Measurements				
Phalanx 1				
R	—	—	—	24.00
L	—	—	—	25.00

Table VII (Continued)

Phalanx 2				
L	—	—	—	24.00
Phalanx 3				
L	—	—	—	13.00
Phalanx 4				
L	—	—	—	15.00

TABLE VIII: MEASUREMENTS AND INDICES OF THE BONES OF THE PELVIS

Specimen No.	10	18	21	49
Sex	F	F	M	M
Innominates				
Measurements				
Maximum Height—R	—	185.00	—	131.00
L	—	—	—	131.00
Maximum Breadth—R	—	129.00	—	144.00
L	—	—	—	143.00
Iliac Crest Length—R	—	—	—	153.00
L	—	220.00	—	156.00
Acetabulum Diameter, Superior-Inferior—R	—	—	—	54.00
L	—	—	—	50.00
Sciatic Notch Breadth—R	—	—	—	41.00
L	—	45.00	—	41.00
Distance from Anterior-Superior to Posterior-Inferior Iliac Spines—R	—	—	—	130.00
L	—	—	—	130.00
Sacrum				
Measurements				
Anterior Chord Length-	—	—	—	104.00
Anterior Arc Length	—	—	—	114.00
Anterior Chord Breadth	—	—	—	90.00
Anterior Arc Breadth	—	—	—	82.00

Table VIII (Continued)

Sacral Vertebra 1, Diameter, Anterior-Posterior	—	—	—	26.00
Sacral Vertebra 1, Diameter, Lateral	—	—	—	39.00
Sacral Vertebra 1. Height	—	—	—	28.00
Innominates + Sacrum				
Measurements				
Bicristal Diameter	—	—	—	235.00
Pelvic Inlet Diameter, Anterior-Posterior	—	—	—	110.00
Pelvic Inlet Diameter, Transverse	—	—	—	115.00
Indices				
Innominate Height-Breadth—R	—	143.50	—	93.06
L	—	—	—	93.71
Sacral	—	—	—	86.54
Pelvic Inlet	—	—	—	95.65

TABLE IX: ESTIMATION OF STATURE

Specimen No.	10	18	21	49
Sex	F	F	M	M
Formulae of Pearson, 1889				
Series 1, Formula (a)				
Femur—R	—	155.12	—	166.85
L	—	154.14	—	166.47
Series 2, Formula (b)				
Humerus—R	165.58	152.99	170.31	169.62
L	—	—	—	167 59
Series 3, Formula (c)				
Tibia—R	—	—	—	169.43
L	—	156.39	—	169.43
Series 4, Formula (d)				
Radius—R	—	157.09	—	168.68
L	—	157.75	—	167.70

Table IX (Continued)

Series 5, Formula (e)				
Femur + Tibia—R	—	—	—	168.28
L	—	155.29	—	168.05
Series 6, Formula (g)				
Humerus + Radius—R	161.88	155.05	—	169.79
L	—	—	—	168.06
Series 7, Formula (i)				
Femur + Humerus—R	—	156.66	—	168.51
L	—	—	—	167.20
Series 8, Formula (k)				
Femur + Tibia +				
Humerus + Radius—R	—	154.62	—	167.69
L	—	—	—	169.16
Maximum Estimate	165.58	157.75	—	169.79
Minimum Estimate	161.88	152.99	—	166.47
Mean Estimate	163.74	155.51	—	168.34

Formulae of Dupertuis and Hadden, 1951

Series 1, Formula (a)				
Femur—R	—	159.42	—	170.92
L	—	158.26	—	170.47
Series 2, Formula (b)				
Tibia—R	—	—	—	172.16
L	—	160.47	—	172.16
Series 3, Formula (c)				
Humerus—R	164.98	158.04	167.72	175.14
L	—	—	—	173.06
Series 4, Formula (d)				
Radius—R	168.46	161.49	—	172.75
L	—	162.26	—	171.65
Series 5, Formula (e)				
Femur + Tibia—R	—	—	—	171.83
L	—	159.54	—	171.58
Series 6, Formula (f)				
Humerus + Radius—R	166.82	159.49	—	174.24
L	—	—	—	172.52

Table IX (Continued)

Series 7, Formula (i)				
Femur + Humerus—R	—	—	—	171.65
L	—	—	—	170.87
Series 8, Formula (k)				
Tibia + Humerus + Radius—R	—	158.74	—	172.16
L	—	—	—	171.67
Maximum Estimate	168.46	162.26	—	175.14
Minimum Estimate	164.98	158.04	—	170.47
Mean Estimate	166.76	159.74	—	172.17

Formulae of Trotter and Gleser, 1952

Series 1				
Humerus—R	165.49	157.45	168.09	175.78
L	—	—	—	173.63
Series 2				
Radius—R	171.10	162.52	—	174.64
L	—	163.47	—	173.51
Series 3				
Ulna—R	170.91	162.37	—	175.43
L	—	—	—	174.69
Series 4				
Femur—R	—	158.57	—	169.70
L	—	157.34	—	169.22
Series 5				
Tibia—R	—	162.16	—	174.88
L	—	—	—	174.88
Series 6				
Fibula—R	—	—	—	172.81
L	—	156.88	—	—
Series 7				
Humerus + Femur + Tibia—R	—	160.23	—	172.21
L	—	—	—	171.84
Maximum Estimate	171.10	163.47	—	175.78
Minimum Estimate	165.49	156.88	—	169.22
Mean Estimate	169.16	160.11	—	173.32

Table IX (Continued)

Formulae of Athawale, 1964

Series 1				
Radius—R	160.44	153.05	—	163.73
L	—	154.74	—	163.25
Series 2				
Ulna—R	161.50	153.67	—	164.92
L	—	—	—	162.79
Series 3				
Radius + Ulna—R	158.41	152.13	—	164.11
L	—	—	—	164.29
Maximum Estimate	161.49	154.74	—	164.92
Minimum Estimate	158.41	152.13	—	162.79
Mean Estimate	160.11	153.40	—	163.35

Summary of Means

Formulae of Pearson, 1899	163.74	155.51	170.31	168.34
Formulae of Dupertuis & Hadden, 1951	166.76	159.74	167.72	172.17
Formulae of Trotter and Gleser, 1952	169.16	160.11	168.08	173.32
Formulae of Athawale, Unpublished MSS. 1964	160.11	153.40	—	163.35
Totals	164.93	157.19	168.70	169.30

TABLE X: DENTAL MEASUREMENTS AND INDICES

Specimen No.	10	18	19	21	72	72a	49
Sex	F	F	?	M	?	?	M
Maxilla							
Third Molar							
MD—R	9.1	—	—	7.5	—	—	—
L	8.5	8.2	—	7.6	—	—	—

Table X (Continued)

BL —R	10.3	—	—	13.5	—	—	—
L	10.6	9.5	—	10.9	—	—	—
I —R	88.3	—	—	55.5	—	—	—
L	80.1	86.3	—	69.7	—	—	—
Second Molar							
MD—R	9.9	—	10.3	8.9	—	—	8.7
L	9.6	8.5	10.3	—	—	—	8.9
BL —R	12.7	—	10.8	11.7	—	—	9.7
L	10.9	10.0	10.4	—	—	—	9.8
I —R	77.9	—	95.3	76.0	—	—	89.6
L	88.0	85.0	99.0	—	—	—	90.8
First Molar							
MD—R	11.0	11.3	11.5	9.5	10.8	11.9	—
L	11.0	9.9	11.9	10.1	—	11.5	—
BL —R	11.5	10.8	11.6	11.9	11.5	11.3	—
L	11.5	10.6	11.0	11.4	—	11.5	—
I —R	95.6	95.3	99.1	79.8	93.9	105.3	—
L	95.6	93.4	108.1	88.6	—	100.0	—
Second Premolar							
MD—R	6.8	7.8	—	6.8	—	—	5.8
L	6.9	6.9	—	6.3	—	—	—
BL —R	8.9	8.8	—	9.1	—	—	8.3
L	8.5	8.5	—	9.1	—	—	—
I —R	76.4	88.6	—	75.8	—	—	69.8
L	81.1	81.1	—	69.2	—	—	—
First Premolar							
MD—R	6.8	6.6	—	5.8	—	—	—
L	7.0	6.8	—	6.0	—	—	6.7
BL —R	9.5	8.5	—	8.9	—	—	—
L	9.3	8.5	—	9.0	—	—	8.4
I —R	71.5	77.6	—	65.1	—	—	—
L	75.2	80.0	—	66.6	—	—	79.7

Table X (Continued)

Canine							
MD—R	7.9	7.5	—	6.2	—	—	7.1
L	8.5	9.0	—	7.0	—	—	7.2
LL —R	8.8	7.7	—	8.0	—	—	7.9
L	8.0	7.5	—	9.0	—	—	7.9
I —R	89.7	97.4	—	77.5	—	—	89.8
L	106.2	120.0	—	77.7	—	—	91.1
Lateral Incisor							
MD—R	7.9	7.0	7.5	—	—	—	5.7
L	8.8	—	7.8	6.5	7.9	—	6.6
LL —R	7.0	5.0	6.9	—	—	—	6.5
L	6.8	—	6.9	6.8	5.8	—	6.0
I —R	112.8	140.0	108.7	—	—	—	87.6
L	129.4	—	113.0	95.5	136.2	—	108.3
Central Incisor							
MD—R	9.2	9.0	9.3	6.4	—	—	7.8
L	9.0	9.0	9.0	7.3	—	—	7.8
LL —R	7.4	6.6	7.2	5.8	—	—	6.5
L	7.4	6.8	7.1	8.0	—	—	6.6
I —R	124.3	136.3	129.1	110.3	—	—	120.0
L	121.6	132.3	126.7	91.2	—	—	118.1
Mandible							
Third Molar							
MD—R	—	10.0	—	10.8	—	—	8.9
L	11.0	9.5	—	—	—	—	—
BL —R	—	9.0	—	10.6	—	—	9.8
L	—	9.6	—	10.5	—	—	—
I —R	—	111.1	—	110.8	—	—	90.8
L	—	98.96	—	—	—	—	—
Second Molar							
MD—R	11.5	10.4	10.0	—	—	—	10.0
L	10.8	9.6	10.7	—	—	—	9.9
BL —R	10.2	9.4	9.4	—	—	—	8.7
L	10.7	9.0	10.1	—	—	—	9.0
I —R	112.7	110.6	106.3	—	—	—	113.6
L	100.9	106.6	102.8	—	—	—	110.0

Table X (Continued)

First Molar							
MD—R	11.0	10.0	10.9	—	6.9	11.5	11.3
L	11.5	10.0	11.0	—	—	12.3	11.0
BL —R	10.8	9.5	11.0	—	9.6	10.5	10.7
L	10.8	9.9	10.8	—	—	10.5	10.7
I —R	101.8	107.3	99.0	—	71.8	109.5	105.6
L	106.4	101.0	101.8	—	—	117.1	102.8
Second Premolar							
MD—R	7.9	6.5	—	7.4	—	—	6.0
L	7.5	7.5	—	6.9	—	—	6.5
BL —R	8.8	7.5	—	8.0	—	—	7.5
L	8.0	6.9	—	9.0	—	—	7.5
I —R	89.7	94.2	—	92.5	—	—	80.0
L	93.7	108.7	—	76.6	—	—	86.7
First Premolar							
MD—R	7.8	7.5	—	7.9	—	—	5.7
L	7.8	7.6	—	6.5	—	—	5.9
BL —R	8.5	7.8	—	7.9	—	—	6.8
L	8.4	6.9	—	9.7	—	—	—
I —R	91.7	96.1	—	100.0	—	—	83.8
L	92.8	110.1	—	67.0	—	—	—
Canine							
MD—R	6.8	7.5	—	6.8	—	—	6.6
L	7.6	7.0	—	6.9	—	—	6.2
LL —R	8.0	7.7	—	9.0	—	—	7.6
L	7.8	6.9	—	8.5	—	—	7.1
I —R	85.0	97.4	—	75.5	—	—	86.8
L	97.4	101.4	—	81.1	—	—	87.3
Lateral Incisor							
MD—R	6.5	5.8	6.9	5.4	—	—	5.0
L	6.5	6.0	6.9	—	—	—	4.7
LL —R	6.5	5.5	6.5	6.5	—	—	6.1
L	6.0	5.0	6.7	—	—	—	6.0
I —R	100.0	105.4	106.1	83.0	—	—	81.9
L	108.3	107.1	102.9	—	—	—	78.3

Table X (Continued)

Central Incisor							
MD—R	6.0	5.4	—	4.4	—	—	4.0
L	6.1	5.8	6.5	3.9	—	—	5.0
LL —R	5.8	5.2	—	6.4	—	—	5.5
L	5.8	5.5	6.5	6.8	—	—	5.6
I —R	103.4	103.8	—	68.7	—	—	72.7
L	105.1	105.4	100.0	57.3	—	—	89.2

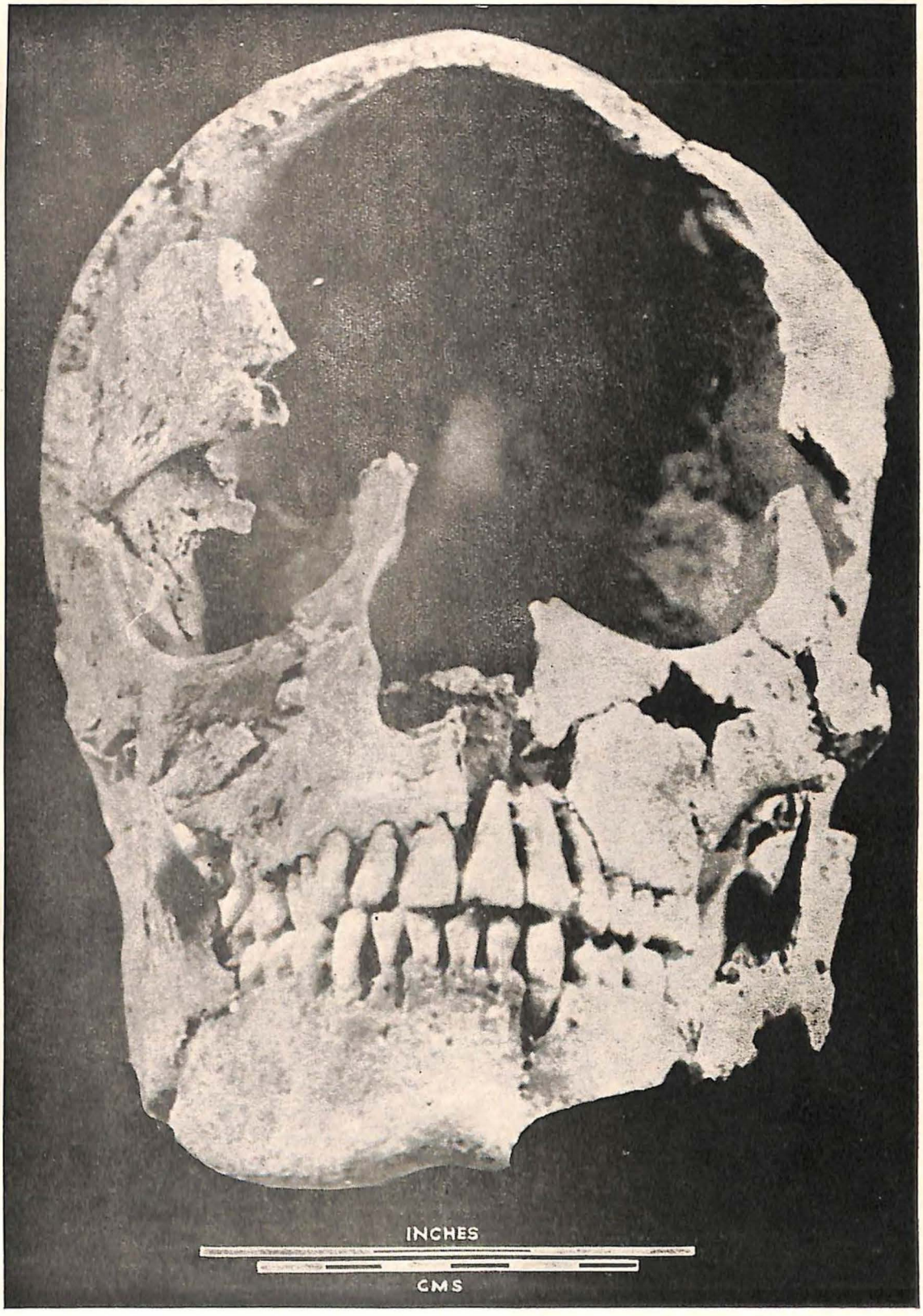
Key:
MD = Mesio-Distal Diameter.
BL = Bucco-Lingual Diameter.
LL = Labio-Lingual Diameter.
I = Crown Index.

Specimen No. 10.

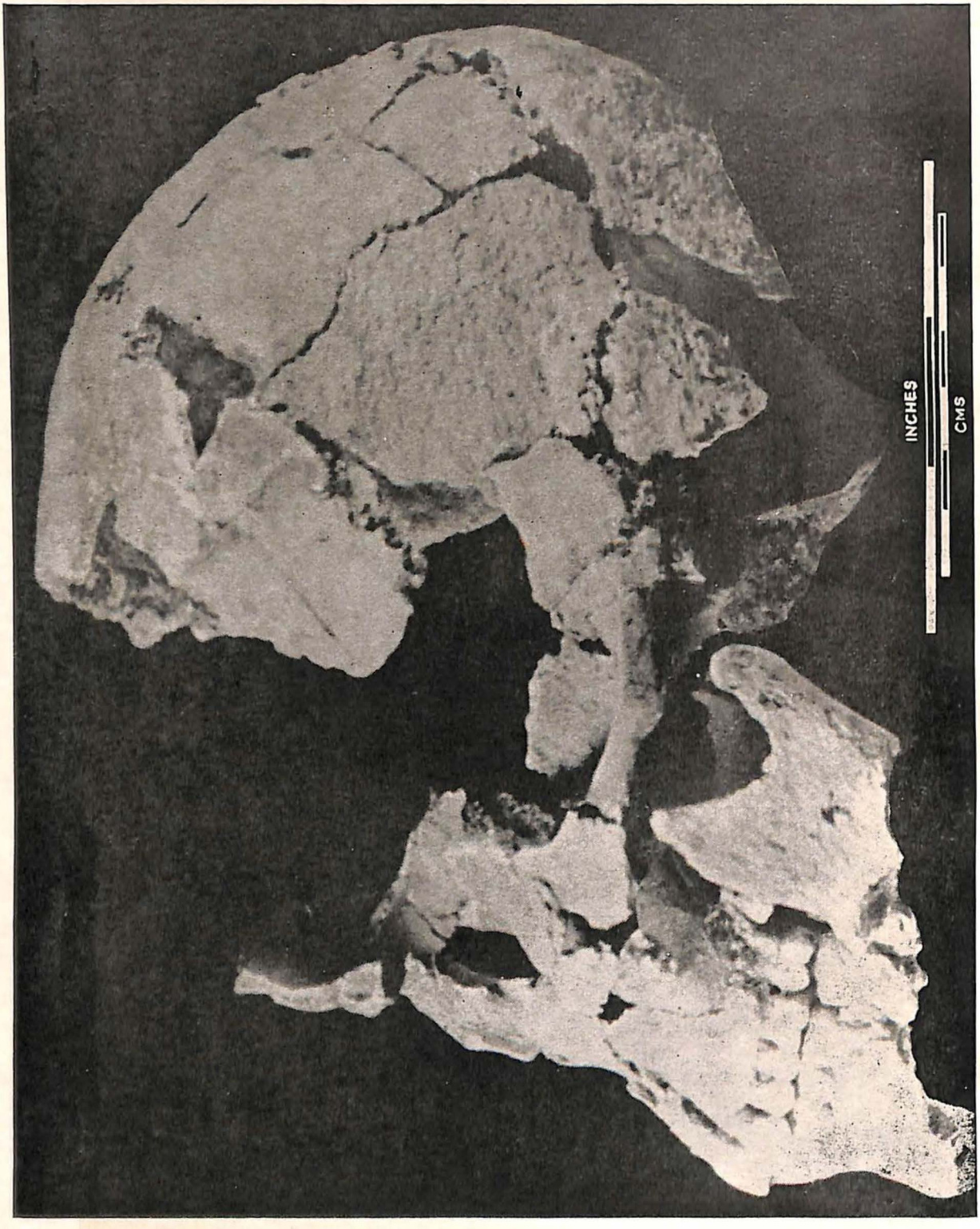
Calvaria (Photographs 3-5). The present investigators concur on the whole with the description of this specimen by Dr. Ehrhardt, but include here some additional observations from their own examinations of the specimen. On the basis of a subsidiary measurement for Cranial Length, the Cranial Length-Breadth Index falls within the dolichocranic group. The height of the vault when measured from both *basion* and *porion* to *bregma* is orthocranic in its relation to Cranial Length. However, in ratios of these height measurements to Cranial Breadth, the indices are acrocranic for Basion-Bregma Height and metriocranic for Auricular-Bregma Height. This difference is surely a consequence of post-mortem distortion of the vault. Cranial capacity is aristencranic when calculated for both Basion-Bregma Height and Auricular-Bregma Height.

Ehrhardt[23] maintains that while nothing can be said of the curvature of the frontal bones, the forehead region is vertical. The limited amount of frontal bone preserved makes such a claim a bit rash. The presence of slight development of the torus, which she notes, does not seem certain on the basis of the remains themselves, and the reduced development of other muscular attachements on the skull. Similarly, glabella may have been small, but such an opinion is highly speculative from the evidence at hand. More certain observations are possible in the examination of the superior aspect of the vault. The degree of sagittal elevation is moderate and the parietal eminences are prominent. Parietal foramina are not observable. The temporal lines, which are low on the frontal bone, are essentially absent on the parietals. The temporal region is full, *eurion* occurring at a point

[23] EHRHARDT, S., The Urn Burials from Nevasa, *From History to Prehistory at Nevasa: Report on the Excavations and Explorations in and Around Nevasa 1954-56*, 506-522, Poona, 1962.



PHOTOGRAPH 3
Specimen No. 10. Cranium. Norma Frontalis.



PHOTOGRAPH 4
Specimen No. 10. Cranium. Norma Lateralis.

just superior to the squamosal sutures. Supramastoid crests are low. The occipital region shows a pronounced degree of curvature but the nuchal tori are low and mound-shaped with ill-defined crests. *Inion* is absent. While post-coronal depression is slight, lambdoid depression is absent. The little that can be observed of undamaged sutural patterns of the vault suggest that the serrations are simple to sub-medium in their degree of complexity. Wormian bones are not present.

Face. The absence of *nasion* has necessitated the estimation of a "subsidiary measurement" for the determination of Total Facial Height and Upper Facial Height. The index of the former falls within the leptoprosopic class. The mesene feature of the upper portion of the face indicates that facial breadth develops in this region, and Ehrhardt has confirmed this by noting the high Jugo-Frontal and Fronto-Biorbital Indices. The Nasal Index given by the present researchers is tentative, for there is damage to this portion of the face, but a chamaerrhinic condition would not be unexpected since Specimen No. 21 demonstrates that broad short noses are present in the Nevasa series. The orbits are mesoconch.

Morphological analysis of the face indicates that these orbits are small and have sharp and even borders. Their conformation is square, but post-mortem distortion may have altered their pristine condition. Sub-nasal fossae are shallow. The zygomae are of moderate size and project neither laterally nor anteriorly to a remarkable degree. The zygomatic process of the temporal is also moderately developed. The auditory meatus is elliptical in form and adjacent to it is a tympanic plate of moderate proportion. As already noted, the nasal structure is low but the root of the nose appears to be of medium elevation. Nasal sills and sub-nasal grooves are dull and barely traceable. The palate is hyperbolic in form and of medium height. The face is prognathous both with and without the mandible in articulation, and alveolar prognathism is markedly pronounced. Lack of a true *nasion* has precluded the metrical evaluation of these facial angles.

Mandible. For a female specimen the brachyeurymandibular index is unusual. As Ehrhardt has suggested, the facial form of this specimen may have been one in which the inferior portions were not pointed but, rather, somewhat broad, as supported also by the lateral eversion of the rami. The chin is of medium size and is median in its form. The degree of chin projection is pronounced, and the chin is sharp and jutting. Genial tubercles and the mylo-hyoid ridge preserved on the right side of the mandible are weakly developed. Mandibular alveolar prognathism is moderately developed.

Dentition. The molars and premolars are of moderate size, the first molars being the largest in both upper and lower jaws; the third molars are the

smallest of the series. The occlusal surfaces of the third molars are round, but the more sharply defined borders of the lower second molars mark their transition to the rectangular forms of the first molars and the premolars. The canines have triangular occlusal surfaces.

The cusp and groove pattern for the mandibular molars is +4. The maxillary molars exhibit considerable variation in their cusp numbers. The right second molar has four large cusps, and a prominent paramolar tubercle (photograph 15). This latter structure is not a feature of the left second molar, but the other accessory cusps are present. The third molars are tricuspid, but the right third molar also supports a small paramolar tubercle. These accessory cusps are situated on the mesio-buccal surface. Since their apices do not descend to the plane of the occlusal surfaces of these molars, they are unabraded. Crenulation is marked by simple patterns on the third molars of both jaws. The upper central and lateral incisors show shovel-shaped lingual contours, but only to a moderate degree.

The degree of dental attrition is slight for all of the teeth and negligible for the premolars and second molars. The third molars are still in the process of eruption and so exhibit no wear at all. The direction of attrition is buccal for the molar teeth. Occlusion of all the teeth is normal and a bite pattern of the edge-to-edge type is observed.

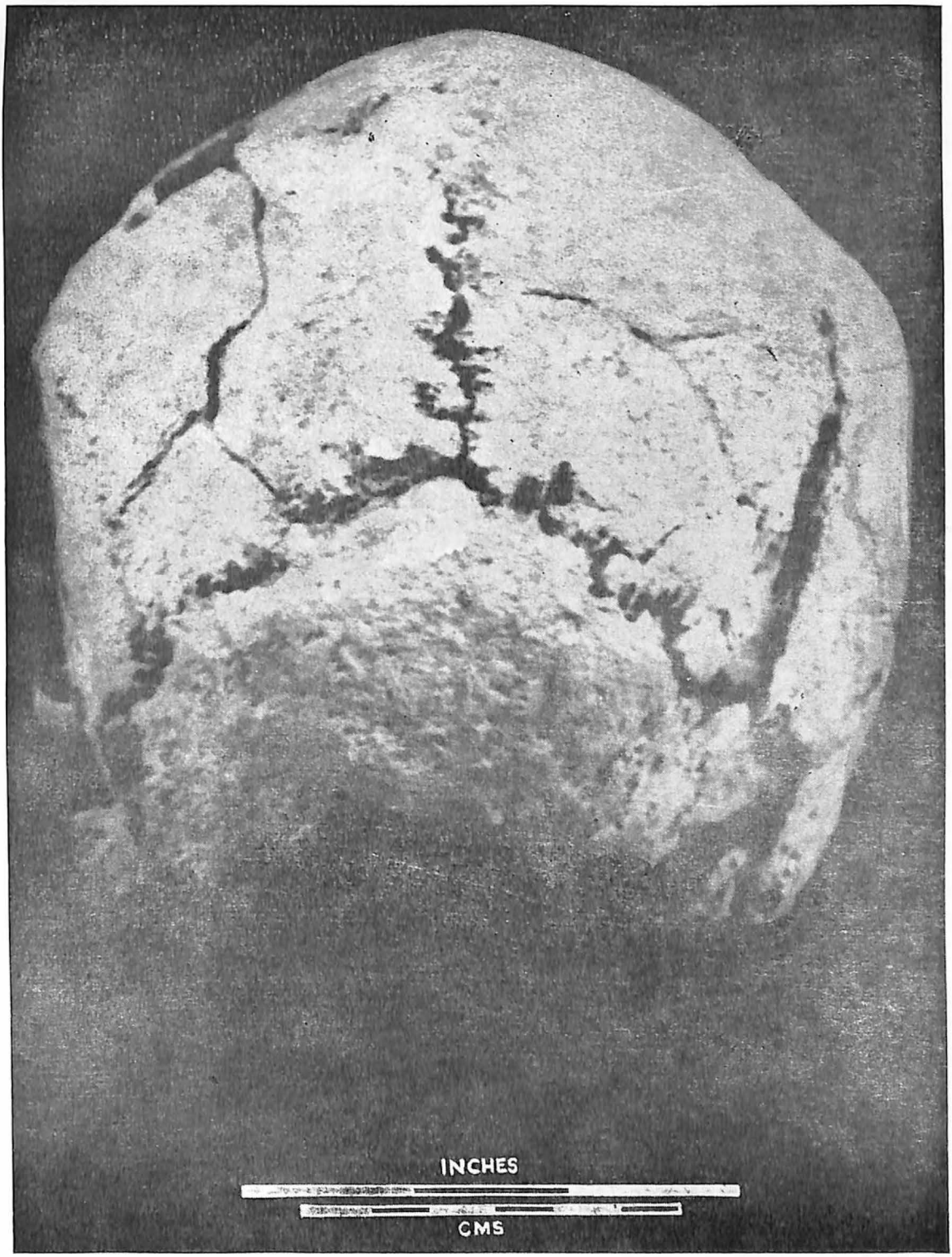
This dentition appears to be free from pathological changes. Crowding is absent and there is no evidence of caries or other dental diseases.

Upper Extremity. The humerus is not of great length. In its transverse section it is oval and its muscular attachments are reduced in size. The radius and ulna are similarly unmarked by prominent crests and borders.

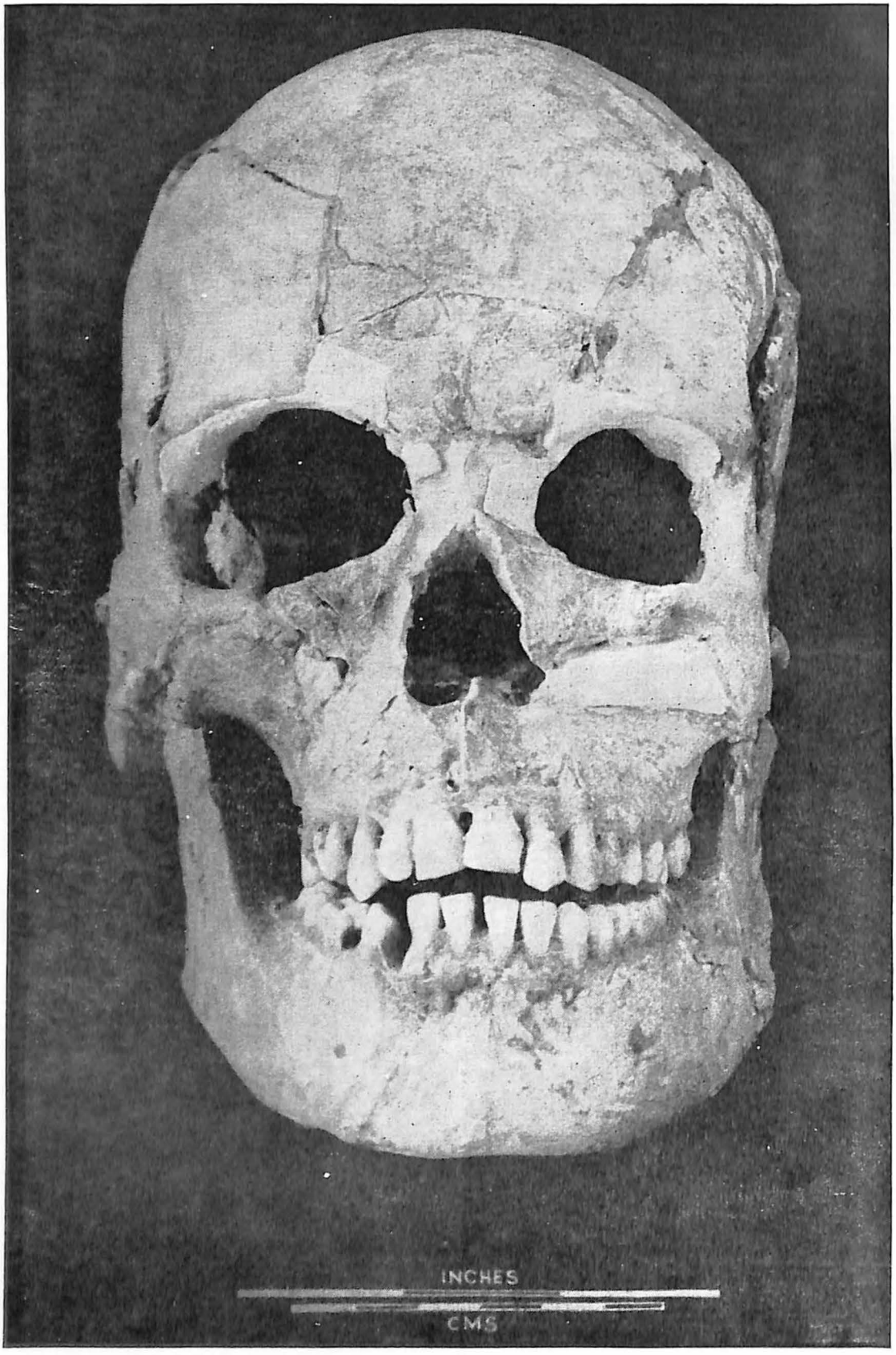
Lower Extremity. The femur is eurymeric. Its Pilastric Index is the highest of the four specimens examined in the series. Robusticity is not a feature of the femur, and the hypotrochanteric crest and fossa are absent. The mid-shaft transverse section is oval in form. The sub-medium *linia aspera* supports a low pilaster.

Specimen No. 18

Calvaria (Photographs 6-9). The Cranial Length-Breadth Index lies just within the mesocranic group and near the dolicho—cranic—mesocranic border (74.9–75.0). Thus the specimen's cranial proportions are close to those of Specimen No. 10. The Length-Breadth Indices, taken from the *poria* to either *bregma* or *vertex,* place Specimen No. 18 well inside the hypsicranic category. The Height-Breadth Indices are also different, the higher ratios of this latter specimen falling into the class of acrocrany.

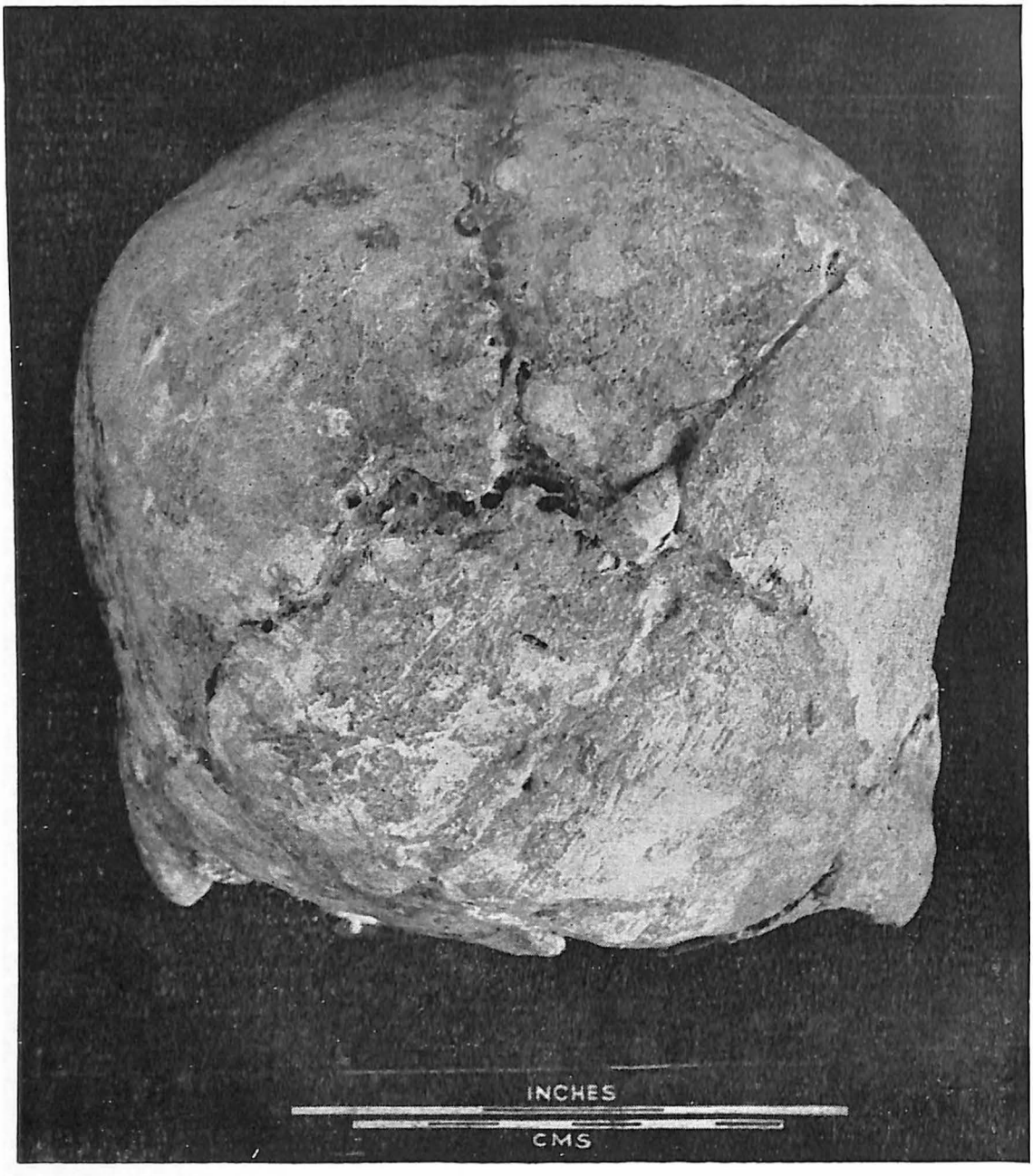


PHOTOGRAPH 5
Specimen No. 10. Cranium. Norma Occipitalis.



PHOTOGRAPH 6
Specimen No. 18. Cranium. Norma Frontalis.

PHOTOGRAPH 7
Specimen No. 18. Cranium. Norma Lateralis.



PHOTOGRAPH 8
Specimen No. 18. Cranium. Norma Occipitalis.

Cranial capacity is cuencephalic when calculated for Auricular Height. The cranial form is rhomboid. The median frontal torus is low and glabella is very small. The prominence of the frontal eminences lends the effect of a bulbous frontal bone to the gently sloping frontal region. A slight median crest is also observable on this bone. Parietal elevation is difficult to determine due to post-mortem distortion of the sagittal region. The eminences are moderately developed and the post-coronal depression is slight. Parietal foramina are not observable. Distortion of the temporal region precludes an estimation of its degree of lateral fullness, but this feature was probably slight in its development. The temporal lines and supromastoid crests are low, the former barely discernable on the parietal bones. Robust muscular attachments are similarly reduced in the occipital region, and *inion* is absent. The degree of occipital curvature is moderate. Lambdoid flattening is of medium degree. The mastoid processes are very small, their crests being represented as nodules. Serration patterns of the sutures are very simple in the few cases where they can be observed. Post-mortem damage and attempts to reconstruct the specimens in the field both served to obscure this set of features.

Face. Damage to the zygomae and nasal bones does not permit the formulation of facial indices, save for the ratio of the height and breadth of the right orbit which is mesoconch. The shape of the orbit is oblong, but the left orbit is too distorted for accurate observation of this feature. The right suborbital fossa is shallow. The small malars show little lateral projection and no anterior projection, but damage to this part of the face has been severe. The left zygomatic process of the temporal is small. The left auditory meatus is round and very reduced in size. The nasal profile is observable only as a small portion of the nasal root: this is concave. Nasion depression is small and the breadth of the nasal root could not have been very large. The size of the spine is pronounced. Subnasal grooves are moderately developed. Alveolar prognathism is obvious, but post-mortem distortion prevents the accurate assessment of the degree of total and mid-facial prognathism. Hence the values obtained from measurement of the Upper Facial Angle and the Nasal Profile Angle, which would mark this specimen as prognatheous, do not represent the normal form of the face. For the measurement of the Alveolar Profile Angle, however, the values are more reliable. The alveolar portion of the face is hyperprognatheous (Dioptrographic Diagram 2). The palate is hyperbolic with a very high alveolar border and a medium-sized and mound-shaped palatine torus.

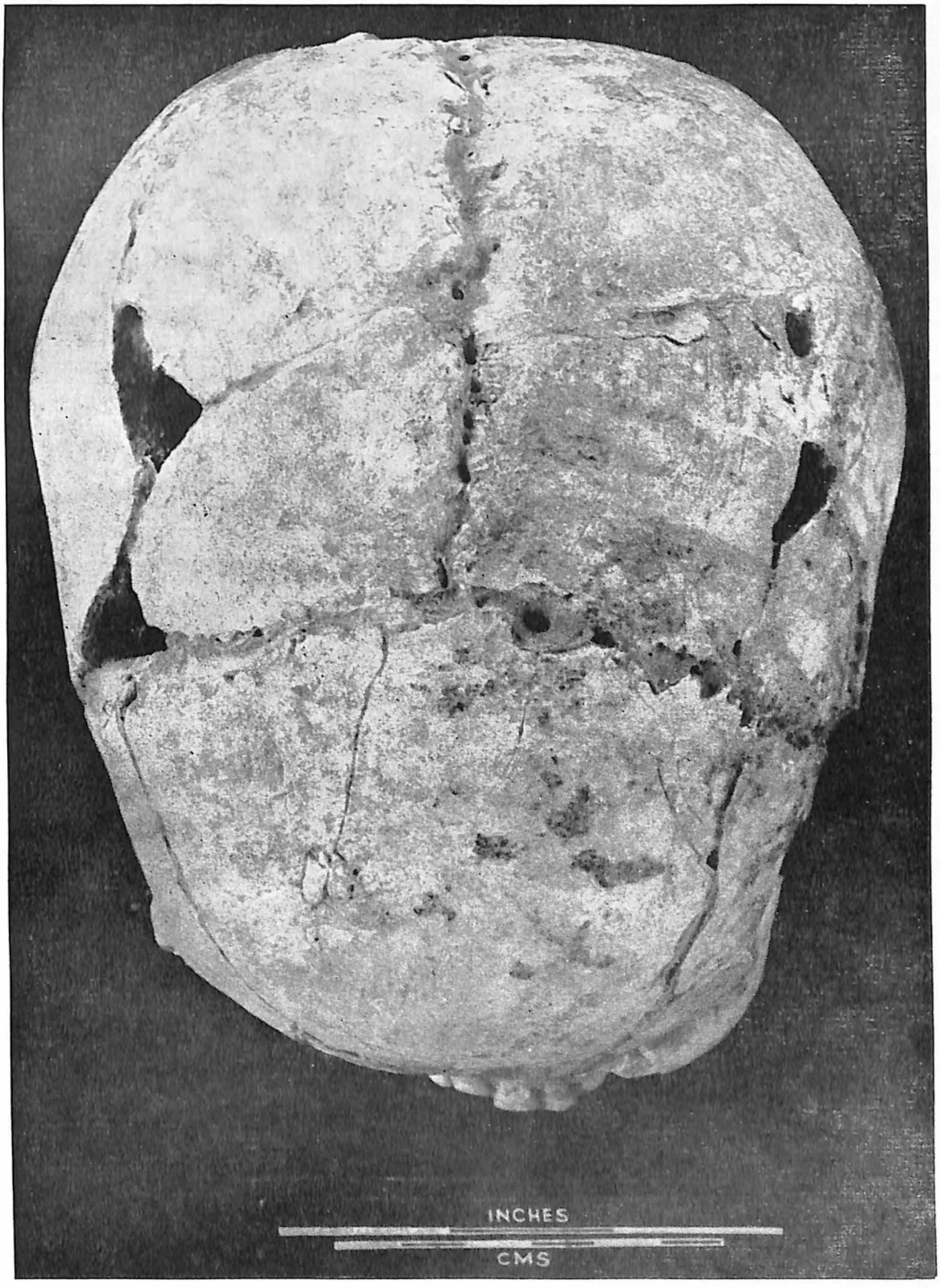
Mandible. The mandible is medium in its size and its muscular attachments are weakly developed. The large projecting chin is of a median type.

Gonial angle eversion is small to medium. The rami are narrow and the corocoid process exceeds in height the mandibular condyle. Digastric fossae, pterygoid attachments, mylo-hyoid crests and genial tubercles are all small and similar in their degrees of development to the mandibular structure of many female specimens.

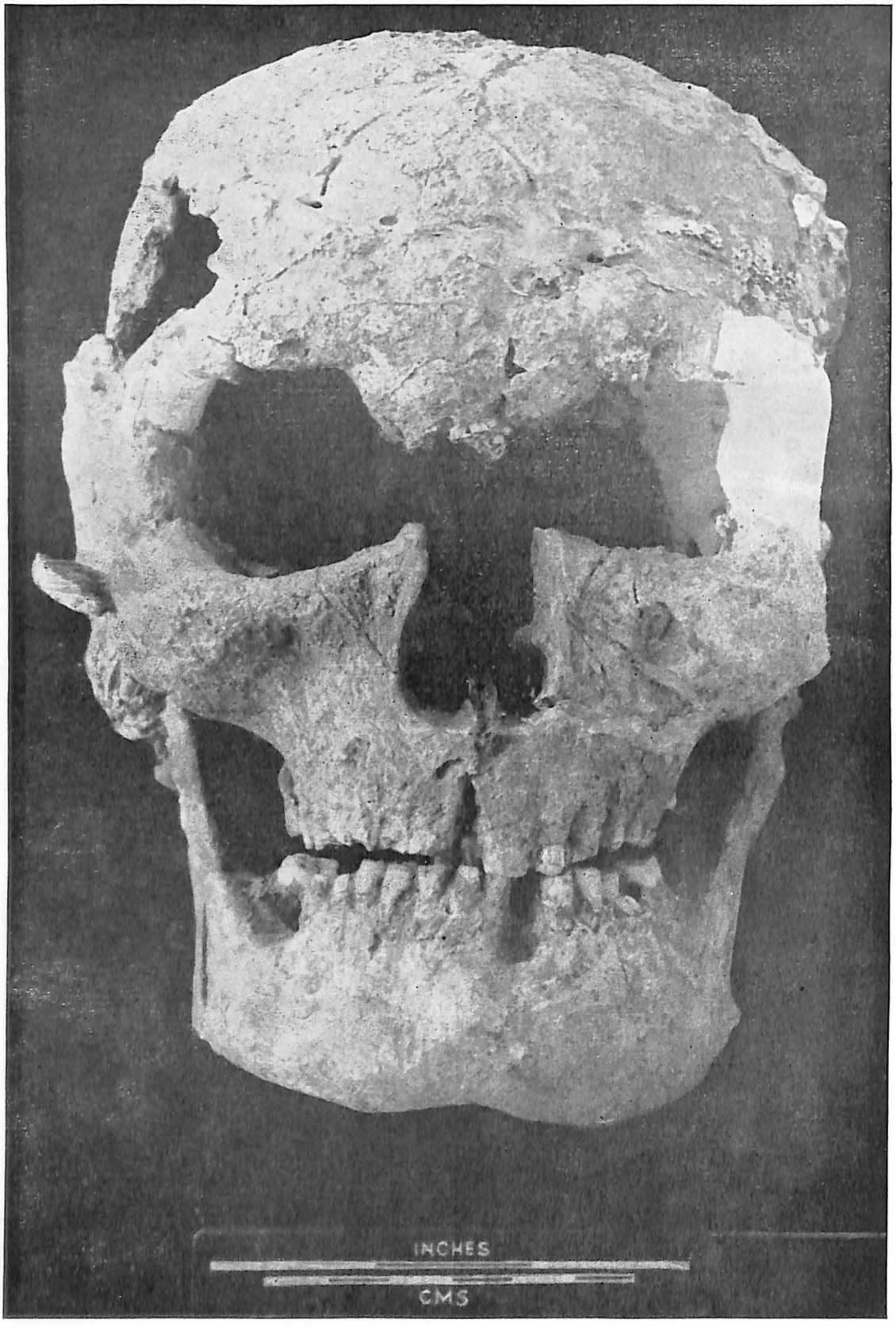
Dentition. The sizes of the molars and premolars of this specimen are smaller than the corresponding teeth of Specimen No. 10. In the maxilla the first molar is the largest of the molar row, the third the smallest. But in the mandible the second molar is the largest of the series, the first and second molars being nearly equal in size. The occlusal surfaces of the second and third maxillary molars have a triangular form, as does the third molar of the mandible, whereas the other molars of both jaws are square in their conformation. The maxillary second and third molars are of the +4 pattern, save for the tricuspid right third molar which is of the Y3 pattern. There is slight shovelling of the incisor teeth of both jaws and of these the central incisors bear small lingual tubercles. The degree of attrition is slight for all of the teeth. There is somewhat greater wear on the occlusal surfaces of the first molars of the maxilla and mandible. The direction of attrition is lingual for these first molars, but buccal for the others. Crowding of teeth is not present. There is a large carious aperture on the mesial surface of the lower right second premolar, but this is unaccompanied by any pathological alteration in the bone of its alveolus. Occlusion of the two jaws shows a slight over-bite condition. Occlusion is normal save for the mandibular third molars which are linguo-verted.

Upper Extremity. The upper limb bones are the smallest in size for the Nevasa series. The humerus reveals a pronounced bicipital groove and marked collar tuberosities. The transverse section of the shaft is oval in form and the total shaft is prominently bowed. The olecranon fossa is small, deep, and unperforated. Pronounced cresting of muscular attachments is also a feature of the ulna, particularly along the interosseous border. The radius has a low deltoid tuberosity, a prominently bowed shaft, and a small spherical head.

Lower Extremity. Since the left femur has undergone minor shaft damage, the Platymeric Index for this bone seems the more trustworthy guide to the natural condition, whereas the right femur has suffered severe crushing. The index of the left femur falls within the class of platymeria, whereas the right is eurymeric. Crests for muscular attachments of both femora are low. The *linia aspera* is very weakly defined. At the point where the *linia aspera* bifurcates at the distal extremity the medial and lateral crests are barely discernable. There is a pronounced medial retroversion of the superior aspect of the



PHOTOGRAPH 9
Specimen No. 18. Cranium. Norma Verticalis.



PHOTOGRAPH 10
Specimen No. 21. Cranium. Norma Frontalis.

greater trochanter and the entire shaft is bowed. The proximal end is very massive and somewhat more robust than the distal end. The hypotrochanteric crest is sub-medium in its development and its fossa is moderately developed. The transverse section of the shaft is round, although crushing of the bone is a factor here. The pilastric and robusticity indices bear out these characteristics of shaft conformation and type of muscular relief. The tibia are eurycnemic with a mid-shaft transverse section that is prismatic. While there are well defined crests along the anterior border and lateral border of each shaft, the tibial tuberosity is small and low. The tibial head shows moderate retroversion. Squatting facets are present at the distal extremity. The fluting of the fibula is sub-medium in development and quite uniform along the length of the shaft.

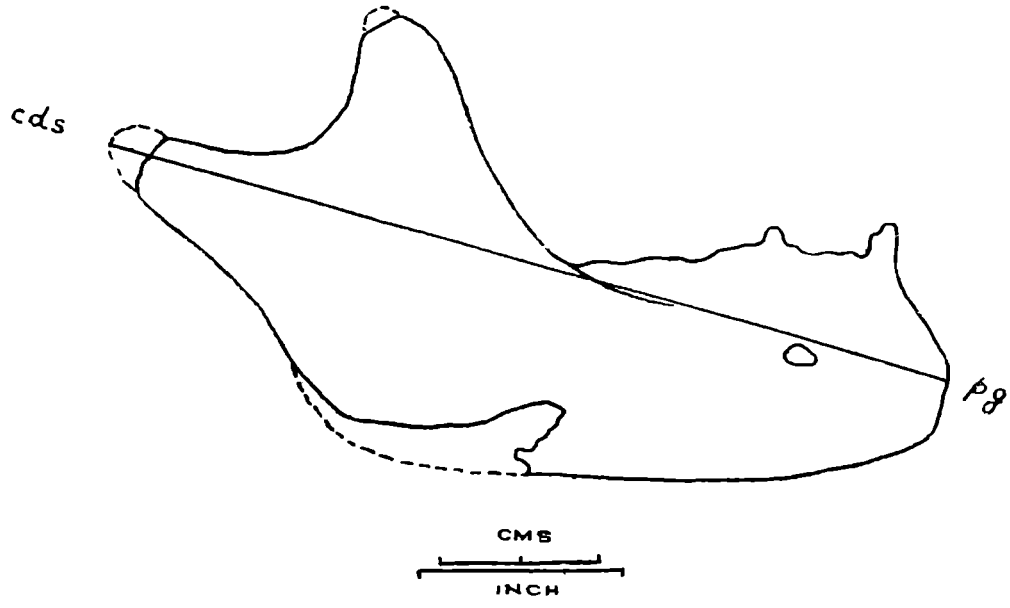
Pelvis. The pelvic bones show low muscularity, as already described above under the subject of the sex of the specimen. The absence of a sacrum prevents the proper articulation of the bones of the pelvis, but fragments of the innominates suggest that the size of the pelvic girdle must have been small.

Specimen No. 19

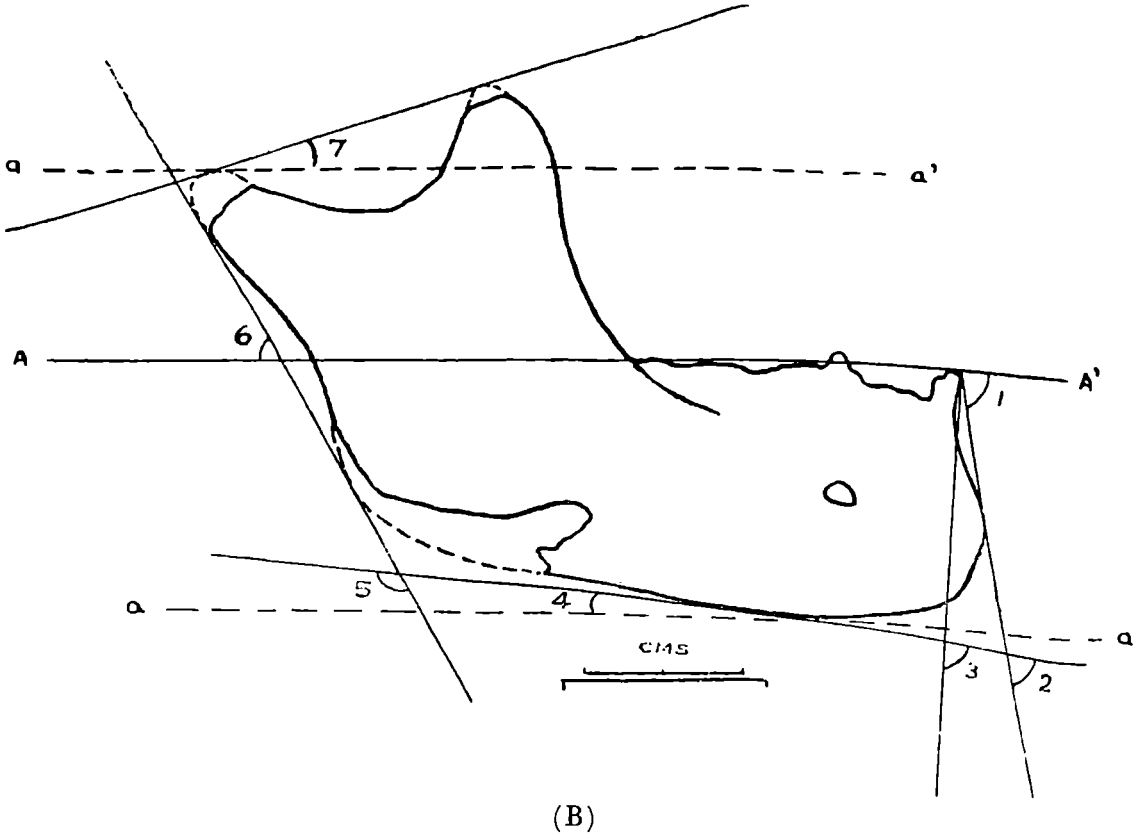
Dentition. The permanent teeth observable in this immature specimen, namely the first and second molars and the central and lateral incisors of both jaws, are medium in size. The first molars exceed the second molars in size. The form of the occlusal surface of the maxillary second molars is compressional, but the adjacent first molars are rectangular. The mandibular first and second molars have a square form. All molars have four cusps, the mandibular set being of the +4 pattern. There is a slight degree of crenulation of the right second molar of the mandible. Lingual pits occur on the maxillary lateral incisors. Like their adjacent central incisors, these incisors have prominent lingual grooves running parallel from the edge of the tooth to the neck of the crown. The maxillary incisors also show a slight to medium degree of shovelling. As would be expected in a mixed dentition, wear of the enamel is negligible. The direction of attrition is buccal. Occlusion of the teeth results in the over-bite pattern, but this may not represent the true condition of the specimen prior to the deformation of the bones of the lower part of the face. No pathological conditions are observable in this dentition.

Specimen No. 21

Calvaria (Photograph 10). A metrical examination of the cranial vault is not feasible because of post-mortem deformation. Morphologically these bones can be described as thick, heavy, and indicative of pronounced muscular



(A)



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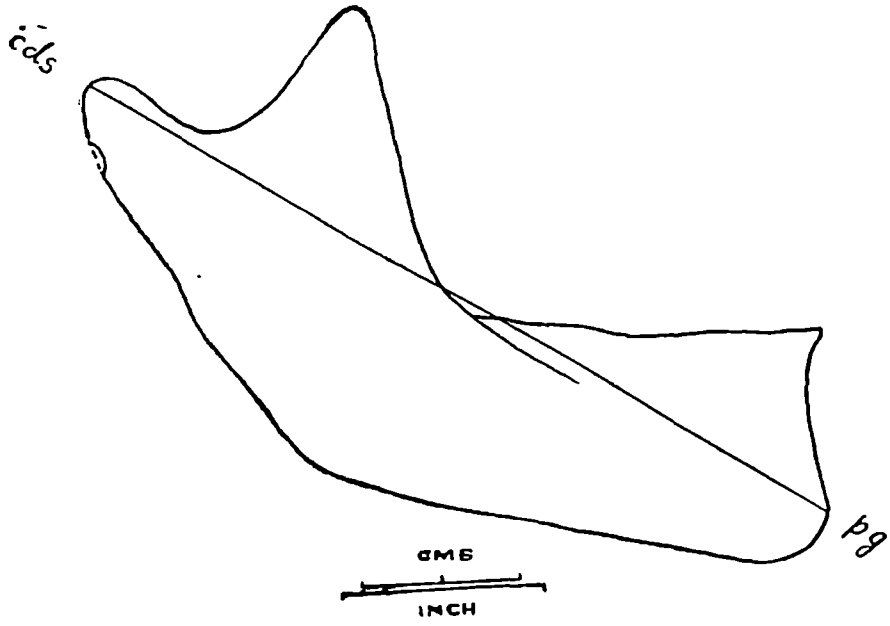
DIOPTROGRAPHIC DIAGRAM 12
Specimen No. 10. Mandible. Norma Lateralis.

robusticity. The median supraorbital torus is large and the glabella is prominent. Frontal height is within the medium range of variation and the slope is moderate in degree. A small median crest is present. Frontal eminences are small. The parietals are badly damaged, but the temporal crests would seem to have been low. Pronounced muscular cresting is apparent at the supramastoid crests, which cap the large and robust mastoid processes, at the ridge-shaped occipital torus with an enlarged inion, and at the muscular attachments of the face and mandible.

Face. The rather short face has a chamaerrhine nasal form and square, slightly inclined, orbits. The malars are very large, but their degrees of projection may have been greater than was normal during the life of this individual, for there is some distortion here. It appears, however, that anterior projection is greater than lateral projection. The external auditory meatus has the shape of a mere slit, a condition that seems unaffected by post-mortem damage to the specimen. Nasion depression is deep, as suggested by the degree of curvature of the inferior glabellar region. The nasal spine is of moderate size and the nasal sills are quite sharp. The subnasal grooves are prominent. The palate is hyperbolic, as are the other specimens of the Nevasa series. Its alveolar border is of medium height as measured from the floor of the hard palate at ectomolare. There is a moderately developed ridge-shaped palatine torus. Alveolar prognathism is slight, but it is more difficult to determine the degree of facial prognathism with the distortion factor to consider. Some mid-facial prognathism does seem evident.

Mandible. The mandible is massive and wide, but in contrast to the ridged brachystaphaline palate and the heavily crested bones of the cranial vault, the muscular architecture of the lower jaw is not striking. The mylo-hyoid ridge, genial tubercles, and digastric fossae are all weakly developed. The pterygoid attachments show a somewhat greater degree of robusticity. There is moderate to pronounced gonial eversion. The bilateral chin is prominent in its degree of projection. The mental spine is low. Alveolar prognathism is slight.

Dentition. The dimensions of the maxillary molars and pre-molars are smaller than those of Specimens Nos. 10 and 18, but the pronounced abrasion of the teeth is a factor in a consideration of this comparison. For this reason it is not possible to discover the original molar sizes of the mandibular dentition, but for the maxilla the first molar appears to be the largest in the molar row. The occlusal surfaces of the maxillary third molars are compressional in form, but the other molars of both jaws are of a rectangular conformation (Photograph 16). The maxillary third molars are tricuspid, but the adjacent teeth of



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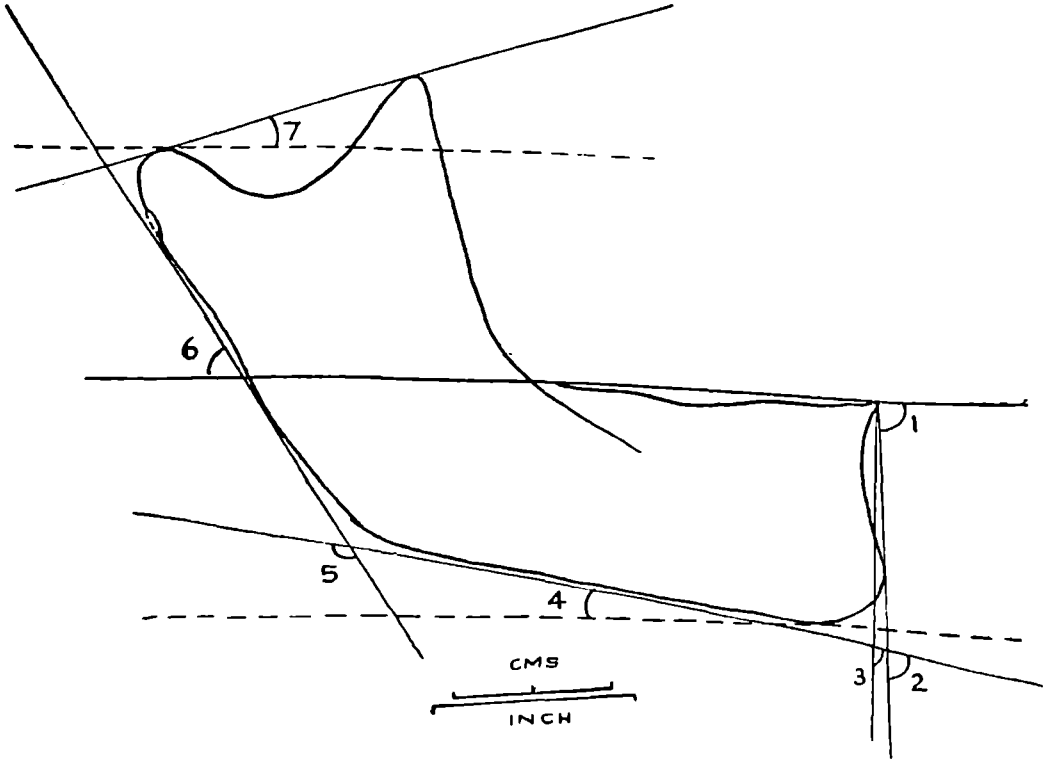


(B)

DIOPTROGRAPHIC DIAGRAM 13
Specimen No. 18. Mandible. Norma Lateralis.

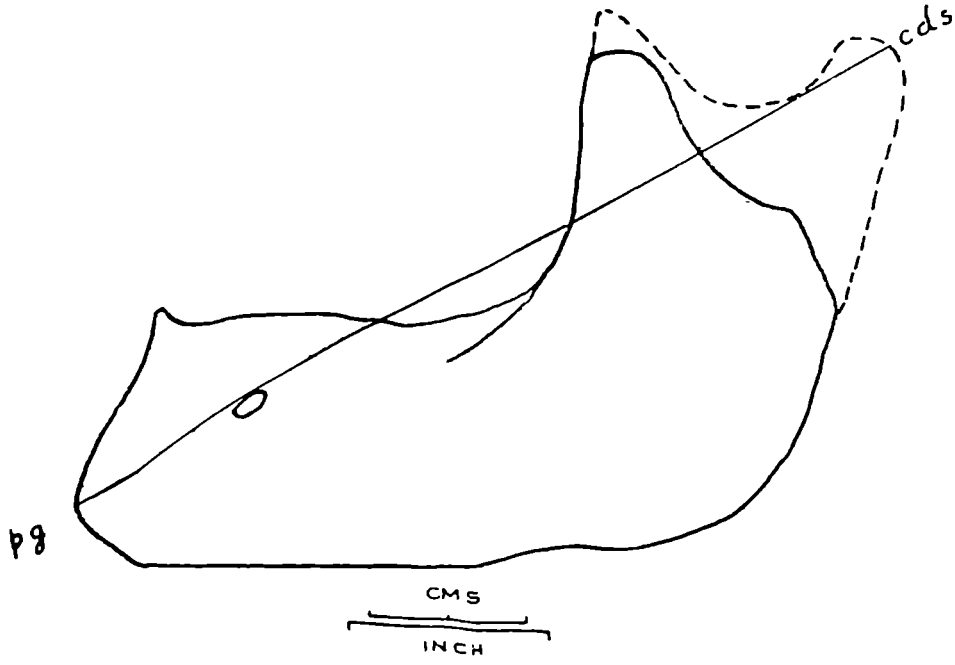
the right side indicate the presence of four cusps. The mandibular third molars are of the +4 type and these show a small accessory cusp on their mesio-buccal borders. This cusp is isolated by a faint groove. Attrition is pronounced for all of the teeth but it is greatest for the anterior teeth of both jaws. The wear pattern is uneven for these latter teeth. There is some crowding of the third molars. Occlusion is normal and represents the edge-to-edge type. The median diastema must be attributed to post-mortem damage to the palate. There is no evidence of caries.

Upper Extremity. The arm bones are robust and prominently crested. The humerus shows an extensive and deep bicipital groove and a large deltoid tuberosity. The shaft is oblong in its transverse section with marked curvature of the proximal extremity. The lesser tubercle and the lateral lip of the bicipital groove are somewhat less well developed. The interosseous border of the radius is sharply defined and attains a maximum elevation from the surface of the shaft of some 7 mm. This crest is 59 mm. in length with its point of origin some 15 mm. inferior to the radial tuberosity. The impression for the *Pronator tares* is unusually prominent. There is moderate lipping of the border of the radial head and neck, these structures being rather broad in their dimensions. The ulna correspondingly exhibits a well developed interosseous border. The ulnar tuberosity is high and shows a prominent *Supinator* crest. The shafts are bowed.

Lower Extremity. Both femora are stenomeric and have high pilastric indices. These bones are heavily crested, but hypertrochanteric crests and fossae are absent. The medium size *linia aspera* of the femur supports a well developed pilaster. The shape of the transverse section of the shaft is oval. The tibia are equally well endowed with robust muscular attachments, the popliteal line being particularly prominent. The form of the transverse mid-shaft section is prismatic. The head is retroverted to a slight degree. The proximal end of the shaft is platycnemic, as observed from the relevent indix for the left tibia. The fibula is deeply fluted with sharp crests setting off the grooves.

Specimen No. 72

Dentition. Of the three permanent teeth in this immature specimen, the maxillary right first molar is of moderate size, the mandibular first right molar is smaller, and the maxillary left lateral incisor is medium to large in its dimensions. The upper molar has a round occlusal surface; the lower molar is rectangular. The former is tricuspid; the latter has five cusps an accessory cusp imposed upon a +4 groove pattern. The right lateral incisor of the maxilla is



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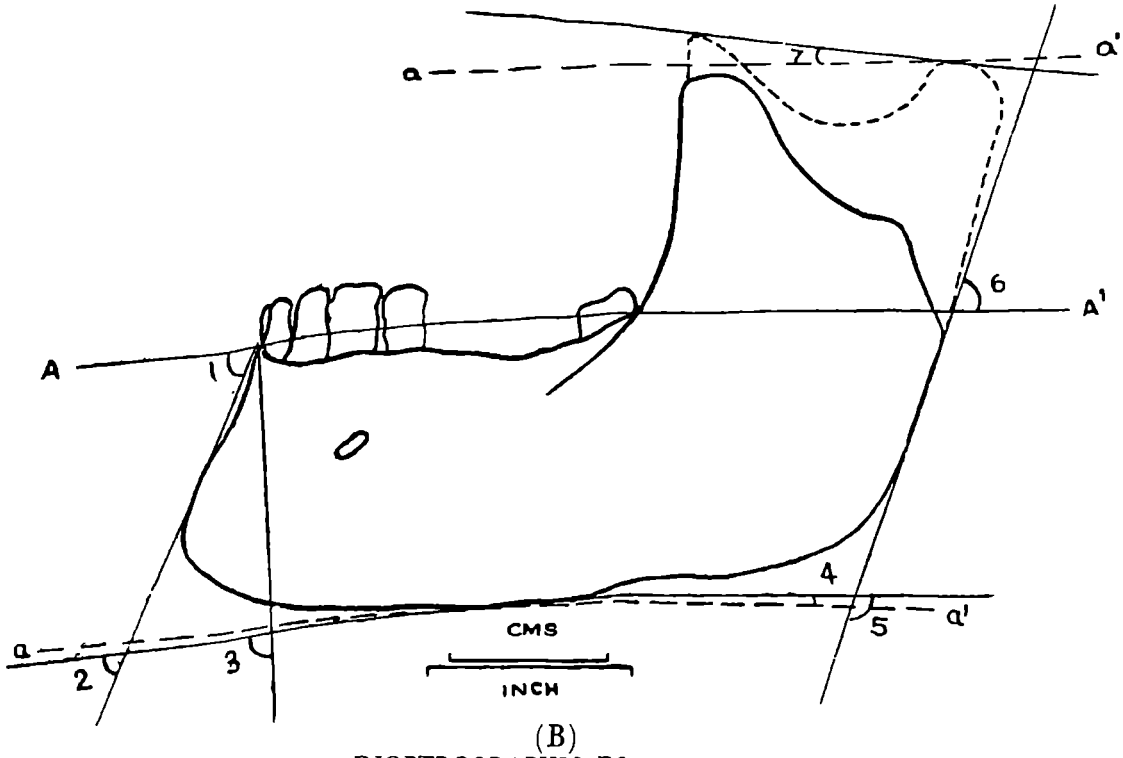

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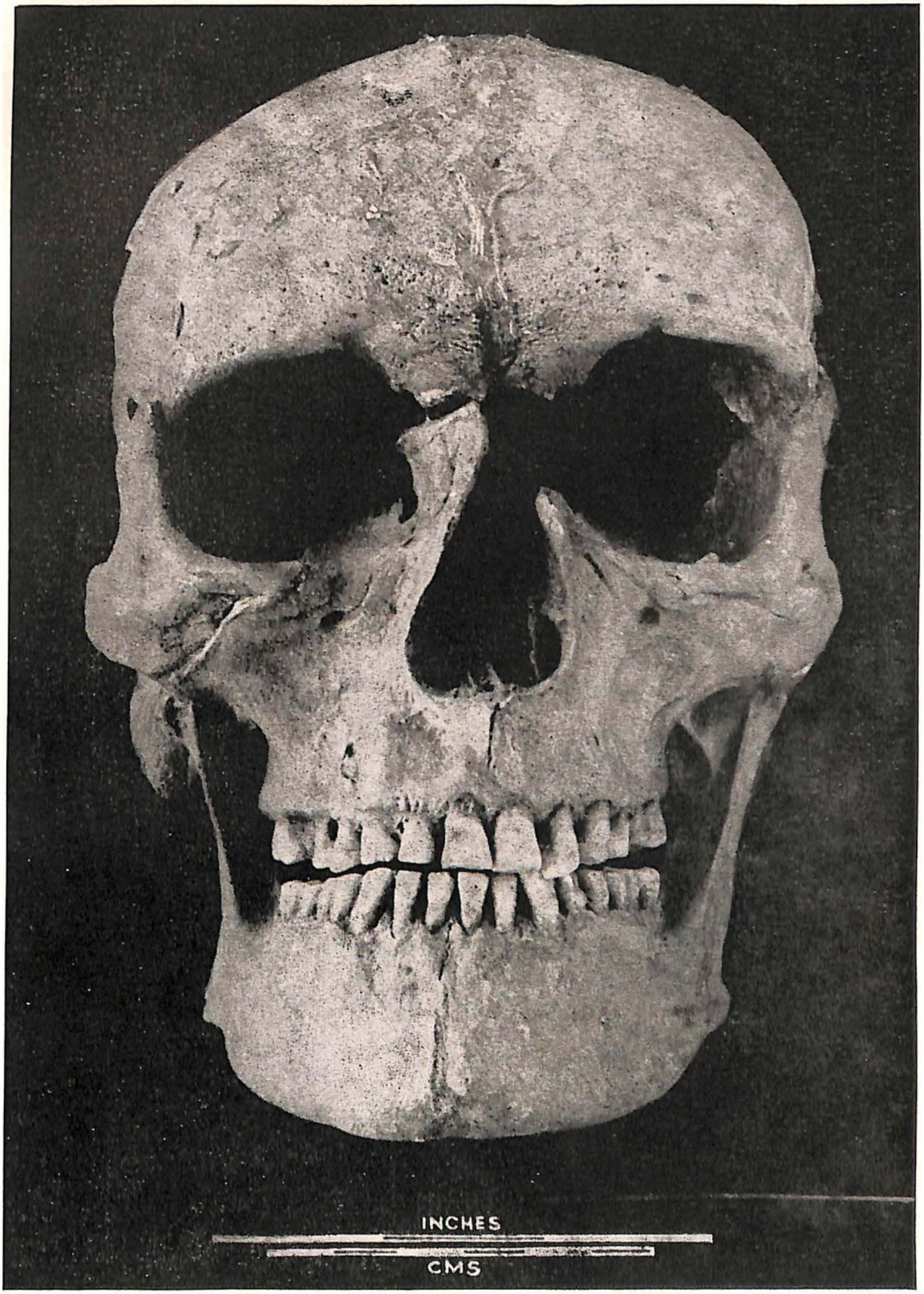
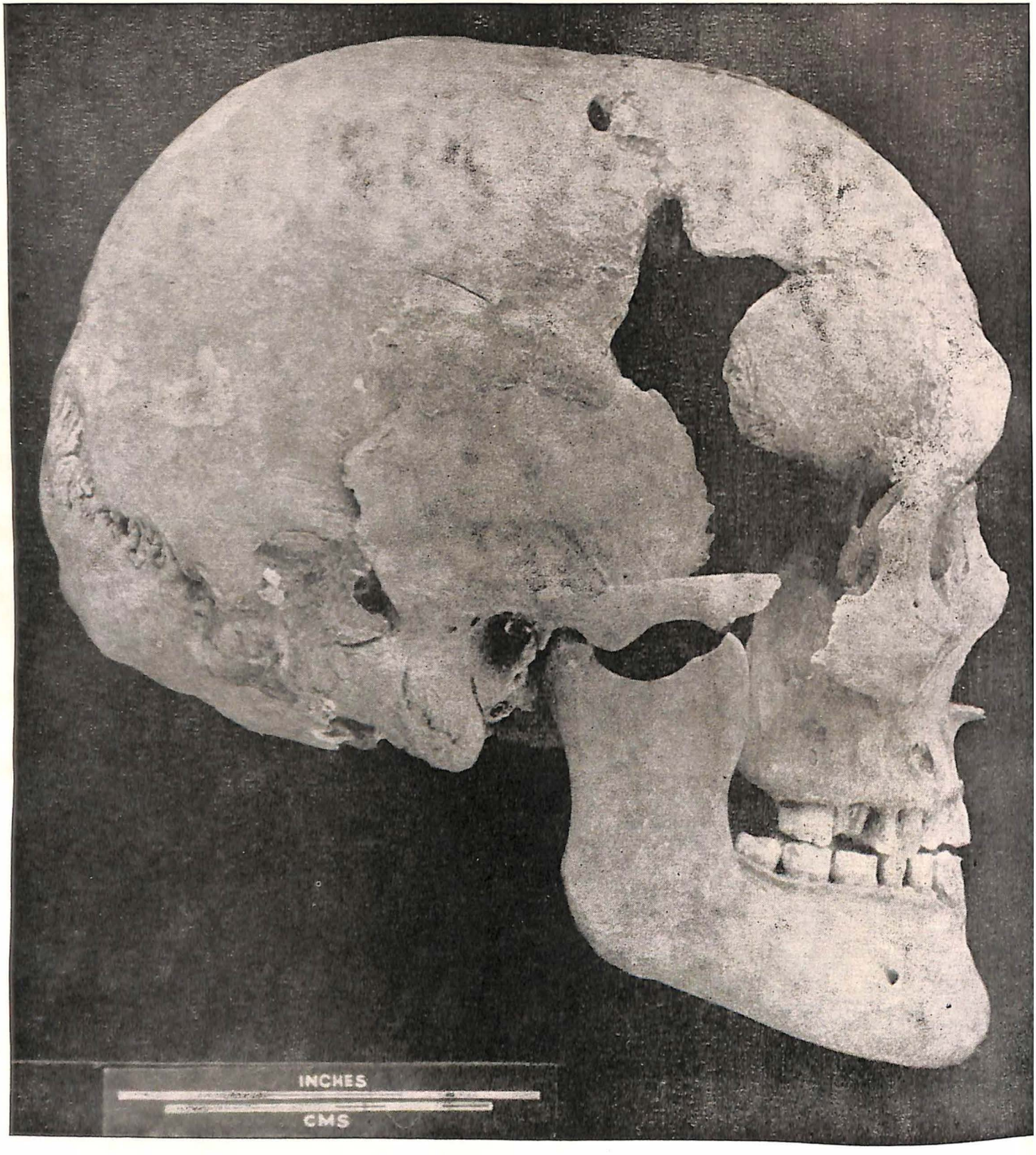
DIOPTROGRAPHIC DIAGRAM 14
Specimen No. 21. Mandible. Norma Lateralis.



PHOTOGRAPH 11
Specimen No. 49. Cranium. Norma Frontalis.



PHOTOGRAPH 12
Specimen No. 49. Cranium. Norma Lateralis.

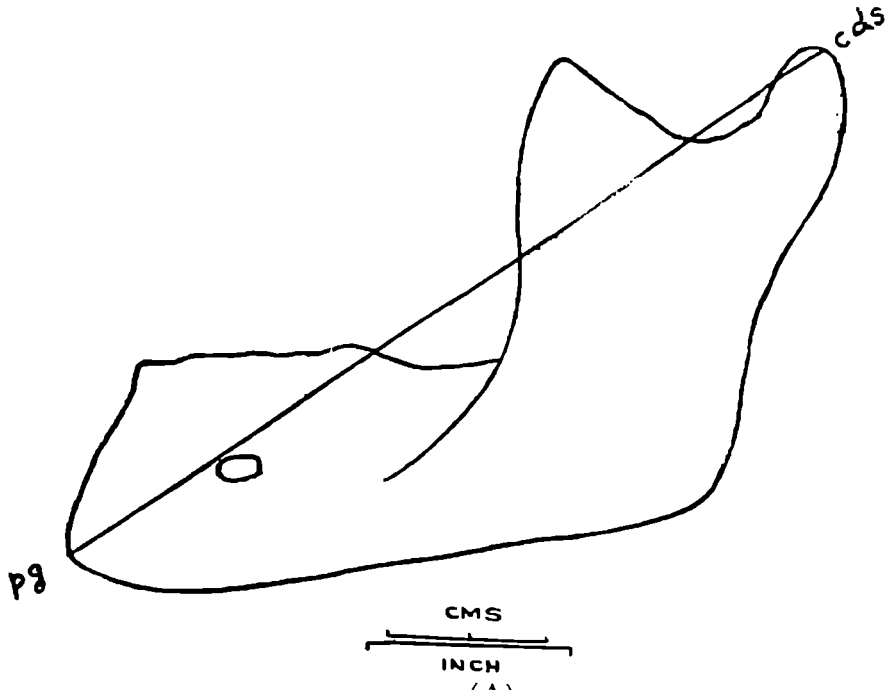
slightly shovel-shaped, and a small lingual tubercle is present. Attrition, which is very slight, seems to be heaviest on the lingual side of the upper molar. Crowding and pathological conditions are not present.

Specimen No. 72a

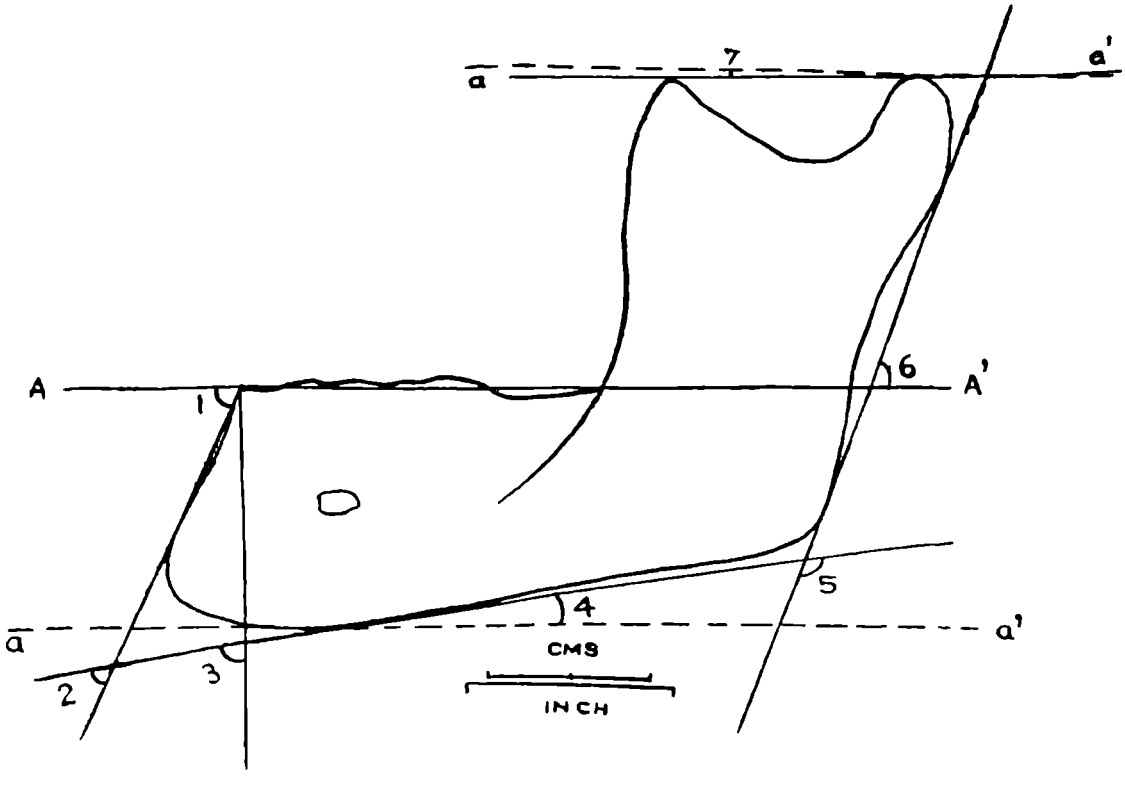
Dentition. The first molars of this specimen are medium to large in their sizes. The upper molars are square, the lower molars round in the form of their occlusal surfaces. The former have four cusps, the latter five cusps. The Y5 groove pattern is present on the lower molar. There is a moderate degree of crenulation on all molar surfaces, especially on the left first molar of the mandible (Photograph 17). While the deciduous dentition shows considerable wear, the newly erupted molars are unabraded.

Specimen No. 49 (*Indo-Roman*)

Calvaria (Photographs 11-14). This very narrow skull has a Length-Breadth Index of the Cranium which falls within the hyper-dolichocranic class. The Cranial Height-Length Indices, with height measurements taken from the *poria* to *bregma* and to *vertex,* are orthocranic. Using these same landmarks in the ratios of Cranial Height-Breadth, the specimen is acrocranic. Cranial capacity is euencranic when calculated for Auricular-Bregma Height. In its superior aspect the cranial form is ovoid. The frontal bone is narrow and the degree of forehead inclination is slight. The forehead height is quite low and the bosses lend a bulbous appearance to this part of the vault. These features are accompanied by a very prominent glabella and well formed supraorbital torus. There is a shallow post-glabellar sulcus. The parietal bones support low temporal lines and small eminences. The post-coronal region is slightly depressed. On each side of the sagittal suture are two parietal foramina of moderate size. The occipital portion of the vault exhibits mederate curvature commencing from the slight depression at *lambda* to the plane of the supramastoid crest, at which place the bone undergoes a sudden change in its direction and descends steeply to the basalar portion of the skull. The supramastoid crests are well developed and the occipital torus is robust—a shelf or ridge-like structure of considerable sharpness. Inion is small. The degree of temporal fullness is low. The mastoid processes are medium to large in development. Traces of a metopic suture are present, but this feature is in part obscured by post-mortem damage to the bones. Serration patterns of the normal cranial sutures are observable only at a limited number of loci. For the sagittal suture there exists a complex serration at *pars verticis* and *pars lambdica* and a sub-medium pattern at *pars asterica.* There are three large wormian bones of which two are situated at *lambda* and the



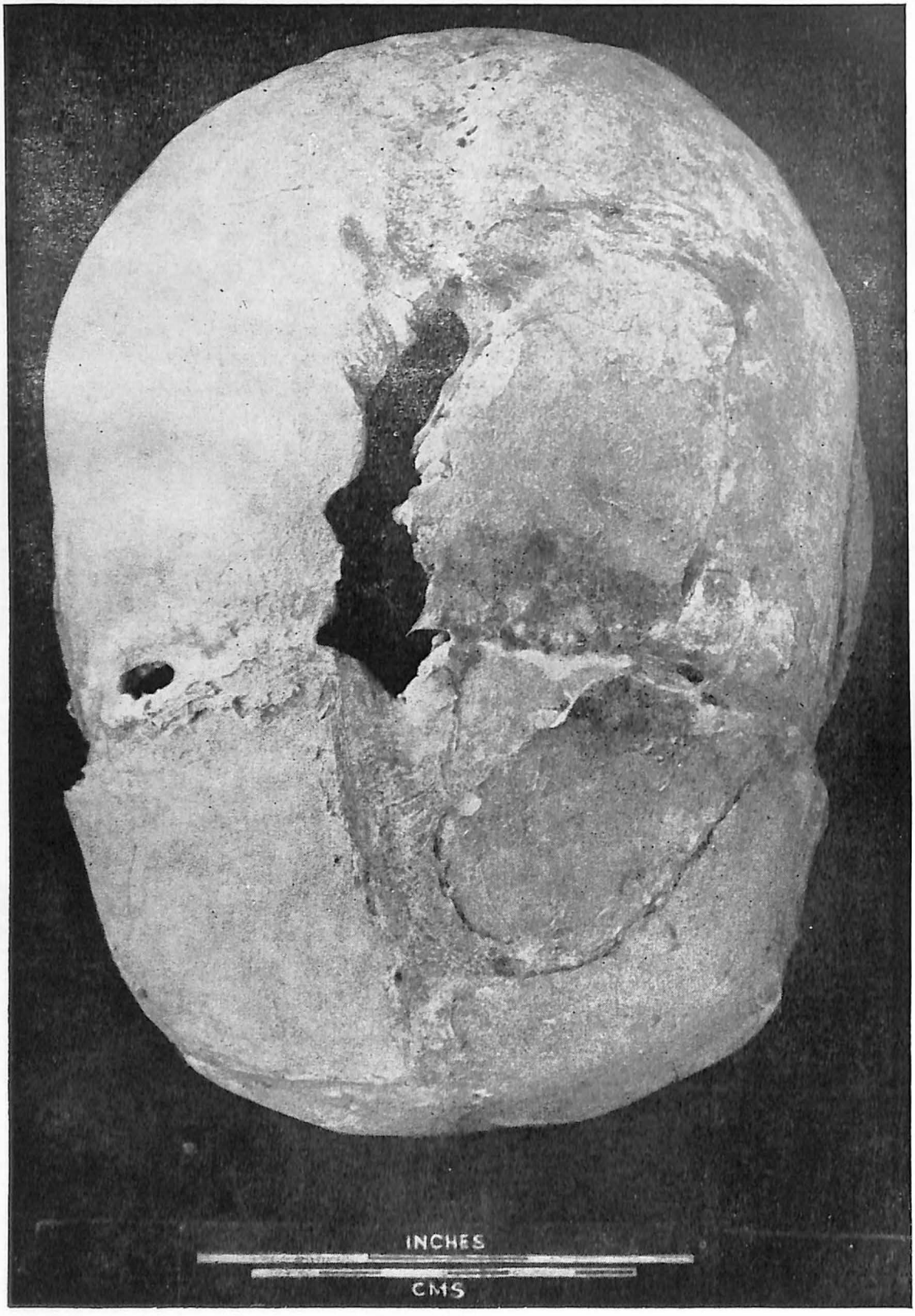
(A)



(B)

DIOPTROGRAPHIC DIAGRAM 15
Specimen No. 49. Mandible. Norma Lateralis.

PHOTOGRAPH 13
Specimen No. 49. Cranium. Norma Occipitalis.



PHOTOGRAPH 14
Specimen No. 49. Cranium. Norma Verticalis.

third, along with some four smaller islets of bone, along the course of the left lambdoid suture. In conjunction with these there are two small wormian bones on each side of the sagittal suture at *pars lambdica*.

Face. The Total Facial Index is leptoproscopic. The mid-facial region is leptene. As in the case with the Chalcolithic specimens of the Nevasa series, this Indo-Roman calvarium supports a chamaerrhine nasal form, and, as with Specimen No. 10, its orbits are hypsiconch. The palate is mesostaphaline in the ratio of its external dimensions. The index of the internal palate is mesostaphaline. Due to post-mortem distortion the right orbit is the one that most accurately reflects the pristine condition: its form is elliptical. There is a moderate degree of orbital inclination. The orbital borders are not sharply defined, as is the case with Specimen No. 10. The sub-orbital fossae are deep and extensive. *Nasion* depression is moderate. The broad nasal root is moderate to high in elevation and the bridge of the nose is broad and prominent. The nasal profile is concave. The subnasal structure exhibits sharp sills, a large spine and prominent subnasal grooves. The evidence for well developed muscular attachments which appears in the subnasal region applies to the malars are well. These are not particularly large, but support prominent ridges for the attachment of *Zygomaticus major*. Lateral malar projection exceeds anterior projection of these structures. The zygomatic process of the temporal is of medium size. The external auditory meatus has an elliptical form and its adjacent tympanic plate is thick. The form of the palate is hyperbolic, as with the Chalcolithic specimens of the Nevasa series. The palate height is medium when calculated as the mean of palate heights for the left and right side of the specimen. The well developed palatine torus is smooth and mound-shaped. An unusual feature of the basalar portion of the face is the greater size of the medial pterygoid plate over the external plate. The fossae between the plates are deep and narrowly defined. Angular measurements indicate hyperorthognathy for the Angle of the Upper Face and the Alveolar Profile Angle. The value for the Nasal Profile angle falls within the orthognatheous category (Dioptrographic Diagram 8).

Mandible. The Mandibular Index is low and places the specimen in the dolichostenomandibular group. This narrow jaw is an harmonious component of the long and narrow face of this specimen. This relationship is supported by the indices of the frontal and bizygomatic diameters with the gonial diameter. In total size the mandible falls within the medium range for present day populations. The degree of chin projection is high. The chin form is median. Alveolar prognathism is absent. Apart from a well defined mental spine, the mandible is not heavily crested. The digastric fossae are shallow. The mylo-hyoid ridges are low, and the single median genial tubercle is moderately developed.

The gonia are strongly everted and support small to medium pterygoid attachments. The mandibular notch of the ramus is shallow and on the left ramus the corocoid process exceeds the mandibular condyle in height.

Dentition. The maxillary second molars are small, but in the mandibular dentition small size is a characteristic only of the right third molar, the other teeth of the molar row being of medium to large dimensions. In the mandible, for which a complete molar row is observable on the right side, the order of molar size is with the first molar as largest and the third as smallest. As expected from such variability of molar size, the forms of the occlusal surfaces are of different types. The maxillary second molars have square surfaces and to a certain degree approximate the rectangular second molars of the lower dentition, but the first and third molars of the mandible are round. The upper premolars are uniformily rectangular but the lower second premolar is triangular while its adjacent premolar is round. The maxillary second molars have four cusps. The mandibular first molars have five cusps but the groove patterns are different for these two teeth. The degree of attrition on the crown surfaces obscures the original patterns, but the Y5 form is obvious only on the right first molar. The second molars are of the conventional +4 pattern. The right third molar is tricuspid (Photograph 18). Crenulation of the teeth and accessory cusps are not present. The upper central incisors are marked by a small lingual tubercle. Dental attrition is pronounced for all of the anterior teeth of both jaws, and moderate for the posterior teeth. Whereas the latter show a buccal direction of wear, the front teeth are worn lingually. Occlusion is normal save for the bucco-verted upper left second molar. The anterior teeth reveal a moderate degree of overbite. Crowding is not a feature of this dentition. There is a large carious aperture along the entire distal surface and greater part of the lingual surface of the upper right first premolar. This condition has progressed into the root of this tooth.

Trunk. The segments of the vertebral column are large, the fourth and fifth lumbar vertebrae being especially robust and massive. The Lumbar Index for this specimen places it within the koilorachic group. The ribs are large with sharply crested inferior margins. The elements of the sternum are completely fused. The manubrium is prominently crested, but the muscular relief of the corpus is not striking. The jugular notch is shallow. The second costel facet is deep and extensive. There is not any evidence of a sternal foramen.

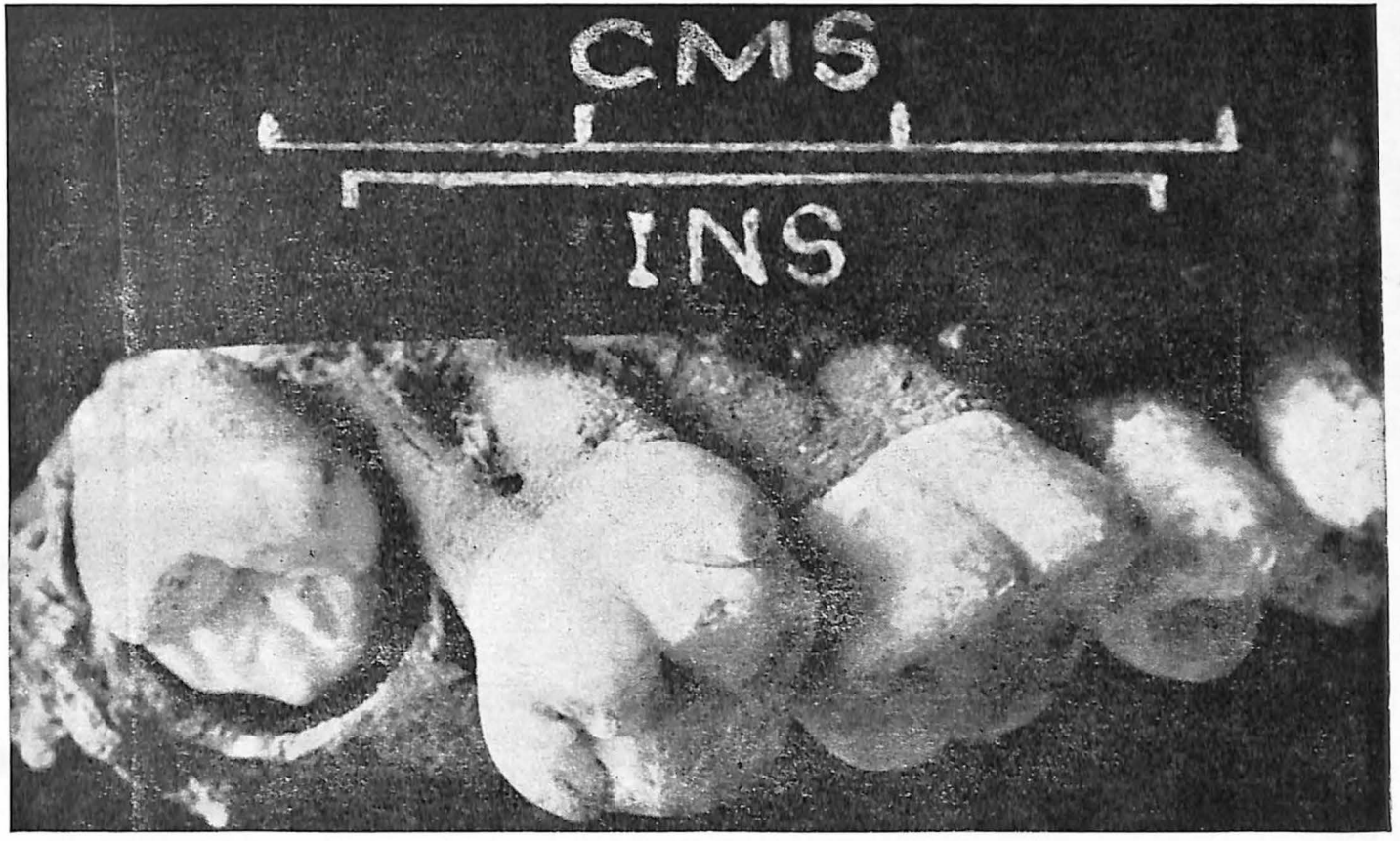
Upper Extremity. The clavicle is marked by a large corocoid tuberosity. The deltoid tuberosity is low. The scapulae are moderately developed in their muscular relief. The axillary border is thick and deeply fluted, especially for the right scapula. The vertebral border shows a low convexity which becomes most

prominent at the region of the inferior angle. The superior border is oblique in its conformation and supports a much deeper scapular notch on the right scapula than on the left. There is also a difference between right and left scapulae in the degree of lipping of the clavicular facet, the right bone showing a more pronounced development of the feature. The glenoid fossae are moderately lipped with the greatest development of this characteristic on the inferior borders of the fossae. The shape of the glenoid fossae is oval. The acromion process is quadrangular with a concave anterior border. The left process is roughly triangular with a straight anterior border. Pleating or buckling of the surfaces of the scapulae is not obvious. The right scapula exhibits a higher degree of muscularity than does the left, a condition that suggests an occupational or functional cause. The humeri are marked by a number of prominent muscular attachments of which the most striking are the development of the bicipital grooves, the deltoid tuberosities, the lesser tubercles, and the supracondyloid borders. The form of the transverse section is plano-convex. The radius is moderately fluted along its interosseous border, especially for the right radius. The size of the radial tuberosity is moderate and there is considerable lipping of the radial neck-caput border. The shaft is slightly bowed. The ulnae have pronounced interosseous crests but low ulnar tuberosities. The head and neck are retroverted to a moderate degree. The bones of the hand are within the medium range of variation as regards their length measurements. The metacarpal formula for both hands is the same: II-III-IV-V-I.

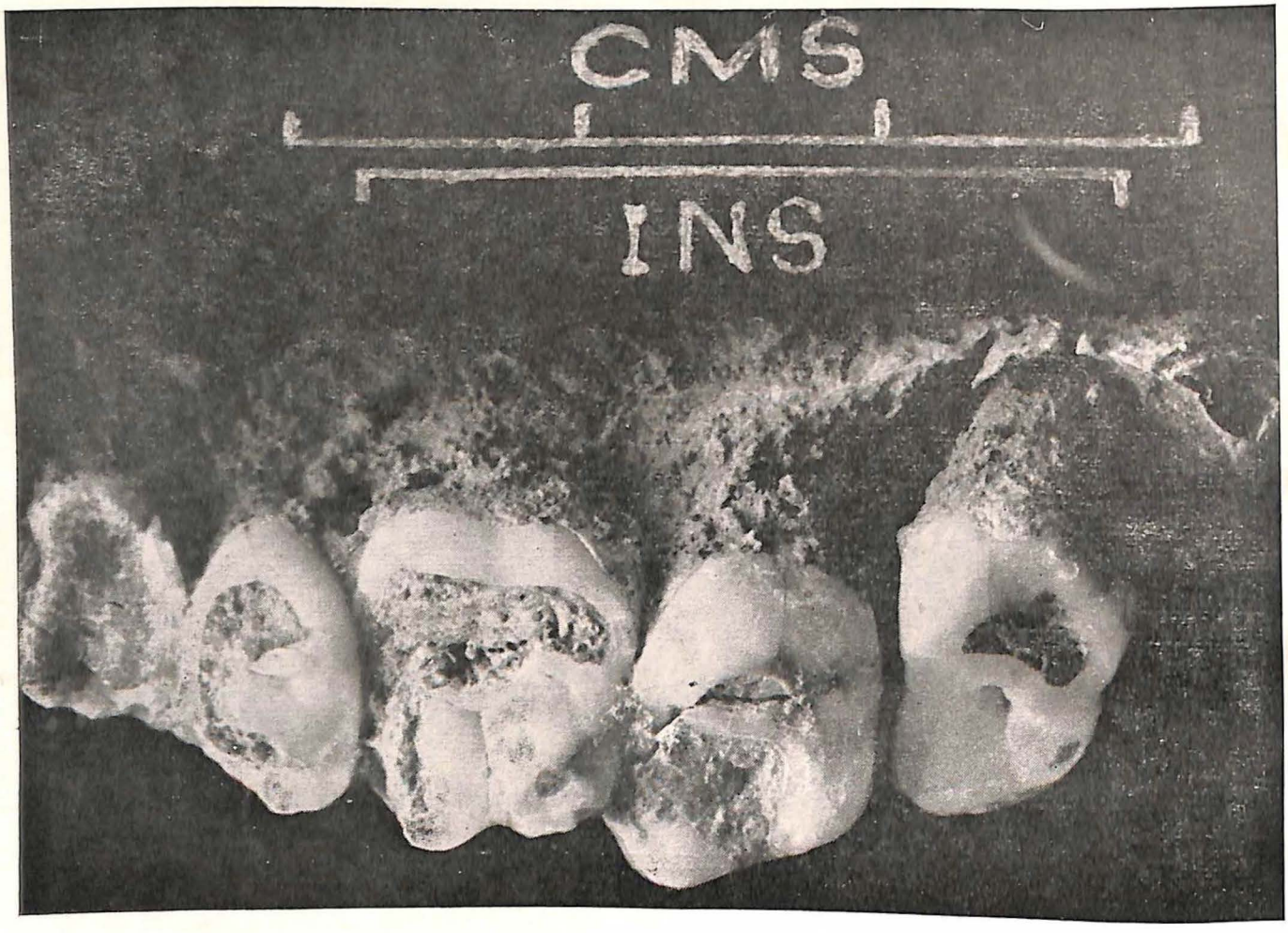
Lower Extremity. The right femur has an index which is hyperplatymeric, whereas the left femur is platymeric. Because of the degree of post-mortem damage, the left femur should be regarded as reflecting most accurately the pristine condition of the specimen. The trochanters are small in size and their adjacent hypotrochanteric crests are not prominent. The third trochanter, however, is well developed, rising out of the lower hypotrochanteric crest, a feature observed on both right and left femora. The right *linia aspera* is sub-medium in development and the distal bifurcation is weakly developed. The right *linia aspera,* however, is more sharply defined and the distal bifurcation is here well marked. There is no pilaster on the left femur but a sub-medium development is observable on the right. The shape of the transverse section at the mid-shaft is elliptical. The shaft is bowed. The tibiae are eurycnemic and the mid-shaft transverse section is plano-convex. The tibial tuberosity of both right and left bones is low and there is only minor muscularity evident for this part of the lower extremity. There is a sub-medium degree of head retroversion. The fibulae are deeply fluted, gracile bones with a moderate sized head. Of the bones of the feet, the calcaneous is not robust: all its facets are

smooth and its tuberosities are low. The talus is marked by a very deep fissure which defines the facet for articulation with the calcaneous and the head of the talus.

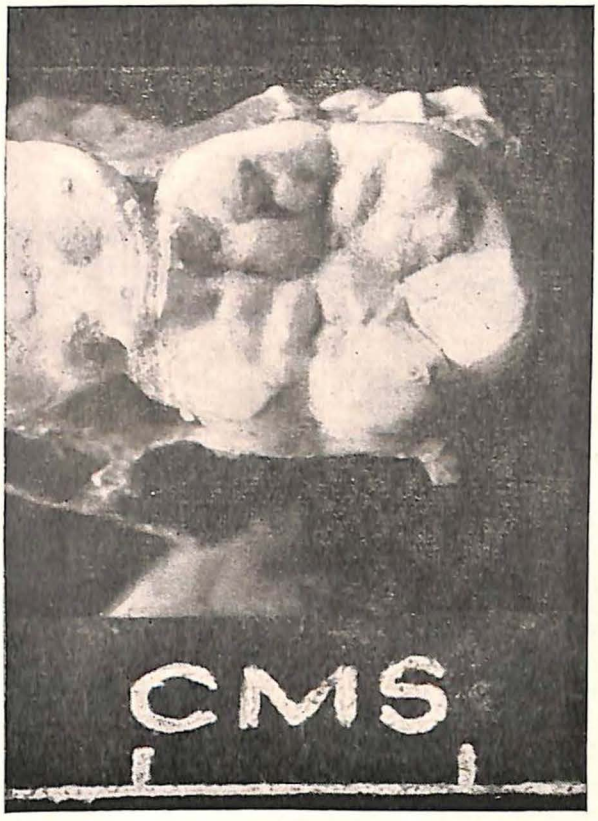
Pelvis. The sacrum consists of five segments which are completely fused. The curvature which originates at the third segment is slight. The sacral type is hypobasal. The sacral *cornua* commences at the distal border of the third sacral foramina. The Sacral Index places this specimen in the dolichohieric group. In articulation with the innominates, the pelvis has an Index of the Pelvic Inlet that is dolichopellic, but close to the upper limits of the mesatipellic group. The innominates have been described above in the discussion of their sexual features and robustcity. They are much narrower than the pelvic bones of Specimen No. 18, a factor which supports their assignment to the male sex in spite of various feminine features which they exhibit.



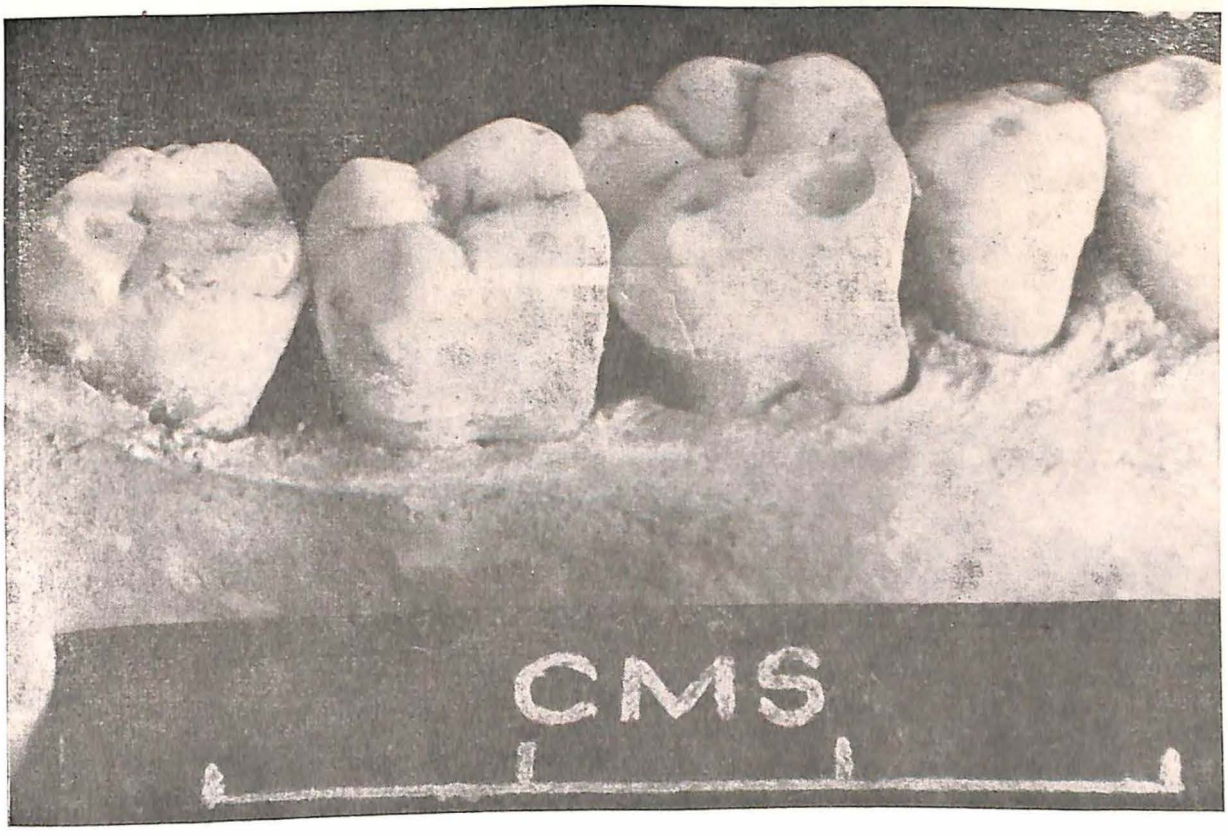
PHOTOGRAPH 15
Specimen No. 10. Maxillary right molar row. Bucco-occlusal surface.



PHOTOGRAPH 16
Specimen No. 21. Maxillary right molar row. Linguo-occlusal surface.



PHOTOGRAPH 17
Specimen No. 72a. Mandibular left first molar. Occlusal surface.



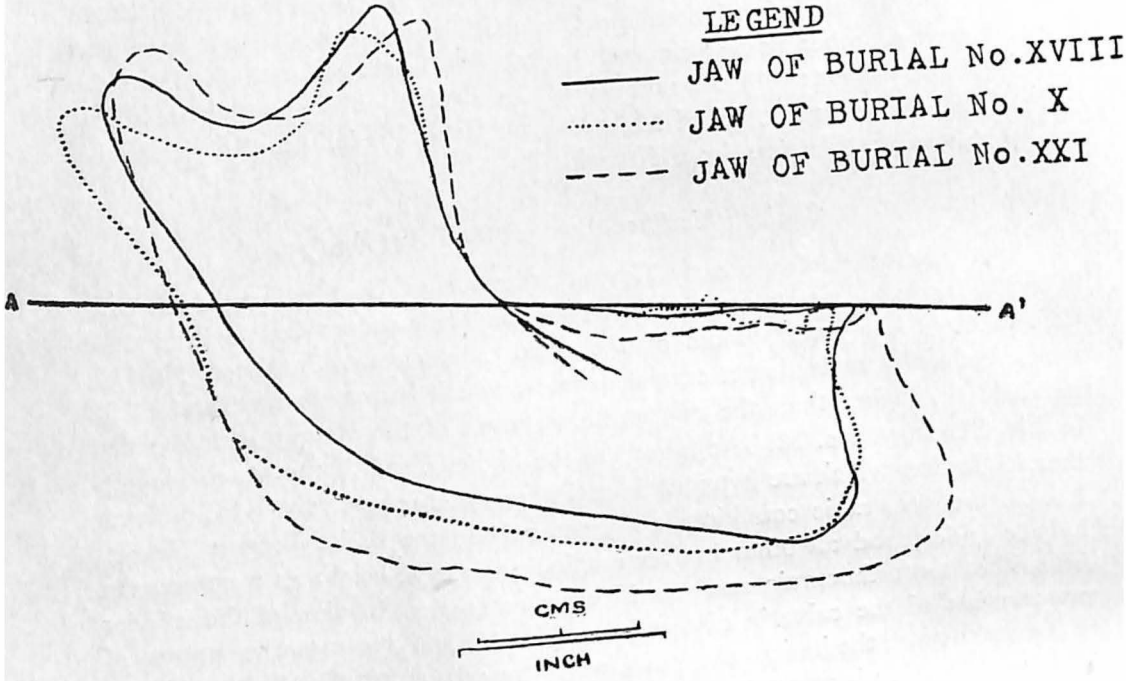
PHOTOGRAPH 18
Specimen No. 49. Mandibular right molar row. Bucco-occlusal surface.

COMPARATIVE ANALYSIS

A definition of the phenotypic patterns represented at Nevasa procedes from four levels of comparative analysis: (1) an intra-series analysis of the individual specimens of the Chalcolithic occupation level; (2) an analysis of the similarities and differences between these Chalcolithic inhabitants of Nevasa and later Indo-Roman occupants, as represented by the single individual, Specimen No. 49; (3) an analysis of both the Chalcolithic and Indo-Roman specimens with respect to other prehistoric and Early Historic skeletal remains from the Indian Subcontinent; (4) an analysis of the degree of possible biological affinities of the living peoples of Maharashtra, Uttar Pradesh, and Gujerat with the prehistoric population from Nevasa.

The Chalcolithic Phenotype: Intra-Series Analysis

The specimens of the early Nevasa series for which the Cranial Length-Breadth Index is known are the two females. Their values fall within the dolichocranic and lower values of the mesocranic classes. Specimen No. 10, which is dolichocranic, has a cranial capacity which is aristencranic and 43.32 to 59.28 cc. higher than the euencranic calvaria of the other broader-headed female, Specimen No. 18. The latter has the higher Height-Length and Height-Breadth Indices which are hypsicranic and acrocranic respectively. For Specimen No. 10 the acrocranic condition is present only in the Basion-Bregma Height-Length Index, and all other indices employing cranial height as a component fall within the orthocranic and metriocranic categories. In view of the inferior preservation of the calvaria of Specimen No. 10 and the extensive nature of its reconstruction, the indices of cranial height must be accepted with reservations. The frontal region is vertical or moderately inclined in these female specimens as well as in the male Specimen No. 21. The latter exhibits the larger supraorbital torus and glabella. All three specimens have a median glabellar form. While the frontal eminences are prominent for Specimen No. 18, they are considerably reduced in size for the male specimen. Both Specimens Nos. 18 and 21 have low median frontal elevations which continue their course along the mid-sagittal region of the parietal bones. The frontal bone is narrowest at *fronto-temporale* for Specimen No. 18. Parietal foramina are not observable. Temporal lines are barely traceable on the parietals, and on the frontals they are low. The occipital region reflects sexual differences, as in the low mound-shaped nuchal tori of the female specimens and the more pronounced development of this feature in



DIOPTROGRAPHIC DIAGRAM 16
Specimen Nos. 10, 18, 21. Mandible. Norma Lateralis.

Specimen No. 21. The degrees of occipital curvature are moderate, appearing most pronounced in Specimen No. 10. Differences in muscular relief among the three specimens are observed also in the size and form of the supramastoid crest: in the male the crest is massive and of the three specimens this one possesses the largest mastoid process. Temporal fullness may have been prominent, particularly in Specimen No. 10, but this feature is difficult to discern in the series due to the severe degree of post-mortem distortion. Post-coronal and lambdoid depressions are features found only in Specimen No. 18, although the other female specimen offers evidence to suggest a minor degree of postcoronal flattening.

Few generalizations can be made about the indices of the face due to the gross distortions suffered by all specimens in the series. Specimen No. 10 has a face which is leptoprosopic and mesene. Both this female and the male have Nasal Indices which fall within the chamaerrhine class. Orbital Indices are mesoconch for Specimen No. 10 and on the mesoconch-chamaeconch border for Specimen No. 18. The External Palate Index is calculable only in a single case, the male specimen whose palate is placed among the upper values for brachystaphalines. Distortion of the faces from post-mortem causes precludes, as well, reliable generalizations about their degrees of prognathism. Both of the females appear prognathous. Certainly in the case of the alveolar profile these specimens are prognathous, and Specimen No. 18 may have a prognathous nasal profile. The male specimen suggests an orthognathous condition for the upper face and alveolar profile. The nasion depression is pronounced only in Specimen No. 21. Loss of nasal bones does not permit the investigators to determine whether the moderate degree of nasal elevation which is present in Specimen No. 10 or the concave nasal profile which is present in Specimen No. 18 are also characteristics of the male face. The latter has sharp nasal sills and prominent sub-nasal grooves, while the female specimens have nasal sills which are dull and their sub-nasal grooves are less pronounced. Orbital conformation is square for the male and in Specimen No. 10, but oblong for the other female. The zygomae are massive in all of the faces but to a lesser degree in Specimen No. 18. There is no evidence of either pronounced lateral or anterior projection of the malars. In Specimen No. 10 the zygomatic process of the temporal bone is large. All specimens exhibit the hyperbolic palatal form (Dioptrographic Diagram 11).

The lower jaws of the two female Nevasians are brachystenomandibular. While the mandible of the male is the more massive of the three in over-all size, it's values do not exceed those of the female specimens for the Bigonial Diameter, Ascending Ramus Maximum Breadth and in the Molar Tooth Row Length

measurements (Dioptrographic Diagram 16). Angular measurements of these mandibles have been discussed above in the section on Sex Determination. The mandible of the male specimen has a bilateral chin form in contrast to the median mental process of the female mandibles. All of the specimens have prominent chins. Muscular development is weak for the mandibles of both sexes. Alveolar prognathism is not a prominent feature.

With regard to the dental analysis, the molars of the Nevasa Chalcolithic series range in size from the small teeth of Specimens Nos. 18 and 21 to the somewhat larger molars of Specimens Nos. 10, 19, 72, and the large newly erupted first molars of Specimen No. 72a. The first molar exceeds the second and third in its size in all cases, save in the mandible of Specimen No. 18 where the order of size is the second molar larger than the first, the first larger than the third. There is considerable variability in the forms of the occlusal surfaces of the molars. The compressional type is encountered in the maxillary left third molar of Specimen No. 10 and in the maxillary second of Specimens Nos. 19 and 21. For the latter specimen it is present also in the maxillary third molar. A triangular form is observed in the maxillary second and third molars of Specimen No. 18. A round occlusal form is observed in the maxillary second molar of Specimen No. 10. Maxillary first molars are either round, as in Specimen No. 72, square, as for Specimens Nos. 18 and 72a, or rectangular, as in the remaining cases. There is also variability of occlusal form in the mandibular dentition. The third molars of Specimen No. 18 are triangular, those of Specimens Nos. 10 and 72a are round, while the square form is encountered in the first and second molars of Specimens Nos. 18 and 19. The remaining forms of the lower molars in the series are rectangular. Cusp number and groove pattern show a higher degree of uniformity. In all cases the maxillary third molars are tricuspid. The maxillary second molars bear four cusps, save in the case of Specimen No. 18 where these teeth are tricuspid. The mandibular molars show the +4 cusp and groove pattern except in two cases: the Y 3 pattern of the right third molar of Specimen No. 18 and the Y5 pattern in the five-cusped first molars of Specimen No. 72a. Accessory cusps are found in the paramolar tubercles of the maxillary right second and third molars of Specimen No. 10, in the mandibular third molars of Specimen No. 21, and in the lower molars of Specimen No. 72. These accessory cusps are all situated along the mesio-buccal surfaces of the teeth. Crenulation is a common feature of the molar teeth, especially in Specimens Nos. 10, 18, and 72a, but only the latter exhibits this feature on all of the first molar teeth, and this may be explained by the comparatively recent eruption of these molars, as yet unabraded. Shovel-shaped incisors are found on all the specimens where maxillary anterior teeth are still preserved, but in no case is this trait pronounced. Specimen No. 72 shows a small tubercle on the

lingual surface of its maxillary right lateral incisor. Lingual pits appear on all four maxillary incisors of Specimen No. 19. Attrition varies according to the age of the specimen. Only Specimen No. 21 shows a dentition which has suffered heavy abrasion. Direction of wear for this and other specimens is buccal, although the maxillary teeth of Specimen No. 72 show the commencement of lingual attrition. Pathological conditions are infrequent in the series. There is a single case of caries, and crowding is found to a slight degree in the worn dentition of Specimen No. 21 and in the linguo-verted mandibular third molars of Specimen No. 18. The bite pattern is of the edge-to-edge type for Specimens Nos. 10 and 21, while Specimens Nos. 18 and 19 exhibit a slight overbite.

As for the post-cranial skeleton, the long bones of the upper extremity are uniformly marked by pronounced bowing of the shafts, oval or oblong transverse humeral sections and, for the females, a low degree of muscular robusticity. The femora of the female specimens are eurymeric, but Specimen No. 21 shows stenomeric features. The tibiae of Specimens Nos. 18 and 21 are eurycnemic. Except in the case of the male specimen, muscular relief is reduced for the bones of the lower extremity. Oval or round transverse sections are present in the femora. Prominent femoral bowing is a feature only of Specimen No. 18. The tibiae of the latter and of Specimen No. 21 are prismatic in transverse section and the tibial heads are slightly retroverted. The former specimen exhibits "squating facets" at the distal end of the tibial shafts. The fluting of the fibulae are pronounced only for the male specimen.

An analysis of the results of stature estimation for the four adult specimens shows a wide range of values between the four formulae which were used. Although the range of values obtained within any given method is normal, a comparison of mean values for some of the specimens shows stature differences of as much as 10 cm. A selection of that one formula of the four which is best applicable to the prehistoric Nevasa series must be an arbitrary procedure, but the authors feel that the methods practiced by Athawale for living Maharashtrians deserve special attention. However, Athawale obtains much lower stature estimate values than do the other workers whose formulae have been applied. Another problem to be considered in this connection is that certain long bones render values more significant than others for an estimation of stature, viz., the femoral measurements afford more reliable results than radial or ulnar measurements. When these four formulae are calculated for their means, the investigators find that the female specimens show a stature estimate of 164.93 cm. (5 feet 4 inches) and 157.19 (5 feet 2 inches); the male specimen 168.70 cm. (5 feet 5 inches). If the stature estimates of Athawale are more reliable, then the stature values for the female specimens are much lower than the means just noted:

160.11 cm. (5 feet 2 inches) and 153.40 cm. (5 feet 0 inches). This is a difference of 4.82 cm. and 3.79 cm. less than the total means. All of these values fall within the range of measurements for medium-statured people of world populations today.

The Indo-Roman Phenotype:

Comparison with Chalcolithic Nevasians

When the Indo- Roman specimen is compared with the Chalcolithic series we find both striking differences and remarkable similarities. Its Cranial Length-Breadth Index is hyperdolichocranic, but in indices involving cranial height its values fall within the orthocranic and acrocranic categories, as do those for the Chalcolithic specimens. The cranial capacity is euencranic, as is that of Specimen No. 18. Like the earlier inhabitants of Nevasa this individual exhibits a low degree of frontal inclination, low temporal lines on the frontals and parietals, a moderate to pronounced degree of occipital curvature, and slight coronal and lambdoid depressions. In muscular features it is similar to the male Specimen No. 21, but it has small post-glabellar sulcus and a more rugged occipital crest. *Inion* is present as well. The Indo-Roman specimen is unique in the possession of a complex serration pattern of its cranial sutures; multiple wormian bones and paired parietal foramina are features not present in the earlier inhabitants of Nevasa as represented by the present series.

Specimen No. 49 has a facial architecture which is leptoprosopic with a chamaerrhine nasal type and a hypsiconch orbital form. The upper facial region is leptene and the palate falls within the mesostaphaline class. Morphological facial features which set this specimen apart from the earlier series from Nevasa are observed in the slliptical orbits, the pronounced guttering of the sub-nasal region, and the lateral projection of the zygomae and malar complex. The sub-orbital fossae are also quite extensive. Other of the principal features of the face observed in the Chalcolithic series are not unique and are shared by both populations.

Unlike the other mandibles, the Indo-Roman one is dolichostenomandibular and shows no alveolar prognathism. In other features, however, the Indo-Roman mandible resembles those of the earlier series, for the chin is prominent, the coronoid processes exceed the condyloid processes in height, and the muscular relief is very poorly defined.

Apart from the mandibular first molars, the teeth of this Indo-Roman specimen are small and are within the range of size of the Chalcolithic dentitions.

They are not strikingly different in any way from the latter with respect to morphological features, save for the peculiar cusp and groove pattern of the mandibular molars. Like the Chalcolithic teeth the anterior teeth of the Indo-Roman specimen shows greater attrition than that exhibited by the posterior teeth, thus suggesting that either there was a persistent practice of holding objects in the mouth or that the biting functions of the anterior teeth were called into use with a considerably high frequency.

Apart from the greater size of the long bones the post-cranial bones of the Indo-Roman skeleton exhibit few features which set it apart from the Chalcolithic specimens. Where these features are present, they are of minor significance. The transverse sections of shafts of long bones of both upper and lower extremities are different: plano-convex for the humerus and tibiae, and elliptical for the femora. The indices of the femora and tibia are within the hyperplatymericplatymeric and eurycnemic classes. The Platycnemic Index falls within the values for the Chalcolithic series.

The stature estimations, however, show that the Indo-Roman specimen stands somewhat apart from the others. The mean estimate of 169.30 cm. (5 feet 6 inches) is the largest of the four calculated. Athawale's lower stature estimate is 163.35 cm. (5 feet 4 inches). The latter value is a very low one for a male individual by standards of present world population, but it remains proportionately higher than the estimations for the females from the Chalcolithic group.

The Chalcolithic and Indo-Roman Phenotypes Compared with Other Prehistoric Series from the Indian Subcontinent

The four skeletal specimens from Nevasa, including the Indo-Roman Specimen No. 49, are compared metrically and morphologically with specimens and series from sixteen prehistoric localities which cover an area extending from Baluchistan to Ceylon. The metrical results of this comparative analysis are summarized in Table XI and Graphs 1 to 8. Only those measurements taken directly upon the specimens have been reproduced in the Table and Graphs: values based upon estimates of cranial capacity and stature have been omitted. The Table shows the absolute values for measurements and indices of these specimens and series while the Graphs depict these values in terms of size-shape relationships. Hence specimens which may possess identical or similar indices but have very different metrical components for these indices are plotted on the Graphs with respect to both variables. With the exception of the single

specimen from Shahi-tump, all others represented here have been examined by one or both of the present investigators. The metrical data are compiled from our records as well as from the published sources, but where we conjectured that a discrepancy exists between the two, we favored our own results and included them in the Tables and Graphs. A case in point is the sex determination of Specimen I-E from Brahmagiri which, we agreed, is that of a male and included it as such in the calculation of means for the Brahmagiri cranial series. In the same manner our own morphological observations of these series has taken precedence over the published data where incompatabilities exist.

A comparison of five different cranial indices of these specimens and series with Nevasa Specimen No. 10 indicates that the latter shows closest similarities to the male specimens from the Harappa Cemetery R-37, save in the case of the Basion-Bregma Height-Length Index where the mean index of the Adittanalur male specimens is the more similar. Next closest in similarity stand the male specimens of the Harappa Cemetery H, Stratum I, with respect to the Cranial Length-Breadth Index, Basion-Bregma Height-Length Index and the Auricular-Bregma Height-Length Index. The female specimens of the Harappa Cemetery H, Stratum II, have values for the Basion-Bregma Height-Breadth Index which cluster around the relevant index for Specimen No. 10. The only other specimens from these prehistoric series whose cranial indices approximate the indices of Specimen No. 10 are the male specimen from Langhnaj in its indices of Cranial-Length-Breadth, Basion-Bregma Height-Length and Auricular-Bregma Height-Length, and both the Langhnaj male and female specimen in their Auricular-Bregma Height Breadth Indices. The males of the Brahmagiri series approximate the values of Specimen No. 10 for the Indices of Basion-Bregma Height-Length and Auricular-Bregma Height-Length. The other female of the Nevasa series, Specimen No. 18, has close affinities to Specimen No. 10 in its cranial in only one out of the three cases for which its values are compared: the Auricular-Bregma Height-Breadth Index. Hence it comes nearest to the values for the males of the Harappa Cemetery R-37. Its Cranial Length-Breadth Index is close to that of the female specimens from Piklihal and the Harappa Cemetery H, Stratum I. In its Index of Auricular-Bregma Height-Length it stands apart but shows values between those of the male and female specimens from Piklihal.

Comparative facial indices for the female specimens from Nevasa support these findings. Here again Specimen No. 10 has values which lie close to those of the series from the Harappa Cemetery R-37; the closest similarities are with the females. In the comparison of cranial indices described above, Specimen No. 10 consistently showed values lying closer to the means for males. For the Upper Facial Index Specimen No. 10 finds its closest affinities with the males

TABLE XI: COMPARATIVE CRANIOMETRY OF THE NEVASA SERIES WITH OTHER PREHISTORIC SERIES OF THE INDIAN SUBCONTINENT

Specimen or Series	Frequency by Sex		Reference	Maximum Cranial Length	Maximum Cranial Breadth	Cranial Length-Breadth Index	Basion-Bregma Height	Basion-Bregma Height-Length Index	Basion-Bregma Height-Breadth Index	Auricular-Vertex Height	Auricular-Vertex Height-Length Index	Auricular-Vertex Height-Breadth Index	Auricular-Bregma Height	Auricular-Bregma Height-Length Index	Auricular-Bregma Height-Breadth Index	Minimum Frontal Diameter	Bizygomatic Diameter	Prosthion-Nasion Height	Total Facial Index	Upper Facial Index	Nasal Height	Nasal Breadth	Nasal Index	Orbital Height	Orbital Breadth	Orbital Index	External Palate Length	External Palate Breadth	External Palate Index
Nevasa:	21	M		—	—	—	—	—	—	—	—	—	—	—	—	—	—	64	—	—	48	25	52.0	35	—	—	58	65	89.2
	49	M		186	125	67.2	—	—	—	115	61.8	92.0	110	59.1	88.0	89	122	64	91.8	57.1	46	24	52.1	32	35	91.4	47	64	73.4
	10	F		185	134	72.4	134	72.4	100.0	—	—	—	114	61.6	85.0	111	125	67	92.8	53.6	47	24	51.0	32	40	80.0	64	—	—
	18	F		174	132	75.8	—	—	—	123	70.6	93.1	115	66.0	87.1	92	—	60	—	—	44	—	—	30	39	76.9	64	—	—
Adittanalur	1-7	M	Chatterjee & Gupta, 1963[24]	185	130	69.9	133	70.8	120.0	117	61.0	—	—	—	—	93	126	61	—	47.6	51	25	49.4	33	41	82.5	45	—	—
	1-4	F		180	128	70.5	126	69.3	103.6	114	64.0	—	—	—	—	92	128	62	—	54.6	47	27	54	32	40	80.3	—	—	—
Bayana	1	M	Keith, 1919[25]	178	127	71.3	131	73.6	103.1	108	60.6	85.0	—	—	—	90	136	—	—	—	—	—	—	—	—	—	—	—	—
Bellan Bandi Palassa	1	M	Kennedy, MSS.[26]	200	147	73.5	135	67.5	91.8	132	66.0	89.6	127	63.5	86.5	117	164	—	—	—	—	—	—	37	41	90.2	61	69	88.4
	1	F		177	130	73.4	—	—	—	93	52.5	71.5	95	53.6	73.0	91	110	64	91.8	58.1	44	23	52.2	—	—	—	53	63	82.5
Brahmagiri	5	M	Sarkar, 1960[27]	187	144	77.1	138	74.8	94.5	—	—	—	112	59.9	78.0	94	89	59	—	57.3	48	25	58.8	33	42	73.3	—	44	—
Chandoli	1	M	Malhotra, MSS.[28]	197	128	64.9	—	—	—	—	—	—	126	63.4	98.4	81	—	—	—	—	—	—	—	—	—	—	—	—	—
Chanhu-daro	1	F	Krogman & Sassman, 1943[29]	178	126	71.0	123	69.1	97.5	108	69.1	86.5	—	—	—	97	124	—	—	49.0	48	25	51.5	32	—	75.5	44	39	88.6
Harappa: Cemetery R-37	15	M	Gupta, Dutta & Basu, 1962[30]	187	133	71.0	133	—	—	—	—	—	115	61.3	86.2	95	131	70	93.6	52.6	51	26	51.0	34	42	80.8	—	39	—
	19	F		179	130	72.6	127	—	—	—	—	—	111	61.9	85.4	93	124	65	89.2	—	47	24	51.9	33	40	83.2	—	39	—
Harappa: Area G	7	M	Gupta, Dutta & Basu, 1962	180	138	76.4	133	—	—	—	—	—	114	63.1	82.0	98	127	66	—	—	50	25	50.6	31	41	77.5	—	42	—
	3	F		174	125	74.4	123	—	—	—	—	—	107	61.6	82.7	88	115	66	—	—	45	23	51.4	31	37	80.7	—	35	—
Harappa: Cemetery H, I	3	M	Gupta, Dutta & Basu, 1962	187	138	73.8	135	—	—	—	—	—	118	62.1	85.9	96	133	65	93.8	49.1	49	27	55.2	32	40	90.7	—	40	—
	12	F		176	131	75.8	126	—	—	—	—	—	107	60.2	81.8	91	121	59	—	—	46	24	55.1	32	39	80.7	—	35	—
Harappa: Cemetery H, II	7	M	Gupta, Dutta & Basu, 1962	189	144	76.7	134	—	—	—	—	—	119	62.1	85.6	95	136	70	85.6	50.0	52	25	47.6	33	41	79.2	—	39	—
	6	F		181	133	76.0	134	—	—	—	—	—	109	62.6	82.3	93	117	66	96.5	—	45	24	53.3	33	40	82.7	—	35	—
Langhnaj	1	M	Ehrhardt, 1963[31]	187	137	73.3	130	69.4	94.6	—	—	—	112	59.8	81.7	103	138	67	82.6	48.5	47	26	55.3	36	—	—	—	—	—
	1	F		190	136	71.6	—	—	—	—	—	—	117	61.5	85.9	95	—	—	—	—	—	—	—	—	—	—	—	—	—
Mohenjo-daro	3	M	Sewell & Guha, 1931[32]	197	130	66.0	139	70.6	107.2	112	—	—	—	62.0	—	95	127	—	88.9	53.9	46	22	51.0	31	37	84.4	—	—	—
	4	F		180	118	63.4	136	75.6	—	—	—	—	—	—	—	—	—	—	—	—	46	22	48.4	32	38	87.9	—	—	—
Nal	1	M	Sewell & Guha, 1931[33]	188	132	70.0	146	77.4	110.6	120	63.6	90.9	—	—	—	93	120	92	—	60.0	49	23	49.9	33	40	82.5	—	—	79.2
Piklihal	1	M	Ayer, 1960[34]	172	139	79.4	141	87.7	101.4	—	—	—	124	72.7	80.6	95	126	—	—	—	46	23	51.1	35	45	77.7	—	—	—
	1	F		175	131	74.9	131	74.9	100.0	—	—	—	110	62.9	74.9	94	128	—	—	—	46	23	51.1	33	41	80.4	—	—	—
Shahi-tump	1	M	Sewell & Guha, 1931[35]	—	—	—	119	—	—	—	—	—	—	—	—	—	116	81	—	70.3	54	23	43.5	—	—	—	—	—	—
Sialkot	1	M	Keith, 1919[36]	180	128	71.1	140	77.7	109.3	119	66.1	92.9	—	—	—	98	—	—	—	—	—	—	—	—	—	—	—	—	—

[24] Chatterjee, B. K., Gupta, P., *Report on the Adittanalur Skulls,* Calcutta, 1963.

[25] Keith, A., Report on Two Human Crania of Considerable but Uncertain Antiquity, *Journal of the Anthropological Society of Bombay,* 11.6.663-672, Bombay, 1919.

[26] Kennedy, K. A. R., *The Balangodese of Ceylon: Their Biological and Cultural Affinities with the Veddas,* Ph. D. Thesis, University of California, Berkeley, 1962.

[27] Sarkar, S. S., Human Skeletal Remains from Brahmagiri, *Bulletin of the Department of Anthropology,* 9.1.5-26, Calcutta, 1960.

[28] Malhotra, K. C., *The Chandoli Skull,* MSS. in progress of publication.

[29] Krogman, W. M., Sassman, W. H., Skull Found at Chanhu-daro, *Chanhu-daro Excavations 1935-36,* 252-263, New Haven, 1943.

[30] Gupta, P., Dutta, P. C., Basu, A., Human Remains from Harappa, Human Skeletal Remains from Harappa, *Memoir of the Anthropological Survey of India,* 9.13-188, Calcutta, 1962.

[31] Ehrhardt, S., Frühmenschliche Skelette aus Langhnaj in Gujarat, Vorderindien, *Zeitschrift für Morphologie und Anthropologie,* 54.2.151-162, Stuttgart, 1963.

[32] Sewell, R. B. S., Guha, B. S., *Mohenjo-daro and the Indus Civilization, Being an Official Account of Archæological Excavations Carried Out by the Government of India Between the Years 1922 and 1927,* 2.599-648, London, 1931.

[33] Sewell, R. B. S., Guha, B. S., Report on a Collection of Bones Made by Sir Aurel Stein in Makran, *Memoir of the Archaeological Survey of India,* 43.191-200, Calcutta, 1931.

[34] Ayer, A. A., Report on Human Skeletal Remains Excavated at Piklihal near Mudgal, *Andhra Pradesh Government Archæological Series,* 1.143-154, *Hyderabad,* 1960.

[35] Sewell, R. B. S., Guha, B. S., Report on a Collection of Bones Made by Sir Aurel Stein in Makran, *Memoir of the Archæological Survey of India,* 43.191-200, Calcutta, 1931.

[36] Keith, A., Report on Two Human Crania of Considerable but Uncertain Antiquity, *Journal of the Anthropological Society of Bombay,* 11.6.663-672, Bombay, 1919.

and females of the Adittanalur series, for the Nasal Index with the females of the Harappa Cemetery H, Stratum I, and the Langhnaj male, and for the Orbital Index with the males of this latter series and with the females from Adittanalur. Specimen No. 18 is compared only for its Orbital Index and in this value it stands apart from all of the others. Specimen No. 21 is aberrent in that it is more similar to the males of Brahmagiri and the female specimen from Chanhu-daro in regard to the Nasal Index.

A comparison of the morphological features of the Nevasa Chalcolithic specimens with these other prehistoric series presents additional evidence that the phenotypic affinities of the latter are primarily with the ancient people buried at the Harappa Cemetery R—37 and secondarily with those from the later Harappa Cemeteries H, Strata I and II. The most obvious parallels are observed in the size and form of the frontal bone, the shallow to medium depression of the nasal root, moderate development of the mastoid process, degree of reduction of temporal fullness, and, in the case of the male specimens, a pronounced supraorbital torus and related indications of the greater muscular robusticity of the vault. There is, however, a major morphological distinction between these Harappans and the Chalcolithic Nevasians: the prominent chignon of the former population is not represented by commensurate degrees of occipital protrusion in the series from Nevasa.

As for comparisons between the Chalcolithic Nevasians with series from Adittanalur, Brahmagiri and Piklihal, the parallels are less obvious. Among the specimens of the first series, there are interesting metrical and morphological similarities observed in Specimens Nos. 2 and 5, females, and 7, a male. The Adittanalur phenotype is characterized by cranial indices which are mesocranic to hyperdolichocranic, orthocranic to chamacranic, and a high incidence of acrocrany. Facial indices are mesene to euryene, hypsiconch to mesoconch and mesorrhine to chamaerrhine. Palates are mesostaphaline and brachystaphaline. Morphologically there is a high incidence of occiptal protrusion, pronounced glabellar development, moderate prominence of the supraorbital torus, vertical to bulbous frontal regions, a tendency towards temporal fullness, low temporal crests and frontal eminences, prominent parietal eminences and moderate subnasal prognathism. Many, but not all, of these traits also characterize the Chalcolithic Nevasians.

The Iron Age burials from Brahmagiri show fewer metrical and morphological similarities to the population with which this report is concerned. At Brahmagiri is found a phenotype distinguished by cranial indices which are mesocranic and brachycranic, orthocranic and tapeinocranic and having a Nasal

Index which is hyperchamaerrhine. The metrical values of Specimen I—E are closest to those of the Nevasa females, but morphologically Specimen I—C is very much like the male Specimen No. 21 of Nevasa. Striking differences between these latter two specimens lie in the higher degree of temporal fullness, the protrusion of the occiput (chignon) and the U-shaped palate of the Brahmagiri male.

The two adult male and female crania from the Neolithic—Chalcolithic site of Piklihal show some metrical and morphological similarities as well in comparisons with the Nevasa series. The female cranium is dolichocephalic, the male mesocephalic. For the Basion—Bregma Height—Length Index and the Auricular—Bregma Height—Length Index they are orthocranic and hypsicranic respectively. The Upper Facial Index is mesene for both. Their Nasal Indices are identical and are on the mesorrhine—chamaerrhine border. Palatal Indices are brachystaphaline. In addition to some of these parallels with the Nevasa series there are the morphological similarities in the form of the frontal eminences, the moderate nasal root depression, the moderate to large size of the zygomae, the presence of sub—nasal prognathism, and the rounded shape of the occiput. But for other cranial features there is less morphological agreement, and on the whole the Piklihal specimens are least like those from Nevasa.

When these phenotypes are compared with metrical and morphological data relating to the Indo-Roman Specimen No. 49 the Harappan elements decrease in number and significance and parallels with the specimens from the Iron Age sites of Adittanalur and Brahmagiri become more obvious. For the Cranial Length—Breadth Index Specimen No. 49 has a value close to that of the Specimens from Chandoli and Mohenjo—daro, but in terms of its absolute measurements it is nearer to the male specimens of Adittanalur. For the Auricular—Bregma Height—Length Index there is a resemblance to values for male series from Brahmagiri, Langhnaj and Harappan Cemetery R—37. The female series of the Harappa Area G has a mean Auricular—Bregma Height—Breadth Index close to the Indo-Roman value. The male specimen from the Ceylonese site of Bellan Bandi Palassa and the males and females from Harappan Cemetery R—37 have similar Auricular—Bregma Height—Breadth Indices.

Comparative studies of the facial indices place the Indo-Roman specimen close to Specimen No. 10 for the Upper Facial Index and the Nasal Index. Hence it lies close to the females of the Harappa Cemeteries R—37 and H, Stratum I, and the males of Adittanalur, for the former ratio, and for the latter,

close to the females of Harappan Cemetery R—37, Cemetery H, Strata I and II, the males of Harappan Cemetery H, Stratum I and both the male and female specimens from Piklihal. The female series from the Harappan Area G has a Nasal Index similar to that of the Indo-Roman Specimen, and for the Orbital Index both these and the males of Area G are like the Nevasa specimen. Hence it is in the Indices of Auricular—Bregma Height—Length, and the Upper Facial and Nasal Indices that the Indo-Roman specimen shows its closest similarities with the earlier inhabitants of Nevasa. Its other traits are more frequently represented among the post—Harappan Iron Age series of Brahmagiri and Adittanalur. Where it is similar to the series from Harappan Cemeteries R-37 and H, Strata I and/or II, it is also close to the values of Specimen No. 10 whose affinities with the Sind series have been discussed.

The metrical data which finds the Indo-Roman specimen like that of the Adittanalur series is reflected again to a strong degree in the morphological features of the crania. Its low, slightly inclined forehead with its prominent supraorbital torus and glabella, low temporal crests, large frontal eminences and general bulbous conformation of the forehead are reminiscent of this same kind of frontal development in Specimens Nos. 3 and 8, the males, and 9 and 12, the females, from Adittanalur. However, the shape of the cranium, the absence of alveolar prognathism, and the low development of temporal fullness place the Indo-Roman specimen outside the morphological features of this South Indian population. Morphological similarities with the Brahmagiri and the Piklihal series are very minor, and one must look again to the Harappan specimens for more consistent morphological comparisons. Such similarities are best seen at Cemetery R—37 where the male specimens are characterized by moderately depressed nasal roots, moderate muscular relief, and absence, or a submedium manifestation, of, sub—nasal prognathism.

It is interesting to note in these metrical and morphological comparisons that certain prehistoric populations of the Subcontinent reveal very minor or no similarity to the Chalcolithic and Indo-Roman Nevasians. This may not be surprising for such northern populations as those represented by the series from Nal, Sialkot, and Shahi—tump or for the series from Bellan Bandi Palassa in Ceylon. It is not surprising that the Chandoli specimen which was recovered from a Chalcolithic site, and the Mohenjo—daro series are so dissimilar. The dissimilarity of the Chalcolithic Nevasians and the series from Mohenjo—daro may be due to the fact that the specimens selected for comparison from the latter series are not truly representative of that population.

Although the majority of these Harappan specimens which bear such a striking similarity to the Nevasa series were examined by one of the writers

(K.A.R.K.) immediately after the completion of the metrical and morphological analysis of the Nevasa series, reference has been made to the publication put by the Anthropological Survey of India—*Human Remains from Harappa.*[37] The Government anthropologists have divided the Harappan series as a whole into some five "Types" in lieu of assigning to them the traditional racial names with their geographical connotations. Hence in Cemetery R—37 two Types are defined: Type A which corresponds to the more familiar "Proto—Australoid", "Caucasic", "Veddoid", or "Euroafrican" elements; Type A_1 which refers to the "Mediterranean", "Indo-European", and "Caspian" groups. They have also isolated a sub-group of Type A whose specimens are noted as bearing affinities to the so-called "Proto-Nordic" pattern. From the Harappa Cemeteries H, Strata I and II, and from Area G have come specimens assigned to other Types. These latter refer to mesocephalic and brachycephalic specimens which in other features as well do not resemble so closely the Nevasians as do Types A and A_1 dolichocranic specimens of Cemetery R-37. Although is does not lie within the aims of the investigators of Nevasa series to employ these new typologies, it may be noted that many of the skulls designated Types A and A_1 from the cemeteries at Harappa show striking parallels in their morphology to the series from Nevasa. We find that the morphological features of the Chalcolithic Nevasians crosscut both the A and A_1 Types. Hence the male Specimen No. 21 has many morphological characteristics found in the Type A whereas the female specimens are morphologically more similar to the females of Type A_1. However, specimens assigned by the Government anthropologists to certain Types in one cemetery do not particularly resemble individuals assigned to the same Type in another cemetery. Type A males from Cemetery R-37 have mean Auricular Height-Length Indices which are hypsicranic, Cranial Height-Breadth Indices which are acrocranic, and a Nasal Index which is mesorrhine, whereas the Type A males from Cemetery H, Stratum I, have mean indices which are orthocranic, metriocranic and chamaerrhine for the same. There is closer agreement between specimens of these types from different cemeteries when morphological features are compared. That there appears to be a lesser metrical and morphological correspondence between the Chalcolithic Nevasians and the Harappan specimens from cemeteries other than R-37 may be due to the fact that other Types than A and A_1 appear there in a higher frequency and so obscure statistically the values for individual crania which more nearly approximate Nevasa norms.

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[37] GUPTA, P., DUTTA, P. C., BASU, A., Human Remains from Harappa, Human Skeletal Remains from Harappa, *Memoir of the Anthropological Survey of India,* 9.13-188, Calcutta, 1962.

The Chalcolithic and Indo-Roman Phenotypes Compared with Present-Day Phenotypic Patterns of Maharashtra, Uttar Pradesh and Gujarat

It does not lie within the scope of this study to compare the metrical and morphological characteristics of the three Chalcolithic and the single Indo-Roman specimens with the anthropometry of various modern tribal and village communities scattered across the face of the Subcontinent. Nor is this feasible in view of the paucity of skeletal series available from these present-day populations. For Maharashtra and its neighboring States there are no published records of the anthropometry of large and carefully selected series of skeletal remains, although some studies of single specimens and small collections exist in the anthropological literature. However, anthropometric surveys of the living inhabitants of Maharashtra, Uttar Pradesh and Gujarat have been prepared, and upon the findings of these studies the following comparative analysis with the Nevasa series is possible. These series of living subjects are comprised of eighty-six caste groups of which twenty-two come from Uttar Pradesh, as examined by Mahalanobis[20], twenty-six from Gujarat, as examined by Majumdar[21] with the remainder from Maharashtra, as examined by Karve[22]. Certain limitations are set by this kind of comparative study between measurements of living subjects and skeletal remains, but where it has been possible to translate the one sort of data into meaningful terms for skeletal analysis, the results of the comparison are presented.

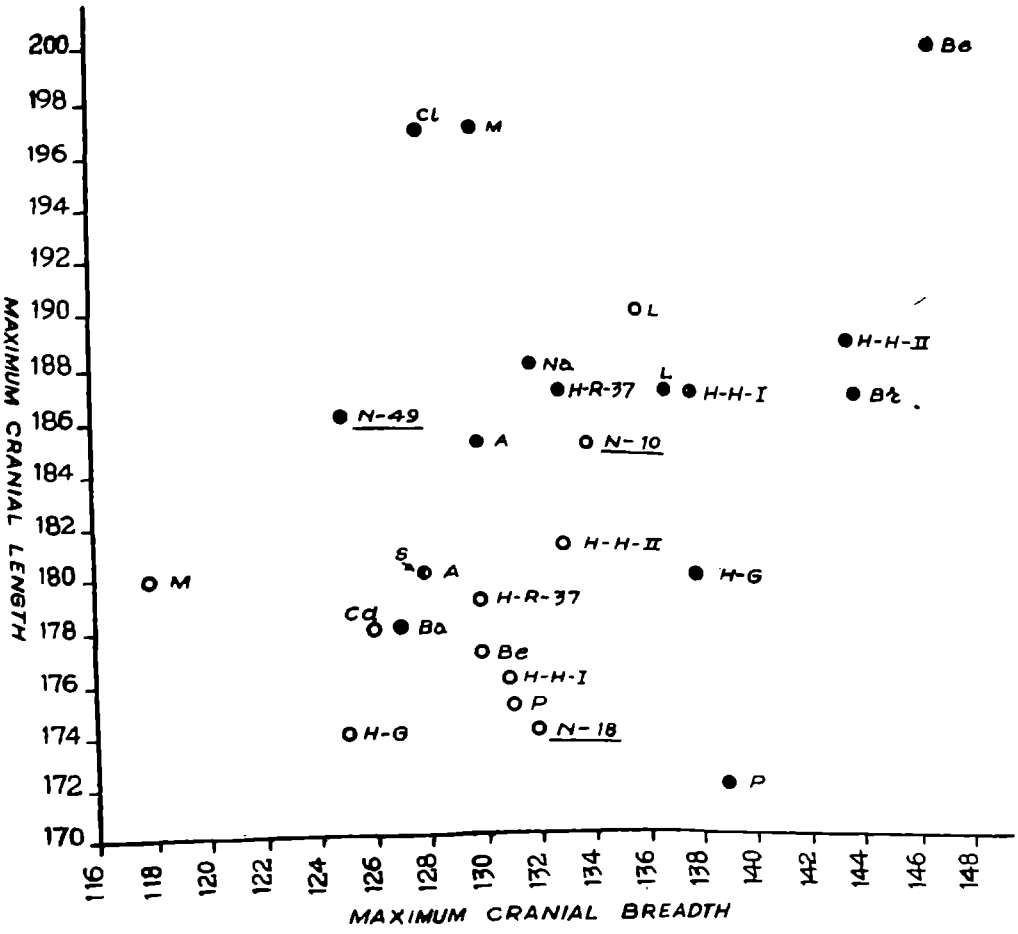
Comparisons of the Cranial Length-Breadth Index for the Chalcolithic Nevasians with these series indicate that the prehistoric specimens have values which fall within the index range of certain castes from Uttar Pradesh (72-74). This correspondence is limited to the cranial shape: for the measurements of Cranial Length and Cranial Breadth of the Uttar Pradesh series are much higher (186-192 mm. — 134-144 mm.). The Maharashtrian castes not only have these greater absolute Cranial Length and Breadth values, but the range of the Cranial Length-Breadth Index is higher (75-80). In Gujarat the Index is still higher (75-82).

Comparisons of absolute cranial size, measured by Head Circumference are much less reliable indicators of racial affinities, especially as this measurement had been carried out with some difficulty upon the Maharashtrian subjects. From the data collected it appears that there is a small-headed group represented

[38] MAHALANOBIS, P. C., MAJUMDAR, D. N., RAO, C. R., Anthropometric Survey of the United Provinces, *Sankhya*, 9.90-324, Lucknow, 1941.

[39] MAZUMDAR, D. N. Race Realities in Cultural Gujarat. *Gujarat Research Society*, 46-48. Esplanade Mansion, Bombay, 1950.

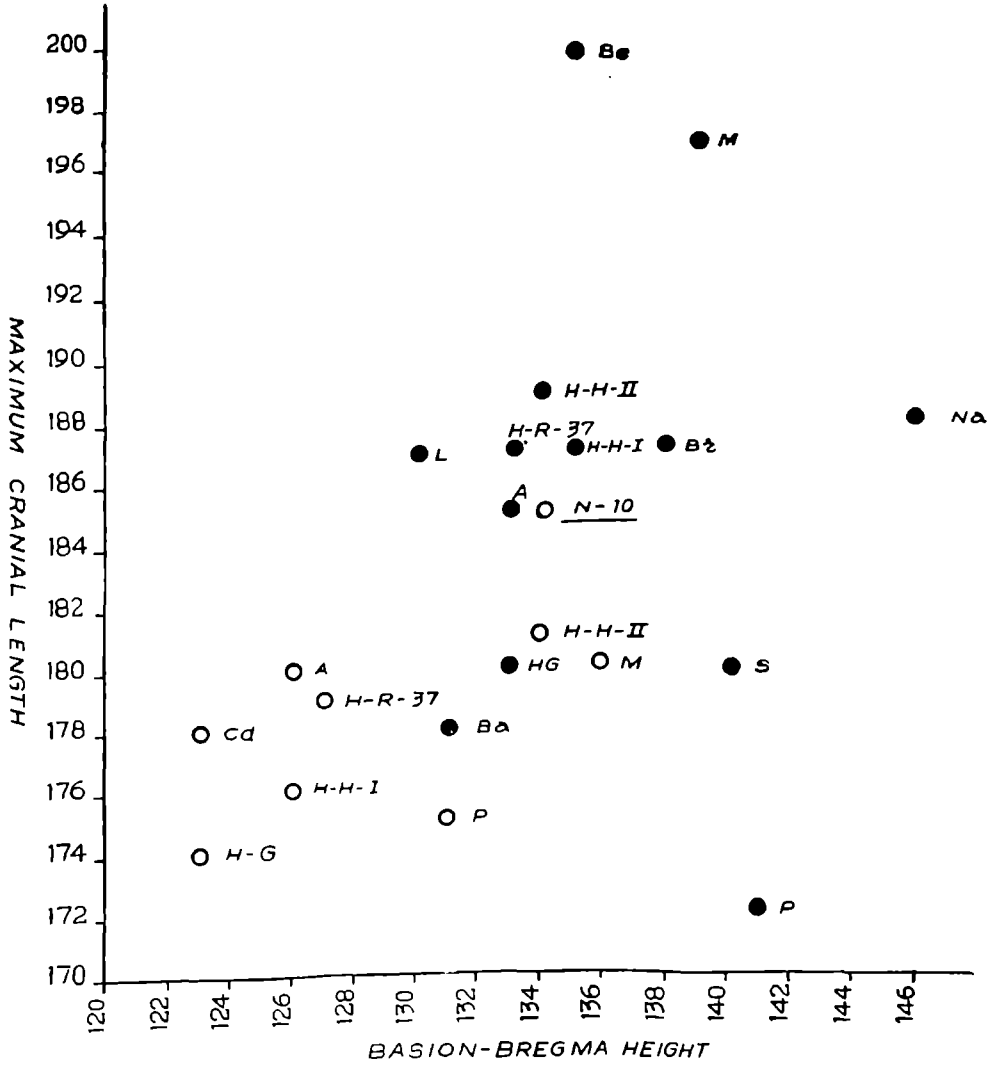
[40] KARVE, I., DANDEKAR, V. M., Anthropometric Measurements of Maharashtra, *Deccan College Monograph Series*, 8, Poona, 1951.



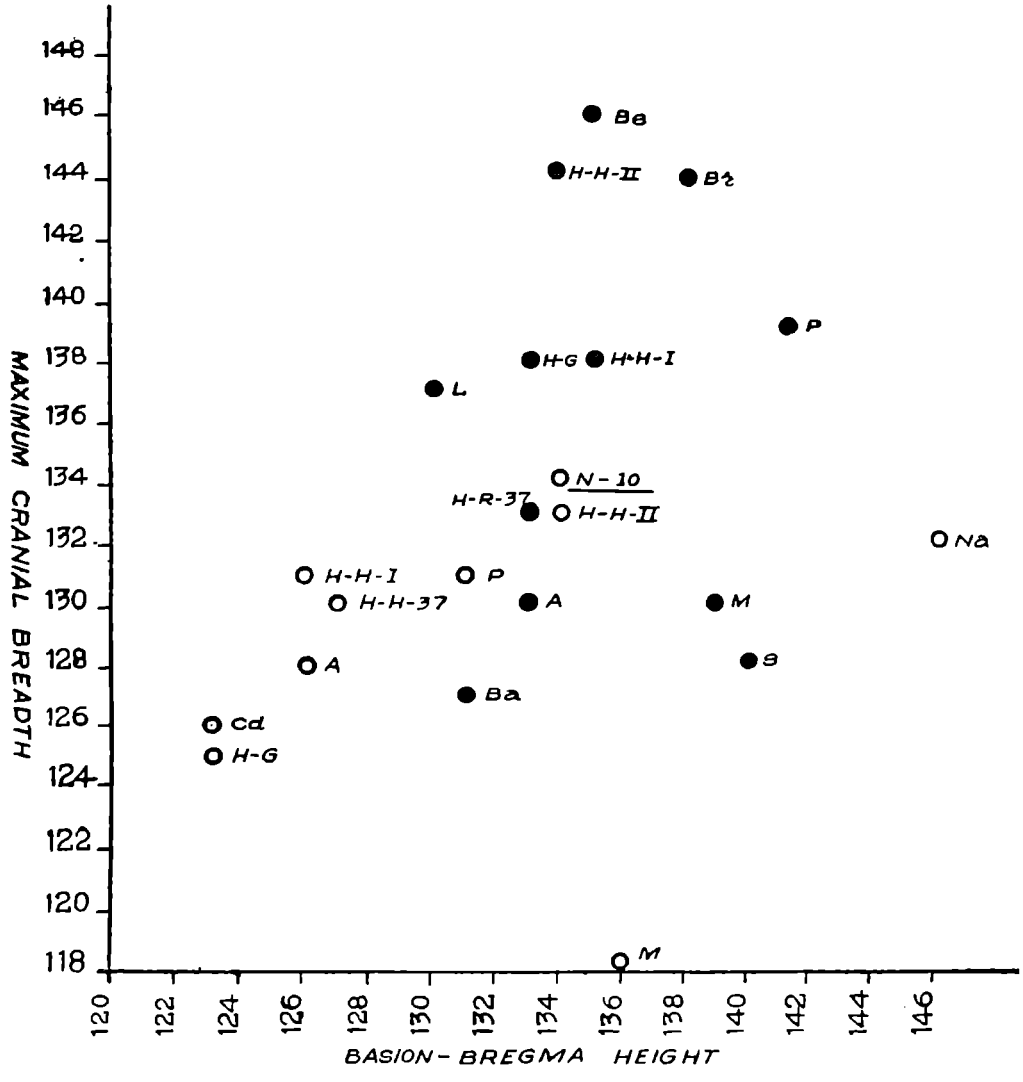
GRAPH 1: COMPARATIVE CRANIAL LENGTH-BREADTH INDICES

NOTES TO GRAPHS 1 TO 8

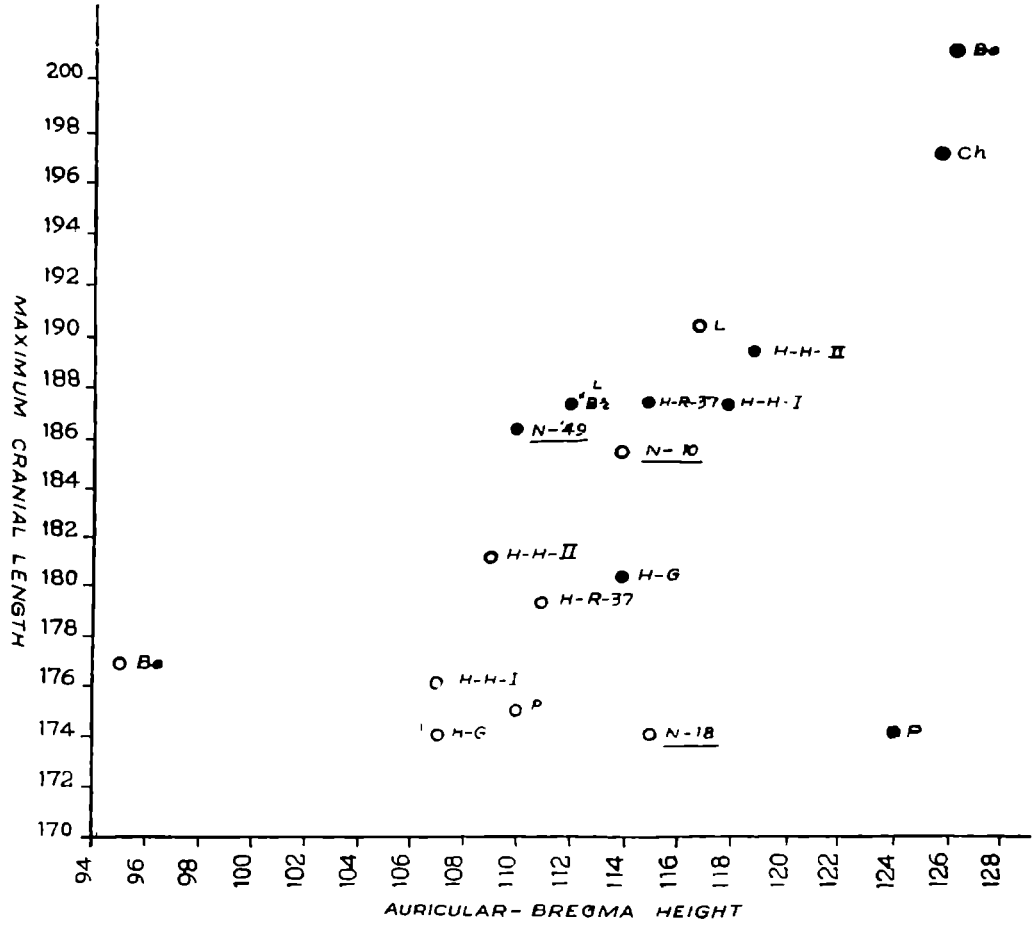
The symbols and numbers of the specimens are as follows: O and M = Male; ● and F = Female; ◐ = Males and females of the same series with identical metrical values; A = Adittanalur (Males 3, 4, 5, 7, 10, 11, Females 2, 12, 13, 14); Ba = Bayana; Be = Bellan Bandi Palassa (Male 2/17, Female 3/27); Br = Brahmagiri (Males A,B,C,E,F); Ch = Chandoli; Cd = Chanhu-daro; H-R-37 = Harappa, Cemetery R-37 (Males 820iii, 779e, 793, 794, 796B, 798A, 798B, 798C, 806, 793B, 811, 818, Skl. 10, 793A, Skl. 1, Females 817, 795A, 779a, 804, 788, 806A, 812, 816, 820II, Skl. 2, 791A, 798AI, 780, 798a, 779c, 801A, 805, 779d, 820I); H-G = Harappa, Area G 289 (Males II-S-18, II-S-42, III-S-2, III-S-22, III-S-23, III-S-47, I-S-11, Females I-S-73, III-S-21, II-S-5); H-H-I = Harappa, Cemetery H, Stratum I Jar Burials (Males 255a, 344, 206B, Females 246c, 7435B, 154a, 153a, 61, 206d, 247a, 247b, 245e, Pot.No. 11, Pot.No. 12a, Pot.No. 12b); H-H-II = Harappa, Cemetery H, Stratum II Open Burials (Males 184K, 484a, 487a, 502G, 695, 307a, 698, Females 306a, 699, 88, 488, 501a, 710); L = Langhnaj (Male 5, Female 4); M = Mohenjo-daro (Males 2, 11, M, Females 7, 10, 19, 26); Na = Nal; P = Piklihal; Sh = Shahi-tump; S = Sialkot.



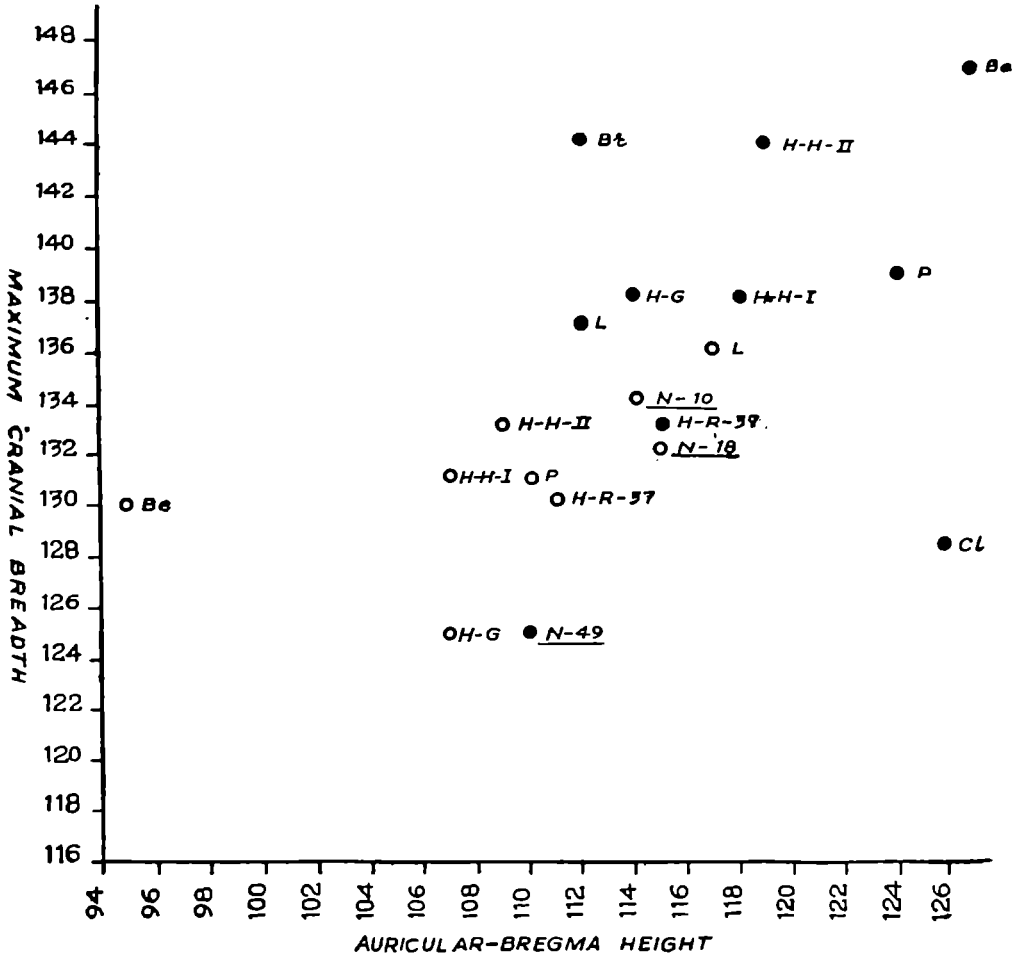
GRAPH 2 : COMPARATIVE BASION – BREGMA HEIGHT – LENGTH INDICES



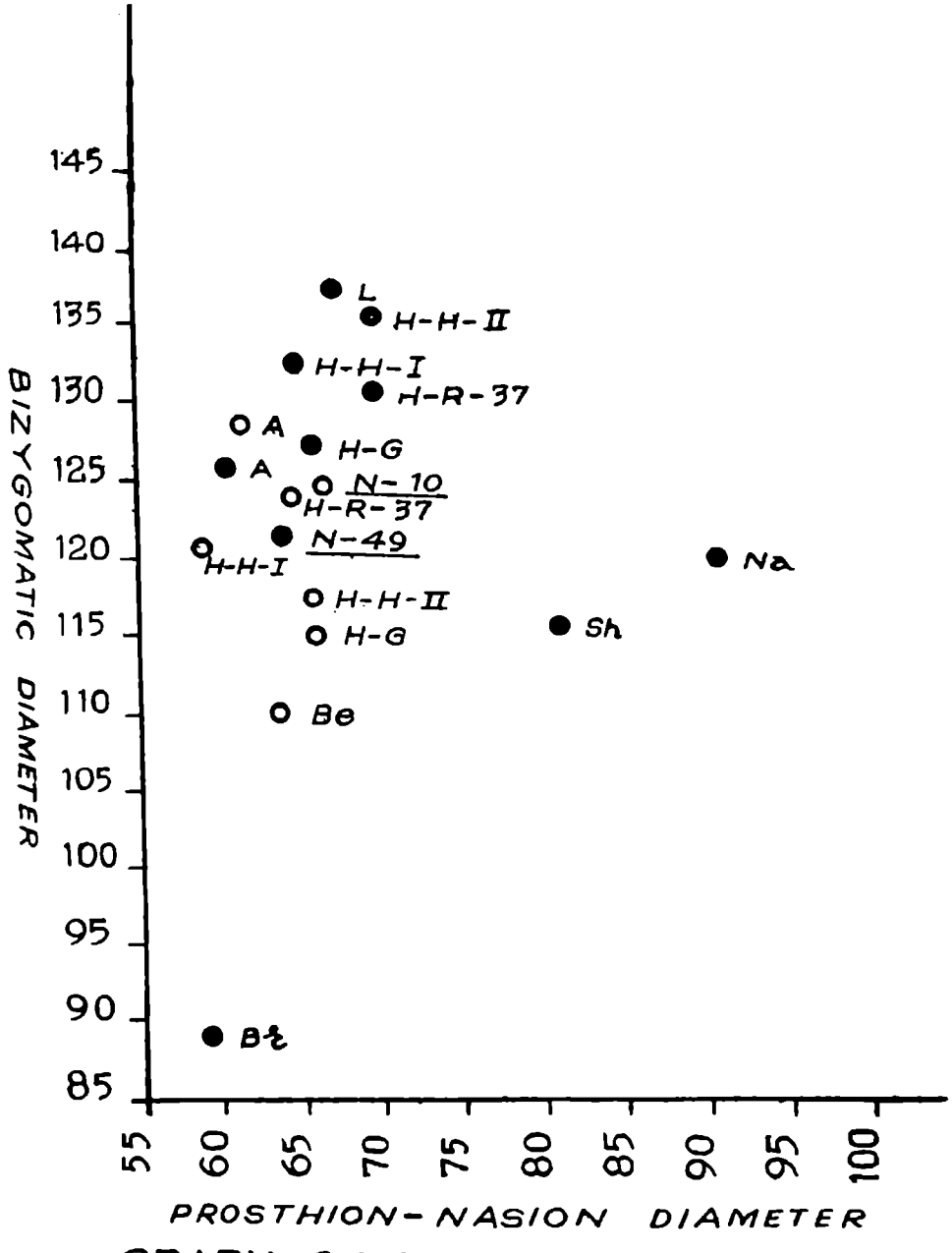
GRAPH 3: COMPARATIVE BASION - BREGMA HEIGHT-BREADTH INDICES



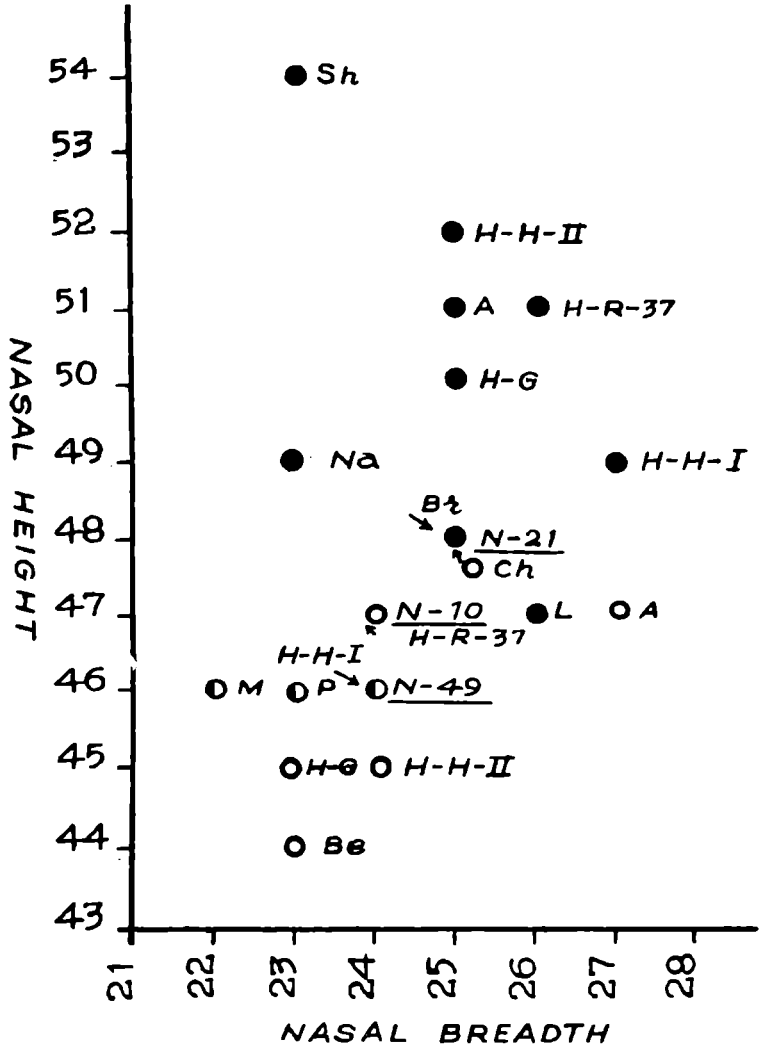
GRAPH 4: COMPARATIVE AURICULAR-BREGMA HEIGHT-LENGTH INDICES



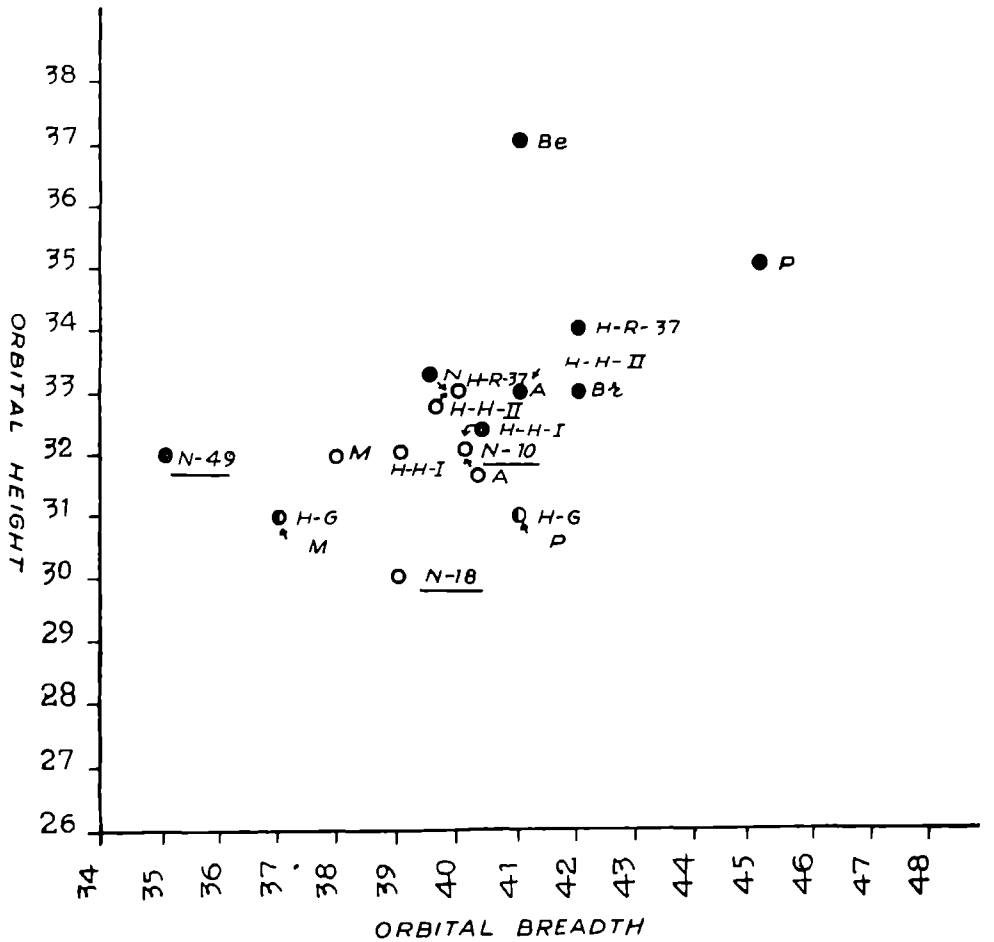
GRAPH 5 : COMPARATIVE AURICULAR-BREGMA HEIGHT-BREADTH INDICES



GRAPH 6 : COMPARATIVE UPPER FACIAL INDICES



GRAPH 7: COMPARATIVE NASAL INDICES



GRAPH 8 : COMPARATIVE ORBITAL INDICES

in that portion of the series comprised of the Malhar Koli, Varli, and Thakur of the Konkan and the Maveli Tadvi and other Bhils who comprise the tribal peoples of the western part of Satpuras in Khandesh. In their values for Head Circumference these subjects measure less than 522 mm. A similarly low value for this trait is found in Specimen No. 18. These small-headed Maharashtrians have Cranial Length measurements of less than 180 mm. and Cranial Breadth measurements of less than 140 mm. Hence these small-headed subjects are dolichocephalic, the lowest indices appearing among the Bhils (75-76). When the Bhils are found living in Uttar Pradesh their Cranial Index is the highest in comparison with those of the macro-population: in Gujarat the Bhils show the lowest Index amongst their neighbors. To find other cranial dimensions and indices close in their values to those manifested in the Chalcolithic Nevasa series one must seek among the larger-headed and dolichocephalic groups called Gond, Kolam, Korku, Gowari, Dhwar, Kunbi, Mana, Kumbi, Khaire, Mahar, Bavni, Kohali and Powar. These are low caste populations consisting of tribals, agricultural laborers and two immigrant castes. The lowest Cranial Index to be found in this group is among the Gond and Kolam (76). In short, all of the primitive and semi-primitive castes of the Maharashtrian, Uttar Pradesh, and Gujarat series are members of the small-headed dolichocephalic phenotypic pattern or of the bigger-headed dolichocephalic complex. This situation is significant in connection with the present comparison, for the Cranial Length and Breadth measurements and the Cranial Length-Breadth Indices of the Chalcolithic Nevasians fall within the range of values characterizing these very groups. Among the village and urban populations of the three geographical areas, values for the Head Circumference and Cranial Length-Breadth Index are considerably higher, and show close similarities to the corresponding values for the prehistoric specimens from Nevasa.

As for the comparative analysis of facial features it is observed that the chamaerrhine Nasal Index of the early people of Nevasa is represented by the broad noses of the present-day tribal populations. Other groups, particularly in Maharashtra, have Nasal Indices which are mesorrhine. It should be noted, however, that the prehistoric series exhibits a low chamaerrhine condition, and this is seen today among the Thakurs and Tadvi Bhils (82-83). Bhils living in the United Provinces and in Gujarat have Nasal Indices well within the mesorrhine class and are quite distinct from the prehistoric Nevasians (77.5; 76-78), while for the Mavchi and other Bhils of Maharashtra the nasal form is quite broad (87-88).

Just as the Cranial Index finds a close approximation in the indices of certain populations from the United Provinces, so does the Total Facial Index

compare closely with values from this region (86-90). Leptoprosopic faces are less frequent in Maharashtra where mesoprosopy has a higher frequency (80-86). In this feature the tribal groups do not stand apart. Rather, they share the indices of the face which are characteristic of neighboring populations. The Maharashtrian groups closest in their Total Facial and Upper Facial Indices to the Nevasians are the Khatri and Wani. There is no comparative data available for this feature from Gujarat. The indices of the face seem to be of lesser importance in a comparative analysis.

The presence of large supraorbital tori in males and an incidence of prognathism among the Chalcolithic Nevasians and modern tribal peoples of Western India may be noted as a feature common to both groups. The height and degree of inclination of the frontal bone, the prominence of the frontal eminences and the moderate depth of the nasal notch are other morphological features which suggest phenotypic affinities of the ancient Nevasians with tribal groups living in India today.

Stature differences are not strikingly different between series from Maharashtra, Uttar Pradesh and Gujarat. Among subjects from Maharashtra the range is one into which the estimations of stature for the Chalcolithic population could easily fit (158-167). The tribal groups have somewhat lower statures and here might best apply the estimates calculated on Athawale's formulae, a method based upon the stature measurements from arm bones of living Maharashtrians.

As has been noted already, the Indo-Roman specimen closely resembles the earlier Chalcolithic specimens in its metrical features save for its hyperdolichocrany, leptene Upper Facial Index, and its greater stature. These differences are not sufficient in either significance or degree to place Specimen No. 49 outside the range of the phenotypic pattern of the earlier inhabitants of Nevasa. The specimen bears close affinities as well with the tribal populations of Maharashtra, Uttar Pradesh, and Gujarat, and little similarity to the village and urban dwellers of these regions today.

SUMMARY AND CONCLUSIONS

The human skeletal remains from the Chalcolithic and Indo-Roman occupation levels at Nevasa are the subject of anthropometric and comparative analysis. Results of these analysis are as follows:

1. A close metrical and morphological similarity exists between the Chalcolithic specimens from Nevasa and the Indo-Roman specimen.

2. Comparisons of the Chalcolithic phenotypic pattern with those of specimens and series from other contemporary prehsistoric sites in the Subcontinent indicate that there is a high frequency of anthropometric features which the Nevasians share with series from Harappa. That series from the Harappa Cemetery R-37 shows the most striking incidence of metrical and morphological parallels with the Nevasa specimens; a secondary degree of similarity is established among the specimens from the Harappa Cemetery H, Strata I and II; a tertiary degree of similarity is established among the specimens from the later Iron Age sites of Adittanalur and Brahmagiri.

3. Comparisons of the Indo-Roman specimen from Nevasa with the specimens and series from the prehistoric series indicate that it shares the greatest number of its features with the series from Adittanalur, Brahmagiri and Langhnaj; a secondary degree of similarity is established among the specimens from the Harappa Cemetery R-37 and Cemetery H, Strata I and II, and Area G.

4. Those prehistoric specimens and series whose phenotypes are dissimilar from those of the Chalcolithic and Indo-Roman Nevasians are from areas of North and North-Western India (including Baluchistan).

5. Comparisons of the anthropometric data of the Chalcolithic and Indo-Roman Nevasians with the living inhabitants of Maharashtra, Uttar Pradesh and Gujarat indicate that pehnotypic similarities can be traced not among the present urban and village populations but among the tribal peoples, particularly among the Bhils and Gonds.

6. The predominent racial type identifiable among both the Chalcolithic and Indo-Roman specimens from Nevasa is "Mediterranean". The non-"Mediterranean" physical features are racially assignable to "Proto-Australoid" phenotypic elements.

From these data the present writers advance the following conclusions:

1. The phenotypic pattern which was present at Nevasa during the Chalcolithic period (*circa* 1500-1000 B.C.) bears close metrical and morphological similarities to that pattern dominent at Harappa during the zenith of the Indus Valley Civilization (2500-1800 B.C.) and which persisted through Iron Age times with survivals of some of its features among present-day tribal populations. Hence the "Mediterranean-Proto-Australoid" phenotypic complex has been existent in the Subcontinent for at least 5000 years, and certainly for a still longer period of time.

2. Commensurate with this considerable time depth for the phenotype is its wide geographical distribution. The distinctive physical features of the Nevasians are to be discerned in series from Sind in the North to Tinnevelly in the South.

3. The fact that other specimens and series from prehistoric populations in North and North-Western India are phenotypically distinct from the Chalcolithic and Indo-Roman Nevasians and the populations with whom they were most closely related is suggestive of a situation whereby a distinct "Mediterranean" population without "Proto-Australoid" components may have been established in this border land of the subcontinent while the phenotype represented at Nevasa was the dominent one in the Indian heartland.

4. Since certain elements of the Nevasian "Mediterranean-Proto-Australoid" phenotype are found at the present day among tribal populations and not among their urbanized and sedentary neighbors, the hypothesis may be advanced that at the close of the Chalcolithic period the ancestors of the latter groups may have pushed the survivors of the aboriginal population into relict areas where their phenotype persists today among the hill tribes.

5. Hence the phenotypic pattern identifiable at the Chalcolithic and Indo-Roman occupation levels at Nevasa is not a unique one. Rather it is a part of a very ancient racial sub-stratum with an extensive geographical distribution in Chalcolithic times. Upon this phenotypic pattern was superimposed in post-Chalcolithic times (and in the region of South India in post-Iron Age times) a very different "Mediterranean" population with its origins, in so far as they can be traced at present, in the North and North-Western periphery of the Subcontinent.

6. Until the time when the physical anthropologist is able to study more complete series of prehistoric osseous remains than are at present available, further generalizations about the Chalcolithic phenotypes would be unfounded. The authors maintain, however, that certain genetic characters were shared by those populations of Chalcolithic times whose skeletal remains are available to us, and that many of these physical characters persist today in sections of the population of the Subcontinent.

APPENDIX A: BIOCHEMICAL ANALYSIS OF BONE SAMPLES

Samples of bone were secured from six skeletal specimens of the Nevasa series (Specimens Nos. 1, 7, 10, 14, 19, and 21). These were forwarded to Dr. Kenneth P. Oakley of the British Museum (Natural History), London, for the analysis of their nitrogen content.

One of the protein components of bone is nitrogen. This element undergoes rapid diminution during the first century or so after the interment of a bone, but nitrogen loss procedes at a slower rate thereafter. In a time duration of 5,000 to 10,000 years the nitrogen content of a bone sample may reach the order of 0.1%. Hence the percentage of nitrogen in bone serves as an indicator of age. This method of relative dating is most successfully applied to large samples of ancient bones. Percentages of hundredths of 1.0% must be accepted as unreliable for dating purposes.

The qualities of nitrogen present in the samples from Nevasa were estimated on the basis of the percentage of milligrams of nitrogen per 100 milligrams of ground bone. Samples from Specimens Nos. 1 (depth 2 feet 8 inches), 7 (depth 4 feet 9 inches), 14 (depth 0 feet 8 inches), and 19 (depth 4 feet 10 inches) gave no evidence of the presence of nitrogen. For Specimen No. 10 (depth 4 feet 10 inches) 0.49% nitrogen was present: for Specimen No. 21 (depth 2 feet 4 inches), 0.66%. These samples in which nitrogen was still present were taken from the temporal bone and the first lumbar vertebra, respectively.

The difference in these values is not great enough to suggest that the interments of Specimens No. 10 and 21 could have been widely separated in time. The greater depth of Specimen No. 10 with its lower percentage of nitrogen content may indicate a temporal gap which can be reckoned in decades rather than in centuries, i.e. these individuals were essentially contemporary inhabitants of Nevasa during the Chalcolithic period there. Only until larger samples of bone from this site are subjected to biochemical analysis can these questions of the relative dating of the burials be clarified.

APPENDIX B: DISPOSAL OF THE DEAD AT NEVASA AND AT OTHER CONTEMPORARY PREHISTORIC SITES

An attempt is made here to study the various burial rites practised at Nevasa and at other sites in India during the Chalcolithic period. The way in which a skeleton is buried may help to solve certain problems. The type of burial may be typical for a particular period of time. The position and orientation of the body may help to show the distribution of a cultural style in both time and space. When different types of burial practices are associated with a single culture they may assist in establishing the existence of divergent beliefs and customs. Very often archaeologists lay much stress upon the importance of burial customs and draw far-reaching conclusions therefrom regarding the distribution of a physical type. Such a situation may be relevant in certain cases, but in others its significance may be nil. In the concluding part of this Appendix an attempt has been made to assess the reliability of such conclusions. Although mention has been made of various types of burial customs practised at Nevasa[41], a comprehensive account has been wanting.

At Nevasa the dead were buried either directly under the floors of houses or near settlements. The former custom is still in practice among some primitive tribes of Khandesh and Bihar[42]. Among these people there seems to exist a variation in the burial rites depending upon the age, social and economic status, and sex of the deceased individual. Some of them are victims of infectious diseases. At Nevasa children up to the age of eleven years were usually buried in urns. In the majority of cases the adults were buried in pits especially dug for this purpose. The urns were generally buried under the floors of houses and in a distinct pit, but in certain cases they were simply kept on the ground and covered up with earth: "The inhumation of children was fragmentary and in urns in a variety of ways, such as (i) in single urn covered with bowl, (ii) in double urns placed horizontally face to face, (iii) in double urns placed vertically face to face and (iv) in three urns, of which two were placed horizontally face to face and the third covered the broken bottom of one of the

[41] *India Archaeology- A Review,* 7, New Delhi, 1954-1955; *Indian Archaeology- A Review,* 8, New Delhi, 1955-1956; *Indian Archaeology- A Review,* 25-28, New Delhi, 1959-1960; *Indian Archaeology- A Review,* 19-20, New Delhi, 1960-1961; EHRHARDT, S., The Urn Burials from Nevasa, *From History to Prehistory at Nevasa: Report on the Excavations and Explorations in and Around Nevasa 1954-56,* 506-522, Poona, 1960; SANKALIA, H. D., *Prehistory and Protohistory in India and Pakistan,* 221-222, Bombay, 1962.

[42] EHRHARDT, S., The Urn Burials from Nevasa, *From History to Prehistory at Nevasa: Report on the Excavations and Explorations in and Around Nevasa* 1954-56, 506, Poona, 1960.

other two"[43]. Usually two urns were buried mouth to mouth. In most of the cases there was an individual burial, but in two cases the bones of two children were found in urns- a child to each urn[44]. The preferred orientation of the burial was north-south in the majority of cases and rarely east-west or in a north-west to south-west direction.

In all of the urns, except in the vertical ones, the northern urn always contained the skull, thorax bones and the bones of the upper extremity, while the pelvic bones and the bones of the lower extremity were found in the southern urn. Some of the urns were found completely empty. Either they contained bones of infants which had later disintegrated in the course of time, or they were of merely symbolic function. In most cases it was a partial burial. While describing the burial practices at Nevasa Sankalia[45] mentions that ". . . after partial cremation or exposure of the body, the bones were placed in a hand-made urn". However, the present authors share the opinion of Ehrhardt[46]: "It appears to me, however, more possible that the dead bodies of the children were placed into the urns after a process of dessication". It is very likely that in such a process many parts of the body were lost or that only certain bones were ritually collected and placed in the urns. The presence of a few partially burnt bones rules out the hypothesis that fully cremated corpses were placed into the urns. Nor do the contents of the urns appear to be burials of partially cremated corpses. The presence of a few bits of charcoal could well have accompanied the earthy deposit during the filling of the urns. Hence these may not be ". . .. derived from burnt offerings"[47]. The latter practice was wide-spread both in space and time. The earliest evidence for it is from Harappa. In Cemetery II the later phase is characterized by "pot-burials"[48]. This custom flourished into the Chalcolithic period and continued until the second century A.D. in South India[49]. Why did people bury their dead, particularly the infants, in urns? To understand the motive behind this custom it is necessary to study in detail the shape and decoration, etc., of the urns.

The urns are grey ware vessels with globular bodies and flaring rims. They were made specially for burial practices. Very often they were decorated, a

[43] *Indian Archaeology- A Review*, 8, New Delhi, 1955-1956.

[44] EHRHARDT, S., The Urn Burials from Nevasa, *From History to Prehistory at Nevasa: Report on the Excavations and Explorations in and Around Nevasa 1954-56*, 507, Poona 1960.

[45] *Indian Archaeology- A Review*, 7, New Delhi, 1955-1956.

[46] EHRHARDT, S., The Urn Burials from Nevasa, *From History to Prehistory at Nevasa: Report on the Excavations and Explorations in and Around Nevasa 1954-56*, 522, Poona 1960.

[47] *Ibid.*

[48] GHOSH, A., The Archaeological Background, Human Skeletal Remains from Harappa. *Memoir of the Anthropological Survey of India*, 9.4, Calcutta, 1962.

[49] SASTRI, N. K. A., *The Colas*, 91, Madras, 1955.

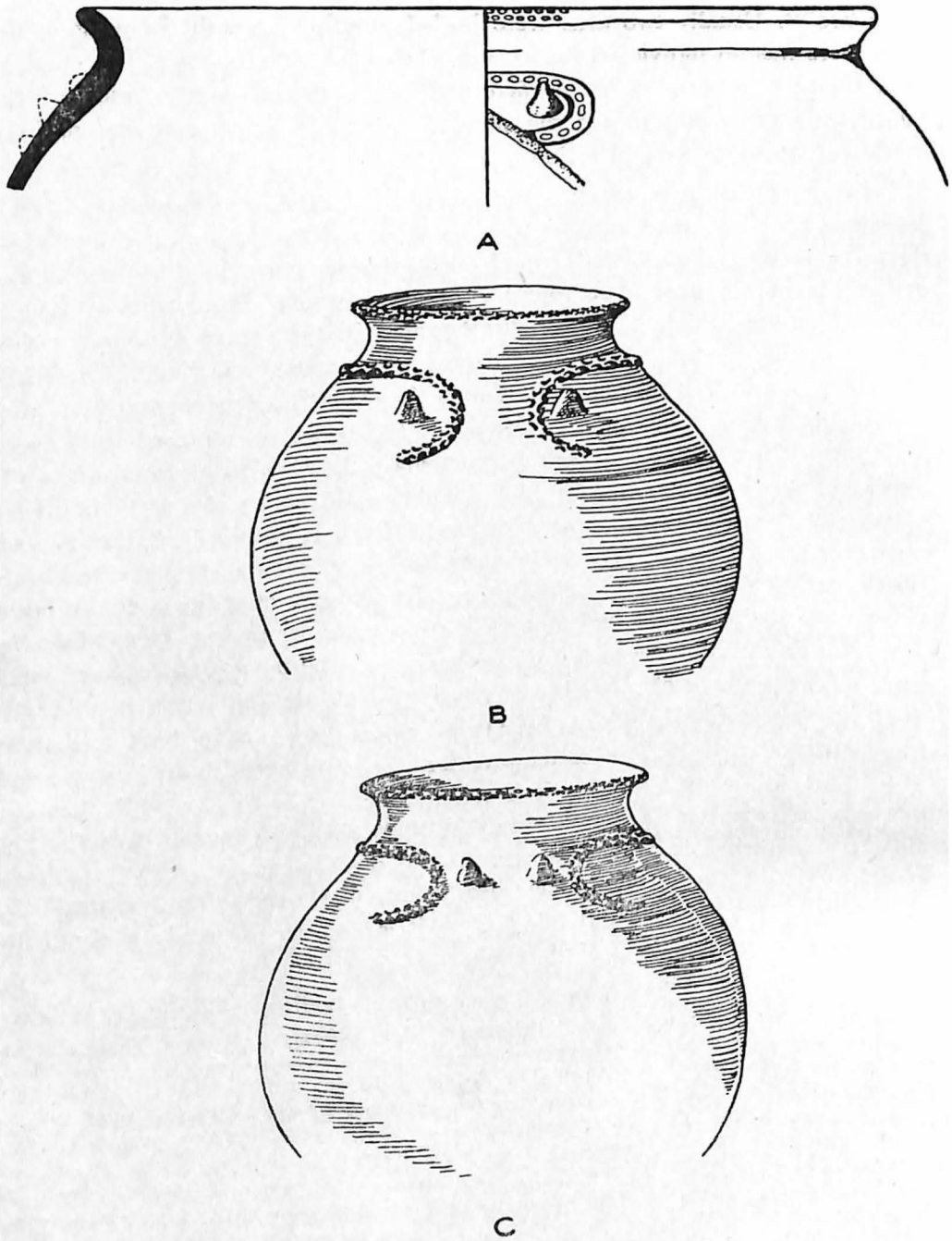


Fig. 2 DECORATIVE PATTERNS ON BURIAL URNS
A PATTERN FROM PIKLIHAL
B & C PATTERNS FROM TEKKALAKOTA

feature to which was attached some special significance in all probability. The shape of the urns resembles very much the abdomen of a pregnant female. In one of the big pots illustrated by Allchin[50] there are two small bosses of *applique* clay in addition to a finger-tip decoration. A similar decoration has been encountered recently at Tekkalakota in Bellary District[51]. In four pot burials containing the disarticulated bones of an adult the large middle two urns have similar *applique* bosses (two for each) in addition to the finger-tip decoration (Fig. 2). The present writers suggest that these clay protuberances are symbolic representations of female breasts. Therefore, it is significant to note that there seems to be a deliberate attempt to give the urns the form of the pregnant female abdomen. In this context it is interesting to observe that jars reminiscent of types from Brahmagiri with their incised oblique and criss-cross lines and chain patterns occur also at Bahal with *applique* work, finger-tip decoration and female figurines[52]. Furthermore it has been invariably observed at the sites of Harappa's Cemetery H late period, at Brahmagiri, at Tekwada and at Daimabad that the infants are put into urns in an embryonic posture.

The foregoing description suggests that the custom of burying infants in a position of embryonic flexure within belly-shaped urns was for the purpose of facilitating the rebirth of the child and symbolically affording it a re-entry into the maternal womb. The adults were buried in two ways: directly under the floors of houses in a supine fully extended or slightly flexed posture and within shallow pits lined with lime; within horizontally placed urns the number of which was variable. No fractional adult burials were encountered at Nevasa. The orientation of the adult burials is north-south, as is the case for most of the child burials. The head was found towards the north-with the face turned towards the east or west, the lower extremities towards the south. Funerary furnishings consisted of vessels and beads both in the case of the child and adult burials. However, in some burials grave goods were entirely absent. This may be indicative of the economic status of the deceased. In one burial a necklace of copper beads strung together with silk thread was placed around the neck of a child. Similar evidence is reported from Chandoli. It has been observed that in adult burials at Nevasa the bones of the feet were missing. A similar feature is found in the burials from Chandoli[54] and Daimabad[55].

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[50] ALLCHIN, F. R., Piklihal Excavations, *Andhra Pradesh Government Archaeological Series*, 1. Plate 27, Figure 37-b, Hyderabad, 1960.

[51] Quoted with the kind permission of Dr. H. D. Sankalia.

[52] *Indian Archaeology- A Review*, 17 New Delhi, 1956-1957.

[53] To avoid repetition, when the orientation of a body is mentioned, the first cardinal point noted refers to the position of the skull, *viz.* a body oriented North-South has its skull to the North.

[54] MALHOTRA, K. C., The Chandoli Skull, *Link*, Nov. 24, 41, New Delhi, 1963.

[55] *Indian Archaeology- A Review*, 15, New Delhi, 1958-1959.

A brief survey of the burial customs practised at contemporary prehistoric sites in India will not be out of place here in order to evaluate, compare and contrast elements of burial customs at Nevasa.

Harappa[56]: For the sake of convenience various mounds have been dealt with separately.

Mound G. No regular burial could be detected. Burials were of a secondary nature. First the bodies were exposed and then the remaining bones were collected and buried in pits.

Mound AB. While a post-exposure burial of a fractional nature seems to be indicated the details are not clear[57].

Cemetery R-37. This deposit yielded normal extended burials. The grave pit was generally wider towards the head end and included a large quantity of pottery. The number of pots accompanying a burial ranged from two to forty, with an average of fifteen to twenty. Along with funerary pots, personal ornaments and toilet objects formed an occasional part of the grave furniture.

Cemetery H. "Here there were two 'strata' of burials (respectively called early and late Cemetery H) each characterized by its own method of burial; it was earth burial in early Cemetery H and pot burial in late"[58]. In the early levels of Cemetery H complete bodies were found laid in an extended position. In the late levels of Cemetery H disarticulated bones collected after the exposure of the bodies were found placed without order at the bottoms of the jars. Babies were enclosed in the embryonic posture.

To sum up, at all the aforesaid areas there were three types of burials: (1) fractional burials without urns; (2) normal extended burials in pits; (8) urn burials containing the bones of bodies which had been exposed. Although extended burial was the most predominant practice at Harappa, post-cremation burials are also found in different levels.

Tekwada: Both urn and normal extended burials in pits have been found at Tekwada. The children were buried in urns. An adult skeleton lay on its spine in a north-south orientation. Besides funerary pots of various wares and shapes a few beads were also found[59].

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[56] Although Harappa is chronologically earlier than Nevasa, its burial practices have been used in this comparison, as are its data on the physical anthropology of the human remains.

[57] GHOSH, A., The Archaeological Background, Human Skeletal Remains from Harappa, *Memoir of the Anthropological Survey of India*, 9.2, Calcutta, 1962.

[58] *Ibid.*, 2.

[59] *Indian Archaeology- A Review*, 18, New Delhi, 1956-1957.

Chandoli: All the skeletons except two were found in pairs of urns. Normally these were oriented north-south and without any pit. Usually small children were found in urns whereas the adults were buried under the floors of houses in a north-south direction, the face turned to the east. Funerary pots were very often associated with the burials. In one child burial a copper necklace was found, as at Nevasa. Signs of the disposal of the dead by burning are practically absent in all of the burials, except in a single case[60]. However, it appears that such calcination was accidental rather than intentional. As at Nevasa, it is interesting to note that some parts of the lower extremities of burials 16 and 24 were cut off before interment[61].

Brahmagiri: In the Chalcolithic levels at Brahmagiri two types of burials were encountered. Numerous urn burials were unearthed which contained the bones of ". . . the child or infant being folded up into close compass and packed into the pot"[62]. The adult skeletons lay extended in an articulated fashion, the orientation being east-west with the head pointing towards the east. Adult urn burial is totally absent. Funerary goods were found along with the burials themselves.

Piklihal: Excavations at Piklihal yielded osseous remains of three individuals of which two were adults and one a child[63]. All of the skeletons were extended. One of the three, an adult, lay upon its back in a north-south orientation. In the case of the others the orientation was south-north, the head to the south. Grave furniture consisted of pots, chert blades and stone axes, but these were absent in the child burial.

Tekkalakota: Excavations at Tekkalakota yielded seven burials of which two belong to Period I and the rest to Period II. The first period is characterized by fractional burials. In Burial no. 1 bones of three individuals are involved, probably indicating a community type burial. The bodies were extended in a south-north orientation, although in one case the orientation was north-south.

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[60] Some charring is observed on the skull and clavicles.

[61] MALHOTRA, K. C., The Chandoli Skull, *Link*, Nov. 24, 41, New Delhi, 1963.

[62] WHEELER, R. E. M., Brahmagiri and Chandravalli 1947: Megalithic and Other Cultures in the Chitaldrug District, Mysore State, *Ancient India*, 4.202, New Delhi, 1947-1948.

[63] ALLCHIN, F. R., Piklihal Excavations, *Andhra Pradesh Government Archaeological Series*, 1.22, Hyderabad, 1960.

[64] A small scale excavation was carried out at Tekkalakota, Bellary District, Mysore State, by Shri M. S. Nagaraja Rao, Research Scholar at the Deccan College Postgraduate and Research Institute, Poona. According to this investigator the earliest levels at Tekkalakota represent the "late Neolithic" whereas the later period belongs to a Chalcolithic phase. One of the authors (K. C. M.) participated in this excavation. Appreciation is extended to Shri Nagaraja Rao for his kind permission in allowing this information to appear in this note.

In the case of one burial a carinated pedestalled goblet was found amid the grave furniture. Period II is marked with normal extended burials. The adult bodies were usually buried in a north-south direction in pits, but again in one case there is an exception, for the orientation was east-west. Generally grave goods accompanied the dead. Three child burials were found, one in an urn and the others as interments under house floors.

Daimabad: At Daimabad the adults were buried under the houses in the normally extended manner. The bodies were placed in a north-south direction, the head pointed towards the north. It is very significant to note that fourteen post-holes were found encircling an extended adult burial " . . . indicating a canopy and lying-in-state before a burial"[65]. Here, as at Nevasa and Chandoli, the feet were amputated. All adult burials were devoid of grave furnishings. In the latter periods the children were buried in urns. The number of urns varied from one to three. The urns were butted both vertically and horizontally. Usually the urns were placed horizontally mouth-to-mouth in a north-south line. The northernmost urn was always filled with the skull, whereas the southernmost urn contained the bones of the extremities. With the adult burials grave furniture in the form of various pots and bone beads were found along with the urns.

To sum up, it is evident that during the Chalcolithic period in India various ways of burying the dead were the customary procedures and cremation was totally absent. The most important and significant innovation in burial traditions was the practice of urn burial. Infants were buried within the urns in an embryonic position. The fractional burials of adults which occur in the earlier levels at several sites, particularly in the Southern Deccan and Karnatak, possibly represent Late Neolithic phases whose traditions were replaced by the custom of normal extended burial during Chalcolithic times. Although the orientation of the body remained the same, i.e. along the north-south line of orientation, the position of the skull becomes reversed in the Chalcolithic period. The skull here occupies the northernmost end of the burial pit instead of being situated to the south. The burial furniture, which was negligible in the earlier period, assumes rather elaborate proportions during the Chalcolithic period. Sometimes a burial having as many as nine funerary vessels is found. Another interesting feature noticed at Nevasa, Chandoli, and Daimabad is that the feet of the deceased were severed and removed before interment. The significance of this cannot be understood at present, and it is premature to generalize that this practice was a necessary feature of the funeral rite. It is thus evident from the foregoing analysis that during the Chalcolithic period in India the above described methods for disposal of the dead had a homogeneous pattern. Variations from these norms may be simply regional modifications of certain basic practices.

[65] SANKALIA, H. D., *Prehistory and Protohistory in India and Pakistan*, 203, Bombay, 1962.
[66] *Indian Archaeology- A Review*, 15, New Delhi, 1958-1959.

APPENDIX C: REFERENCES TO ANTHROPOMETRIC METHODOLOGY

The majority of measurements listed in Tables II-VIII and X are described in the *Lehrbuch der Anthropologie,* 3rd Edition, 1957, of Martin and Saller[67]. In this text the standard procedures for various measurements are detailed and identified by a number. That number relevant to each measurement which the present investigators have used is given below. The indices of the Tables are based upon values obtained through the practice of these methods.

Cranial Measurements: Maximum Cranial Length (1); Maximum Cranial Breadth (8); Basion-Bregma Height (17); Auricular-Bregma Height (20); Auricular-Vertex Height (21); Minimum Frontal Diameter (9); Bizygomatic Diameter (45); Bimastoid Diameter (13); Biasterion Diameter (12); Menton-Nasion Height (47); Prosthion-Nasion Height (48); Prosthion-Subnasale Height (48-1); Nasal Height (55); Nasal Breadth (54); Orbital Height (52); Orbital Breadth (51); Inter-orbital Breadth (50); Biorbital Breadth (44); External Palate Length (60); External Palate Breadth (61); Internal Palate Length (62); Internal Palate Breadth (63); Depth of Palate at M2 (64); Transverse Arc (24); Nasion-Opisthion Arc (25); Frontal Curve (25); Frontal Chord (29-1); Parietal Curve (27); Parietal Chord (30); Maximum Circumference Above Supraorbital Tori (23); Upper Facial Angle (72); Nasal Profile Angle (73); Alveolar Profile Angle (74).

Mandibular Measurements: Condylo-Symphysial Length (68); Bigonial Diameter (66); Bicondylar Diameter (65); Ascending Ramus Height (70); Ascending Ramus Maximum Breadth (71-1); Ascending Ramus Minimum Breadth (71); Symphysial Height (69); Bimental Diameter (67); Mental Angle (79).

Vertebral Measurements: Vertical Ventral (1); Vertical Dorsal (2); Cranial Transverse (7); Caudal Transverse (8); Cranial Sagittal (4); Caudal Sagittal (5); Sagittal Diameter of the Foramen (10); Transverse Diameter of the Foramen (11).

Sternal Measurements: Manubrium Height (2); Manubrium Breadth (4); Corpus Breadth (5).

[67] MARTIN, R., SALLER, K., *Lehrbuch der Anthropologie in Systematischer Darstellung mit besonderer Beruchichtigung des anthropologischen Methoden begrundet von Rudolf Martin,* 1, Stuttgart, 1957.

Clavicular Measurements: Maximum Length (1); Mid-Shaft Diameter, Anterior-Posterior (5); Mid-Shaft Diameter, Superior-Inferior (4); Mid-Shaft Circumference (6).

Scapular Measurements: Morphological Length (2); Morphological Breadth (1); Axillary Border Length (3); Superior Border Length (4); Corocoid Process Length (11); Corocoid Process Breadth (14); Acromion Process Length (10); Acromion Process Breadth (9); Glenoid Fossa Height (12); Glenoid Fossa Breadth (13); Supra-Spinous Angle (20); Infra-Spinous Angle (19); Axillo-Spinous Angle (16); Vertebral Border Angle (15); Axillo-Glenoid Angle (17).

Humeral Measurements: Maximum Length (1); Bicondylar Length (2), Head Diameter, Anterior-Posterior (9); Head Diameter, Superior-Inferior (10); Bicondylar Diameter (4); Mid-Shaft Diameter, Anterior-Posterior (6c); Mid-Shaft Diameter, Lateral (6b); Minimum Shaft Circumference (7); Condylo-Diaphysial Angle (16).

Radial Measurements: Maximum Length (1); Physiological Length (2); Head Diameter, Lateral (4-1); Mid-Shaft Diameter, Anterior-Posterior (5); Mid-Shaft Diameter, Lateral (4); Collo-Diaphysial Angle (7).

Ulnar Measurements: Maximum Length (1); Physiological Length (2); Olecranon Height (8); Mid-Shaft Diameter, Anterior-Posterior (11); Mid-Shaft Diameter, Lateral (12); Joint Axis Angle (15).

Carpal Measurements: Length (1); Breadth (2).

Metacarpal Measurements: Length (1).

Phalangeal Measurements: Length (1).

Femoral Measurements: Maximum Length (1); Bicondylar Length (2); Maximum Trochanteric Length (3); Physiological Trochanteric Length (4); Head Diameter, Anterior-Posterior (19); Head Diameter, Superior-Inferior (18); Bicondylar Diameter (21); Sub-Trochanteric Diameter, Anterior-Posterior (10); Sub-Trochanteric Diameter, Lateral (9); Mid-Shaft Diameter, Anterior-Posterior (6); Mid-Shaft Diameter, Lateral (7); Collo-Diaphysial Angle (29); Condylo-Diaphysial Angle (30).

Tibial Measurements: Lateral Condylo-Malleolar Length (1); Medial Condylo-Malleolar Length (1b); Spino-Malleolar Length (1a); Nutrient Foramen Diameter, Anterior-Posterior (8a); Nutrient Foramen Diameter, Lateral (9a); Mid-Shaft Diameter, Anterior-Posterior (8); Mid-Shaft Diameter, Lateral (9); Tuberal Diameter, Anterior-Posterior (4); Tuberal Diameter, Lateral (4a); Minimum Shaft Circumference (10b).

Fibular Measurements: Maximum Length (1); Mid-Shaft Diameter, Anterior-Posterior (3-2); Mid-Shaft Diameter, Lateral (3-1); Minimum Shaft Circumference (4-2).

Patellar Measurements: Height (1); Breadth (2).

Tarsal Measurements: Length (1); Breadth (2); Height (3).

Metatarsal Measurements: Length (1).

Phalangeal Measurements: Length (1).

Innominate Measurements: Maximum Height (1); Maximum Breadth (6a); Acetabulum Diameter, Superior-Inferior (22); Ischiatic (Greater Sciatic) Notch Breadth (8); Distance from Anterior-Superior to Posterior-Inferior Iliac Spines (12).

Sacral Measurements: Anterior Chord Length (2); Anterior Arc Length (1); Anterior Chord Breadth (5); Anterior Arc Breadth (4); Sacral Vertebra 1 Diameter, Anterior-Posterior (18); Sacral Vertebra 1 Diameter, Lateral (19); Sacral Vertebra 1 Height (24).

Innominate and Sacral Measurements: Bicristal Diameter (2); Pelvic Inlet Diameter, Anterior-Posterior (23); Pelvic Inlet Diameter, Transverse (24).

Dental Measurements: Mesio-Distal Diameter (81); Bucco-Lingual and Labio-Lingual Diameter (81-1).

The angular measurements of the mandibles are defined in an article by Oetteking,[68] "Skeletal Remains from Prince William Sound, Alaska", in the *American Journal of Physical Anthropology,* New Series, Vol. 3, 1945. These angles have been used in the sexing of the adult specimens of the Nevasa series, and the data of Dioptrographic Diagrams 12-15 are interpreted as follows:

A-A′, alveolar plane line of mandibular orientation; a-a′, any parallel to A-A′.

1. Chin Angle: Chin tangent and A-A′ line;

2. Mentobasal Angle: Chin and basal tangents;

3. Anterobasal Angle: Infradentale vertical and basal tangent;

4. Basal Angle: Basal tangent and a-a′ line through lowest point of basal outline;

[68] OETTEKING, B., Skeletal Remains from Prince William Sound, Alaska, *American Journal of Physical Anthropology,* 3.1.57-96; 3.2.117-206; 3.3.277-312, Philadelphia, 1945.

5. Posterobasal Angle: Ramus and basal tangents;

6. Ramus Angle: Ramus tangent and A-A' line;

7. Condylo-Coronoid Angle: Condylo-Coronoid tangent and a-a' line passing through condylion superius.

The formulae used in the estimates of stature have been referred to above.

Estimates of cranial capacity are based upon the methods of Lee and Pearson[69].

The additional anthropometric techniques practiced in the analysis of the Nevasa series are not discussed in the sources just quoted. The present investigators have defined these measurements as follows:

Cranial Measurements:

External Palate Arc- The arc distance from the right to the left alveolon taken with the steel tape resting upon the inferior borders of the alveolar portion of the maxilla.

Cranial Quadrilateral- The angle formed at bregma by the intersection of chords measured from nasion to bregma and from lambda to bregma.

Mandibular Measurements:

Pogonion-Bigonial Length- The distance measured from pogonion to that point on the bigonial diameter line which lies on the mid-sagittal plane and equidistant between the two gonia.

Corpus Length- The chord distance from pogonion to the right (or left) gonion point.

Molar Tooth Row Length- The straight-line distance measured from the mesial border of the first molar to the distal border of the third molar.

Premolar-Molar Tooth Row Length- The straight-line distance measured from the mesial border of the first premolar to the distal border of the third molar.

Clavicular Measurements:

Mid-Shaft Circumference- The circumference taken with the steel tape at the mid-shaft region of the clavicle.

[69] LEE, A. PEARSON, K., Data for the Problem of Evolution of Man: VI, a Field Study of the Correlation of the Human Skull, *Philosophical Transactions of the Royal Society of London*, 196.235-264, London, 1901.

Sternal Head Diameter- The diameter measured across the most anterior and posterior extensions of the sternal head.

Acromial Head Diameter- The diameter measured across the most anterior and posterior extensions of the acromial head.

Conoid Tubercle Diameter- The anterior-posterior diameter of the clavicle taken at the region of the conoid tubercle.

Internal Angle of Curvature- The angle formed by the medial and lateral portion of the shaft of the clavicle at the posterior (internal) surface.

External Angle of Curvature- The angle formed by the lateral portion of the shaft of the clavicle with its acromial head on the anterior (external) surface.

Scapular Measurements:

Supra-Spinous Fossa Length- The distance from the vertebral border of the spinous process to the point of union of the spine with the scapular surface above the level of the spinous process.

Infra-Spinous Fossa Length- The distance from the vertebral border of the spinous process to the point of union of the spine with the scapular surface below the level of the spinous process.

Radial Measurement:

Minimum Shaft Circumference- The smallest circumference of the shaft as measured with the steel tape.

Ulnar Measurement:

Minimum Shaft Circumference- The smallest circumference of the shaft as measured with the steel tape. This is most commonly in a region along the distal third of the shaft.

Innominate Measurement:

Iliac Crest Length- The distance measured with the steel tape from the anterior superior iliac spine to the posterior superior iliac spine.

Sacral Measurements:

Anterior Arc Length- The arc distance measured from the promontorium sacri of the first sacral vertebra to the most distant point on the last sacral vertebra along the anterior surface of the sacrum. This measurement is taken with the steel tape.

Anterior Arc Breadth- The broadest arc of the sacrum measured across the anterior surface. This is commonly taken at a point superior to the first pair of sacral foramina and inferior to the promontorium sacri.

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