APPENDICES
APPENDIX I
Nonmetric Traits

Cranium

1. **Highest nuchal line** (Berry and Berry, 1967):

   The inferior and superior nuchal lines form well-marked ridges running horizontally across the occipital bone. A third line (the highest) is sometimes present. It arises with the superior nuchal line at the external occipital protuberance, and arches anteriorly and laterally, providing attachment for the epicranial epineuroste. It is more easily felt than seen.

2. **Ossicle at lambda** (Berry and Berry, 1967; Corruccini, 1974b):

   A bone may occur at the junction of the sagittal and lambdoid sutures (the position of the posterior fontanelle). It is classified as intermediate to inca bone. Jantz (1970) and Mathews (1889) point out the subjectivity occasionally involved in distinguishing os inca from large lambdoid ossicles, though Finnegam (1972) states that they are distinct entities since the lambda ossicle is derived from the lambdoid fontanelle.

   **Plate I**

3. **Lambdoid ossicles** (Berry and Berry, 1967):

   One or more ossicles may occur in the lambdoid suture.
Up to about twelve distinct bones may be present on either side.

Plate I

4. **Parietal foramen** (Berry and Berry, 1967):

   This pierces the parietal bone near the sagittal suture a few centimeters in front of the lambda. It transmits a small emissary vein, and sometimes a small branch of the occipital artery.

   Plate I

5. **Bregmatic bone** (Berry and Berry, 1967):

   A sutural bone (the bregmatic or inter-frontal) may occur at the junction of the sagittal suture with the coronal one (the position of the anterior fontanelle).

6. **Metopism** (Berry and Berry, 1967):

   The medio-frontal suture disappears within the first two years of life. In a few individuals it persists throughout life; this condition is known as metopism.

   Plate I

7. **Coronal ossicles** (Berry and Berry, 1967):

   Ossicles are sometimes found in the coronal suture.

   Plate I
8. **Epipteric bone** (Berry and Berry, 1967; Corruccini, 1974b):

   A sutural bone (the epipteric bone or pterion ossicle) may be inserted between the anterior inferior angle of the parietal bone and the greater wing of the sphenoid. When large it may also articulate with the squamous part of the temporal bone. Pittard and Seylan (1936) suggest considering this bone to be the fourth form of pterion.

   *Plate I*

9. **Fronto-temporal articulation** (Berry and Berry, 1967):

   Normally the frontal bone is separated from the squamous part of the temporal bone by the greater wing of the sphenoid and the anterior inferior angle of the parietal bone. Occasionally the frontal and temporal bones are in direct contact, forming a fronto-temporal articulation.

   *Plate I*

10. **Auditory torus** (Berry and Berry, 1967):

    Rarely a bony ridge or torus is found on the floor of the external auditory meatus.

11. **Ossicle at asterion** (Berry and Berry, 1967):

    The junction of the posterior inferior angle of the parietal bone with the occipital bone and mastoid portion of the temporal bone is known as the asterion. A sutural bone may occur at this junction.

   *Plate I*
12. **Foramen of Huschke** (Berry and Berry, 1967):

   This is a foramen occurring in the floor of the external auditory meatus. It is always present in young children but only occasionally does it persist after the fifty year. It is most easily scored from the inferior aspect of the tympanic part of the temporal bone.

13. **Mastoid foramen exsutural** (Curruccini, 1974b):

   In the event of multiple mastoid foramen, this variant is classed as absent if any mastoid foramen lies on the suture.

   **Plate II**

14. **Mastoid foramen** (Berry and Berry, 1967; Curruccini, 1974b):

   When present, the mastoid foramen usually lies in the suture between the mastoid part of the temporal bone and the occipital bone. Less frequently it lies exsuturally, piercing the mastoid part of the temporal bone, or, more rarely, the occipital bone. The true mastoid foramen transmits to the transverse sinus, but there are 'other' foramina occurring in the same area (Jantz, 1970). This trait is more usefully considered quantitatively as the number of genuine foramina between mastoid process and suture.

15. **Mastoid grooves** (Rommanes, G.J., ed., 1972; Curruccini, 1974b):

   In skulls in which the supra-mastoid crest is not a mere curved ridge but is a broad, blunt, prominent elevation, there
is a depression behind the crest in the angle between the squamous-temporal and the base of the temporal.


   Mastoid notch is present just posterior and lateral to the stylomastoid foramen and medial side of mastoid process. The morphology of this feature is dependent on the size of the process. Notches slightly to the side of the tip of the process were still classified as present, but intergraded with encroaching diagastric grooves in the case of small mastoid processes. Bipartite diastic grooves are an additional useful variant (Finnegan, 1972); they must not be confused with the groove for the occipital artery.

17. **Posterior condylar canal patent** (Berry and Berry, 1967; Corruccini, 1974b):

   The posterior condylar canal usually pierces the condylar fossa which lies immediately posterior to the occipital condyle. Sometimes it ends blindly in the bone, and has only been scored as patent when a seeker can be passed through it. Scoring this character is unsatisfactory in skulls in poor condition because the bone of the condylar fossa is often fragile, so that a patent canal and a broken fossa are indistinguishable. Canals which are not patent are 'intermediate'. The post-condylar fossa and its perforation are apparently independent additional traits.
18. **Anterior condylar canal double** (Berry and Berry, 1967):

This canal (foramen hypoglossi) pierces the anterior part of the occipital condyle and transmits the hypoglossal nerve. Embryologically, the nerve originates from several segments and this may result in the canal being divided into two, for part or all of its length. This is most easily scored by looking inside the foramen magnum.

**Plate II**

19. **Condylar facet double** (Berry and Berry, 1967; Corruccini, 1974b):

Occasionally the articular surface of the occipital condyle is divided into two distinct facets. This trait, though having clearly defined end-points, is also actually continuous rather than discontinuous in nature. The occipital condyles vary from convex to flat, with a medial notch or fold, which does not divide the condylar surface into two distinct facets.

**Plate II**

20. **Precondylar tubercles** (Berry and Berry, 1967):

Occasionally a bony tubercle lies immediately anterior and medial to the occipital condyle. A centrally placed tubercle has been regarded as two fused tubercles, and classed as bilateral.

21. **Postcondylar tubercles** (Corruccini, 1974b):

Eminences on the posterior rim of the foramen magnum.
22. **Intermediate condylar canal** (Corruccini, 1974b):
Complimentary to posterior condylar canal patent
(Definition No. 17).

23. **Foramen ovale** (Berry and Berry, 1967):
Rarely the postero-lateral wall of the foramen ovale
is incomplete.
**Plate II**

24. **Foramen spinosum** (Berry and Berry, 1967):
The posterior wall of the foramen spinosum is sometimes
deficient.

25. **Foramen ovale-spinosum continuous** (Berry and Berry, 1967):
Rarely the postero-lateral wall of the foramen ovale is
incomplete so that the foramen is continuous with foramen
spinosum.
**Plate II**

26. **Accessory foramen spinosum** (Corruccini, 1974b):
When more than one foramen spinosum is present this trait
is scored.

27. **Foramen of vesalium** (Rommanes, G.J., ed., 1972; Corruccini,
1974b):
Very frequently there is a small aperture, called
sphenoidal emissary foramen (Vessalli), situated antero-medial
to the foramen ovale and close to scaphoid fossa. Partial
foramen through which a feeler could not be passed are classed
as intermediates.

28. **Accessory lesser palatine foramen** (Berry and Berry, 1967;
Corruccini, 1974b):

The lesser palatine foramina lie on both sides of the
posterior border of the hard palate immediately posterior to
the greater palatine foramen, and transmit the lesser palatine
nerves. When more than one (there may be three or four) foramen
is present, it is scored as accessory. They also vary in
position, often occurring in the hard-to-observe valley behind
the tuberosity posterior to $M_3$.

Plate II

29. **Palatine torus** (Brothwell, 1963; Corruccini, 1974b):

It is a bony cigar-shaped prominence along the median
line of the hard palate, and usually thought to be a post-natal
pyperostoris. There are at least two different entities referred
to as palatine tori by different workers. From two to four
distinct types of torus have been classified. Thin, sharp
palatine ridges are considered intermediate; well-defined, thick
exostoses are considered present.

30. **Medio-palatine bones** (Brothwell, 1963):

On the palatal surface a pair of sutures may be found
running parallel to the median palatine suture and either
anterior or posterior to the transverse palatine suture. The resulting extra bones are called anterior and posterior medio-palatine bones.

31. **Maxillary torus** (Berry and Berry, 1967):

   The maxillary torus is a bony ridge running along the lingual aspects of the roots of the molar teeth.

32. **Zygomatico facial foramen** (Berry and Berry, 1967):

   This is a small foramen which pierces the zygomatic bone opposite the junction of the infraorbital and lateral margins of the orbit. It transmits a nerve and small artery, and may be single, multiple or absent.

33. **Palatine bridging** (Rommanes, G.J., ed., 1972; Corruccini, 1974b):

   At each of the posterior corners of the bony palate, opposite the root of the last molar tooth, there is a hole almost wide enough to admit a match; it is called greater palatine foramen and is the lower end of the greater palatine canal, the upper end of which opens into the pterygo-palatine fossa. The lateral palatal sulci and canaliculi laterali accessorii (Akabori, 1939a) may be bridged.

34. **Zygomatic tubercle** (Corruccini, 1974b):

   Like the Carabelli cusp, this trait seems to have an intermediate form in the fossa forming underneath the molar at
the maxillary suture.

35. **Supra-orbital foramen** (Berry and Berry, 1967; Corruccini, 1974b):

   This feature varies from total lack to increasing circular enclosure, and may be multiple. The supraorbital foramen transmits the supraorbital vessels and nerve. It is frequently incomplete (or open). In this case it is often described as a 'supraorbital' notch.

   **Plate II**


   About one cm. below the infra-orbital margin the maxilla is perforated by the infra-orbital foramen; it lies on or just lateral to a vertical line passing through the supra-orbital notch. This varies from a small slit on the border of the infra-orbital foramen to a large, separate foramen.

   **Plate II**

37. **Infra-orbital foramen sutural** (Corruccini, 1974b):

   This suture was classed as partially complete when it was visible but did not reach the infraorbital foramen. The suture varies additionally in that it may originate independently from the orbit or from the zygomatic suture.

   **Plate II**

38. **Orbital osteoporosis** (Brothwell, 1963; Nathan and Haas, 1966):

   These are strainer-like perforations in the roof of the
orbit. *Cribra orbitalia* is divided into three main types, which are considered to be three progressive degrees of development of the condition:

1) **Porotic type**: Consisting of isolated small pores,
2) **Cribrotic type**: In which pores are large and conglomerate, but still preserve their individuality,
3) **Trabecular type**: Where the apertures have become confluent and the bone remaining between them has been converted into a network of trabeculae.

**Plate III**

39. **Frontal notch or foramen** (Corruccini, 1974b):

This trait includes essentially any foramen from the lateral half of the superior margin of the orbit to approximately halfway back to the coronal suture. The frontal foramen can be distinguished by its inclination towards the back of the orbit and by the depth of the bone around it. When it penetrates the supra-orbital foramen it seems always to just barely pierce the margin and is surrounded at most by a thinning of bone. The frontal foramen is scored 'intermediate' when it appears but does not visibly exit into the orbit, and present when it enters the orbit.

**Plate II**

40. **Frontal grooves** (Corruccini, 1974b):

The number, depth, and bridging of these grooves all vary as well as their simple presence or absence; the grooves may enter the frontal bone supero-posteriorly through a foramen, another possible trait.

**Plate III**
41. **Frontal grooves bridging.**

   Plate III

42. **Frontal grooves depth.**

43. **Anterior ethmoid foramen exsutura (Berry and Berry, 1967):**

   The anterior ethmoid foramen pierces the medial wall of the orbit. It normally lies on the suture between the medial edge of the orbital plates of the frontal and ethmoid bones, but it occasionally emerges above the suture.

44. **Posterior ethmoid foramen (Berry and Berry, 1967):**

   The posterior ethmoid foramen lies just behind the anterior ethmoid foramen on the same suture line. Its absence can only be scored satisfactorily in well-preserved skulls.

   Plate III

45. **Marginal meatal foramen (Corruccini, 1978b):**

   Suggested by Ossenberg (1970). The suprameatal foramen or tubercle, and the location of the external exit of the canalis temporalis (Loewenstein, 1895), are possible new traits of interest in this area.

   Plate III

46. **Marginal meatal tubercles:**

   Complementary to marginal meatal foramen.

   (definition No. 45)
47. **Pterion types** (Corruccini, 1974b):

   The X pterion configuration was considered intermediate between the normal H and the K forms.

   *Plate III*

48. **Os japonicum** (Corruccini, 1974b):

   Traces of malare bipartitum are considered partial presences. Buschan (1898) shows that these are much more useful traits due to their higher frequency.

   *Plate I*

49. **Hypoglossal septum** (Corruccini, 1974b):

   A complete range of variation is observed between absence, unconnected spicules, and bipartition of the anterior condylar canal. It is fairly common for the upper and lower septa to fall just short of connecting.


   Jugular process of the occipital bone articulates with the petrous temporal. The anterior border of the process is free and forms the posterior boundary of the jugular foramen. This large foramen lies between the occipital bone and the jugular fossa of petrous-temporal and is placed at the posterior end of the petro-occipital suture. In front it is separated from the lower orifice of the carotid canal by a raised ridge of bone, and on its lateral side it is related to medial aspect of the sheath of the stylomastoid process. Medially it is separated from the anterior condylar canal by a thin bar of bone. The spur which
divides the jugular foramen superiorly may be partial or almost connecting as well as complete or completely absent. A second, medial type of bridging commonly occurs and forms a small foramen.

51. **Pharyngeal fossa** (Corruccini, 1974b):
   These are continuous gradation between a flat pars basilaris, small pits or shallow depressions, and the well-formed fossa.
   Plate III

52. **Pharyngeal tubercles** (Corruccini, 1974b):
   The pharyngeal tubercle is also a variable trait meriting further study, as is the pit or foramen piercing it.

53. **Pterygoid foramen** (Corruccini, 1974b):
   A true foramen between the superior and inferior pterygoid spines, not a perforation is scored as one.

54. **Pterygoid foramen** (Corruccini, 1974b):
   Foramina occur in a number of locations around the superior root of the lateral pterygoid plates. Pterygoid foramina are located in the pterygoid fossa or, commonly, between the pterygoid and scaphoid fossae. A more clearly definable foramen occurs less commonly on the basal sphenoid, lateral to the lateral plate and antero-lateral to foramen Ovale.
   Plate III
55. **Pterygoid spurs** (Corruccini, 1974b):

Partial pterygo-spinous bridge extensions of the lateral plate with spurs are not included, though they may represent related phases of the same trait.

*Plate III*

56. **Connecting lamina** (Corruccini, 1974b):

The presence of the lamina connecting the medial and lateral pterygoid plates is also a useful trait.

57. **Pterygoid spinous bridge** (Corruccini, 1974b):

The irregular border of lateral pterygoid plate may present a backward projection, termed the pterygo-spinous process, which is connected by a ligament (sometimes ossified) to the spine of the sphenoid. The completed bridge is rather rare, but partial bridging commonly extends from both the spinous process and the lateral pterygoid plate toward each other.

*Plate III*

58. **Spino-basal bridge** (Corruccini, 1974b):

This forms over the foramen spinosum, and is often incomplete or almost complete. There is, in addition, a fairly common bridge over the gutter between foramen spinosum and foramen ovale which is not properly a spino-basal bridge.

59. **Paramastoid or paracondylar process** (Corruccini, 1974b):

These are considered by most researchers to be the same
trait, as enlargement of the jugular process that may come into articulation with a vertebra.

60. **Third occipital condyle** (Corruccini, 1974b):

   It is a third articular facet for the atlas vertebra that is completely distinct from the two regular condyles, it may be anterior or posterior to the other two condyles.

   **Plate IV**

61. **Nasal sill sharp** (Corruccini, 1974b):

   The inferior border of nasal aperture being either smoothly founded to right and left of nasospinale or forming a ridge.

   **Plate IV**


   A rare bony spur in the supero-medial corner of the orbit. Below or behind the medial end of the supra-orbital margin about midway between the supra-orbital notch and the fronto-lacrimal suture, there is a small depression or spine.

   **Plate IV**

63. **Sagittal ossicles**.

   Ossicle is at times found in sagittal suture.

   **Plate I**

64. **Temporal ossicle** (Corruccini, 1974b):

   It is on the temporal bone at the parietal squama.

   **Plate IV**
65. **Optic foramen anomaly.**
   When the optic foramen is double.

66. **Stylomastoid foramen** (Corruccini, 1974b):
   This does not vary in human groups except for Malanesians.

67. **Parietal notch bone** (Berry and Berry, 1967):
   The parietal notch is that part of the parietal bone that protrudes between the squamous and the mastoid portions of the temporal bone. It may form a separate ossicle which is known as parietal notch bone.

68. **Inion salience.**
   When inion is pointing outwards, or jutting out. It is scored as prominent, conspicuous, or noticeable.

69. **Sub-asterionic ossicle** (Corruccini, 1974b):
   It is a discrete ossicle on the occipito-mastoid suture below and not connecting asterion.

**Mandible**

1. **Mandibular torus** (Brothwell, 1963; Corruccini, 1974b):
   The torii mandibulares are bony protuberances on the lingual (inner) surface of the lower jaw occurring bilaterally and usually
restricted to the molar and premolar regions. They consist of compact osseous tissue with a restricted number of Haversian canals. Their size may differ considerably. When the torus is ill-defined or only consists of incipient swellings, it is classed as 'intermediate'.


   Above the anterior ends of the mylohyoid lines the posterior surface of the symphysis menti is marked by a small irregular elevation, which may be divisible into two or more parts, is termed the genial tubercles. These may be single or double as well as absent.

   Plate V


   Below the interval between the two premolar teeth or below the second premolar, the mental foramen opens on the surface. Care is taken to avoid identification of double foramina when the inferior alveolar and mandibular canals diverge visually in edentulous mandibles due to resorption (Drennan, 1930). Ashley-Montagu (1954) suggests that the direction of the mental foramen is also a variable and useful trait.

   Plate V

4. Mylohyoid bridge (Corruccini, 1974b):

   This trait varies from complete absence or slight lipping at the mylohyoid groove's lateral edges to increasingly convergent bony arches. The completed bridge may form only at
one point or may be a long tunnel, or even a double tunnel. Several intermediate bridging stages were identified. The groove itself varies in depth and may be double.

Plate V

5. Accessory mylohyoid or mandibular foramen (Corruccini, 1974b):

No truly bipartite foramina were observed. This trait probably differs from the definition used by previous investigators, since only a small accessory foramen within the mylohyoid opening was necessary for a presence.

Plate V

6. Gonial eversions (Corruccini, 1974b):

This may be expressed only below the inferior angle (intermediate) or on both sides of gonion (present).

Plate V