Ancient Monuments Laboratory
Report 16/91 (PARTS I & II)

PART I: THE MEDIAEVAL BURIALS FROM THE BLACKFRIARS FRIARY, SCHOOL STREET, IPSWICH, SUFFOLK (EXCAVATED 1983-85)

S A Mays

SEE ALSO PART II: APPENDIX: DATA FOR INDIVIDUAL BURIALS

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Summary

250 burials (148 male adults, 64 female adults, 14 unsexed adults and 24 juveniles) interred between 1263 and 1538 are examined. The material was excavated in 1983-85, from the site of the Blackfriars Friary, School Street, Ipswich. The burials represent interments within the friary complex. A study of the effects of preservation and recovery factors on the assemblage is carried out. Comparison between this group and other archaeological assemblages suggests a change in cranial form in East Anglia about the time of the Norman conquest. Pathologies include possible cases of rheumatoid arthritis, syphilis (which a high precision radiocarbon date indicates probably predates 1493), tuberculosis, leprosy, Paget's disease and weapon injuries. Despite the above it seems likely that this was a fairly privileged group in terms of diet and health.

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Introduction to the site

Bones from 250 inhumations of Mediaeval date are studied. They represent benefactors and friars buried within the Blackfriars' complex (Fig. 1). The numbers of interments studied from the various locations within the friary are shown in Table 1.

Table 1: Location of burials studied

Location	Number
Church Nave	183
Church Choir	18
East Range of Cloister	13
North Range of Cloister	11
Church Walking Place	8
South Range of Cloister	7
Chapter House	7
To South of Nave	3

The friary was founded in 1263 and was suppressed in 1538 (Page 1975: 122-123). Although there was much inter-cutting of graves, more precise dating of particular burials or groups of burials within this 275 year period was not possible. Human bones were also uncovered during alterations to the brewery which lay on the north side of the site; it seems probable that they were derived from a cemetery, associated with the friary, to the north of the friary church (Blatchly & Wade 1980). It is probable that not all the buildings of the friary complex were excavated; documentary evidence (Gilyard-Beer 1980) suggests the existence of a second cloister to the south of the excavated area: perhaps further burials were located here. Names of 15 individuals buried in the friary are known (Palmer 1887, 1891), but in no case was it possible to associate names with particular skeletons. The friary buildings partially overlay a late Anglo-Saxon (10th-11th century) cemetery; bones from this burial ground formed the subject of a previous report (Mays 1989).

The human remains

1. Bone preservation and skeletal completeness

Bone preservation was scored for each skeleton as good, moderate or poor on the basis of visual inspection of the remains. The completeness of individual skeletons was also estimated.

Table 2: Bone preservation and skeletal completeness

	Preservation			
Approx. completeness	Good	Moderate	Poor	TOTAL
<20%	1	11	9	21
20-40%	5	11	17	33
40-60%	5	9	14	28
60-80%	9	44	15	68
80+	38	58	4	100
TOTAL	58	133	59	250

Preservation of bone varied markedly at School Street, ranging from soil silhouettes, where all bone had vanished, to near complete, well preserved skeletons. Plotting bone preservation on the site plan revealed little regular spatial patterning, the exceptions being the burials in the Chapter House and in the adjacent East Cloister Range which were, in the main, rather poorly preserved; these bones frequently had a light sandy soil adhering to them.

Purple/black staining was found on some bones, frequently on those elements which make up the base of the skull; these stained areas are generally more poorly preserved than nearby non-stained bone. In order to investigate any changes in these stained areas more fully, stained and unstained fragments from the skull base of burial 0954 were removed for analysis. Analysis by scanning electron microscopy revealed that no major differences exist in the elemental composition of the bone mineral in the stained and unstained areas. The X-ray diffraction patterns show sharpening of peaks in the stained compared with the unstained bone. The degree of splitting of the phosphate anti-symmetric bending frequency (at 550-600cm^{-1}) in the infra-red spectrum is greater (measured using the methodology of Termine & Posner 1966) in the stained areas but the difference is very slight.

The spectrographic results suggest improved crystalinity of the hydroxyapatite structure of the bone in stained areas. This is in concordance with the findings of Piepenbrink (1986), who suggested that the improved crystalinity in areas of staining on the bone material he studied was due to partial acid solubilisation of the bone mineral with subsequent recrystalisation, which he associated with fungal activity. It may well be that such an explanation is pertinent here - the poor preservation of bone in the stained areas is consistent with localised increased acidity (Gordon & Buikstra 1981). The reasons why stained areas tend to be located on the bones which make up the base of the skull are unclear, but if the suggestion that fungi are involved is correct, then it may be that the microenvironment in this area particularly favoured fungal

activity. Perhaps decomposition products accumulated in this area during the putrefaction of the corpse producing an acidic milieu, which tends to favour fungi over other micro-organisms.

Many graves inter-cut, and when a grave was cut by a later feature the parts of the skeleton lying nearest the later feature are often a little less well preserved than the rest of the skeleton. The reasons for this are obscure but perhaps it is related to differences in permeability between the natural, undisturbed soil and the more loosely packed fill of a man-made feature.

There is no significant association between skeletal completeness or bone preservation and age or sex.

Many bones are rather fragmentary as a result of breakage during interment due to soil pressure etc, and breakage during storage.

The large number of graves cut by later features, principally other graves - 104 of the 250 graves containing the material under study are cut by later interments - is partially responsible for the rather incomplete nature of many of the skeletons. However a chi-square test shows a significant (at the 0.1% level) association between bone preservation and skeletal completeness, suggesting that destruction of bones by aggressive soil conditions is also a significant factor in determining skeletal completeness.

The overall preservation of the Blackfriars burials is fairly similar to that of the Anglo-Saxon School Street skeletons, but preservation of the Mediaeval burials was rather more variable. Skeletal completeness is markedly greater for the Friary burials, reflecting the greater damage suffered by the Saxon inhumations as a result of cutting of later features.

A skeletal element was scored as present if it was represented by a complete or incomplete bone. The results, for adults (defined in the present work as those thought to be aged 18 years or over at death) only, and for the whole assemblage, are shown in Tables 3 and 4 respectively. In the table for adults (of which there are 226) the representation of each skeletal element, expressed as a percentage of that expected if all burials were represented by complete skeletons, is also given.

Table 3: Representation of skeletal elements (adults only)

Skeletal element	No present	% of expected
Skull	186	82.3
Mandible	164	72.6
Hyoid	37	16.4
Cervical vertebrae	876	55.4
Thoracic vertebrae	1836	67.7
Lumbar vertebrae	823	72.9
Sacrum	175	77.4
Sternum	134	59.3
L ribs	1205	44.4
R ribs	1139	42.0
L clavicle	169	74.8
R clavicle	158	69.9
L scapula	178	78.8
R scapula	173	76.5
L humerus	185	81.4
R humerus	184	81.4
L radius	183	81.0
R radius	187	82.8
L ulna	181	80.1
R ulna	190	84.1
L carpals	722	40.0
R carpals	810	44.9
L metacarpals	747	66.1
R metacarpals	790	69.9
L hand phalanges	944	29.8
R hand phalanges	1073	33.9
Total hand phalanges	2571	40.6
L pelvis	188	83.2
R pelvis	190	84.1
L femur	196	86.7
R femur	197	87.2
L patella	120	53.1
R patella	121	53.5
L tibia	200	88.5
R tibia	193	85.4
L fibula	180	79.6
R fibula	178	78.9
L calcaneus	188	83.2
R calcaneus	189	83.6
L talus	185	81.9
R talus	184	81.4
L tarsals*	757	67.0
R tarsals*	787	69.6
L metatarsals	854	75.6
R metatarsals	856	75.8
L foot phalanges	496	15.7
R foot phalanges	554	17.5
Total foot phalanges	1352	21.4

L=left R=right U=unknown side *=excluding talus and calcaneus

Table 4: Representation of skeletal elements (all burials)

Skeletal element	No present
Skull	207
Mandible	184
Hyoid	37
Cervical vertebrae	932
Thoracic vertebrae	1972
Lumbar vertebrae	882
Sacrum	191
Sternum	142
L ribs	1304
R ribs	1235
L clavicle	185
R clavicle	173
L scapula	193
R scapula	192
L humerus	203
R humerus	205
L radius	200
R radius	207
L ulna	199
R ulna	207
L carpals	758
R carpals	850
L metacarpals	801
R metacarpals	844
L hand phalanges	1003
R hand phalanges	1140
Total hand phalanges	2726
L pelvis	208
R pelvis	210
L femur	219
R femur	219
L patella	126
R patella	126
L tibia	221
R tibia	215
L fibula	197
R fibula	194
L calcaneus	203
R calcaneus	203
L talus	199
R talus	199
L tarsals*	806
R tarsals*	836
L metatarsals	918
R metatarsals	919
L foot phalanges	523
R foot phalanges	589
Total foot phalanges	1439

L=left R=right U=unknown side *=excluding talus and calcaneus

By comparison with the Anglo-Saxon cemetery all skeletal elements are better represented among the Blackfriars burials: 21118 bones were identified from 226 adults; the corresponding figures for the Anglo-Saxon cemetery are 4401 bones from 74 adults. However the pattern of relative representation of the different skeletal elements is remarkably similar in the two assemblages; this supports the suggestion that the lesser completeness of the Anglo-Saxon skeletons is due to random destruction of parts of these skeletons by the cutting of later features.

Most bones are well represented at the Blackfriars, particularly the longbones; only the ribs, hyoid, carpals, and hand and foot phalanges are represented by less than 50% of expected values based on complete skeletons.

It was argued above that destruction of bones during the period of interment by physical, chemical and biological agents is likely to be significant factor in determining skeletal completeness. In order to investigate this further, relative representation of skeletal elements in well preserved (N=51) and poorly preserved (N=55) adult skeletons are compared. Table 5 shows the ratio (expressed as a percentage) of the percentage of expected totals for each skeletal element in poorly preserved to those in well preserved skeletons.

Table 5: Representation of skeletal elements in poorly preserved divided by representation in well preserved skeletons.

Skeletal element	$\frac{\text{Percentage of expected in poorly pres indivs}}{\text{Percentage of expected in well pres indivs}} \times 100$
Mandible	105.5
Left tibia	100.8
Skull	99.2
Left calcaneus	97.1
Left talus	97.1
Right talus	95.0
Left femur	94.8
Right tibia	92.7
Right femur	90.9
Left patella	89.0
Right calcaneus	88.5
Right radius	86.6
Left ulna	85.8
Right metatarsals	85.8
Right humerus	84.5
Left humerus	82.4
Right tarsals	82.2
Right pelvis	80.4
Left metatarsals	79.5
Right ulna	78.6
Left radius	77.2
Left fibula	75.9
Left pelvis	74.3
Right fibula	73.7
Right patella	72.9

Skeletal element	$\frac{\text{Percentage of expected in poorly pres indivs}}{\text{Percentage of expected in well pres indivs}} \times 100$
Left tarsals	70.4
Left scapula	66.0
Sacrum	65.4
Left clavicle	64.7
Right scapula	61.8
Lumbar vertebrae	55.4
Right metacarpals	55.4
Right clavicle	54.2
Left metacarpals	52.2
Total foot phalanges	50.2
Thoracic vertebrae	48.2
Left carpals	39.3
Total hand phalanges	39.1
Right carpals	36.4
Sternum	34.8
Cervical vertebrae	34.3
Hyoid	~~23.1~~ 21.6
Right ribs	22.7
Left ribs	22.4

It could be argued that excavators tend to be rather less careful when excavating a skeleton which is clearly poorly preserved than one which appears well preserved; had this been the case at Ipswich this factor would clearly affect the relative representation of the various skeletal elements in well and poorly preserved skeletons. At the Ipswich Blackfriars site permanent teeth are little affected by preservation factors, generally being whole even in poorly preserved individuals; thus it is argued that investigation of the recovery rates of loose permanent teeth from poorly preserved and well preserved adult skeletons might illuminate any differences in the care with which the inhumations were excavated. Calculations involving estimations of the proportions of loose teeth recovered in well and poorly preserved skeletons failed to support the hypothesis that excavation of poorly preserved skeletons was less careful than that of well preserved ones.

The entries in Table 5 are arranged in order of percentage of expected in poorly preserved individuals divided by percentage of expected in well preserved individuals. Thus the further down the table a skeletal element lies the greater the deficit in its numbers in poorly preserved compared with well preserved skeletons, that is, the greater its vulnerability to destruction in the soil. Those elements least affected seem to be the skull, mandible, the large long-bones of the appendicular skeleton, pelvic bones, tali, calcanei and metatarsals. This is much as might be anticipated on the basis of the strength and relative cortical bone content of these bones. Conversely those most affected by preservation factors tend to be those with high proportions of cancellous bone, for example the vertebrae, sternum and ribs. Among the vertebrae the lumbar are the least, and the cervical the most affected by soil erosion, as expected given their relative strength and robusticity. It has been claimed (Waldron 1987) that under-representation of the small

bones of the hands and feet in skeletal collections from archaeological sites is largely due to their being overlooked during excavation. However the present data show that both the carpals and hand phalanges are very much less frequent in poorly preserved material, implying that factors operating in the soil resulted in their destruction (or damaged them sufficiently to render them unidentifiable) and hence were an important cause of their fairly low level overall. Foot phalanges seem rather less affected by preservation factors than hand phalanges, but despite this are present in rather smaller quantities in the assemblage as a whole. It seems highly probable that this is due to differential recovery - more of the smaller foot phalanges were missed in excavation. The patellae seem little affected by preservation factors but are under-represented in the assemblage as a whole compared with bones of similar size and strength (e.g. tali and calcanei). This would seem to imply poor recovery as a factor in their under-representation, surprising in view of their fairly large size.

2. The demographic composition of the assemblage

(a) Determination of age and sex

Sex is determined using dimorphic aspects of the pelvis and skull. It is not generally feasible reliably to determine sex in juveniles from their bones.

For individuals aged under about 15 years dental development (Ubelaker 1978: Fig. 62) is used to estimate age. When dental material was not available age is estimated from long-bone lengths using the formulae of Scheuer et al. (1980) for foetal and perinatal material and, for older children, using comparisons with long-bone lengths in children in the assemblage for whom dental age could be determined. For adolescents and young adults epiphysial fusion (Workshop of European Anthropologists 1980: Fig. 6) is used as an age indicator.

The principal method used to estimate age at death in adults (those thought to be aged 18 years or over at death) is dental attrition, a technique which has been shown to be fairly reliable in a variety of populations both living and dead. Insufficient immature individuals are present to calibrate the rate of attrition as recommended by Miles (1963), however research by Brothwell (1963) shows that it is probable that the rate of attrition did not change markedly in British populations from Neolithic to Mediaeval times; he was able to derive standards relating attrition stages to age at death (Brothwell 1981: Fig. 3.9). These standards are used in age estimation for the Ipswich adults.

The closure of the skull sutures (Perizonius 1984) is also taken into account, as is the state of the pubic symphyses (Suchey et al. 1987, 1988).

Table 6: Composition of the juvenile part of the assemblage by age and sex

	0≤x<2	2≤x<4	4≤x<6	6≤x<8	8≤x<10	10≤x<12	12≤x<14	14≤x<16	16≤x<18	TOTAL
Male	0	0	0	0	0	0	0	0	1	1
Probably male	0	0	0	0	1	0	0	0	2	3
Female	0	0	0	0	0	0	0	0	0	0
Probably female	0	0	0	0	0	1	0	0	0	1
Unsexed	5	2	3	2	2	4	0	1	0	19
Total	5	2	3	2	3	5	0	1	3	24

Table 7: Composition of the adult part of the assemblage by age and sex

	18≤x<25	25≤x<35	35≤x<45	45≤x<55	55+	ADULT	TOTAL
Male	19	24	39	16	24	19	141
Probably male	1	3	2	0	0	1	7
Female	9	10	12	4	15	8	58
Probably female	0	3	1	0	0	2	6
Unsexed	0	1	2	0	1	10	14
Total	29	41	56	20	40	40	226

Note: henceforth probable males and probable females are, unless stated, included in the totals for adult "males" and "females".

Table 8: Mean age at death for adults

Males	Females	All adults
40.5	41.5	40.8

Of the 250 interments studied in the present work, 89 showed evidence for burial in a coffin, in the form of traces of wood fragments or coffin staining and/or the presence of iron nails. There is no association between presence of a coffin and the sex or age of the individual.

The position of the arms of each skeleton was noted on excavation and classified as: placed across the stomach or chest, placed across the pelvis or abdomen, or placed by the sides. Of the 193 interments studied for which the position of both arms could be recorded, in 173 cases the left and right arms were positioned in a symmetrical manner. The variation in arm position with respect to gender for those adults whose arms were positioned symmetrically is shown in Table 9.

Table 9: Arm position in male and female adult burials

	Males	Females
Both arms across chest/stomach	21*	3#
Both arms across the pelvis/abdomen	16*	5*
Both arms by sides of body	66+	44*

*=includes 1 case in which sex could not be determined with certainty +=includes 2 cases in which sex could not be determined with certainty #=includes 3 cases in which sex could not be determined with certainty.

A chi-square test indicates that the association between arm position and sex in adults is significant at the 5% level. The data presented in Table 9 indicate that this is primarily a reflection of the fact that most interments with their arms across the chest/stomach area are male; indeed of the 3 interments buried in this manner which were classified as female indications of gender from the bones were somewhat ambiguous - all were sexed as "?females" - no certain females were buried in this position.

A significant association exists between burial in a coffin and asymmetry in arm position. During the act of interment any slight bumps which the coffin might receive could cause minor changes in the position of the corpse within; in addition the void space above the corpse in a coffined burial allows minor changes in corpse position during decomposition. It may thus be that interments showing asymmetry in arm position do so as a result of accident rather than design.

The difference in the numbers of male and female adults (148 males, 64 females) is significant at the 5% level. This sexual imbalance is consistent with findings from other Friary sites.

Table 10: Comparisons in sexual composition of Friary assemblages

Site	M:F ratio (adults)	N	Reference
Oxford Greyfriars	47:1	48	Harman (1985)
Leicester Austin Friars	15:1	16	Stirland (1981)
Guildford Blackfriars	6.3:1	80	Henderson (1984a)
Oxford Blackfriars	5.3:1	63	Harman (1985)
Beverley Blackfriars	4:1	10	Dawes (1987)
Ipswich Whitefriars	3:1	12	Mays (1991)
Northampton Greyfriars	2.5:1	14	Griffiths (1978)
Chester Blackfriars	2.4:1	34	West (1990)
Ipswich Blackfriars	**2.3:1**	**212**	-
Carlisle Blackfriars	1.8:1	145	Henderson (1984b)
Chelmsford Blackfriars	1.5:1	108	Bayley (1975)
Hartlepool Greyfriars	1.2:1	122	Birkett (1986)

Sexing of adults from skeletal remains has been shown to be highly reliable (e.g. Meindl et al. 1985), hence these figures cannot be explained by systematic sexing bias. It would seem logical to argue that the sex imbalance is due to the burials of friars increasing the numbers of males.

Table 11: Location of sexed adult burials

Location	Males	Females	Unsexed
Church Choir	8	5	0
Chapter House	5	0	2
Church Nave	110	53	8
Church Walking Place	6	2	0
East Cloister	8	3	2
North Cloister	8	1	1
South Cloister	1	0	1
To South of Nave	2	0	0

Female burials are found in all locations within the friary buildings save the Chapter House and the south range of the cloister, indicating that burials of layfolk occurred in all locations within the friary buildings, except possibly these two. Seven burials were received from the south range of the cloister, 1 male adult, 1 unsexed adult, 2 male juveniles and 3 unsexed juveniles, but due to the small numbers no firm conclusions can be reached. It has been suggested (Loader nd) that the burials in the Chapter House may be exclusively of religious, and the skeletal evidence (all burials are adult, 5 males, 2 unsexed) is consistent with this, although again numbers are rather small.

In all locations in the friary complex males outnumber females. If the hypothesis, above, that the sex imbalance, observed at Ipswich Blackfriars, and other Friary sites, is due to burials of friars then it would seem that at Ipswich, other than perhaps in the locations discussed above, burials of friars were not segregated from those of lay benefactors. (That burials of friars and layfolk need not be segregated is consistent with evidence from a collection of wills of individuals buried at 28 Blackfriars friaries in England and Wales (Palmer 1891) which shows a few cases of lay benefactors requesting burial next to particular friars.)

Consistent with the hypothesis that burials of friars were not at Ipswich generally segregated from those of layfolk, there is no evidence for spatial patterning with respect to age and sex within the 6 of the 7 locations in which the burials of females and children are found in addition to those of adult males. The exception to this is in the church choir: there are only 5 burials of infants (those thought to be aged under 2 years at death) in the friary as a whole: all these are located towards the east end of the church choir. Segregation of young children also occurred at the Oxford Blackfriars (Harman 1985) where they were located in the Chapter House.

Of the infant burials 2049 was aged about 31 weeks in-utero and 1314 about 33-34 weeks. The normal gestation period for a human foetus is 40-42 weeks, but after about 28 weeks the foetus is potentially viable, and, given care, might be expected to survive

(discussion in Molleson 1989). It was not possible to determine from the skeletal remains whether these infants were stillborn or died during the immediate post-natal period.

Table 12: Percentage of juveniles in Friary assemblages

Site	% juvenile	Number of burials
Leicester Austin Friars	26.9	26
Chester Blackfriars	24.5	49
Hartlepool Greyfriars	21.2	118
Oxford Blackfriars*	21.0	83
Oxford Greyfriars*	20.4	49
Guildford Blackfriars*	11.5	113
Chelmsford Blackfriars	10.1	138
Ipswich Blackfriars	**9.6**	**250**
Carlisle Blackfriars*	8.9	214
Northampton Greyfriars	8.3	24

Note: references as Table 10, juveniles defined as those aged under 18, except * where individuals aged under 20 were classed as juveniles.

In the absence of modern medical care the number of deaths in childhood is generally high - up to 40% of deaths may occur in the under 15 age group, with most of these occurring during infancy (discussion in Brothwell 1987); in addition there is documentary evidence that infant mortality was high during the Mediaeval period, even among the wealthier classes (Thrupp 1962). Thus the relative lack of immature individuals in general, and infants in particular, at Ipswich Blackfriars is very unlikely to reflect a low infant and childhood mortality among the people using the friary for burials. One factor contributing to the low proportion of immature individuals is that an (unknown) proportion of the assemblage are interments of friars. Although entry to the order of the Dominican friars could occur during adolescence or even childhood (Hinnebusch 1951: 317f) the overall effect of the burials of religious will tend to be to bias the assemblage towards adults as well as towards males.

Table 13: Mean age at death of adults in skeletal series and from documentary sources (of Mediaeval date unless stated)

Site/source	Mean age	No of skeletons
Carlisle Blackfriars	32.4	90
Oxford Blackfriars	32.7	43
Guildford Blackfriars	35.2	50
Chelmsford Blackfriars	35.6	93
Ipswich Sch. St (10th-11th cent)	35.7	52
St Helen's, York	38.0	474
Ipswich Blackfriars	**40.8**	**186**
Hartlepool Greyfriars	46.4	93
Secular Peerage 1350-1500	46.1	-
London Merchants 1448-1520	49.7	-
From inquests post-mortem 1250-1348	50.3	-

References for archaeological studies as above. The last 3 entries in Table 13 give figures for life expectancy at age 20 from documentary sources: figures for the secular peerage are from Hollingsworth (1975), those for London merchants are from Thrupp (1962) and those calculated using entries in the inquisitions post-mortem are from Russell (1937). For all three the data are for males only.

Table 14: Percentage of adults aged over about 45 years at death from skeletal series and documentary sources

Site/source	Percentage of aged adults over 45
St Nicholas Shambles, London	11.3
Chelmsford Blackfriars	17.2
Carlisle Blackfriars	18.9
Oxford Blackfriars	20.9
St Helen-on-the Walls, York	23.0
Ipswich Sch. St (10th-11th cent)	23.1
Guildford Blackfriars	30.0
Ipswich Blackfriars	**32.3**
Hartlepool Greyfriars	54.9
Data from inquisitions post-mortem 1250-1348	60.4
London Merchants 1448-1520 (doc sources)	60.8

Number of individuals for skeletal data and references as above, except St Nicholas Shambles data which refer to 133 adults and are from White (1988). The documentary data refer to males only.

The Ipswich Blackfriars adults seem to be slightly older on average compared with adults from the Mediaeval archaeological sites listed in Tables 13 & 14, the exception to this pattern is at the Hartlepool Greyfriars, where the estimated mean age at death of adults, and the proportion older than about 45 years were quite markedly greater than at the other sites. Compared with the 10th-11th century material from the same site, the 13th-16th century Ipswich Blackfriars adults were in general rather older; this difference in age at death is reflected in differences in the type and frequency of bony pathologies

suffered by the 2 groups (Section 5).

Turning to the documentary evidence, it is apparent that, compared with the Ipswich Blackfriars data, and the archaeological evidence in general, it shows a greater mean length of life and a greater proportion of adult deaths at older than 45 years. Documentary evidence relating to members of the secular peerage summoned to parliament (Hollingsworth 1975), the merchant classes (Thrupp 1962) and the upper classes, represented in the inquisitions post-mortem (Russell 1937), give similar values for mean age at death of about 45-50 years, with about 60% of adults dying at ages greater than 45 years. Several factors need to be considered when attempting to interpret the marked discrepancy between the archaeological and documentary evidence. Firstly, all the documentary evidence is biased towards the upper end of the social scale, and refers solely to males. It is difficult to assess the social classes from which burials in friaries are drawn, but Hinnebusch (1951: 287) states that friars themselves were generally drawn from the lesser nobility and the middle classes. Documentary evidence relating to burials of benefactors (e.g. Palmer 1891; Golding 1986) shows that burials at friaries often included members of the nobility, and monastic annalists stress the importance attached by religious communities to the burial of wealthy patrons or benefactors in their own churches: according to Matthew Paris friars hung around the deathbeds of magnates and the wealthy so that they made secret wills commending themselves to the friars alone (Golding 1986). However the overall social composition of those layfolk buried at friaries is hard to resolve (discussion in Poulton & Woods 1984), although given the need for the friars to support themselves, the poorer sections of society are unlikely to be represented (ibid.). Several archaeological reports (e.g. Daniel 1986: 272; Poulton & Woods 1984: 44f) comment that burial within the friary buildings is likely to be more desirable than burial in the cemetery associated with the friary, so perhaps the excavated Ipswich burials represent the wealthier benefactors.

Secondly Thrupp (1962) and Russell (1937) select their data to exclude the great plague years; this factor will tend to increase their age at death figures compared with Mediaeval archaeological data.

Thirdly it may be that anthropological methods tend to under-age adult remains, as has been contended by previous writers (e.g. Cayton 1980) when comparing archaeological with documentary demographic data. The major method used to age the adults in the present collection, dental wear, has been shown to be reliable on a wide range of groups of known age, although in the present work it is unfortunate that insufficient juveniles were present to calibrate the rate of wear in the group under study.

In conclusion it seems probable that all 3 factors discussed above played some part in the discrepancies between the archaeological and the documentary adult age at death data.

It is a frequent finding in archaeological groups that female adults show a lower mean age at death than males, and this is often ascribed to mortality associated with childbirth. Unlike the case at the School Street Anglo-Saxon cemetery the age at death for males and females at the Ipswich Blackfriars is similar (Table 8), although the comparison between the sexes here is

complicated by the probability that the male part of the assemblage represent a mixture of friars and layfolk, while the female burials clearly cannot be friars.

3. Metric variation

The data discussed in this section relates to adults only.

(a) Stature

Stature is calculated from long-bone measurements using the formulae of Trotter & Gleser (1952, 1958). The figures in Tables 15-17 are in centimetres unless stated.

Table 15: Distribution of adult stature

	144≤x<148	148≤x<152	152≤x<156	156≤x<160	160≤x<164	164≤x<168	168≤x<172	172≤x<176	176≤x<180	180≤x<184	184≤x<188
Males	0	0	0	0	4	14	39	47	20	6	1
Females	1	0	8	18	17	5	6	2	1	0	0

Table 16: Adult stature means and ranges

	N	Mean	Range
Males	131	172.7 (5'8")	162.3-185.1 (5'4"-6'1")
Females	58	161.1 (5'3")	146.3-176.9 (4'10"-5'10")

Table 17: Stature comparisons

	Males		Females	
	Mean	N	Mean	N
Guildford Blackfriars	173	47	161	9
Oxford Blackfriars	173	18	-	-
Ipswich Blackfriars	**173**	**131**	**161**	**58**
Ipswich Sch. St (10-11th cent)	172	26	159	23
Ipswich Whitefriars	172	8	157	3
Chelmsford Blackfriars	171	39	157	23
Carlisle Blackfriars	171	54	160	20
Chester Blackfriars	169	16	161	4
Pooled Mediaeval (Manchester 1983)	172	-	-	-
Modern (White 1988)	174	-	161	-

The stature figures from Ipswich Blackfriars are similar to modern and to other Mediaeval data. They are also of similar stature to the 10th-11th century material excavated from the same site, although the Mediaeval skeletons seem to be of rather more robust build.

(b) Cranial measurements

Although many of the skeletons are quite complete and well preserved, the crania in particular are often rather fragmentary; this limited the number of measurements which could be taken. Cranial measurements are selected from Howells (1973).

(i) Raw measurements (in millimetres)

Table 18: Cranial measurements: males

	N	Mean	s.d.
Glabello-occipital length	45	184.4	7.8
Cranial breadth	38	145.8	6.8
Basi-bregmatic height	20	134.7	4.7
Basion-nasion length	19	103.9	3.9
Maximum frontal breadth	61	123.3	6.2
Bimaxillary breadth	16	96.8	8.2
Bizygomatic breadth	9	133.7	5.1
Bifrontal breadth	64	100.1	4.4
Bregma-lambda chord	66	112.3	6.5
Lambda-opisthion chord	58	97.1	5.1
Mastoid height	96	30.5	2.9
Nasion-bregma chord	79	111.4	4.2
Biasterionic breadth	53	114.0	5.6
Simotic chord	32	10.1	2.8
Orbital breadth	17	41.2	1.8
Orbital height	17	33.8	1.7
Foramen magnum length	22	37.7	3.5

Table 19: Cranial measurements: females

	N	Mean	s.d.
Glabello-occipital length	18	178.3	7.1
Cranial breadth	16	139.7	8.2
Basi-bregmatic height	10	128.9	4.8
Basion-nasion length	9	96.8	3.3
Maximum frontal breadth	23	119.0	5.9
Bimaxillary breadth	10	91.6	10.4
Bizygomatic breadth	4	124.8	7.4
Bifrontal breadth	27	97.2	4.4
Bregma-lambda chord	27	109.7	5.4
Lambda-opisthion chord	18	95.4	5.1
Mastoid height	43	28.4	2.6
Nasion-bregma chord	23	109.8	3.7
Biasterionic breadth	18	108.8	4.3
Simotic chord	14	8.8	2.1
Orbital breadth	10	40.1	1.7
Orbital height	10	34.1	1.3
Foramen magnum length	8	36.9	1.5

(ii) Indices. These were calculated according to the definitions of Vallois (1965).

Table 20: Cranial indices: summary statistics

	Males				Females			
	N	Mean	s.d.	Range	N	Mean	s.d.	Range
Cranial index	32	78.6	5.1	68.6-88.8	14	78.4	6.3	62.8-86.9
Height (to basion)-breadth index	18	92.8	5.4	82.4-104.4	8	94.0	5.4	84.6-99.3
Height (to basion)-length index	19	73.1	3.1	66.5-78.2	9	73.1	3.0	69.4-78.0
Orbital index	17	82.0	3.8	74.0-88.3	10	85.0	5.8	75.7-91.6

Since the differences in the indices for males and females are statistically insignificant, they are henceforth combined.

Table 21: distribution of cranial indices

Cranial index:	Hyperbrachycranic	7
	Brachycranic	13
	Mesocranic	14
	Dolichocranic	10
	Hyperdolichocranic	2
Height-breadth index:	Tapeinocranic	11
	Metriocranic	10
	Acrocranic	5
Height-length index:	Chamaecranic	6
	Orthocranic	15
	Hypsicranic	7
Orbital index:	Chamaeconchic	2
	Mesoconchic	15
	Hypsiconchic	10

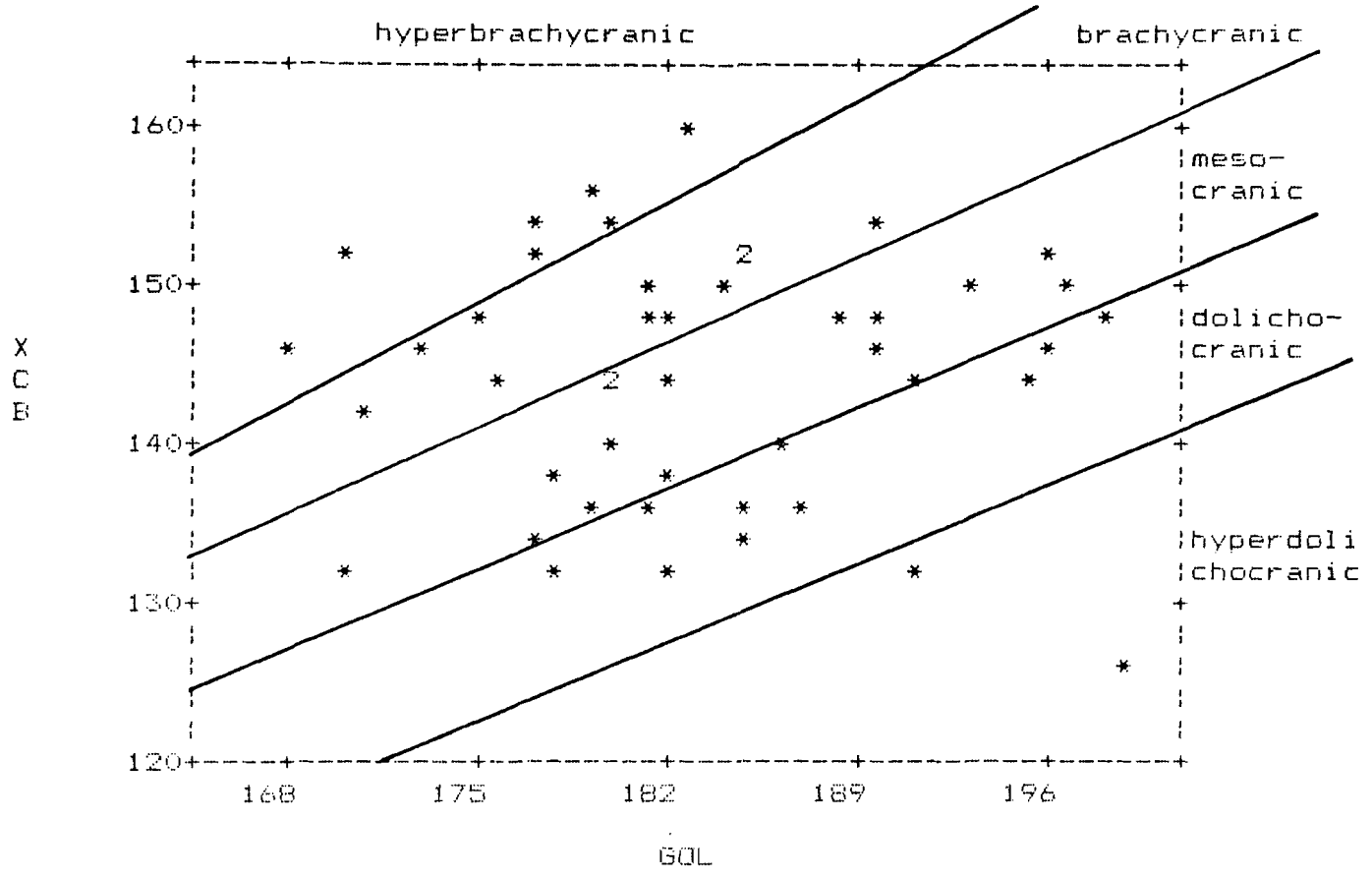
Due to the nature of the material from the Saxon cemetery at the School Street site very few cranial measurements could be taken, hence no comparisons can be drawn.

The mean cranial index is similar to that noted for Mediaeval crania from Rivenhall, Essex (about 78 - calculated from O'Connor 1984) and that for the skulls from the Chelmsford Blackfriars (about 79 - estimated from Bayley 1975). At the Anglo-Saxon site at Burgh Castle, Norfolk, mean cranial index is 74.2 (calculated from Anderson & Birkett 1989), at Anglo-Saxon Brandon Staunch Meadow, Suffolk, the mean is 73.3 (Anderson 1990), and for the Anglo-Saxon material from Caister-on-Sea, Norfolk, the figure is 75.0 (Anderson 1991); for the Saxon material from Norwich Castle (Stirland 1985), North Elmham Park, Norfolk, (Wells 1980) and Great Chesterford, Cambridgeshire, (Waldron 1988) means are not given but the skulls are predominantly dolichocranic. It has been suggested (Brothwell 1972) than in general dolichocrany prevails in Anglo-Saxon populations and brachycrany in Mediaeval groups; this change in skull shape around the time of the Norman conquest has also been demonstrated in skeletal series from York (Dawes 1980) and the data discussed above suggests that this may

also apply to the East Anglia region.

The cranial indices for adults from the Blackfriars are plotted on a bivariate plot in Fig. 2.

Fig. 2: Plot of cranial breadth with glabello-occipital length



46 cases plotted. XCB=Maximum cranial breadth GOL=Glabello-occipital length. 2 indicates two or more overlapping cases.

The outlier with a very hyperdolichocranic index of 62.8 is burial 1874 (female, probably aged about 25-35). It may be that this represents a case of scaphocephaly - premature suture closure. All 3 vault sutures are in a rather advanced state of closure considering the age at death of about 25-35 consistent with the state of the pubic symphyses and the dental wear. The elongated nature of the skull suggests earliest closure of the sagittal suture.

The quantity of missing data was such that no attempt at multivariate analysis of the cranial measurements was made - of the 226 adults, in only 21 could three-quarters or more of the cranial measurements used in the present work be taken.

(c) Post-cranial measurements

(i) Meric and cnemic indices. The meric index is a measure of the anterio-posterior flattening of the femur in the sub-trochanteric region; the cnemic index expresses the transverse

flattening of the tibia at the level of the nutrient foramen. The precise significance of these indices is disputed, but it seems probable that this type of variation in shaft cross-section reflects patterns of mechanical stress on the bone (e.g. Lovejoy et al. 1976). The indices are taken according to the definitions of Brothwell (1981: 88-89).

Table 22: Meric and cnemic indices: summary statistics

		Males				Females			
		N	Mean	s.d.	Range	N	Mean	s.d.	Range
Meric index	L	105	81.1	7.2	64.6-100.3	44	79.3	5.9	68.0-95.0
	R	104	81.3	7.3	64.2-100.4	53	79.5	5.6	65.8-90.0
Cnemic index	L	104	73.3	6.2	61.6-89.7	52	74.4	5.9	62.0-89.8
	R	103	73.1	6.2	61.4-94.1	49	75.1	6.3	63.9-88.3

Since the indices are similar for males and females the sexes are combined in Table 23.

Table 23: Distribution of meric and cnemic indices

		L	R
Meric index:	Hyperplatymeric	39	31
	Platymeric	70	89
	Eurymeric	40	37

		L	R
Cnemic index:	Platycnemic	4	3
	Mesocnemic	40	46
	Eurycnemic	112	103

As might be expected side to side correlation for both indices is high (Pearson coefficients in the region of 0.8). For the males, associations between meric and cnemic indices in a particular limb or particular individual are low, none reaching statistical significance (at the 5% level); for the females the correlations are rather higher (about 0.2-0.3 compared with about 0.1 or less for the males), those between the left meric and left cnemic index, and the left cnemic and right meric index reaching statistical significance at the 5% level.

Compared with the 10th-11th century material from the School Street site, the meric and cnemic indices for the 13th-16th century Blackfriars material are both somewhat greater, indicating less flattened femoral and tibial cross sections.

(ii) Robusticity of the femora and humeri

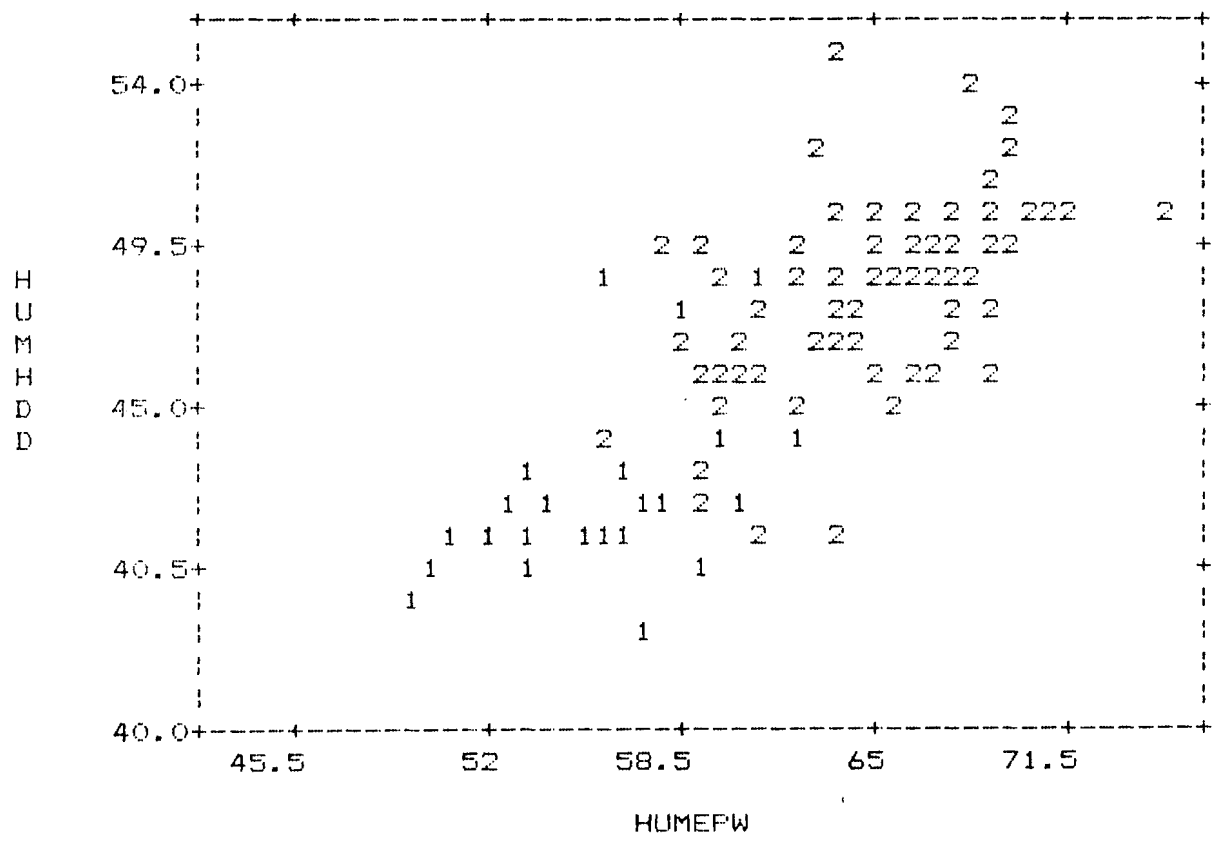
Vertical diameter of the femoral head, femoral bicondylar breadth, humeral head diameter and humeral epicondylar width were taken. These measurements are of some significance in sex determination (discussion in Buikstra & Mielke 1985) and one of the purposes for which they were recorded was to investigate sexual dimorphism in these bones.

Table 24: Humeral head diameter and epicondylar width and femoral head diameter and bicondylar breadth

		Males				Females			
		N	Mean	s.d.	Range	N	Mean	s.d.	Range
Humeral head diameter	L	63	48.1	2.7	41.5-54.9	29	41.9	2.2	37.2-47.8
	R	60	48.5	2.6	43.3-54.2	23	43.2	2.6	39.0-48.7
Humeral epicondylar width	L	85	64.7	3.7	55.8-74.8	30	56.9	3.8	49.7-64.6
	R	64	65.7	4.9	43.6-72.3	30	57.6	4.1	50.1-66.1
Femoral head diameter	L	74	49.2	2.6	42.0-55.5	35	44.0	2.3	40.3-48.5
	R	72	49.8	2.8	44.3-57.6	41	44.1	2.2	40.2-48.1
Femoral bicondylar breadth	L	69	82.7	3.5	76.5-90.0	29	75.4	4.3	67.7-86.8
	R	62	83.3	3.5	76.9-90.1	20	76.7	3.9	49.0-87.4

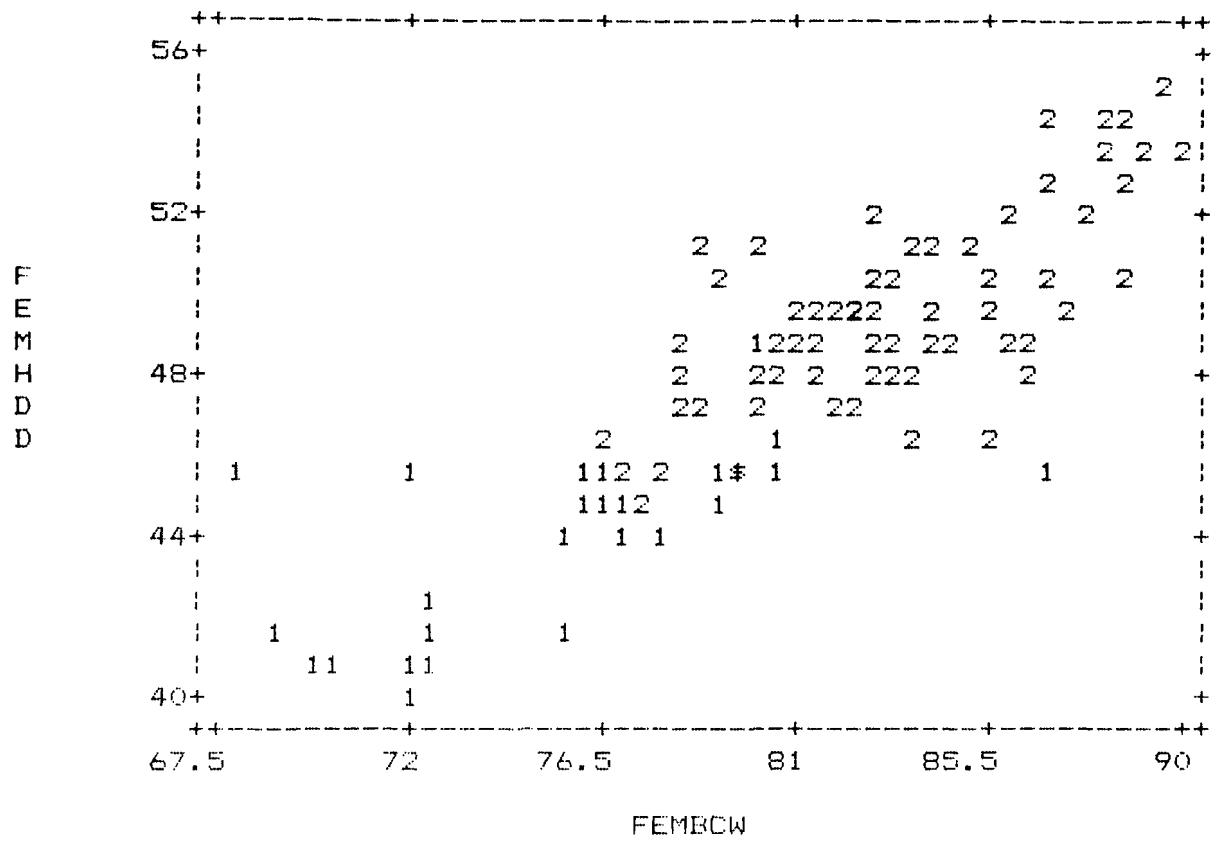
Plots of these figures are shown in Figs. 3 and 4.

Fig. 3: Plot of humeral head diameter against humeral epicondylar width



95 cases plotted. HUMHDD=humeral head diameter, HUMEPW=humeral epicondylar width; 1=female, 2=male.

Fig. 4: Plot of femoral head diameter against femoral bicondylar breadth



98 cases plotted. FEMHDD=femoral head diameter, FEMBCW=femoral bicondylar breadth; 1=female, 2=male, $=overlapping cases.

The plots reveal that both bones are quite markedly sexually dimorphic in the Ipswich Blackfriars assemblage. It was mentioned above that the 13th-16th century Blackfriars skeletons seemed rather more robust that the material excavated from the 10th-11th century cemetery at the School Strret site; comparison for the above measurements supports this contention: for both males and females the femoral measurements are greater for the Blackfriars material (the humerus measurements were not taken on the Anglo-Saxon skeletons).

(iii) Limb bone asymmetry

The measurements discussed in section (ii), together with long-bone lengths, were compared on left and right sides for skeletons where both sides were intact for measurement, in order to study any directional asymmetry in the appendicular skeleton.

Table 25: Limb bone asymmetry

	Left greater	Right greater	Equal to 1dp	Sig.
Humeral head diameter	13	38	4	*
Humeral epicondylar width	11	63	0	*
Femoral head diameter	19	56	5	*
Femoral bicondylar breadth	20	36	5	*
Femur length	49	38	9	
Tibia length	58	42	12	
Fibula length	8	6	2	
Humerus length	9	57	8	*
Radius length	10	38	7	*
Ulna length	11	33	5	*

Sig.: * indicates that the difference between the number of individuals for whom the left measurement is greater and those for whom the right is greater is significant at the 5% level according to the chi-square test.

Table 26: Limb bone asymmetry: summary statistics

	All adults			Males			Females		
	r-l	N	sig.	r-l	N	sig.	r-l	N	sig.
Humeral head diameter	0.54	55	***	0.55	39	**	0.51	16	*
Humeral epicondylar width	1.12	74	***	1.05	50	**	1.25	24	***
Femoral head diameter	0.42	80	***	0.54	51	***	0.22	29	
Femoral bicondylar breadth	0.19	61		0.16	46		0.29	15	
Femur length	-0.98	96	*	-0.92	65		-1.10	31	
Tibia length	-0.63	112		-0.52	77		-1.12	33	
Fibula length	-0.31	16		-0.31	13		-0.33	3	
Humerus length	3.27	74	***	2.92	53	***	4.14	21	***
Radius length	1.80	55	***	1.60	40	**	2.33	15	***
Ulna length	1.96	49	***	1.73	37	**	2.67	12	**

r-l=mean for right bones-mean for left bones (i.e. a negative figure in this column indicates that the mean for left bones was the greater) sig.=significance level of the difference between left and right side means according to the paired t-test, ***=significant at the 0.1% level, **=significant at the 1% level, *=significant at the 5% level and blank denotes a non-significant difference.

Several studies have demonstrated a greater length of forearm (refs in Falk et al. 1988), and upper and forearm bones (Schulter-Ellis 1980), on the dominant side, and there is some evidence that the strength of such associations is increased by unilateral activity involving the dominant arm. A problem with these and other studies which have investigated directional asymmetry associated with handedness is the relatively low numbers of left-handed individuals - it seems unclear whether the asymmetries observed are directional for the dominant arm or are directional to the right side, regardless of handedness. For example Schell et al. (1985) found a greater humeral epicondylar width (taken on living subjects) on the right in right-handed individuals but no significant difference between left and right

sides in non right-handers, but the study included only 19 non right-handers (left-handed and ambidextrous individuals) compared with 116 right handers. van Dusen (1939) found greater right arm and hand dimensions in children and Schultz (1926) found that the right humerus was longer than the left in a statistically significant number of cases in foetal material. Directional asymmetry in leg and foot bones generally seems to be lacking (e.g. Schell et al. 1985; Schultz 1926; refs in Falk et al. 1988).

The Ipswich Blackfriars data show significant directional asymmetry favouring the right side in all the arm bone measurements whereas for the leg bones (with the exception of femoral head diameter) no directional asymmetry was found. This pattern is broadly compatible with that found by the writers cited above and would seem to be a reflection of handedness (assuming a majority of right handers, as is the norm in human populations).

An unexpected result is the directional asymmetry in femoral head diameter. It is difficult to dismiss this highly statistically significant result (both in terms of the paired t-test and the chi-square test, above). None of the workers cited above studied laterality in this measurement. Since it is most unlikely that it represents asymmetry through increased use of the right limb over the left (particularly as no other leg bones measurements show directional asymmetry), it may be a manifestation of inborn lateralisation of the type described for foetal arm bones by Schultz (1926), although why this should be the case for the femoral head diameter and no other leg bone measurements is a mystery.

4. Non-metric variation

Non-metric traits take the form of minor variations in skeletal morphology such as presence or absence of bony spurs or foramina. For at least some of these variants there is evidence that they are to some extent inherited, although the causation of many remains obscure. Thirty-three cranial and 20 post-cranial traits are scored. The cranial traits are mainly selected from those defined by Berry & Berry (1967). Those not studied by Berry & Berry (1967) are selected from de Villiers (1968) and Ossenburg (1977). Where the scoring rules of Berry & Berry (1967) conflict with those of Sjøvold (1984) the latter are used. The post-cranial traits are those defined by Finnegan (1978).

In children the presence of many traits is age correlated; most workers omit these individuals from population studies, a strategy pursued for the variants scored in Tables 27 and 28.

Table 27: Frequencies of cranial non-metric traits

Trait	1	0	1/1	-/1	1/-	1/0	0/1	-/0	0/-	0/0
Metopic suture	17	155								
Ossicle at lambda	18	115								
Lambdoid ossicle	76	48								
Inca bone	1*	147								
Sagittal ossicle	2	67								
Ossicle at bregma	0	152								
Coronal ossicle	7	118								
Fronto-temporal articulation			1	0	0	1	0	23	22	60
Squamo-parietal ossicle			0	1	0	1	1	22	26	87
Epipteric bone			1	0	2	2	0	23	23	53
Parietal notch bone			2	1	1	2	10	19	27	102
Auditory torus			0	0	0	0	0	13	17	126
Foramen of Hushke			4	1	1	6	0	11	19	111
Ossicle at asterion			6	3	1	7	5	16	21	92
Clinoid bridging			0	1	1	0	0	1	1	1
Palatine torus	21	105								
Maxillary torus	8	92								
Mastoid foramen extra-sutural			43	4	3	26	23	9	8	48
Mastoid foramen absent			4	1	0	8	8	12	11	123
Double condylar facet on occipital			1	1	0	2	0	15	17	58
Parietal foramen			46	3	0	17	23	2	4	62
Accessory infra-orbital foramen			3	3	3	2	2	20	15	39
Zygomatic-facial foramen			88	18	20	11	7	3	3	9
Divided hypoglossal canal			6*	4*	6+	11*	7+	17	12	51
Posterior condylar canal patent			29	13	14	6	5	10	7	11
Precondylar tubercle			3	0	0	5	0	9	7	71
Foramen ovale incomplete			1	0	1	1	0	21	24	33
Accessory lesser palatine foramen			23	9	13	7	2	5	5	4
Supra-orbital foramen complete			18~	6	2	21#	11#	6	10	88
Maxillary M3 agenesis			16	2	2	5	3	14	11	60
Mandibular M3 agenesis			20	2	2	3	4	12	11	79
Mandibular torus	2	109								
Mylohyoid bridging			5*	7*	5	9	5*	15	12	64

1=trait present 0=trait absent -=no observation possible. Scores for bilateral traits are presented as score for left side/score for right side. *=includes 1 partial manifestation of trait, +=includes 2 cases of partial manifestations of the trait, #=includes 3 cases of partial manifestations of the trait ~=includes 5 cases of partial manifestations of the trait.

Table 28: Frequencies of postcranial non-metric traits

Trait	1	0	1/1	-/1	1/-	1/0	0/1	-/0	0/-	0/0
Fossa of Allen			13	2	1	2	10	29	19	84
Plaque formation			31	12	7	5	11	11	14	63
Exostosis in trochanteric fossa			70	18	17	10	5	8	5	34
Supra-condyloid process			0	0	0	0	0	15	20	144
Septal aperture			1	0	1	3	0	19	21	138
Acetabular crease			10	1	1	3	5	15	20	114
Accessory sacral facets on ilium			0	3	1	2	3	11	17	55
Spina bifida occulta	6+	118								
Sixth sacral segment	17+	61								
Acromial articular facet			3	2	1	1	2	16	27	72
Os acromiale			2	0	2	2	6	18	26	68
Supra-scapular foramen			0	3	1*	3+	2	19	20	91
Vastus notch			22	6	8	13	11	14	14	42
Vastus fossa			8	5	7	7	4	14	17	70
Emarginate patella			0	0	0	0	0	19	23	90
Anterior calcaneal facet double			61	3	3	14	8	8	3	87
Anterior calcaneal facet absent			9	0	1	1	2	10	5	159
Atlas facet double			6	4	5	7	8	12	6	65
Posterior atlas bridging			1	1*	1	5+	1*	17	33	77
Lateral atlas bridging			0	1	0	1	1	15	14	71

1=trait present 0=trait absent -=no observation possible. Scores for bilateral traits are presented as score for left side/score for right side. *=includes 1 partial manifestation of trait, +=includes 2 cases of partial manifestations of the trait,

Of these 53 traits a chi-square test shows that 6 traits (anterior calcaneal facet double, palatine torus, extra-sutural mastoid foramen, maxillary and mandibular M3 absent and fossa of Allen) have significantly different frequencies (at the 5% level) between males and females. This number is greater than that which might be expected by chance alone. Studies of the frequencies of non-metric variants often report some few traits for which the difference in frequency between the sexes reaches significance, but, as Berry (1975: 528) remarks "there seems little consistency in the occurrence of these dimorphisms, and a variant predominating in males in one sample may predominate in females in another". It thus seems unlikely that differences in frequencies between the sexes reflect any biological predisposition for either presence of absence of particular traits. The explanation for the differences in frequency between the sexes for the 6 traits in the present material is obscure, but perhaps it reflects a difference in genetic composition of the male and female parts of the assemblage, the latter being drawn from the population of layfolk whereas the former are a mixture of layfolk and friars.

The occurrences of those traits for which a literature search (Mays 1987) revealed evidence for a genetic component in their causation were plotted on the site plan in an attempt to discern whether there was any spatial patterning which might be interpreted as evidence for genetically related individuals being buried near one another in "family groups". This exercise revealed no such evidence. The data were also subjected to a multivariate analysis by which a similarity coefficient between each pair of individuals was generated, taking into account the traits which they shared in common; the results were then used as the input for a cluster analysis, the reasoning being that the clusters thus produced might be expected to correspond to groups of related individuals. These clusters were plotted onto the site plan. Consistent with the results above, this exercise produced no evidence for the existence of "family groups" among the friary burials.

Thus there is no evidence from either univariate or multivariate analysis of the non-metric variants that genetic relationships with pre-existing interments was an important factor in determining location of burials. Palmer (1891) collected together evidence from wills of some of the benefactors buried at 28 friaries. Of 255 individuals recorded as having expressed some preference concerning their place of burial within a particular friary, only 8% stated that they wished to be buried next to blood relatives. The lack of skeletal evidence for the existence of family groups at the Ipswich Blackfriars might be viewed as consistent with this.

There are several features, in addition to those recorded above, which might be viewed as aspects of non-metric variation.

(a) Hypodontia and localised microdontia

Hypodontia (congenitally missing tooth or teeth) and localised microdontia (reduction in size of 1 or some few teeth) are thought to be linked and share a significant genetic component in their causation (Graber 1978; Grahnen 1956; Brook 1984). Other than hypodontia of the 3rd molars (which was included in the analysis, above) instances of hypodontia and/or microdontia are detailed below.

Table 29: Hypodontia (other than 3rd molar) and localised microdontia)

Burial	Hypodontia	Microdontia	Notes
0669 (juvenile aged about 14)	Both maxillary PM2s & right mandibular PM2	-	Where the PM2s are missing the deciduous M2s are retained. Both maxillary, and the left mandibular M3 absent.
0953 (male aged 25-35)	-	Maxillary M2s	-
1459 (male aged 25-35)	Right maxillary I2	Left maxillary I2	-
1757 (male aged 40-50)	Right mandibular I2	-	-
1797 (female aged 30-40)	-	Mandibular M3s	-
1846 (female aged 25-35)	-	Left mandibular M3	-
1999 (male aged 21-24)	All 4 PM2s & right maxillary I2	-	All 4 M3s absent. Deciduous M2s retained.
2457 (female aged 30-40)	-	Maxillary M3s	-
2482 (male aged 35-45)	Left maxillary I2	-	-
2533 (female aged 35-45)	Both mandibular, & right maxillary M2	All teeth rather small, esp. molars	All 4 M3s absent; the maxillary M1s have only 1 root.
2576 (male aged 30-40)	Left maxillary I2	Right maxillary I2	-
2617 (male aged 30-40)	Left maxillary canine	-	-
3091 (male? aged 30+)	-	Left maxillary I2	-

Other than the 3rd molar, the teeth generally found to be the most frequently absent are the premolars and the maxillary lateral incisors (Grahnen 1956; Graber 1978). The present results are consistent with this, but the missing second molars of burial 2533 are unusual.

(b) Vertebral fusion

Fusion of 2 vertebrae was classified as congenital where no evidence of trauma or disease was present. In general no osteophytes were present at the line of fusion, which is usually visible, albeit sometimes faintly.

Table 30: Probable cases of congenital block vertebrae

Burial	Fused vertebrae	Location of fusion
0740 (male aged 30-40)	C3 & 4	Bodies, facet joints & neural arches
	C5 & 6	Bodies, facet joints, right side of neural arches
	T3 & 4	Bodies, facet joints and neural arches
1012 (male aged 40-50)	C3 & 4	Facet joints
1376 (female aged 30-40)	C6 & 7	Bodies
1418 (male aged 40-50)	2 middle thoracics	Bodies (other parts missing)
1455 (male aged about 18)	2 middle thoracics	Left facet joints
1795 (female aged 45-60)	C2 & 3	Right facet joint & right Luschka joint; left parts of bone missing
1952 (female aged 25-35)	T5 & 6	Anterior/left side of bodies
2386 (female aged 35-45)	C2 & 3	Left facet joint, left side of neural arch
2448B (male aged 25-45)	C2 & 3	Left side of bodies & neural arches; left facet joint
3054 (female aged 40-50)	C2 & 3	Left facet joint

In burial 0740 there are several other vertebral anomalies in addition to the block vertebrae. There is some scoliosis at the fused C5 & 6, and the neural arches of these vertebrae show failure of fusion at the midline - spina bifida occulta. There is a supernumary articulation between the neural spine of T6 and the neural arch of T7. There are 6 lumbar vertebrae, the last of which shows spina bifida occulta.

In most of the cases of block vertebrae there was marked osteophytosis and/or osteoarthritis on the intervertebral joints adjacent to the fused vertebrae, reflecting the increased strain put upon these joints as a consequence of the immobility of their neighbours.

(c) Spondylolysis

Spondylolysis is the condition where the posterior part of the neural arch is cleft from the rest of the vertebra at the pars interarticularis; thus in skeletal material the posterior part of the neural arch appears as a separate fragment, although in life it is bound to the rest of the vertebra by fibrous tissue. The fibrous union between the 2 parts of the vertebra may be ruptured by trauma, leading to forward slippage of the vertebral body - spondylolisthesis. In skeletal material this is manifested by periosteal reactive bone on the anterior wall of the slipped vertebral body and/or its immediate neighbours, as a result of activation of the periosteum (Ortner & Putschar 1985: 358). It seems that there is a strong inherited component to spondylolysis (e.g. Wynne-Davis & Scott 1979).

Table 31: Spondylolysis

Burial	Location of defect	Spondylolisthesis
0974 (male aged 22-25)	L5	No
0984 (male aged 50+)	L5	No
1933 (male adult)	L5	No
1962 (male aged 22-50)	L5	No
2332 (male aged 40+)	L4 or 5	-
2348 (female adult)	L5	No
2432 (male aged 35-45)	?L5	-
2474 (male aged 50+)	L4 & 5	No
2506 (female aged 30-40)	L4	Yes
2508 (male aged 35-45)	L5	No
2622 (male aged 50+)	L5	Yes
2628 (female aged 50+)	L4	Yes
2642 (males aged 40-50)	L5	No
3107 (male aged 50+)	L5	No

Studies in modern populations have noted an increased frequency of spina bifida occulta at the lower lumbar or sacral level (Wynne-Davis & Scott 1979; Wiltse 1962) and an increased frequency of lumbo-sacral transitional variations (Wynne-Davis & Scott 1979) in individuals showing spondylolysis. These findings are not born out in the Ipswich Blackfriars assemblage: only 1

out of the 14 cases of spondylolysis showed spina bifida (burial 0984) or a lumbo-sacral transitional variant (burial 1933 has 6 sacral vertebrae, the 6th being an extra segment, rather than sacralisation of L5). The predominant location of defects at the 5th lumbar vertebra is consistent with findings in modern studies (e.g. Eisenstein 1978).

(d) Other

Two individuals (burials 2624 & 3126) show an unusual scapula variant. There seems to be some dysplasia of the scapula necks which results in the glenoid cavities facing posteriorly (Plate 1). The acromia of 2624 are abnormally high and broad; those of 3126 are missing post-mortem so no observations can be made. In addition the acetabula of 2624 are rather shallow; those of 3126 are missing post-mortem. It seems likely that these represent congenital anomalies. There is evidence from familial studies that dysplasia of the scapula neck, which may (as in the case of burial 2624) be accompanied by anomalies of the acromia and other bony elements of the shoulder joint, has an inherited component in its causation (discussion in Pettersson 1980); it may thus be that burials 2624 and 3126 are closely related genetically, although, consistent with the evidence above that individuals were not generally interred in "family groups" at the Ipwsich Blackfriars, these 2 burials are not near to one another in the friary.

Many individuals show minor skeletal variants, details are given in the Appendix; these include 6 instances of carpal or tarsal coalitions or accessoria (burials 1762, 1980, 2313, 2361, 2626 & 3095) and 2 instances of lumbar ribs (burials 1472 & 1757).

5. Pathology

Fuller descriptions of pathological lesions than those given in this section may be found under the entries for individual burials in the Appendix.

(a) Oral

(i) Dental caries. Dental caries was scored as present or absent in each tooth, and as present or absent in individuals with 1 or more erupted teeth available for study. Of the 24 juveniles, 18 had one or more erupted teeth, and of these 7 showed dental caries. The rates in terms of total teeth are 13/194 with respect to permanent teeth and 7/123 with respect to deciduous teeth.

Table 32: Prevalence of dental caries in the adult permanent dentition

	Individuals Present	Absent	Carious teeth	Total teeth
Males	76	39	202	2039
Females	40	11	99	854
Total adults	117	52	302	2917

Table 33: Distribution of dental caries in adult permanent teeth

	MAXILLA																
	LEFT									RIGHT							
	M3	M2	M1	PM2	PM1	C	I2	I1	I1	I2	C	PM1	PM2	M1	M2	M3	Un i.d.
Teeth	51	89	86	94	95	108	87	68	64	75	106	104	97	94	93	58	2
Carious	8	17	15	12	9	5	4	2	2	2	9	13	13	20	21	7	1
Teeth	64	92	86	109	124	114	105	81	89	102	119	113	105	90	96	56	1
Carious	14	16	16	7	5	3	2	1	0	3	5	7	12	17	21	13	0
	MANDIBLE																

Although it must be considered a multifactorial disease, many studies of non-industrialised societies (e.g. Turner 1979 & refs therein) have shown a strong correlation between caries rates and carbohydrate consumption. Of the carbohydrates sugars are the most cariogenic. Small amounts of sucrose were imported during the Mediaeval period, but previous studies (Moore & Corbett 1978, 1983) suggest that they had a negligible influence on caries experience. The only widely available sweetening agent was honey. The principal carbohydrates consumed were starches, which are less cariogenic than sugars, but when oral hygiene is poor food residues may be retained in the mouth for sufficient time for starches to be broken down enzymatically to highly cariogenic lower molecular weight carbohydrates (Moore & Corbett 1978; Mörmann & Mühlemann 1981).

When making comparisons between caries prevalence in different groups age at death needs to be taken into account since teeth in older individuals have been longer exposed to the agents of decay.

No significant difference was found between the sexes in terms of caries prevalence with respect to its presence/absence in individuals (standard statistical tests are not valid for prevalences with respect to total teeth). No significant difference was found between caries rates in the 13th-16th century Blackfriars assemblage and the 10th-11th century material from the School Street site. This would appear consistent with the contention of Moore & Corbett (1978) that sugar consumption by most British Mediaeval populations was minor.

From pooled Mediaeval cemetery data Brothwell (1959) found a caries prevalence of 12-15% with respect to total teeth, so the rate with respect to total teeth in the Blackfriars material of 10.4% cannot be considered atypical for a Mediaeval group. The pattern by which molars and premolars are more affected by caries than the anterior dentition is paralleled by modern (Shafer et

al. 1983: 436) and archaeological (Moore & Corbett 1983) studies.

(ii) Ante-mortem tooth loss. Ante-mortem tooth loss was scored on a presence-absence basis for each erupted tooth position and as present or absent in individuals with one or more erupted tooth positions available for study. One juvenile showed ante-mortem loss of one permanent tooth (a mandibular M1); the data for adults is shown below.

Table 34: Prevalence of ante-mortem tooth loss in adults

	Individuals			
	Present	Absent	No of tooth posits. showing a-m loss	Total tooth positions
Males	80	25	490	2920
Females	35	14	238	1255
Total adults	116	50	731	4205

Table 35: Distribution of ante-mortem tooth loss in the adult dentition

	MAXILLA															
	LEFT								RIGHT							
	M3	M2	M1	PM2	PM1	C	I2	I1	I1	I2	C	PM1	PM2	M1	M2	M3
Tooth posits.	74	120	133	132	135	140	138	140	132	131	136	131	133	133	124	77
A-m loss	16	30	43	28	22	15	15	15	16	15	14	23	28	39	31	19
Tooth posits.	101	140	145	142	143	145	142	138	139	144	146	142	143	145	140	101
A-m loss	31	48	57	21	8	1	2	12	9	4	3	9	26	52	42	37
	MANDIBLE															

Dental caries and diseases of the periodontal tissues are major causes of ante-mortem tooth loss.

As for dental caries, age at death should be taken into account when comparing rates of tooth loss in different groups - if anything ante-mortem tooth loss tends to be more strongly age correlated than dental caries.

Prevalence for males and females at the Blackfriars are similar. The overall rates for adults (69.9% with respect to individuals and 17.4% of total tooth positions) are rather higher than the corresponding figures for the 10th-11th century School Street material (52.3% and 10.5% respectively); the rather older age at death of the Blackfriars adults would seem to be playing a part here.

The pattern by which molars are the most, and the canines the least frequently lost ante-mortem is paralleled by studies on archaeological material (Whittaker et al. 1981) and on living groups which do not have access to modern Western dental surgery (Tal & Tau 1984).

(iii) Alveolar abscesses. These were recorded in terms of affected tooth positions and affected individuals in an analogous fashion to the tooth loss data. Two juveniles showed one alveolar abscess cavity each; the data for adults is shown below.

Table 36: Prevalence of alveolar abscesses in adults

	Individuals Present	Absent	No of tooth posits. showing abscesses	No of tooth posits. not showing abscesses
Males	62	52	164	2920
Females	26	23	67	1255
Total adults	88	77	231	4205

Table 37: Distribution of alveolar abscesses in the adult dentition

	MAXILLA															
	LEFT								RIGHT							
	M3	M2	M1	PM2	PM1	C	I2	I1	I1	I2	C	PM1	PM2	M1	M2	M3
Tooth posits.	74	120	133	132	135	140	138	140	132	131	136	131	133	133	124	77
Alv. abscesses	3	9	14	9	8	11	6	4	7	9	5	9	7	17	5	1
Tooth posits.	101	140	145	142	143	145	142	138	139	144	146	142	143	145	140	101
Alv. abscesses	3	11	9	9	6	6	2	3	4	3	8	8	3	19	11	2
	MANDIBLE															

Periapical abscesses are usually a consequence of infection of the pulp cavity of a tooth, which generally occurs if the pulp is exposed to the oral environment as a result of dental caries, excessive attrition or trauma.

As for the ante-mortem tooth loss data the prevalences of alveolar abscesses in the 13th-16th century Blackfriars assemblage (54.4% of individuals, 5.5% with respect to total tooth position) are rather greater than those in the 10th-11th century School Street material (31.0% and 3.3% for individuals and tooth positions, respectively), but again the greater age at death of the Blackfriars individuals may to some extent explain the difference.

(iv) Dental calculus. This is a concretion on the teeth consisting mainly of calcium salts and, in life, organic material in which flourish numerous bacteria. It may be considered as mineralised dental plaque and is associated with poor oral hygiene. It was scored on the scale of Dobney & Brothwell (1987).

Table 38: Dental calculus

	Degree of development				
	0	I	II	III	IV
Male adults	20	42	34	10	0
Female adults	13	17	7	7	2
All adults	33	60	41	17	2
Juveniles	11	6	1	0	0

No significant difference exists in the degree of development of calculus deposits in male and female adults, although the Kolmogorov-Smirnov D statistic reveals a significant (at the 5% level) difference between adults and juveniles, presumably reflecting the lesser time for deposits to accumulate on the teeth of juveniles. No significant difference exists in the degree of development of calculus deposits between the Blackfriars and the School Street Anglo-Saxon material.

(v) Dental enamel hypoplasias. These appear macroscopically as linear bands of depressed enamel or bands of pitting (Sarnat & Schour 1941). They are associated with a wide variety of stressors including infectious diseases and nutritional deficiencies (Pindborg 1970: 138-210). The anterior dentition appears to be more susceptible to hypoplasias than the posterior teeth (Goodman & Armelagos 1985). One hundred and forty-nine individuals had anterior permanent dentition in a sufficiently unworn state for hypoplasias to be scored. The results are shown below.

Table 39: Dental enamel hypoplasias

	Number of defects			
	0	1	2	3
Male adults	56	21	9	6
Female adults	31	3	7	1
All adults	88	24	16	7
Juveniles	8	5	1	0

The difference with respect to presence/absence of defects or with respect to number of defects between the sexes is not significant, although males do have a slightly greater number of defects in both respects; this pattern might be expected in view of the growing male's greater vulnerability to environmental stress (Stinson 1985). In some studies of archaeological material (e.g. Goodman & Armelagos 1988; Rose et al. 1978) an earlier age at death was found for individuals with hypoplastic defects, suggesting that those vulnerable to stress in childhood were also vulnerable in later life, or that stress during childhood may have compromised their ability to fight later infections. This pattern was not evident in the present material, either in terms of the adult age at death or in terms of the number of individuals dying in childhood. This suggests that the episodes which gave rise to the hypoplasias were generally of a fairly trivial and transient nature. Long-bone

growth was studied in order to investigate further the growth of the juvenile skeleton. Although few juveniles could be aged by dental development and had long-bones intact for measurement, the older children often tended to have somewhat greater long-bone lengths at a given age than other archaeological series (e.g. Mays 1985) and were similar to, or somewhat greater than, those given for a mid 20th century series by Maresh (1955). Thus the long-bone growth evidence (despite the fact that, obviously, it relates to individuals who failed to survive childhood), such as it is, tends to support the dental enamel hypoplasia data in suggesting a generally fairly healthy childhood.

The frequency of enamel defects is similar to that in the Anglo-Saxon School Street assemblage.

The position of a defect on a tooth was used to estimate the age at which the individual suffered the stress episode which gave rise to the hypoplasia, using the methodology of Goodman et al. (1980). The number of hypoplasias in the present assemblage is greatest in the 2-4 year age group. It is tempting to link this peak with problems associated with weaning, however Goodman & Armelagos (1985) suggest that different parts of the tooth crown may differ in their susceptibilities to hypoplasias; this would clearly influence distribution of defects on a tooth.

It was not generally possible to obtain an indication of the precise cause of the enamel defects in individual cases in the Blackfriars material. There are a few possible exceptions to this. The dentition of burial 2577 (possibly female, aged about 11) showed severe which developed at about 3.2-3.5 and 3.6 years of age. This skeleton shows classic signs of spinal tuberculosis (see below); in the pre-antibiotic era tuberculosis was predominantly acquired during infancy and early childhood (Ortner & Putschar 1985). It seems possible that the marked hypoplastic defects noted on the dentition of this individual mark the onset of the infection. Burial 1340 (female aged 21-23) also shows signs of tuberculosis and displays dental enamel hypoplasias of estimated age of formation of about 2.5 and 3.5 years of age; perhaps these might relate to the onset of the disease.

Burial 0761 (juvenile aged about 8 years) shows severe hypoplastic defects which probably formed in the first year of life. The inner table of the skull shows abnormally prominent markings for the cerebral convolutions, suggestive of increased intra-cranial pressure; it seems possible that the cranial and dental lesions are associated - a possible cause of the cranial lesions is hydrocephalus, a condition generally acquired during the first 6 months of life (Manchester 1980).

(vi) Impacted and embedded teeth. The mandibular 3rd molars of 1469 (probably male aged 20-25) are impacted against the M2s, as is the right mandibular M3 of 2535 (male aged 21-24). The right maxillary canine of 2451 (male 22-25) has failed to erupt and the deciduous tooth is retained; the unerupted canine is visible through the incisive fossa and appears to be orientated medially. The left maxillary deciduous canine is also retained, the permanent tooth erupting alongside it. The right mandibular canine is unerupted and the deciduous tooth has been retained. The left maxillary canine of 3109 (male aged 25-35) is unerupted.

(vii) Dental trauma. Six individuals show evidence for ante-mortem dental chipping. This was differentiated from post-mortem fracture by examination of the fractured edges - smoothing suggests attrition of the broken edges and hence in-vivo chipping.

Table 40: Dental chipping

Burial	Site of dental trauma
1483 (male aged 30-40)	Left maxillary I2
1816 (male aged 35-50)	Left maxillary canine and I2
2333 (female aged 50+)	Right mandibular PM1
2620 (male aged 30-40)	Left mandibular M2
2640 (male aged 40-60)	Right maxillary I2
2650 (male aged 35-45)	Left mandibular canine

Most of the cases of dental trauma involve anterior teeth, as might be expected since they are most exposed to damage via a fall or a blow. Posterior teeth may be chipped as a result of chewing upon some hard object inadvertently taken in with the food. In 2 cases the fracture has exposed the pulp cavity of the tooth. In 1483 the chipping of the I2 has led to the formation of a periapical abscess. The neighbouring medial incisor has been lost ante-mortem, probably as a result of the same traumatic incident which caused the fracture of the I2. The fracture of the premolar of 2333 looked suspiciously "post-mortem" under low power microscope (i.e. it had rather sharp edges), however the presence of an alveolar abscess at the socket of this tooth testifies that the fracture was an ante-mortem event.

(viii) Periodontal disease. Periodontal disease is an inflammation of the gums and other periodontal tissues associated with poor oral hygiene. The manifestations of the disease in skeletal material are porosis and profile changes to the interdental septa, and infra-bony pockets may form in severe cases (Costa 1982). Alveolar resorbtion may accompany these changes, but apparent alveolar resorbtion alone is an insufficient basis upon which to form a diagnosis: as they wear during adult life the teeth continue to erupt in order to maintain occlusion: this gives the misleading appearance of recession of the alveolar bone (Whittaker et al. 1985).

There are 50 cases of periodontal disease among the Ipswich Blackfriars material, 38 males and 12 females. In most cases the disease is widespread in the dental arches but in those cases where the disease is localised, the more posterior parts of the mouth tend to be those affected, and when the whole mouth is affected severe lesions are more likely to occur in the posterior parts of the dental arches.

(b) Arthropathies

(i) Degenerative joint disease: osteoarthritis and spinal osteophytosis (spondylosis deformans). Although the aetiology of osteoarthritis and spondylosis deformans must be considered multifactorial, both human and animal studies have shown that mechanical stress upon the joints plays an important role (Radin et al. 1980; Kellgren & Lawrence 1958; Kellgren 1961). The most usual cause seems to be repeated minor traumata, as might result from day to day activities (although it may occur as a consequence of a single trauma to a joint). Consistent with this, studies of human populations have shown that the prevalence of these 2 conditions varies with individual age and the amount of physical stress to the joints in life (op. cit).

At a synovial joint mechanical stress leads to degeneration of the joint cartilages, with subsequent macroscopic bony changes, including marginal spurring and joint surface irregularities.

At the amphiarthrodial joint between the vertebral bodies mechanical stress may lead to displacement of the intervertebral disc, which in turn causes traction at the sites at which it attaches to the vertebral body; this leads to formation of osteophytes at the margins of the vertebral centra. In addition to their attachments to the margins of the vertebral body, the discs are also attached to the cartilaginous end plate of the centrum; this cartilage may also undergo degenerative changes, in a similar fashion to the cartilage in a synovial joint, resulting in analogous bony changes.

Osteoarthritis and spinal osteophytosis were distinguished from other arthropathies using criteria described by Rogers et al. (1987) and Resnick (1985).

The presence of osteoarthritis and spinal osteophytosis was scored into 3 grades, according to the extent of the bony changes, using to the scheme of Sager (1969, reproduced in Brothwell 1981: Fig. 6.9). Individuals showing erosive arthropathies and those showing advanced DISH (see below) were excluded from the figures (for adults only) shown in Tables 41-44.

Table 41: Spinal osteophytosis: maximum severity by individuals

Maximum severity			
0	I	II	III
40	82	37	14

Table 42: Spinal osteophytosis: prevalence by vertebrae

Cervical				Thoracic				Lumbar				Total			
0	I	II	III	0	I	II	III	0	I	II	III	0	I	II	III
348	114	77	24	658	599	31	6	348	269	37	5	1354	982	145	35

Table 43: Osteoarthritis: maximum severity by individuals

Maximum severity			
0	I	II	III
61	70	35	45

Table 44: Distribution of osteoarthritis

	Severity			
Skeletal element	0	I	II	III
L mandibular condyle	77	5	0	1
R mandibular condyle	85	1	1	0
L ribs	922	159	28	4
R ribs	873	155	37	4
Cervical vertebrae	565	72	30	55
Thoracic vertebrae	1189	144	58	55
Lumbar vertebrae	541	72	16	22
L medial clavicle	102	10	2	1
L lateral clavicle	76	15	7	2
R medial clavicle	89	13	1	1
R lateral clavicle	73	22	9	0
L glenoid cavity	114	24	1	2
R glenoid cavity	111	28	1	1
L proximal humerus	137	2	0	2
R proximal humerus	132	1	1	1
L distal humerus	142	6	1	2
R distal humerus	143	6	0	1
L proximal radius	132	3	1	1
R proximal radius	139	4	0	0
L distal radius	125	11	0	1
R distal radius	136	9	0	1
L proximal ulna	120	30	1	1
R proximal ulna	118	37	1	0
L distal ulna	108	12	0	1
R distal ulna	120	10	1	0
L carpals	636	19	4	6
R carpals	724	19	6	7
L metacarpals	683	10	5	1
R metacarpals	721	10	9	2
L hand phalanges	824	39	2	5
R hand phalanges	944	44	10	9
U hand phalanges	498	16	2	3
L acetabulum	115	37	4	2
R acetabulum	119	38	3	2
L proximal femur	152	11	0	3
R proximal femur	151	11	2	3
L distal femur	144	13	1	4
R distal femur	148	15	2	1
L patella	90	19	2	2
R patella	89	20	2	1
L proximal tibia	144	10	1	2
R proximal tibia	141	15	1	0
L distal tibia	169	2	1	0
R distal tibia	167	2	0	1
L proximal fibula	51	2	1	0

Skeletal element	Severity 0	I	II	III
R proximal fibula	63	3	0	0
L distal fibula	144	0	0	0
R distal fibula	145	0	1	0
L calcaneus	174	0	0	0
R calcaneus	171	6	0	0
L talus	167	2	2	0
R talus	163	4	1	2
L tarsals*	679	8	6	2
R tarsals*	718	5	4	2
L metatarsals	771	12	4	4
R metatarsals	763	11	12	5
L foot phalanges	445	6	3	0
R foot phalanges	510	5	2	2
U foot phalanges	270	0	1	0

L=left R=right U=unknown side *=excluding talus and calcaneus

The numbers of individuals showing osteoarthritis and spinal osteophytosis to the various degrees of severity do not differ significantly between the sexes, and the distributions of osteoarthritis and osteophytosis in the skeleton are also similar. The distribution of lesions in the skeleton is similar to that in the Anglo-Saxon assemblage from the School Street site, although both conditions were rather more frequent and more severe in the Blackfriars material, reflecting the older adult age at death.

Resnick (1985) claims that spinal osteophytosis is found in about 60-80% of individuals aged over 50. The present data suggest at least this frequency of the disease in the Blackfriars people - of 43 individuals probably aged over about 50 years with 1 or more vertebrae present for study, all but 1 show bony signs of the disease.

(ii) Diffuse Idiopathic Skeletal Hyperostosis (DISH). This is a progressive ossification of the spinal ligaments and extra-spinal soft tissues; it occurs in middle-aged and elderly individuals and its precise aetiology is uncertain. In skeletal material it is characterised by massive, flowing osteophytes on the anterior/lateral parts of the vertebral bodies, which tend to be right-sided in the thoracic spine (probably reflecting the inhibiting effect on bone formation on the left side of the vertebral bodies due to the presence of the descending aorta), ossification at the enstheses (particularly on the iliac crests, the insertions of the quadriceps femoris on the patellae, the olecranon processes and the insertions of the Achilles tendons on the calcanei) and, to a lesser extent, at the margins of joints which show no other changes. The disease leads to fusion of vertebrae and, frequently, to bony bridging of the sacro-iliac joints (Rogers et al. 1987; Resnick 1985; Brigode et al. 1982). The spinal changes in burial 1417 are shown in Plate 2.

Rogers et al. (1987) state that DISH is only diagnosed in clinical practice if at least 3 contiguous vertebrae are fused

and extra-spinal manifestations are present, but point out that earlier changes of DISH will be visible on dry bones.

The bony changes in probable cases of DISH in the Blackfriars assemblage are summarised in Table 45.

Table 45: Diffuse idiopathic skeletal hyperostosis (DISH)

Burial	Fused vertebrae	Vertebrae showing ossification of spinal ligaments without ankylosis	Extra-spinal ossifications
0740 (male aged 30-40)	-	T5 & 6, T8 & 9, L6	Yes
1068 (male aged 35-45)	-	T4 & 5, T9-12	Yes
1417 (male aged 60+)	T3-11	T12 & 1 cervical vertebra	Yes
1418 (male aged 40-50)	2 lower thoracics	Several thoracic vertebrae	Yes
1457 (female aged 35-45)	3 middle thoracics	T12, 1 other thoracic & 4 lumbar, & the 1st sacral vertebra	Yes
1757 (male aged 40-50)	T2-5, T10-12	L1, 2 & 5; S1	Yes
1799 (male aged 50+)	4 thoracics (?9-12) & 2 other thoracics	L1-5	Yes
1816 (male aged 35-50)	-	T6-10	Yes
1834 (male aged 50+)	T5-9 (& T10-12?)	L1-5	Yes
1882 (male aged 30-50)	T11 & 12	-	Yes
1892 (male adult)	T8 & 9	L4 & 5	Yes
1985 (male aged 35-45)	-	T7-9	Yes
1987 (female aged 50+)	-	Several middle thoracic vertebrae	Yes
2005 (male aged 35-45)	T6-7 & T9-11	Most thoracic and lumbar vertebrae	Yes
2396 (male aged 40-60)	T10 & 11 (& T9)	T4-6, T7-9	Yes
2466 (male aged 40+)	T9 & 10	-	No
2478 (male aged 30-50)	2 thoracics	2 thoracic vertebrae	Yes
2496 (male aged 45-55)	3 middle/upper thoracics	4 thoracic, 1 lumbar vertebra	Yes
2591 (male aged 35-45)	T5-11	-	Yes
2647 (male adult)	T3-10	T2 & T11, 2 lumbar vertebrae	Yes
2654 (male adult)	T4-L1*	C5 & C6, T3 & T4, some lumbar vertebrae	Yes

* 2654 has 13 thoracic vertebrae so this represents ankylosis of 11 vertebrae.

There are thus 21 individuals showing bony changes which are probably associated with DISH, but only 10 meet the criteria described by Rogers et al. (1987) for clinical diagnosis of the condition. In modern populations DISH is rare in individuals aged under 40, although incipient signs may be observed in those aged 20-40 (Resnick & Niwayama 1988: 1566f). The age distribution of those individuals in Table 45 is consistent with this. Resnick & Niwayama (1989: 1566) indicate that 60-75% of modern cases of DISH occur in males. The Blackfriars data are consistent with this: of the 21 individuals in Table 45, 19 are male and only 2 are female. The difference in frequency of DISH between males and females (with one or more vertebral bodies available for study - 120 males, 58 females) is significant at the 2% level according the the chi-square test.

The prevalence of DISH in individuals aged 40 years or more in a modern population is 2.8% (Julkunen et al. 1971). In the Blackfriars assemblage the prevalence (scored according to the criteria of Rogers et al. 1987) among adults thought to be aged about 40 years or older who had 3 or more vertebrae available for

study (N=67) is 13.4%. Thus the prevalence at the Ipswich Blackfriars site is very much greater than expected from modern figures (the real prevalence would probably have been greater than 13.4% - the incomplete nature of the vertebral columns makes under-estimation of its prevalence likely). Although its precise aetiology is uncertain, increased frequency of DISH has been associated with obesity (Julkunen et al. 1971); Waldron (1985) suggested that the high prevalence of DISH which he found in a (fairly small) series of skeletons from Merton Priory might be explained by obesity among the religious orders, a likely possibility, Waldron suggests, in view of documentary accounts of over-enthusiastic consumption of food among Mediaeval monks and friars. Although one would not wish to press the evidence too far, perhaps the high prevalence of DISH in the Ipswich Blackfriars assemblage suggests obesity may have been a problem among the friars and wealthy benefactors buried there.

In contrast with the present material no suggestion of DISH was found among the 51 adults with vertebrae available for study from the 10th-11th century cemetery on the School Street site. This suggests differences in life style between the 2 groups - perhaps, obesity was not a problem for those buried in the 10th-11th century cemetery.

(iii) Erosive arthropathies. These are a group of joint diseases which, in the lesions of the joints, bone resorbtion predominates over bone proliferation. They include gout, rheumatoid arthritis, ankylosing spondylitis, colitic arthropathy (arthritis associated with inflammatory bowel disease), Reiter's disease (an arthropathy which may arise from sexually acquired or gastro-intestinal infections) and psoriatic arthropathy (arthritis associated with psoriasis).

In the Blackfriars assemblage 6 possible cases of erosive arthropathies were identified. Brief descriptions of lesions, together with, where possible, suggested diagnoses are given below.

Burial 0985 (male aged 40-60, skeleton about 40-60% complete). The head of the right 1st metatarsal is largely destroyed by erosive lesions, so that the bone is 1.5cm shorter than its left foot counterpart. The distal part of the right 4th metatarsal has been destroyed, the distal part of the shaft tapering from the sides to a "knife-edge" deformity (Plate 3). There is a small erosion in the head of the left 1st metatarsal. Several metatarsals show periostitis, as do the lower leg bones and the lower part of the shaft of the left femur; that on the tibiae and fibulae tends to follow the ridges for muscle attachments and the attachment for the inter-osseous membrane (Plate 4). The articulations between the patellae and the lateral condyles of the femora are eburnated. The entire spinal column and the sacro-iliac joints are missing; a few hand bones are present and are normal. This appears to be a proliferative erosive arthropathy. A more precise diagnosis is hampered by the incomplete nature of the remains.

Burial 1754 (female aged 30-40, skeleton 40-60% complete). There are erosive lesions on the distal joint surfaces of the left radius and ulna, all 8 left carpals, the proximal joint

surfaces of the left 2nd-5th metacarpals and on the distal joint surfaces of 2 proximal left hand phalanges. Only a few fragments of the right hand and wrist bones remain; the radius shows an erosive lesion which has destroyed the ulnar facet and part of the facet for the scaphoid. The erosions show negligible sclerosis at their margins and their internal dimensions are larger than those at the point at which they breach the joint surface. Their internal surfaces are of trabecular bone (Plates 5, 6 & 7). The rest of the skeleton (which is rather incomplete, although most of the vertebral column and the sacro-iliac joints are present) shows no further erosive lesions. The changes at the hands and wrists are suggestive of rheumatoid arthritis (McCarty 1989; Jensen & Steinbach 1977).

Burial 1827 (male aged 40+, skeleton 20-40% complete). There is fusion of the upper third of the right sacro-iliac joint (Plate 8). There is destruction of both faces of the right 5th metatarso-phalangeal joint and slight periostitis of the shafts of the right 4th and 5th metatarsals and on the distal parts of the right fibula (the right tibia is missing). Two vertebrae and one hand bone are present and are normal. Probably an erosive arthropathy.

Burial 2306 (male adult, skeleton 40-60% complete). Two mid-thoracic vertebrae are fused at their centra (with negligible osteophyte formation) and at their facet joints. A small fragment shows that 2 other thoracic vertebral centra were fused in a similar fashion. The remainder of the vertebral column is poorly preserved and very fragmentary, but some vertebrae show erosions of the rib facets on their bodies or transverse processes and there is ankylosis between an upper thoracic vertebral body and the head of a rib. A few ribs show erosive lesions on their articular surfaces with the vertebrae. Of the sacro-iliac joints only the iliac face of the left is present; it is normal except for degenerative changes, as are the hand and foot bones. Probably an erosive arthropathy.

Burial 2466 (male aged 40+, skeleton 40-60% complete). Of the hand bones only 2 proximal phalanges are present; both show erosive changes at their distal ends (Plate 9). One shows complete destruction of its distal joint surface with a hook-like overhanging edge, the other shows marginal erosions. Both faces of the left acromio-clavicular joint are destroyed by erosive changes. The surfaces of all these lesions are of somewhat sclerotic trabecular bone. Most of the vertebral column and the left sacro-iliac joint are present and show no erosive changes. The foot bones are missing. The hook-like overhanging edge of the lytic lesion in the phalanx and the probable lack of involvement of the axial skeleton are suggestive of gout (Resnick & Niwayama 1989: 1619-1671; Martel 1968).

Burial 2656 (male adult, skeleton less than 20% complete). The right 1st and 2nd metatarsals and the medial and intermediate cuneiforms are fused together. The joint surfaces of the right cuneiforms and navicular show florid marginal lipping and erosive changes. Most of the right cuboid has suffered destruction ante-mortem, leaving only a small fragment. All the right metatarsal joint surfaces for which observations can be made (distal 1st and 5th, proximal 2nd-5th) show erosions and marginal proliferation. The proximal phalanx of the 4th toe has an erosive lesion on its

distal joint surface. There is heavy spurring at the point of insertion of the Achilles tendon on the right calcaneus. The left lateral cuneiform, cuboid and navicular are fused together, as are the left 2nd metatarsal and medial and intermediate cuneiforms. All the left tarsals show florid osteophytes near their joint surfaces, save the articulation between the 1st metatarsal and the medial cuneiform which is normal. With the above exception, all joint surfaces on the left metatarsals for which observations can be made (proximal 1st and 3rd-5th, distal 1st and 5th) show erosions and marginal proliferation. The proximal phalanx of the left 5th toe shows destruction of its base and that of the 4th shows an erosion on its distal joint surface. There is bony spurring at the insertion of the Achilles tendon on the left calcaneus. (The changes to the foot bones are shown in Plate 10). A distal and a proximal foot phalanx of indeterminate side are also present; the former shows erosions on its joint surface, as does the latter at its distal articular surface. Of the lower leg bones only the right fibula is present; its distal joint surface shows an erosive lesion. Only 2 hand bones are present, the left 2nd and the right 5th metacarpal, both show erosions at their distal ends (Plate 11). The joint surfaces of the right forearm bones and the distal joint surface of the right humerus show florid marginal lipping and there is spurring on the olecranon process and the radial tuberosity. The surfaces of the erosions are of trabecular bone and show negligible sclerosis. Two middle thoracic vertebrae which are probably from this burial are fused at the margins of their centra by a smooth osteophyte; their facet joints are normal. Very few additional bones are present from this skeleton. This seems to be a proliferative erosive arthropathy which affects the extremities in a bilateral and, at least in the case of the feet, a symmetrical manner; a more precise diagnosis is precluded by the very incomplete nature of the remains.

In distinguishing the various erosive arthropathies the distribution of lesions within the skeleton is an important factor; in this light the incomplete nature of all 6 skeletons showing signs of probable erosive arthropathies is particularly unfortunate.

The presence of a probable case of rheumatoid arthritis in the Ipswich Blackfriars assemblage is noteworthy. Some writers have asserted that rheumatoid arthritis is an entirely modern disease (discussion in Dieppe 1989), although a few skeletons from British archaeological sites do show changes which might be interpreted as consistent with a diagnosis of rheumatoid arthritis (e.g. Rogers 1989).

(iv) Aseptic necroses. Three types of aseptic necrosis were identified in the Ipswich Blackfriars assemblage, osteochondritis dissecans, Perthes' disease and Scheuermann's disease. These conditions involve death of a section of bone at a joint through deficient blood supply.

The pathology in osteochondritis dissecans consists of avascular necrosis of the subchondral bone of the joint with eventual cleavage away of the necrotic fragment forming a loose body in the joint (Jacobs 1976: 320f). The evidence for the condition on dry bone is the pit or cleft left in the joint surface after the separation of the necrotic fragment, which tends to be lined with sclerotic bone. Some cases exhibit healing, which manifests itself as infilling of the pit with new bone which frequently rises proud of the normal joint surface (Manchester 1983:69-70).

Diagnosis of osteochondritis dissecans may be difficult in some instances as joint surfaces, particularly in older individuals, often show minor pits or depressions. In order for the lesion to be scored as present a pit or depression lined with sclerotic bone, or a localised raised area of sclerotic bone was required.

Table 46: Osteochondritis dissecans

Burial	Location of lesion(s)	Healed?
0962 (female aged 50+)	Proximal L radius	No
1361 (male aged 45-60)	Distal L tibia	No
	R glenoid cavity	No
1492 (male aged 50+)	Proximal joint surface of R proximal hallucial phalanx	No
1819 (juvenile aged c11)	Distal L tibia	No
1927 (female adult)	Proximal L & R radius	No
1978 (male aged 30-40)	Distal R humerus	Yes
1985 (male aged 35-45)	Trochlear surface of L talus	No
2301 (male aged 30-50)	Trochlear surfaces of both tali	No
2411 (female adult)	Proximal joint surface of L proximal hallucial phalanx	No
2439 (female aged 30-40)	Both patellae	No
2461 (male aged 40-60)	Both patellae	Yes
2476 (male aged 25-45)	Proximal joint surface of R 1st metatarsal	No
	Proximal joint surface of L proximal hallucial phalanx	No
2612 (female aged 35-45)	Proximal joint surface of L proximal hallucial phalanx	No
3118 (female adult)	R patella	Yes

The precise aetiology of osteochondritis dissecans is uncertain but trauma appears to play a part (Jacobs 1976). In modern populations the most frequent sites of lesions are (in descending order) the knee, the ankle and the elbow (ibid.), the location of lesions in the Blackfriars material are, in the main, consistent with this.

Aseptic necrosis of the vertebral epiphyses is termed Scheuermann's disease. This manifests itself in dry bones by erosions at the anterior margins of the vertebral bodies; the eroded areas show marked sclerosis. It generally presents in adolescence (Griffiths 1986). Two individuals show evidence of Scheuermann's disease, 2458 (male aged 21-24) on the 12th

thoracic and 1st lumbar vertebrae (Plate 12) and 2489 (male aged 25-35) on the 12th thoracic vertebra.

Perthes' disease is an extensive necrosis of the femoral head. Burials 1892 (male adult) and 1917 (female aged 50+) show probable Perthes' disease. Inhumation 1892 shows bilateral lesions and 1917 changes on the left femoral head only. The lesions consist of flattening of the weight-bearing parts of the femoral heads and obliteration of the pits for the ligamentum teres; X-ray reveals the femoral necks to be of fairly normal length and there is no evidence for displacement of the femoral heads with respect to the axes of the necks (Plate 13). A differential diagnosis is slipped capital epiphysis but the obliteration of the pits for insertion of the ligamentum teres, the lack of displacement of the femoral heads and the normal length of the femoral necks all argue for Perthes' disease (Ortner & Putschar 1985: 238-242).

Perthes' disease is a disease of childhood; it generally presents between 4 and 7 years of age, 80% of cases are male and in 90% lesions are unilateral (Wynne-Davis & Gormley 1978). It is thus probable that both 1892 and 1917 had the condition from childhood. In both cases there is severe osteoarthritis at the affected hip(s), the severity of the changes testifying to the long-standing nature of the disease. The causes of Perthes' disease are uncertain but it may be initiated by trauma and there appears to be a constitutional disposition (ibid.).

(v) Hallux valgus. Habitual wearing of footwear which constricts the toes may lead to lateral deviation of the big toe - hallux valgus - frequently with a bunion over the medial aspect of the 1st metatarso-phalangeal joint (Barnett 1962; Shine 1965). Its manifestations in dry bones include a smooth-walled cystic cavity near the medial margin of the distal joint surface of the 1st metatarsal and lateral deviation of the proximal hallucial phalanx. Osteoarthritic changes at the 1st metatarso-phalangeal joint are also common (Plate 14).

In the Blackfriars assemblage 16 individuals (13 males, 3 females) showed hallux valgus, all were adult. Thus it would seem that it was mainly males who wore shoes which constricted the toes. It is notable that no instances of hallux valgus were found in the 10th-11th century School Street skeletons, suggesting that constricting footwear was not habitually worn by this group. Further skeletal evidence for the wearing of constricting footwear is provided by 3 individuals (all male) who showed evidence of the type of 5th metatarsal distortion described by White (1988: Fig. 55) or the presence of cystic defects near the 5th metatarsal head analogous to the "bunion erosions" already described for the 1st metatarsal; in one such case hallux valgus was also present. Mediaeval artistic representations and archaeological finds show that footwear which must have constricted the toes was worn in the Mediaeval period (e.g. Steane 1985: 282-3).

(vi) Miscellaneous joint disease. Burial 0938 (male aged 50+, skeleton 80%+ complete). The bodies of many vertebrae bear deposits of sclerotic bone upon their superior and inferior surfaces, and 5 thoracic and 1 lumbar vertebra show Schmorl's nodes, some of which are very large. The 4th and 5th lumbar and the 1st sacral vertebra are fused together (Plate 15) at their bodies by calcification in the disc spaces, and at the right facet joint (L4/5) and the right transverse processes (L5/S1).

There is very severe osteoarthritis of the hips (the left of which also shows a slipped capital epiphysis) and, particularly, the shoulders (Plate 16), although changes in the remainder of the skeleton are generally fairly slight.

There is bony spurring at many sites, including the pubic symphyses and the iliac crests. In addition to ossification of the thyroid there are several unidentified soft tissue calcifications.

The severity of the osteoarthritis at the shoulders is unusual, particularly coupled with the relative lack of severe osteoarthritic changes in most of the rest of the skeleton, and in the absence of any evidence for local trauma, suggests a need to search for other disorders as a cause (Resnick & Niwayama 1988: 1408). The intervertebral calcification, the formation of Schmorl's nodes, fusion of lower vertebrae and marked osteoarthritis at major joints with little peripheral involvement are all features of ochronotic arthropathy, a condition which is a result of alkaptonuria, an inherited metabolic disorder in which a black pigment is deposited in the cartilage of the intervertebral discs and synovial joints resulting in severe degenerative changes at the discs and major joints (O'Brien et al. 1963; Martin et al. 1955; Schumacher 1989). However the radiographic appearance of the vertebral column is not typical of ochronosis (Guyer pers. comm), hence the cause of the lesions in 0938 remains uncertain.

(c) Trauma

(i) Fractures. A total of 41 adults show 80 fractured bones. The overall fracture rate with respect to bones (adults only) is 80/21118=0.38%. No fractures were found in juveniles.

Table 47: Fractures

Burial	Fractures
0950 (male aged 60+)	Body of L4, L humerus (d 1/3), R femur (sub-trochanter, un-united)
0974 (male aged 22-25)	R rib (through articular facet), R humerus (fissure fracture of greater trochanter)
0985 (male aged 40-60)	R radius (Colles' fracture)
0992 (male aged 25-35)	Skull, weapon injury
1012 (male aged 40-50)	7 L middle true ribs (8 fractures, 1/3-1/2 way from sternal ends)
1376 (female aged 30-50)	R middle rib (5-6cm from sternal end)
1749 (male aged 30-40)	Skull, 2 unhealed weapon injuries
1795 (female aged 45-60)	2 U rib fragments
1827 (male aged 40+)	L fibula (p 1/3)
1882 (male aged 30-50)	Neural spine of L2
1892 (male adult)	Neural spine of T4
1904 (male aged 30-40)	R radius and ulna (d 1/3, amputation)

Burial	Fractures
1914 (male aged 35-45)	Bodies of T11 & 12, R 2nd metacarpal & proximal phalanx, R acetabular rim
1935 (male aged 22-50)	Body of T11, L radius (Colles' fracture), ulna styloid
1944 (male aged 30+)	R femoral neck
1965 (female aged 50+)	2 lower thoracic vertebral bodies, L clavicle (lat 1/3), U rib fragment
1967 (female aged 22-25)	1 upper thoracic vertebral body
1978 (male aged 30-40)	Skull (?weapon injury)
1987 (female aged 50+)	3 U rib fragments
2306 (male adult)	1 L 2nd metacarpal
2316 (female aged 22-25)	2 L ribs (3 fractures, 1 un-united in mid-shaft area)
2318 (male aged 25-35)	R radius (d 1/3)
2348 (female adult)	L radius (d joint surface)
2386 (female aged 35-45)	R 2nd, 3rd & 4th metacarpals, R radius (Colles' fracture)
2407 (male aged 35-45)	2 L ribs (1/3 of way from heads), 1 R rib (midshaft), 2 U rib fragments
2436 (male adult)	R tibia (fragment avulsed at distal interosseous border)
2441 (unsexed adult)	Body of T12
2452 (female aged 40-50)	Body of a mid-thoracic vertebra
2461 (male aged 40-60)	Skull (depressed fracture)
2476 (male aged 25-45)	Proximal foot phalanx
2480 (male aged 22-30)	2 U ribs (near sternal ends)
2482 (male aged 35-45)	Body of T12, R 4th metacarpal
2537 (female aged 60+)	Bodies of L1 & L5
2546 (male aged 50+)	Bodies of L2 & 3 middle thoracic vertebrae
2548 (?male aged 25-35)	Sternum, 2 R ribs (midshaft & between head & tuberosity)
2583 (male aged 50+)	1 U rib fragment
2628 (female aged 50+)	L ulna midshaft (un-united)
2647 (male adult)	Bodies of T12 & 2 lumbar vertebrae
2650 (male aged 35-45)	Skull (depressed fracture)
3107 (male aged 50+)	L radius (Colles' fracture)
3109 (male aged 25-35)	L tibia (d joint surface)

Notes: L=left, R=right U=unsided, d=distal, p=proximal, lat=lateral. Fractures united unless stated.

Three burials show evidence of injuries from edged weapons. Burial 1749 shows a cut on the left side of the skull, stretching from the left orbital margin, across the frontal and parietal bones and terminating in the area of the sagittal suture (Plate 17). There is a second, smaller (23mm long) cut on the right parietal, 5-6cm from the coronal and 7-8cm from the sagittal suture.

Neither cut shows any sign of healing and both are very clean with slightly polished surfaces. There is no sign of fragmentation at their edges, suggesting that a very sharp weapon was used. The massive cerebral injury which the main wound must have caused was almost certainly cause of death. Examination of the surfaces of the main lesion under low power binocular microscope reveals fine parallel scratch marks whose orientation suggests that the blow came from directly above the individual.

Burial 0992 shows a wound 4cm long in the left parietal and frontal bones (Plate 18). Its rounded edges indicate healing, and united fractures run from the front and rear edges of the hole. The form of the hole suggests a blow from an edged weapon from above and slightly to the right of the head. It seems probable that the blow resulted in some fragmentation of the bone and that these small fragments were resorbed on healing, leaving

the hole. It would seem that the weapon used to inflict this injury was sufficiently sharp to cut the bone but not sharp enough so that a clean cut resulted (i.e. it was less sharp than the weapon that killed 1749). Consistent with this the united fractures radiating from the front and rear of the hole suggest some splitting of the bone as might result from a thicker blade. The state of healing of the lesions suggests that the injury occurred long before death.

Burial 1978 has a linear gully 18mm long running obliquely near the left frontal eminence. The lesion fails to penetrate the cranial vault and has the appearance of a superficial edged weapon injury, perhaps from a blow which failed to land with the intended force, or perhaps 1978 was wearing a helmet or other protective headgear which took most of the force of the impact.

Although not properly a fracture the rather unusual lesion displayed by burial 2491 (male aged 50+) should probably be discussed in this section. There is an iron fragment embedded in the outer table of the left frontal bone (Plate 19). The fragment has a rectangular cross-section and a pointed tip, and it fails to penetrate the full thickness of the calvarium (Plate 20). The fragment appears to be the tip of a weapon, implement or projectile. The bone of the outer table around the fragment is bevelled inwards suggesting that the injury was an in-vivo event (or occurred fairly soon after death while the bone was still fresh). The injury is clearly insufficient to be cause of death.

The skull of 2461 shows a blunt injury which was probably due to inter-personal violence. There is a healed depressed fracture of the left frontal and parietal bones, the focus of which lies about 1.5cm above the pterion (Plate 21). Healed fracture lines radiate from the focus of the lesion and there is some fragmentation at the point of impact, where the bone is depressed inwards by about 1cm. The state of healing suggests prolonged survival. The appearance of the injury suggests a blunt impact over a fairly small area, the trajectory of the blow being from the individual's left and slightly above and in front. There is also an area of roughened bone on the outer table of the frontal bone 3cm to the right of the midline and 1.5cm from the coronal suture; this probably represents superficial trauma to the outer table with subsequent healing.

Burial 2650 also shows a probable healed depressed fracture of the skull. There is an oval depression about 1x2cm on the left parietal bone, with a corresponding bulge on the inner table.

The right hand of burial 1904 has been amputated by an oblique cut through the radius and ulna (Plate 22). Comparison with the left forearm bones suggests that the radius was severed 73mm from the distal end and the ulna 43mm from its distal end. The bones are united in a supinated position by 2 bridges of callus. No trace of a prosthesis was found in the grave. Comparison of the state of the stump with those of modern amputees (Barber 1929; 1930) suggests a quiescent stump with healing complete - amputation may have occurred many years prior to death. From the nature of the stump it is impossible to determine whether amputation was a result of surgical intervention or due to a weapon injury.

The Calendar of Patent Rolls for 1327 records a complaint by Richard de Holebrok that a mob of 84 named individuals (including 2 women and 3 chaplains) "and others", "assaulted him at Tatyngston, co. Suffolk, bound him to a tree and cut off his right hand". Tattingstone is a village about 4 miles from Ipswich. The Holbrook family were Suffolk gentry and floor tiles bearing the Holbrook family crest were found in the excavations at the Blackfriars site. Amputations are only rarely found in British archaeological material, although a few other Mediaeval examples are known (e.g. from the leper cemetery at Chichester and from Cathedral Green, Winchester). The above suggests that burial 1904 may be Richard de Holbrook, but efforts to investigate further this possibility, using documentary data, proved fruitless.

One further fracture which may have been caused by inter-personal violence is the transverse midshaft fracture of the left ulna displayed by 2628. Such fractures are often due to the forearm being raised to parry a blow aimed at the head (Benjamin 1982).

All individuals showing weapon wounds are males (this is usually the case) as are all those displaying injuries probably associated with violence except 2628 which is female.

In his study of the (male) secular peerage of 1350-1500 Rosenthal (1973) found that 19.1% suffered death through violence. Despite the fact that many violent deaths will not be evident on the skeleton, it seems most unlikely that the rate of violent deaths among those buried at the Ipswich Blackfriars was anything like as high. Documentary evidence (Page 1975) suggests a great deal of lawlessness and violence in Suffolk at times during the period the Ipswich friary was in existence, but the skeletons from Ipswich do not seem to reflect a high level of inter-personal violence.

Most fractures seem to have healed with little shortening or malalignment, although this does not necessarily imply splinting or other treatment of injuries - Schultz (1967) found that many fractures sustained by wild-living apes healed with little deformity or shortening. However 2 individuals showed fractures which failed to unite - a rib of 2316 and the mid-shaft ulna fracture of 2628. This last (Plate 23) shows formation of a pseudarthrosis (false joint) at the site of the fracture, together with severe osteoarthritis of the elbow and distal radio-ulna articulation.

No significant difference exists between the proportion of males and females showing fractures.

The rate of fracture with respect to individuals is rather greater than in the 10th-11th century School Street assemblage (18.1% of adults compared with 8.9%), but the difference in frequency with respect to total bones is somewhat less (0.38% compared with 0.25%). The greater difference in frequencies with respect to presence/absence of fractures in individuals is probably associated with the greater skeletal completeness of the Blackfriars burials. A greater frequency of fractures might also be expected in the Blackfriars assemblage on account of the older age at death of adults here (using the years at risk analysis of Lovejoy & Heiple (1981)). A notable difference between the 2

School Street groups is that in the Anglo-Saxon assemblage there were no skull fractures or edged-weapon injuries and only 1 fracture (an ulna "parry" fracture) which might be ascribed to inter-personal violence.

Some individuals showed signs of trauma which did not result in fracture e.g. myositis ossificans circumscripta (an ossification which often arises through trauma), ossified sub-periosteal haematoma (ossification beneath the periosteum which may follow deep bruising) or severe localised osteoarthritis. These cases are described in the entries for individual burials (Appendix). It is notable that these injuries are particularly common in the ankle region in the present series.

(ii) Slipped capital epiphysis. Burials 0938 (male aged 50+), 1786 (male aged 35-45) and 1955 (male aged 50+) show probable slipped femoral capital epiphyses; 0938 and 1786 show unilateral lesions on their left and right femora respectively (Plate 24), 1955 shows bilateral changes. Lesions include inferior/posterior displacement of the femoral head and shortening of the femoral neck. All cases show severe osteoarthritis.

Slipped capital epiphysis is a stress failure of the epiphysial cartilage in the growing bone. It is most frequent between the ages of 12 and 17 years and is more prevalent in males than females. In some cases slippage seems to be initiated by trauma but in many instances no history of trauma can be obtained. There seems to be a constitutional predisposition to the condition, it being more frequent in obese boys with delayed sexual maturity and in adolescents with a history of rapid growth, so that the individual is tall and slender (Bedbrook 1982). None of the 3 cases at Ipswich is particularly tall, so perhaps the former scenario is the more relevant.

(iii) Schmorl's nodes. An intervertebral disc consists of a tough outer layer (the annulus fibrosus) surrounding an inner core (the nucleus pulposus) which, until young adulthood, is composed of semi-gelatinous material. In younger individuals excessive compression of the spine, as might occur due to heavy lifting, may result in extrusion of material from the nucleus pulposus into the adjacent vertebral body. The bony manifestation of this is a pit or cleft - the Schmorl's node. In some individuals congenital weakness in the cartilage end plate of the vertebral body may predispose to Schmorl's node formation, but there is no doubt that a single trauma may produce a Schmorl's node in a normal spine (Schmorl & Junghanns 1971: 158-168).

No juveniles show Schmorl's nodes; the data for adults is given below.

Table 48: Schmorl's nodes: distribution in the spine

	TOTAL ADULTS			MALES			FEMALES		
	Total vert.	No of vert. with nodes	No of nodes	Total vert.	No of vert. with nodes	No of nodes	Total vert.	No of vert. with nodes	No of nodes
Cervical vertebrae	594	0	0	401	0	0	191	0	0
Thoracic vertebrae	1321	160	175	897	137	147	418	17	20
Lumbar vertebrae	670	49	55	438	42	47	224	7	8

Table 49: Schmorl's nodes: frequencies by individuals

	With	Without
Males	66	54
Females	13	45
Total adults	69	112

The difference in frequency between the sexes with respect to presence-absence of nodes in individuals is significant at the 0.1% level by chi-square, with males having the greater frequency. Although prevalences with respect to vertebrae are not amenable to statistical analysis, the prevalence for males is considerably greater than that for females. These results suggest greater strain was placed upon the vertebral column in young males.

The prevalence of Schmorl's nodes in the 10th-11th century School street adults was lower both with respect to total vertebrae (4.2% of thoracic vertebrae and 4.6% of lumbar vertebrae compared with 12.1% and 7.3% respectively in the Blackfriars assemblage) and with respect to presence/absence in individuals (13.9% compared with 38.1% of the Blackfriars adults) the latter difference being significant at the 0.1% level by Chi-square. This implies a greater stress to the spine during adolescence and early adulthood in the 13th-16th century individuals than among their 10th-11th century predecessors.

(d) Porotic hyperostosis

Cribra orbitalia (porotic hyperostosis of the orbital roofs) takes the form of small pits or perforations in the orbital roofs. The condition was scored using the scheme of Brothwell (1981: Fig. 6.17).

Table 50: Cribra orbitalia

	Absent	Porotic	Cribriotic	Trabecular
Males	85	18	5	5
Females	39	4	4	1
Total adults	125	22	9	6
Juveniles	13	1	3	0

Burial 1855 (male aged 22-25) shows "labyrinth" lesions on the inner table of the occipital, parietal and frontal bones and 2458

(male aged 21-24) shows pitting of the external table of the right parietal and frontal bones in the region of the coronal suture. It seems probable that these represent instances of porotic hyperostosis of the cranial vault - cribra cranii. Both these individuals also show cribra orbitalia.

It seems that cribra orbitalia and cribra cranii share a common aetiology: anaemia (Hengen 1971; Stuart-Macadam 1989). It also seems likely that the lesions in the orbital roofs represent initial changes whereas severe or prolonged anaemia leads to additional lesions in the cranial vault (op. cit.). Iron deficiency anaemia is the most common anaemia in all parts of the world (Steinbock 1976: 230). In addition to deficient dietary intake of iron, iron deficiency anaemia can be caused by gut parasites, frequent in unhygienic conditions which were no doubt prevalent in antiquity.

There is no significant difference in the prevalence of porotic hyperostosis between adults and juveniles or between males and females in the Blackfriars assemblage, nor between the Blackfriars and the Anglo-Saxon School Street skeletons.

(e) Infections

(i) Non-specific infection. When it is not possible to identify a particular micro-organism as responsible for an inflammation it is termed a non-specific infection. In the Ipswich Blackfriars material 2 types of non-specific infection are found: periostitis, inflammation of the periosteum which results in the laying down of new bone upon the underlying cortex, and osteomyelitis, inflammation involving the marrow cavity (Steinbock 1976: 60).

At the Ipswich Blackfriars 37 individuals (22 males, 10 females and 5 infants) show non-specific periostitis.

Periostitis may be a response to systemic disease or to local infection. In the latter case the lesions are generally restricted to a single bone or area of the skeleton. Of the 32 adults showing periostitis it affects the bones of the lower legs in 27 cases. The severity ranges from slight pitting and striation to marked swelling of the affected bones with, in one case (1978 (male aged 30-40), a flat oval plaque betraying the presence of skin ulceration, (Plate 25) but most displayed relatively slight changes.

Documentary evidence (Loudon 1981) shows that infection of the lower legs, probably initiated by trauma, was common in the Post-Mediaeval period. The frequency of non-specific periostitis of the lower legs in the Blackfriars material (13.2% of adults with one or both tibiae present) suggests that lower leg inflammation was frequent in this 13th-16th century group. Loudon (1981) shows that lower leg infections in the Post-Mediaeval period were frequently chronic (with ulceration) and resistant to treatments then known, so that they were a common health problem, particularly among the lower social classes. He suggests that a reason for the chronic nature of the lesions may have been dietary deficiency of ascorbic acid (vitamin C) through a lack of fresh fruit or vegetables in the diet. The relatively slight nature of most lesions in the Blackfriars material suggests that, unlike the scenario which seems common in Post-Mediaeval times,

the non-specific infections in the Ipswich Blackfriars' lower legs generally cleared up fairly rapidly, rather than becoming chronic and leading to ulceration. If Loudon's thesis that ascorbic acid deficiency prevented the healing of lower leg infections, and was thus responsible for their often chronic nature, is correct, then the Ipswich data would tend to imply sufficient ascorbic acid in the diet (as a result of sufficient consumption of fresh fruit and vegetables) to allow fairly speedy healing of such lesions.

In 4 of the other adults showing periostitis the lower parts of the femur were involved, again suggesting local infection of the legs as a cause. The remaining case (burial 3051, male aged 30+) showed swelling of the distal ends of the left radius and right ulna and the left 2nd and 3rd metacarpals. The acromion and spine of the left scapula showed periostitis. It seems probable that these lesions are a result of some systemic infection but the very poor preservation and incomplete nature of the remains prevents identification of their cause.

Periostitis of the long-bones, skull vault and orbital roofs is often found in infants as a response to systemic disease (Mensforth et al. 1978). All 5 infants from the Blackfriars showed periostitis of this type.

Two individuals show evidence of osteomyelitis.

The distal end of the left 2nd metacarpal of 2306 (male adult, skeleton 40-60% complete) is irregularly swollen and X-ray shows a wall of new bone outside the original cortex, some of which has been removed by remodelling. This bone also shows a healed fracture, just behind the distal joint surface.

The distal half of the diaphysis of the right femur of 1923 (male aged about 16 years, skeleton 40-60% complete) is swollen and there is some sub-periosteal woven bone upon the cortex. A radiograph (Plate 26) indicates that this swelling is mainly thickening of the cortex on the medial aspect of the bone and that there is some irregularity of the endosteal surface of the cortex on this side. The (unfused) epiphysis is normal.

In osteomyelitis the pathological process is one of bone destruction, pus formation and bone repair, thus the osteomyelitic bone is enlarged and deformed. Osteomyelitis may arise from local infection following soft tissue injury or via the bloodstream from a primary infection elsewhere in the body (haematogenous osteomyelitis). The fracture of the osteomyelitic metacarpal of 2306 indicates the former as the more likely cause in that case. Haematogenous osteomyelitis generally starts in childhood or adolescence, generally occurs in the long-bones (usually starting at the metaphysis) and is limited to one bone in 80% of cases (data for pre-antibiotic era - Ortner & Putschar 1985: 110). It would seem probable that the lesions in 1923 are osteomyelitis, the changes suggesting a fairly early stage of the infection. The unremodelled nature of the sub-periosteal bone indicates that the infection was active at time of death.

Burials 1495 and 2542 show infections of uncertain cause; the lesions are described in the Appendix.

(ii) Tuberculosis. Burial 2577 (?female aged about 11 years, skeleton 60-80% complete). The 2nd-4th lumbar vertebrae are fused at their facet joints; the bodies of 2 and 3 are almost completely destroyed, with negligible bone regeneration (Plate 27). The superior surface of the body of L4 has suffered some destruction and the anterior wall of the body of the 1st lumbar vertebra also bears a lytic lesion.

Both surfaces of the left sacro-iliac joint of 1340 (female aged 21-23, skeleton 80%+ complete) have been destroyed leaving trabecular bone, which on the iliac surface is highly sclerotic (Plate 28). There is a cavity plugged with new bone on the iliac face and X-ray reveals 2 smaller lytic areas within the wing of the ilium. There is little bone regeneration in the destroyed areas but there is periostitis on the anterior surface of the sacrum.

The lesions in 2577 and 1340 are probably due to tuberculosis. Skeletal tuberculosis is generally a result of secondary infection from lesions in the soft tissues, particularly the lungs, the baccilli reaching the bone via the bloodstream. The baccilli tend to locate themselves in areas of haemopoietic marrow which have high metabolic rates, hence the vertebral bodies are frequent sites of lesions. The lack of bony regeneration, or sinus or sequestrum formation argue for tuberculosis over other bony infections such as osteomyelitis (Ortner & Putschar 1985: 144). The lower thoracic and lumbar spine are particularly favoured sites for lesions. Sacro-iliac involvement is generally an extension of a lumbo-sacral focus (op. cit.:149), but in 1340 the lumbar vertebrae are normal.

(iii) Leprosy. Leprosy manifests itself in the skeleton via changes to the facial, lower leg, foot and hand bones. The facial changes include widening and smoothing of the margins of the pyriform aperture, resorbtion of the anterior nasal spine, recession of the maxillary alveolar process and inflammatory changes on the superior and inferior surfaces of the hard palate. These changes are caused directly by the micro-organism responsible for leprosy, *Mycobacterium leprae* and in combination are pathognomic of leprosy. In addition cribra orbitalia is a frequent finding in leprosy - lepers frequently suffer from anaemia (Hengen 1971). Changes to the feet and lower legs include resorbtion of the metatarsals from their distal ends, producing a tapered appearance, and resorbtion of the digits commencing at the proximal ends. Changes to the hands occur less frequently than those to the feet and include smoothing of the unguicular process of the distal phalanges, followed by resorbtion of the digits commencing at their distal ends; enlargement of nutrient foramina may also occur. Osteitis/periostitis may be a feature of the changes to the extremities and periostitis of the lower legs is also a frequent feature. The changes to the post-cranial skeleton are not due directly to the action of mycobacterium leprae (and may be imitated by other diseases - Gondos 1972) but are secondary to neurological damage resulting in loss of sensation (predisposing to painless trauma and subsequent infection), paralysis and

circulatory disturbance (Lechat 1962; Møller-Christensen 1961, 1974; Patterson 1961; Chhabriya et al. 1985).

At the Ipswich Blackfriars 4 individuals showed evidence for leprosy (Plates 29-31, Table 51).

Table 51: Leprosy

	Location of pathological changes				
Burial	Face	Hands	Feet	Tib/fib	Cribra
1914 (male aged 35-45)	Yes	No	Slight	Slight	Yes
1987 (female aged 50+)	Yes	No	Yes	Yes	Yes
2593 (male aged c25)	Yes	No	Slight	Yes	Yes
2624 (male aged 22-25)	Yes	Slight	Yes	Yes	No

(iv) Treponemal disease. Burial 1965 (female aged 50+, skeleton 60-80% complete) shows an area of irregular thickening on the outer table of the frontal bone (Plate 32), near the midline. The bone in this area is highly sclerotic. To the left and right of this area the frontal bone shows irregular thinning - at the thinnest point a post-mortem defect allows measurement of the thickness of the bone - 1.5mm. The inner table is normal, as are the nasal and facial bones, except perhaps for slight pitting in the maxillary lachrymal groove.

The shafts of the following bones show periostitis, with marked concentric thickening: both tibiae, the right fibula (the left fibula is missing), distal parts of both femora, distal parts of both humeri, distal parts of the right radius (only the distal 1/4 is present), the left ulna, left radius and right 3rd metacarpal; the changes are most marked on the tibiae (Plates 33 & 34); they have several raised plaques of bone upon their subcutaneous surfaces. Some of this new bone formation takes the form of bony spicules with apparent bridging over superficial blood vessels, this pattern being most marked on the lateral surfaces of the tibiae (Plate 35). A post mortem break about one quarter of the way from the distal end of the right tibia reveals that the medullary cavity is partially clogged with cancellous bone. There is a flattened area on the spine of the left scapula suggestive of an overlying skin ulcer.

The entire skeleton shows osteoporosis and hence all bones were markedly radiolucent, but X-ray of the pathological long-bones shows that the endosteal surfaces are rather irregular and in many places the demarcation between cortical and cancellous bone is indistinct. There are small patches of radiolucency within the build up of sub-periosteal new bone.

Thus the lesions displayed by 1965 consist of sclerotic thickening and irregular thinning of the frontal bone, together with diffuse periostitis of most long-bones and one metacarpal. The widespread nature of the lesions is suggestive of a systemic disease rather than localised non-specific infection (of the type which seems to have been responsible for the marked periostitis of the tibiae of 1978), and the absence of cloacae and sequestra, and the widespread nature of the lesions militates against osteomyelitis as a diagnosis. The marked production of new bone and the sparing of the joints and vertebrae in the disease

process argue against a diagnosis of tuberculosis. It seems probable that these lesions represent non-gummatous periostitis associated with treponemal infection (Ortner & Putschar 1985: 180f; Steinbock 1976: 86f; Hackett 1983; King & Catterall 1959). Ortner & Putschar (1985: 214) state that the presence of raised plaques, bony spicules which appear to bridge over superficial blood vessels and the absence of cloacae are "very typical of conditions occurring in long bones in known cases of syphilis, and... are not found together in non-treponemal infectious diseases".

The treponemal diseases which may manifest themselves on the skeleton are yaws, venereal syphilis (which may be congenital or acquired) and endemic syphilis. Yaws is a disease of the tropics whereas venereal and endemic syphilis extend into the temperate regions (Brothwell 1970). If it may be assumed that similar distributions of the diseases existed with respect to climatic zones in the past, then the infections to be considered in the present context are venereal and endemic syphilis. Distinguishing endemic syphilis and acquired or congenital venereal syphilis on the basis of skeletal evidence is difficult, however a few points are worth noting: in congenital venereal syphilis destruction of bony and cartilaginous elements of the nose is frequent, and there are often naso-palatine lesions in endemic syphilis (Steinbock 1976: 106, 139); in 1965 the nasal area is normal. The distribution of changes in skeleton 1965 seems more characteristic of venereal than endemic syphilis (ibid.). Thus the lesions in 1965 may be more typical of acquired venereal syphilis than of congenital venereal syphilis or endemic syphilis, but the evidence is not sufficient to distinguish between these 3 possibilities with any confidence.

Discussion

The earliest case of leprosy in Britain which can be identified from the more diagnostically reliable facial signs dates to the 7th century (Brothwell 1961), although possible cases showing lesions to the post-cranial skeleton only are known from the 5th and 6th centuries in Britain. Documentary evidence (Clay 1909) suggests that the disease peaked in the Norman period with a subsequent decline, so that it was rare by the 15th century. The find of a leprous skeleton in the Anglo-Saxon School Street cemetery testifies to the presence of the disease in Ipswich in pre-conquest times.

During the Mediaeval period considerable efforts were made to segregate sufferers from the general population by their isolation in leper hospitals, of which there were 3 in the Ipswich area during the period in which the Blackfriars burials were interred (Clay 1909). Leper hospital inmates were generally buried in the cemetery attached to the hospital church (ibid). John of Gaddesden, physician to Edward II declared that "no man is to be adjudged a leper, and separated from the intercourse of mankind, until the figure and form of the face is actually changed" (op. cit.: 60-61). The facial bone changes displayed by the Ipswich Blackfriars lepers indicate that the characteristic facial signs of leprosy would have been apparent in life.

Friars sometimes visited leper hospitals to attend to the lepers' spiritual and physical well-being, for example when barber surgeons performed an operation friars attended "leste hurte ande scathe bee done to the lepers" (Clay 1909: 63). Hence it could be suggested that the lepers at the Blackfriars are friars who contracted the disease, however the presence of a female leper (burial 1987) indicates that this cannot be the whole explanation. Manchester & Roberts (1989) suggest that it is probable that some leprosy sufferers were cared for by their kin rather than being segregated in hospitals; it may be that this explanation is relevant in the present cases, particularly as they probably belong to the wealthier strata of Mediaeval society: the wealthy would be better placed to care for their relatives and keep them from being segregated in hospitals against their will. Alternatively they may have been inmates in local leprosaria whose bodies were removed by their families for burial at the Blackfriars. It was suggested above (p30), on the basis of skeletal evidence, that it is likely that burial 2624 (a leper) and burial 3126 (a skeleton showing no signs of leprosy) share a close genetic relationship. It could be argued that this suggests that, at least in the case of 2624, the leper was buried in the friary with his kin.

It has been suggested that syphilis is a disease brought back from the New World by Columbus and his crew (reviews by Baker & Armelagos 1988; Williams 1932; Brothwell 1970), a suggestion which, it has been claimed, is supported by documentary evidence, and by the presence of archaeological specimens showing signs of syphilis of Pre-Columbian date in the New World whereas there is a lack of such specimens from Europe. In this light it was thought to be of interest to attempt to determine, using a precision radiocarbon date, whether burial 1965 pre- or post-dates 1493 (the year in which Columbus made landfall in Europe on his return from the New World). A date of 380+/-18 BP (UB-3202) corrected to 1459-1487 Cal AD (Stuiver & Pearson 1986) was obtained. This indicates that there is about an 84% chance that the burial pre-dates 1493. The only other published evidence of syphilis in Europe pre-1493 comes from an isolated skull showing signs of the disease from St Helen's-on-the-Walls, York (Dawes 1980) which gave a radiocarbon date of 680+/-80 BP (HAR 6887) corrected to 1265-1389 Cal AD (Stuiver & Pearson 1986). This and the Ipswich evidence suggests that syphilis may have been present in Europe prior to Columbus' contact with the New World.

(f) Osteoporosis

In modern Western populations bone mass tends to decrease after the 4th decade; the point at which loss of bone mineral is classified as osteoporosis is arbitrary (Kelsey 1987). In the Blackfriars assemblage 9 skeletons (burials 1738, 1795, 1925, 1932, 1965, 2320, 2537, 2548 and 2628) had noticeably light, radiolucent bones with thin cortices and were thus classified as osteoporotic.

Osteoporosis weakens the bones and hence predisposes to fractures. Of the 9 individuals showing osteoporosis, 4 show one or more healed fractures. For many of these fractures it is

impossible to determine whether osteoporosis was a predisposing factor or whether the individual sustained the fracture before he or she suffered from osteoporosis. A rib fracture in 1965 and the fracture of the sternal body in 2548 are united by cancellous bone and would appear to have been sustained not long before death and so could have been precipitated by osteoporosis. Compression fractures of the vertebral bodies are common in sufferers from osteoporosis (Kelsey 1987; Mensforth & Latimer 1989), hence it may be that those sustained by 1965 and 2537 were precipitated by osteoporosis.

Brief mention should be made here of a condition in which there is bilateral thinning of the parietal bones. This condition generally occurs in the elderly and may be associated with senile osteoporosis (Lodge 1967). Two individuals show biparietal thinning: 0962 (female aged 50+) and 1738 (female aged 50+), the latter also shows osteoporosis.

In modern, Western groups osteoporosis is primarily a disease affecting middle aged and elderly women, and consistent with this all but 2 of the 9 skeletons classified as osteoporotic were middle aged or elderly females, the exceptions being 1932, a probable female aged 25-35, and 2548, a probable male aged 25-35. It has been shown (Donaldson et al. 1970) that prolonged immobility may result in significant loss of bone mineral; thus if an individual was bedridden for an extended period prior to death one might expect an osteoporotic skeleton - perhaps this might have been a causative factor in these two cases.

In the 10th-11th century School Street assemblage no cases of osteoporosis were identified among the 79 adults. The difference between this and the 13th-16th century material is probably associated with the greater adult age at death in the latter, but it also suggests that in no case was an Anglo-Saxon adult bedridden for a sufficient period immediately prior to death for osteoporotic changes to occur in the skeleton.

(g) Neoplasms

Five individuals show evidence for neoplasms; 4 of these (1068 (male aged 35-45), 1982 (female aged 25-35), 2556 (female aged about 25) and 2628 (female aged 50+)) show button osteomata on the outer table of the skull. A button osteoma is a benign bone tumour; it presents in dry bones as a small, smooth, approximately circular projection, most frequently on the outer table of the frontal or parietal bones, or in the sinuses (Steinbock 1976: 328f; Ortner & Putschar 1985: 368f). In all the present cases the osteoma is solitary, all are located on the outer tables of frontal or parietal bones, and sizes range from 6-12mm diameter.

Burial 0954 (male aged 25-35) displays a 10x9mm area of bone raised 2mm proud of the normal bone surface on the right maxilla between the infra-orbital foramen and the pyriform aperture. The surface of this lesion has partly broken away post-mortem, revealing a cavity with spicular bone within it. This lesion is probably indicative of a neoplasm.

(h) Miscellaneous disease

Burial 0950 (male aged 60+). The left humerus, right femur, distal half of the left femur, right tibia, proximal half of the left tibia, right talus and calcaneus, the 4th lumbar vertebra, sacrum and pelvic bones are irregularly swollen and deformed. The right femoral head is rather flattened and there is some lateral bowing of the shaft; the left tibia shows anterior bowing, the right is too fragmentary to assess. X-ray reveals sharp demarcation between the normal and pathological bone in the left femur and tibia, and all affected bones show patchy rarification and increased cortical thickness (Plates 36 & 37). These lesions are typical of Paget's disease.

Paget's disease is a distortion of the normal bone remodelling mechanism in which there is initially excessive bone resorbtion, followed by excessive, disorganised new bone deposition. The architecture of the new bone is abnormal. The aetiology of the disorder is unclear, although it may be a slow viral infection (Hamdy 1981). It is a disease of the middle aged and elderly - it seldom appears before the age of 40 (ibid.).

Although Pagetic bones are thicker than normal, they are also weaker and pathological fractures are a frequent complication of the disease. In 0950 3 pathological (and no normal) bones show fractures. There is a compression fracture of the 4th lumbar vertebral body, a united oblique fracture of the left humerus, just above the olecranon fossa, and the right femur shows an un-united transverse sub-trochanteric fracture (Plate 38). The surfaces of the femoral fracture show varying degrees of remodelling, in some places the bone is smooth, in others trabeculae, although remodelled, are clearly visible. Comparison with modern specimens (Barber 1929) suggests that this fracture occurred a few weeks prior to death (although the possibility that fractures in Pagetic bones heal at a different rate to those in normal bone should not be forgotten - Dove 1980).

Osteoarthritis is also a common complication of Paget's disease, probably because the deformed bones result in un-natural stresses upon the joints (Hamdy 1981). Burial 0950 shows severe and widespread osteoarthritis, especially at the vertebral facet joints and shoulders (Plate 39).

It is worth noting here that the distal end of the shaft of the left femur of 2591 (male aged 35-45) is somewhat swollen with a slightly roughened surface and the cortex here is replaced by cancellous bone exhibiting a sparse trabecular structure; the demarcation between normal and pathological bone is sharp and distinct. In addition X-ray suggests that there is coarsening of the trabeculae on the the left ilium in the area of the sacro-iliac articulation. The appearance of these lesions is very similar to those in 0950 although the radiological changes are insufficient to sustain a diagnosis of Paget's disease (Guyer pers comm).

Pagetic bone mineral is histologically abnormal (Hamdy 1981: 35-36), hence, with a view to aiding diagnosis, attempts were made to prepare histological sections from the abnormal bone of burials 0950 and 2591. However, despite considerable efforts it proved impossible to produce adequate sections from these specimens.

Burial 1455 (male aged about 18). There is a marked lateral asymmetry in the mid-thoracic vertebrae, the height being reduced on the left sides of their centra, the left facet joints are reduced in size and the left transverse processes are more slender than their counterparts on the right side. The facet joints on the cervical vertebrae show a similar asymmetry but the bodies are normal. The lumbar vertebrae are slightly damaged post-mortem but show no great asymmetry. These changes result in 90-100 degree scoliosis of the thoracic spine (Plate 40); there is no scoliosis in the cervical or lumbar spines. At the apex of the curve the 5th and 6th thoracic vertebrae are fused at their left facet joints (Plate 41). The ribs show asymmetrical development in response to the scoliosis, with those on the convex side of the curve (the right ribs) showing increased curvature; those on the concave side are slender and show reduced curvature. The facet joints of those vertebrae near the apex of the curve show grade 2 osteoarthritis, a testimony to the additional stresses imposed upon them by the spinal deformity.

The frontal bone of burial 1477 (unsexed adult) is thickened and has a knobbly, irregular internal surface. This type of internal frontal hyperostosis is most frequent in older females where it is thought to be associated with elevated androgen levels (refs in Armelagos & Chrisman 1988). According to Revel (1986: 174) it is almost never seen in males. Burial 1477 is very poorly preserved and incomplete and not even a tentative determination of sex could be made.

6. Summary

Two hundred and fifty burials from within the Ipswich Blackfriars complex were examined; they date from the period 1263-1538 and represent interments of layfolk and friars.

Bone preservation is variable and some bones exhibit staining which may be associated with fungal activity during burial. Many of the graves were cut by other features, principally later graves; this, together with destruction of bones by physical and chemical factors in the soil, is a major factor affecting the completeness of the skeletons from the site. Despite the above the Blackfriars site skeletons are generally more complete than those excavated from the 10th-11th century cemetery also located on the School Street site.

A study of the representation of the different skeletal elements was carried out in order to investigate the effects of recovery and preservation factors on different parts of the skeleton. As might be expected the denser, larger bones were least vulnerable to destruction by soil erosion. Representation of the small bones of the extremities was affected both by preservation and recovery factors.

In common with burials from other friary sites there is under-representation of juveniles, and males outnumber females. This last was true for all areas of the friary yielding sexable skeletons and it would seem logical to argue that this is due to the burials of friars increasing the numbers of males. Females were found in all locations save the chapter house and the south

range of the cloister (although only a few burials from these locations were studied), indicating that layfolk were interred in all locations, except possibly these. There was no spatial patterning in the interments of males and females in any location. The above data suggest that burials of friars were not in general segregated from those of lay benefactors, except, perhaps in the chapter house and the south range of the cloister. There are only 5 infants in the assemblage and all were buried in the choir. The age at death of adults was rather greater than that in the assemblage from the 10th-11th century cemetery at the School Street site.

An association was found between arm position in the burials and gender; this was largely due to those interments buried with their arms placed across the chest area being predominantly males - indeed no certain females were interred in this posture.

Taken in conjunction with other sites in the region, the craniometric data suggest that brachycephaly was the norm in the Mediaeval period in East Anglia in contrast to the predominance of dolichocephaly in the Saxon period. This pattern has also been found for York and it has been suggested that it may be general. The reasons for this change in cranial form around the time of the Norman conquest are obscure, but it should be noted that secular changes in cranial form do not necessarily imply the arrival of immigrants (Kouchi 1986).

Stature is similar to that for other Mediaeval groups and to modern British figures. It is also similar to that for the 10th-11th century School Street people, although post-cranial measurements confirmed the impression that the 13th-16th century Blackfriars people were of rather more robust build than their 10th-11th century forebears. A study of directional asymmetry in the appendicular skeleton was also carried out. This showed that for the arm bone dimensions studied, mean measurements for right arm bones were significantly greater than those for the left side, whereas for the leg bone measurements, with the exception of the femoral head diameter, there was no significant difference. The directional asymmetry observed in the arm bones is probably associated with handedness, assuming a preponderance of right-handers in the assemblage. Why directional asymmetry was observed in femoral head diameter, but no other leg bone measurements is difficult to explain.

The non-metric traits show no evidence for burial together of genetically related individuals in "family groups" (in contrast with the 10th-11th century School Street cemetery in which such "family groups" were tentatively identified). The number of non-metric variants having a different frequency in males and females is greater than expected by chance; it was felt that the most probable explanation for this was that it reflects a difference in genetic composition of the male and female parts of the assemblage, connected with the probability that the latter is drawn from the population of local layfolk, whereas the former are a mixture of layfolk and friars.

The pathologies evident upon the skeleton at time of death are, to a great extent a cumulative record of insults suffered during life. Furthermore in most cases it is only the more chronic conditions which manifest themselves upon the bones, and many bone diseases are diseases of old age. Although the age

correlation is greater for some conditions than for others, these factors mean that the prevalence of most bony pathologies will tend to be greater in assemblages with a greater adult age at death. The Blackfriars adults show a greater number and variety of pathological conditions than do the Anglo-Saxon School Street skeletons; although by no means the full explanation, the greater age at death of the former is an important factor here.

The prevalence of dental pathologies is similar to those for other Mediaeval assemblages and comparison with the 10th-11th century assemblage offers no evidence for dietary differences between the 2 groups.

The greater frequency of osteoarthritis and vertebral osteophytosis in the Blackfriars assemblage is, at least in part, a function of their greater age at death; the distribution of lesions in the skeleton is similar to that in the Anglo-Saxon burials which, taking into account the aetiology of the conditions, could be interpreted as suggesting a similar pattern of stress to the joints, providing no evidence for any marked differences in activity patterns between the 2 groups.

The evidence for juvenile health status suggests a fairly healthy childhood for those chosen for burial at the friary, with any episodes of disease or poor nutrition mainly being of a fairly trivial and transient nature.

A notable finding is the high level of diffuse idiopathic skeletal hyperostosis (DISH). When the effect of age at death is controlled for, the frequency of the condition is markedly higher than in contemporary populations and in the Anglo-Saxon School Street assemblage (where there is no evidence for it at all). In modern populations increased frequencies of DISH have been associated with obesity. Although one would not wish to overstretch the evidence, perhaps the high frequency of DISH in the Ipswich Blackfriars assemblage suggests obesity may have been a problem among the friars and wealthy benefactors buried at the friary.

Documentary evidence suggests that chronic non-specific infections of the lower legs were common in Post-Mediaeval times, particularly among the lower social classes, and it may be that their chronic nature was due to deficiency of ascorbic acid caused by lack of fresh fruit and vegetables in the diet. At Ipswich the evidence is that infection of the lower legs was fairly common but that the infections were not long-lasting, implying a sufficiently well-balanced diet to enable speedy recovery.

It seems probable that the Blackfriars burials are from the wealthier strata of the population; the above three observations might be viewed as suggesting that this group were also privileged in terms of diet and general health.

Six probable cases of erosive arthropathies are described, including possible cases of gout and rheumatoid arthritis. This last is of interest because few archaeological specimens show changes consistent with this disease and some writers assert that it is an entirely modern disorder.

Several individuals showed evidence for hallux valgus, caused by footwear which constricts the toes. This finding is consistent with Mediaeval artistic depictions of individuals wearing pointed shoes, and with archaeological finds of footwear

which must have constricted the toes. Most of the individuals showing hallux valgus were males, suggesting that in this group it was mainly men who wore constricting footwear. Hallux valgus was not found in the 10th-11th century material suggesting that, unlike their 13th-16th century counterparts they did not habitually wear shoes which constricted the toes.

The greater skeletal completeness and greater age at death are undoubtedly responsible, at least in part, for the greater frequency of fractures in the Blackfriars burials than in their 10th-11th century predecessors. Three individuals show evidence for cranial injuries from edged weapons and in one case the injuries were very probably cause of death (the only case out of the 250 individuals in which cause of death can be inferred). Three other individuals show injuries which are probably a result of inter-personal violence (including one unusual case in which the tip of an iron projectile, weapon or implement is embedded in the skull), and in addition there was one individual with an amputated hand, a mutilation which may have resulted from inter-personal violence rather than surgical intervention. All individuals showing weapon injuries are males (as is generally the case), as are all those showing injuries probably due to inter-personal violence, with the exception of one female showing a midshaft ulna fracture; although such injuries are frequently a result of the raising of the forearm to parry a blow it is also possible that its cause was accident rather than violence. A notable difference between the present group and the Anglo-Saxon School Street burials is the absence of any weapon injuries among the latter - they only showed one fracture which was more probably a result of violence rather than accident, an ulna "parry fracture". Documentary evidence indicates a high frequency of deaths through violence among sections of the Mediaeval peerage and it also suggests a great deal of lawlessness in Suffolk at times during the period at which the friary was in existence. This is not reflected in the Ipswich skeletal data - there is only one instance of violent death evident from the remains and, despite the above, most fractures are of a type more often associated with accident than violence.

Although there are a few cases of non-union, most fractures seemed to have healed firmly with little shortening or deformity, although this does not necessarily imply treatment via splinting etc.

That leprosy was present in Ipswich in Saxon times is demonstrated by the recovery of a leprous skeleton from the Anglo-Saxon School Street cemetery. Four leprous individuals were identified in the Blackfriars assemblage. During the Mediaeval period considerable efforts were made to segregate sufferers from this disease by their isolation in leper hospitals, in whose cemeteries they were normally buried. All 4 cases showed changes to the facial bones indicating that the characteristic facial stigmata of the disease would have been evident in life. One individual is female indicating that at least one of the four was a lay benefactor rather than a friar. It may be that these sufferers were cared for by their families - particularly as it seems probable that that the Blackfriars burials are from the wealthier strata of the population; the wealthy would have been in a better position to care for

afflicted relatives and prevent them being isolated in leprosaria against their will. Alternatively relatives of leper hospital inmates may have ensured the return of their bodies to the friary for burial. In this light the existence of skeletal evidence for a familial relationship between a leprous and a non-leprous skeleton is of interest.

A case of syphilis is tentatively identified. Since it has frequently been asserted that this disease was brought back from the New World by Columbus and his crew it was thought to be of interest to determine the date of this skeleton using a high-precision radiocarbon method. This indicated that there is about an 84% chance that the specimen pre-dates Columbus' return to Europe in 1493, casting doubt on the Columbian hypothesis for the origin of syphilis.

Unlike the 10th-11th century material there was evidence for osteoporosis in some of the Blackfriars skeletons. This is consistent with the greater age at death of the adults in the Mediaeval assemblage - most cases identified here are middle aged or elderly females. It was also identified in 2 adults who seemed to be aged under 35. A possible explanation for this finding is that these individuals were bed-ridden for a prolonged period prior to death - prolonged inactivity is a cause of bone mineral loss.

Possible cases of tuberculosis and Paget's disease are also present.

7. References

Anderson, S.M. (1990). The Human Remains From Staunch Meadow, Brandon, Suffolk. AM Lab Report 99/90.

Anderson, S.M. (1991). The Human Skeletal Remains From Caister on Sea, Norfolk. AM Lab Report 9/91.

Anderson, S.M. & Birkett, D.B. (1989). The Human Skeletal Remains From Burgh Castle, Norfolk, 1960. AM Lab Report 27/89.

Armelagos, G.J. & Chrisman, O.D. (1988). Hyperostosis Frontalis Interna: A Nubian Case. American Journal of Physical Anthropology 76: 25-28.

Baker, B.J. & Armelagos, G.J. (1988). The Origin and Antiquity of Syphilis. Current Anthropology 29: 703-737.

Barber, C.G. (1929). Immediate and Eventual Features of Healing in Amputated Bones. Annals of Surgery 90: 985-992.

Barber, C.G. (1930). The Detailed Changes Characteristic of Healing Bone in Amputation Stumps. Journal of Bone & Joint Surgery 12: 353-359.

Barnett, C.H. (1962). The Normal Orientation of the Human Hallux and the Effect of Footwear. Journal of Anatomy 96: 489-494.

Bayley, J. (1975). Chelmsford Dominican Priory Human Bone Report. AM Lab Report 1890.

Bedbrook, G. (1982). Injuries to the Hip. In (Wilson, J.N., ed) Watson-Jones Fractures & Joint Injuries (6th edition). Churchill-Livingstone, London. pp. 878-973.

Benjamin, A. (1982). Injuries of the Forearm. In (Wilson, J.N., ed) Watson-Jones Fractures and Joint Injuries. Churchill-Livingstone, London. pp. 650-709.

Berry, A.C. (1975). Factors Affecting the Incidence of Non-

metric Skeletal Variants. Journal of Anatomy 120: 519-535.
Berry, A.C. & Berry, R.J. (1967). Epigenetic Variation in the Human Cranium. Journal of Anatomy 101: 361-379.
Birkett, D. A. (1986). The Human Burials. In (Daniels, R.) The Excavation of the Church of the Franciscans, Hartlepool, Cleveland. Archaeological Journal 143: 291-299.
Blatchly, J. & Wade, K. (1980). Excavations at Ipswich Blackfriars. Proceedings of the Suffolk Archaeological and Historical Society 34: 25-34.
Brigode, M., Francois, R.J. & Dory, M.A. (1982). Radiological Study of the Sacroiliac Joints in Vertebral Ankylosing Hyperostosis. Annals of the Rheumatic Diseases 41: 225-231.
Brook, A.H. (1984). A Unifying Aetiological Explanation for Anomalies of Human Tooth Number and Size. Archives of Oral Biology 29: 373-378.
Brothwell, D.R. (1959). Teeth in earlier Human Populations. Proceedings of the Nutrition Society 18: 59-65.
Brothwell, D.R. (1961). The Palaeopathology of Early British Man: An Essay on the Problems of Diagnosis and Analysis. Journal of the Royal Anthropological Institute 91: 318-344.
Brothwell, D.R. (1963). Digging Up Bones (1st edition). Oxford University Press (British Museum Natural History), Oxford.
Brothwell, D.R. (1970). The Real History of Syphilis. Science Journal 6 (9): 27-33.
Brothwell, D.R. (1972). Digging Up Bones (2nd edition). Oxford University Press (British Museum Natural History), Oxford.
Brothwell, D.R. (1981). Digging Up Bones (3rd edition). Oxford University Press (British Museum Natural History), Oxford.
Brothwell, D.R. (1987). The Problem of the Interpretation of Child Mortality In Earlier Populations. Antropologia Portuguesa 5: 135-143.
Buikstra, J.E. & Mielke, J.H. (1985). Demography, Diet and Health. In (Gilbert, R.I. & Mielke, J.H., eds) The Analysis of Prehistoric Diets. Academic Press, London. pp. 359-422.
Cayton, H. (1980). Some Contributions From Written Sources. In (Wade-Martins, P.) Excavations in North Elmham Park 1967-1972. East Anglian Archaeology Report No. 9. pp. 302-313.
Chhabriya, B.D., Sharma, N.C., Bansal, N.K. & Agrawal, G.R. (1985). Bone Changes in Leprosy: A Study of 50 Cases. Indian Journal of Leprosy 57: 632-641.
Clay, R.M. (1909). The Mediaeval Hospitals of England. Methuen, London.
Costa R.L. (1982). Periodontal Disease at the Prehistoric Ipiutak and Tigara Skeletal Remains From Point Hope, Alaska. American Journal of Physical Anthropology 59: 97-110.
Dawes, J.D. (1980). The Human Bones. In (Dawes, J.D. & Magilton, J.R.) The Cemetery of St Helen-on-the-Walls, Aldwark. The Archaeology of York: The Mediaeval Cemeteries Vol 12/1. York Archaeological Trust. pp. 19-120.
Dawes, J.D. (1987). The Human Bones. In (Armstrong, P. & Tomlinson, D., eds) Excavations at the Dominican Priory, Beverley 1960-83. Humberside County Council, Hull. pp. 26-29.

Dieppe, P. (1989). The History of Rheumatoid Arthritis. In (Maddison, P.J., ed) The Antiquity of the Erosive Arthropathies. The Arthritis and Rheumatism Council for Research Conference Proceedings No. 5. pp. 35-38.

Dobney, K. & Brothwell, D. (1987). A Method For Evaluating the Amount of Dental Calculus on Teeth From Archaeological Sites. Journal of Archaeological Science 14: 343-351.

Donaldson, C.L., Hulley, S.B., Vogel, J.M., Hatter, R.S., Buyers, J.H. & McMillar, D.E. (1970). Effect of Prolonged Bed Rest on Bone Mineral. Metabolism, Clinical & Experimental 19: 1071-1084.

Dove, J. (1980). Complete Fractures of the Femur in Paget's Disease of Bone. Journal of Bone & Joint Surgery 62B: 12-17.

van Dusen, C.R. (1939). An Anthropological Study of the Upper Extremeties of Children. Human Biology 11: 277-284.

Eisenstein, S. (1978). Spondylolysis: A Skeletal Investigation of Two Population Groups. Journal of Bone & Joint Surgery 60B: 488-494.

Falk, D., Pyne, L., Helmkamp, R.C. & De Rousseau, C.J. (1988). Directional Asymmetry in the Forelimb of Macaca mulatta. American Journal of Physical Anthropology 77: 1-6.

Finnegan, M. (1978). Non-metric Variation in the Infra-cranial Skeleton. Journal of Anatomy 125: 23-37

Gilyard-Beer, R. (1980). Ipswich Blackfriars. Proceedings of the Suffolk Archaeological & Historical Society 34: 15-23.

Golding, B. (1986). Burials and Benefactors: An Aspect of Monastic Patronage in Thirteenth Century England. In (Ormrod, W.M., ed) England in the Thirteenth Century. Proceedings of the Harlaxton Conference. Boydell, Dover. pp. 64-75.

Gondos, M. (1972). The Pointed Tubular Bone: Its Significance and Pathogenesis. Radiology 105: 541-545.

Goodman, A.H. & Armelagos, G.J. (1988). Childhood Stress and Decreased Longevity in a Prehistoric Population. American Anthropologist 90: 936-944.

Goodman, A.H., Armelagos, G.J. & Rose, J.C. (1980). Enamel Hypoplasias as Indicators of Stress in Three Prehistoric Populations From Illinois. Human Biology 52: 515-528.

Gordon, C.G. & Buikstra, J.E. (1981). Soil pH, Bone Preservation and Sampling Bias at Mortuary Sites. American Antiquity 46: 566-571.

Graber, L.W. (1978). Congenital Absence of Teeth: a Review With Emphasis on Inheritance Patterns. Journal of the American Dental Association 96: 266-275.

Grahnen, H. (1956). Hypodontia in the Permanent Dentition: A Clinical and Genetical Investigation. Odontologisk Revy 7 Supplement 3.

Griffiths, I.D. (1986). Osteonecrosis. In (Scott, J., ed) Copeman's Textbook of the Rheumatic Diseases (6th edition). Churchill-Livingstone, London. pp. 1207-1228.

Griffiths, R. (1978). The Human Skeletal Remains. In (Williams, J.H.) Excavations at Greyfriars, Northampton, 1972. Northampton Archaeology 13: 155-157.

Hackett, C.J. (1983). Problems in the Palaeopathology of the Human Treponematoses. In (Hart, G.D., ed) Disease in Ancient Man. Clarke Irwin, Toronto. pp. 106-128.

Hamdy, R.C. (1981). Paget's Disease of Bone. Armour Pharmaceuticals, Eastbourne

Harman, M. (1985). The Human Remains. In (Lambrick, G.) Further Excavations at the Second Site of the Dominican Priory, Oxford. Oxoniensa 50: 188-190.

Henderson, J. (1984a). The Human Remains. In (Poulton, R. & Woods, H.) Excavations on the Site of the Dominican Friary at Guildford in 1974 and 1978. Research Volume of the Surrey Archaeological Society Vol. 9. pp. 58-71.

Henderson, J. (1984b). The Human Bones From Blackfriars Street, Carlisle. AM Lab Report 4350.

Hengen, O.P. (1971). Cribra Orbitalia: Pathogenesis and Probable Aetiology. HOMO 22: 57-76.

Hinnebusch, W.A. (1951). The Early English Friars Preachers. Institutum Historicum, Rome.

Hollingsworth, T.H. (1975). A Note on the Mediaeval Longevity of the Secular Peerage 1350-1500. Population Studies 29: 155-159.

Howells, W.W. (1973). Cranial Variation in Man: A Study by Multivariate Analysis of Patterns of Difference Among Recent Human Populations. Papers of the Peabody Museum of Archaeology & Ethnography No 67.

Jacobs, P. (1976). Osteochondrosis (osteochondritis). In (Davidson, J.K., ed) Aseptic Necrosis of Bone. Excerpta Medica, Oxford. pp. 301-332.

Jensen, P.S. & Steinbach, H.L. (1977). Roentgen Features of the Rheumatic Diseases. The Medical Clinics of North America 61: 389-404.

Julkunen, H., Heinonen, O.P. & Pyörälä, K. (1971). Hyperostosis of the Spine in an Adult Population. Annals of the Rheumatic Diseases 30: 605-612.

Kellgren, J.H. (1961). Osteoarthrosis in Patients and Populations. British Medical Journal 2: 1-6.

Kellgren, J.H. & Lawrence, J.S. (1958). Osteo-Arthrosis and Disc Degeneration in an Urban Population. Annals of the Rheumatic Diseases 17: 388-397.

Kelsey, J.L. (1987). Epidemiology of Osteoporosis & Associated Fractures. Bone & Mineral Research 5: 409-444.

King, A.J. & Catterall, R.D. (1959). Syphilis of Bones. British Journal of the Venereal Diseases 35: 116-127.

Kouchi, M. (1986). Geographic Variations in Modern Japanese Somatometric Data: A Secular Change Hypothesis. In (Akazawa, T. & Aikens, C.M., eds) Prehistoric Hunter-Gatherers in Japan. New Research Methods. The University Museum, University of Tokyo Bulletin No 27.

Lechat, M.F. (1962). Bone Lesions in Leprosy. International Journal of Leprosy 30: 125-137.

Loader, T. (n.d.) The Burials at Ipswich Blackfriars. Unpublished Manuscript.

Lodge, T. (1967). Thinning of the Parietal Bones in Early Egyptian Populations and its Aetiology in the Light of Modern Observations. In (Brothwell, D.R. & Sandison, A.T., eds) Diseases in Antiquity. Charles C. Thomas, Springfield. pp. 405-412.

Loudon, I.S.L. (1981). Leg Ulcers in the 18th and Early 19th Centuries. Journal of the Royal College of General Practitioners 31: 263-273.

Lovejoy, C.O. & Heiple, K.G. (1981). The Analysis of Fractures in Skeletal Populations With an Example From the Libben Site, Ottawa County, Ohio. American Journal of Physical Anthropology 55: 529-541.

Lovejoy, C.O., Burstein, A.H. & Heiple, K.G. (1976). The Biomechanical Analysis of Bone Stength: A Method and its Application to Platycnemia. American Journal of Physical Anthropology 44: 489-506.

McCarty, D.J. (1989). Clinical Picture of Rheumatoid Arthritis. In (McCarty, D.J., ed) Arthritis & Allied Conditions: A Textbook of Rheumatology (11th edition). Lea & Febiger, Philadelphia. pp. 715-742.

Manchester, K. (1980). Hydrocephalus in an Anglo-Saxon Child From Eccles. Archaeologia Cantiana 96: 77-82.

Manchester, K. (1983). The Archaeology of Disease. University of Bradford Press, Bradford.

Manchester, K. & Roberts, C. (1989). The Palaeopathology of Leprosy in Britain: A Review. World Archaeology 21: 265-272.

Maresh, M.M. (1955). Linear Growth of Long Bones of Extremeties From Infancy Through Adolescence. American Journal of the Diseases of Children 89: 725-742.

Martel, W. (1968). The Overhanging Margin of Bone: A Roentgenological Manifestation of Gout. Radiology 91: 755-756.

Martin, W.J., Underdahl, L.O., Mathieson, D.R. & Pugh, D.G. (1955). Alkaptonuria, A Report of 12 Cases. Annals of Internal Medicine 42: 1052-1064.

Mays, S.A. (1985). The Relationship Between Harris Line Formation & Bone Growth & Development. Journal of Archaeological Science 12: 207-220.

Mays, S.A. (1987). Social Organisation & Social Change in the Early & Middle Bronze Age of Central Europe. A Study Using Human Skeletal Remains. PhD Thesis, University of Southampton.

Mays, S.A. (1989). The Anglo-Saxon Human Bone From School Street, Ipswich, Suffolk. AM Lab Report 115/89.

Mays, S.A. (1991). The Burials From the Whitefriars Friary Site, Buttermarket, Ipswich, Suffolk (Excavated 1986-88). AM Lab Report 17/91.

Meindl, R.S., Lovejoy, C.O., Mensforth, R.P. & Don Carlos, L. (1985). Accuracy & Direction of Error in the Sexing of the Skeleton: Implications for Palaeodemography. American Journal of Physical Anthropology 68: 79-85.

Mensforth, R.P., Lovejoy, C.O., Lallo, J.W. & Armelagos, G.J. (1978). The Role of Constitutional Factors, Diet & Infectious Disease in the Aetiology of Porotic Hyperostosis & Periosteal Reactions in Prehistoric Infants & Children. Medical Anthropology 2(1): 1-59.

Mensforth, R.P. & Latimer, B.M. (1989). Hamann-Todd Collection Ageing Studies: Osteoporosis Fracture Syndrome. American Journal of Physical Anthropology 80: 461-479.

Miles, A.E.W. (1963). The Dentition in the Assessment of Individual Age in Skeletal Material. In (Brothwell, D.R., ed) Dental Anthropology. Pergamon, London. pp. 191-209.

Møller-Christensen, V. (1961). Bone Changes in Leprosy. John Wright, Bristol.

Møller-Christensen, V. (1974). Changes in the Anterior Nasal Spine & the Alveolar Process of the Maxillae in Leprosy. A Clinical Examination. International Journal of Leprosy 42: 431-435.
Moore, W.J. & Corbett, M.E. (1978). Dental Caries Experience in Man. In (Rowe, N.H., ed) Diet, Nutrition & Dental Caries. University of Michigan School of Dentistry & the Dental Research Institute, Michigan. pp. 3-19.
Moore, W.J. & Corbett, M.E. (1983). Dental & Alveolar Infection. In (Hart, G.D., ed) Diseases in Ancient Man. Clarke-Irwin, Toronto. pp. 139-155.
Mörmann, S.E. & Mühlemann, H.R. (1981). Oral Starch Degradation & its Influence on Acid Production in Human Dental Plaque. Caries Research 15: 166-175.
O'Brien, W.M., La Du, B.N. & Bunim, J.J. (1963). Biochemical, Pathologic & Clinical Aspects of Alkaptonuria, Ochronosis & Ochronotic Arthropathy. American Journal of Medicine 34: 813-838.
O'Connor, T.P. (1984). A Report on the Human Remains From Rivenhall Church, Essex. AM Lab Report 4357.
Ortner, D.J. & Putschar, W.G.J. (1985). Identification of Pathological Conditions in Human Skeletal Remains. Reprint Edition of Smithsonian Contributions to Anthropology No. 28. Smithsonian Institute Press, Washington.
Ossenburg, N. S. (1977). Within & Between Race Distances in Population Studies Based on Discrete Traits of the Human Skull. American Journal of Physical Anthropology 45: 701-716.
Page, W. (1975). The Victoria History of the Counties of England: Suffolk. Volume 2. University of London Institute of Historical research, London.
Palmer, C.F.R. (1887). The Friar-Preachers, or Blackfriars, of Ipswich. The Reliquary 1 (ns): 24-29.
Palmer, C.F.R. (1891). Burials at the Priories of the Black Friars. The Antiquary 23: 122-126 & 24: 28-30, 76-79, 117-120, 265-269.
Patterson, D.E. (1961). Bone Changes in Leprosy. Their Incidence, Progress, Prevention & Arrest. International Journal of Leprosy 29: 393-422.
Perizonius, W.R.K. (1984). Closing & Non-Closing Sutures in 256 Crania of Known Age & Sex From Amsterdam (AD 1883-1909). Journal of Human Evolution 13: 201-206.
Pettersson, H. (1980). Bilateral Dysplasia of the Neck of the Scapula and Associated Anomalies. Acta Radiologica Diagnosis 22: 81-84.
Piepenbrink, H. (1986). Two Examples of Biogenous Dead Bone Decomposition & Their Consequences for Taphonomic Interpretation. Journal of Archaeological Science 13: 417-430.
Pindborg, J.J. (1970). The Pathology of the Dental Hard Tissues. Munksgaard, Copenhagen.
Poulton, R. & Woods, H. (1984). Excavations on the Site of the Dominican Friary at Guildford in 1974 & 1978. Research Volume of the Surrey Archaeological Society No. 9.
Radin, E.L., Paul, I.L. & Rose, R.M. (1980). Osteoarthrosis as a Final Common Pathway. In (Nuki, G., ed) The Aetiopathogenesis of Osteoarthrosis. Pitman Medical, London. pp. 84-89.

Resnick, D. (1985). Degenerative Diseases of the Vertebral Column. Radiology 156: 3-14.
Resnick, D. & Niwayama, G. (1988). Diagnosis of Bone & Joint Disorders (2nd edition). W.B. Saunders, London.
Revell, P. (1986). Pathology of Bone. Springer, Berlin.
Rogers, J., Waldron, T., Dieppe, P. & Watt, I. (1987). Arthropathies in Palaeopathology: The Basis of Classification According to Most Probable Cause. Journal of Archaeological Science 14: 179-183.
Rogers,J. (1989). Case Histories. In (Maddison, P.J., ed) The Antiquity of the Erosive Arthropathies. Arthritis & Rheumatism Council for Research Conference Proceedings No 5. pp. 45-47.
Rose, J.C., Armelagos, G.J. & Lallo, J.W. (1978). Histological Enamel Indicators of Childhood Stress in Prehistoric Skeletal Samples. American Journal of Physical Anthropology 49: 511-516.
Russell, J.C. (1937). Length of Life in England, 1250-1348. Human Biology 9: 528-541.
Sarnat, B.G. & Schour, I. (1941). Enamel Hypoplasia (Chronologic Enamel Aplasia) in Relation to Systemic Disease: Chronologic, Morphologic & Etiologic Classification. Journal of the American Dental Association 28: 1989-2000.
Schell, L.M., Johnson, F.E., Smith, D.R. & Paoline, A.M. (1985). Directional Asymmetry of Body Dimensions Among White Adolescents. American Journal of Physical Anthropology 67: 317-322.
Scheuer, J.H., Musgrave, J.H. & Evans, S.P. (1980). The Estimation of Late Foetal and Perinatal Age From Limb Bone Length by Linear and Logarithmic Regression. Annals of Human Biology 7: 257-265.
Schmorl, G. & Junghanns, H. (1971). The Human Spine in Health & Disease (2nd American edition, translated by E.F. Beseman). Grune & Stratton, New York.
Schulter-Ellis, F.P. (1980). Evidence of Handedness on Documented Skeletons. Journal of Forensic Science 25: 624-630.
Schultz, A.H. (1926). Foetal Growth of Man and Other Primates. Quartely Review of Biology 1: 465-521.
Schultz, A.H. (1967). Notes on Diseases and Healed Fractures of Wild Apes. In (Brothwell, D.R. & Sandison, A.T., eds) Diseases in Antiquity. Charles C. Thomas, Springfield. pp. 47-55.
Schumacher, H.R. (1989). Ochronosis, Haemochromatosis and Wilson's Disease. In (McCarty, D.J., ed) Arthritis & Allied Conditions. A Textbook of Rheumatology (11th edition). Lea & Febiger, Philadelphia. pp. 1798-1806.
Shafer, W.G., Hine, M.K. & Levy, B.M. (1983). A Textbook of Oral Pathology (4th edition). W.B. Saunders, Philadelphia.
Sjøvold, T. (1984). A Report on the Heritability of Some Cranial Measurements and Non-Metric Traits. In (van Vark, G.N. & Howells, W.W., eds) Multivariate Statistical Methods in Physical Anthropology. D. Riedel, Groningen. pp. 223-246.
Steane, J.M. (1985). The Archaeology of Mediaeval England and Wales. Croom Helm, London.
Steinbock, R.T. (1976). Palaeopathological Diagnosis and Interpretation. Charles C. Thomas, Springfield.

Stinson, S. (1985). Sex Differences in Environmental Sensitivity During Growth and Development. Yearbook of Physical Anthropology 28: 123-147.

Stirland, A. (1981). The HUman Bones. In (Mellor, J.E. & Pearce, T., eds) The Austin Friars, Leicester. CBA Research Report 35. CBA, London. p. 168.

Stirland, A. (1985). The Human Bones. In (Ayers, B.) Excavations Within the North-East Bailey of Norwich Castle, 1979. East Anglian Archaeology No. 28. pp. 49-57.

Stuart-Macadam, P. (1989). Porotic Hyperostosis: Relationship Between Orbital & Vault Lesions. American Journal of Physical Anthropology 80: 187-193.

Stuiver, M. & Pearson, G.W. (1986). High Precision Calibration of the Radiocarbon Time Scale AD 1950-500 BC. Radiocarbon 28: 805-838.

Suchey, J.M., Wisely, D.V. & Katz, D. (1987). Evaluation of the Todd & McKern-Stewart Methods of Ageing the Male Os pubis. In (Reichs, K.J., ed) Forensic Osteology: Advances in the Identification of Human Remains. Charles, C. Thomas, Springfield. pp. 33-67.

Suchey, J.M., Brooks, S.T. & Katz, D. (1988). Instructions For the Use of the Suchey-Brooks System for Age Determination of the Female Os Pubis. Instructions materials accompanying female pubic symphyseal models of the Suchey-Brooks System. Distributed by France Casting (Diane France), Fort Collins.

Tal, H. & Tau, S. (1984). Tooth Loss and Tooth Retention in a Multitribal Group of Bantu-Speaking South African Blacks: A Study of 500 Dry Mandibles. American Journal of Physical Anthropology 64: 75-82.

Termine, J.D. & Posner, A.S. (1966). Infra-Red Determination of the Percentage of Crystalinity in Apatitic Calcium Phosphates. Nature 211: 268-270.

Thrupp, S.L. (1962). The Merchant Class of Mediaeval London. University of Michigan Press, Lansing.

Trotter, M. & Gleser, G.C. (1952). Estimation of Stature From Long Bones of American Whites and Negroes. American Journal of Physical Anthropology 10: 463-514.

Trotter, M. & Gleser, G.C. (1958). A Re-Evaluation of Stature Based on Measurements of Stature Taken During Life and Long-Bones After Death. American Journal of Physical Anthropology 16: 79-123.

Turner, C.G. (1979). Dental Anthropological Indications of Agriculture Among the Jomon People of Central Japan. American Journal of Physical Anthropology 51: 619-636.

Ubelaker, D.H. (1978). Human Skeletal Remains. Aldine, Chicago.

Vallois, H.V. (1965). Anthropometric Techniques. Current Anthropology 6: 127-143.

de Villiers, H. (1968). The Skull of the South African Negro. A Biometrical & Morphological Study. PhD Thesis, University of the Witwatersrand. Witwatersrand University Press, Johannesburg.

Waldron, T. (1985). DISH at Merton Priory: Evidence for a "New" Occupational Disease? British Medical Journal 291: 1762-1763.

Waldron, T. (1987). The Relative Survival of the Human Skeleton: Implications for Palaeopathology. In (Boddington, A., Garland, A.N. & Janaway, R.C., eds) Death, Decay & Reconstruction. Manchester University Press, Manchester.

Waldron, T. (1988). The Human Remains From Great Chesterford, Cambridgeshire. AM Lab Report 89/88.

Wells, C. (1980). The Human Bones. In (Wade-Martins, P.) Excavations at North Elmham Park, 1967-72. East Anglian Archaeolgical Report No. 9. pp. 247-374.

West, B. (1990). The Human Bones. In (Ward, S.W., ed) Excavations at Chester. The Lesser Mediaeval Religious Houses. Sites Investigated 1964-83. Grosvenor Museum Archaeological Excavation & Survey Reports No. 6. pp. 127-137.

White, W. (1988). The Cemetery of St Nicholas Shambles. BAS, Over Wallop.

Whittaker, D.K., Molleson, T., Bennett, R.B., Ap Edwards, I., Jenkins, P.R. & Llewelyn, J.H. (1981). The Prevalence & Distribution of Dental Caries in a Romano-British Population. Archives of Oral Biology 26: 237-245.

Whittaker, D.K., Molleson, T., Daniels, A.T., Williams, J.T., Rose, P. & Resteghini, R. (1985). Quantatative Assessment of Tooth Wear, Alveolar Crest Height and Continuing Eruption in a Romano-British Population. Archives of Oral Biology 30: 493-501.

Williams, H.U. (1932). The Origin and Antiquity of Syphilis: the Evidence From Diseased Bones. Archives of Pathology 13: 778-814 & 931-983.

Wiltse, L.L. (1962). The Etiology of Spondylolisthesis. Journal of Bone & Joint Surgery 44A: 539-560.

Workshop of European Anthropologists (1980). Recommendations for Age & Sex Diagnosis of Skeletons. Journal of Human Evolution 9: 517-549.

Wynne-Davis, R. & Gormley, J. (1978). The Aetiology of Perthes' Disease. Journal of Bone & Joint Surgery 60B: 6-14.

Wynne-Davis & Scott, J.H.S. (1979). Inheritance and Spondylolisthesis: Radiographic Family Survey. Journal of Bone & Joint Surgery 61B: 301-305.

Acknowledgements

Thanks are due to Dr P.B. Guyer, Don Brothwell, Tony Waldron & Theya Molleson for offering their opinions on some of the pathologies, and to Don Brothwell, Sebastian Payne and Theya Molleson for comments on earlier drafts of this report. Thanks are also due to Dr Tony Deeming, Jon Webb and Gerry McDonnell for carrying out the spectroscopic work, to Sebastian Payne for contributing many helpful discussions, to Dr K.S. Vasudev for endeavouring to obtain histological sections from the Pagetic bones and to David D'Avray and Victoria Bainbridge for their help with some of the historical aspects.

Plates

Plate 1. The scapulae of burial 2624



Plate 2. Thoracic vertebrae of burial 1417 showing changes suggestive of diffuse idiopathic hyperostosis (DISH)



Plate 3. The tarsals and metatarsals of burial 0985 showing erosive and some proliferative lesions



Plate 4. The tibiae of burial 0985 (lateral view) showing periostitis



Plate 5. The hand bones of burial 1754 showing erosive lesions



Plate 6. Radiograph of the hand bones of burial 1754

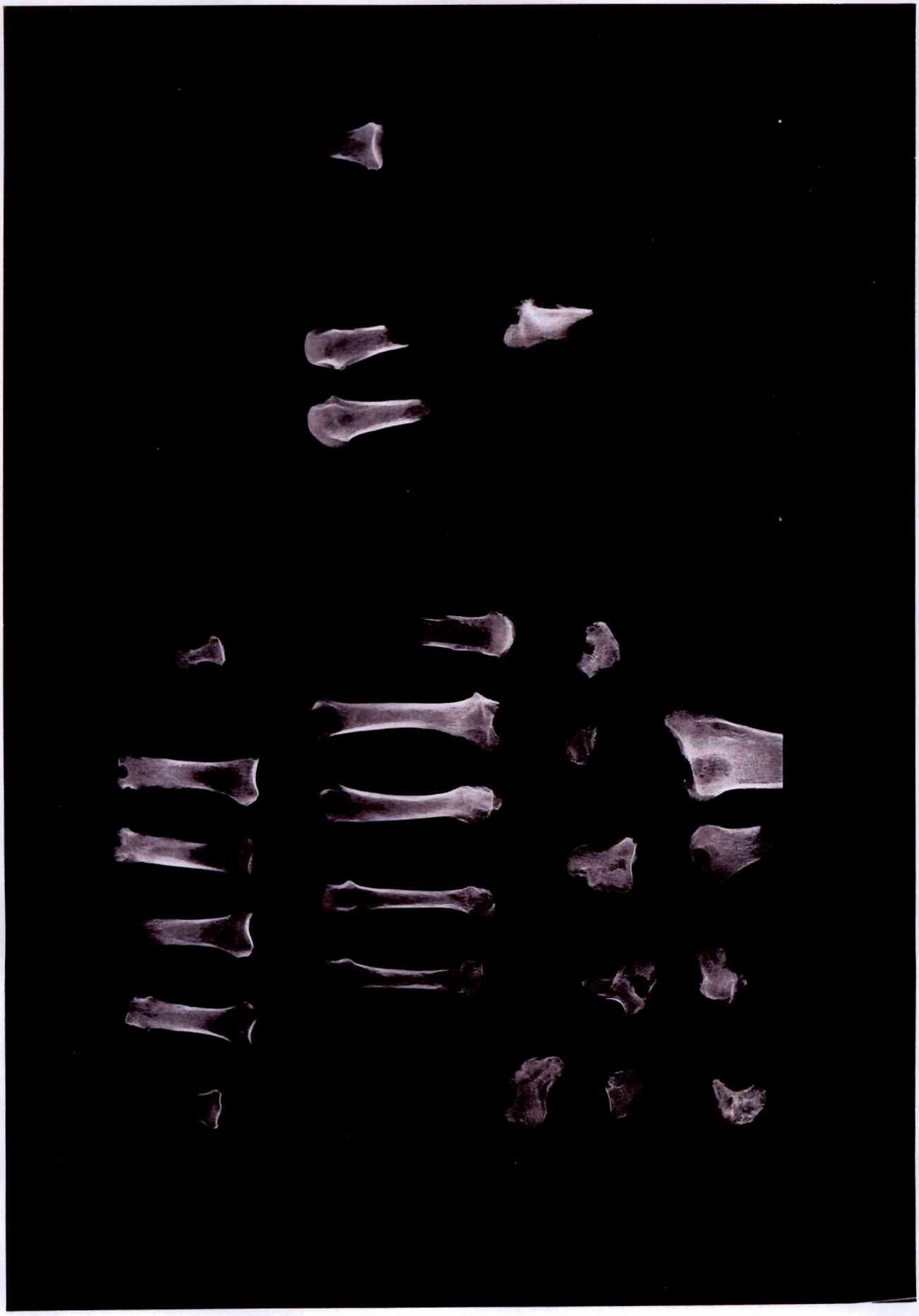


Plate 7. Details of erosive lesions in (from left to right on the photograph) ulnar facet of the distal right radius, distal left radius, left hamate, distal left ulna & left trapezoid of burial 1754

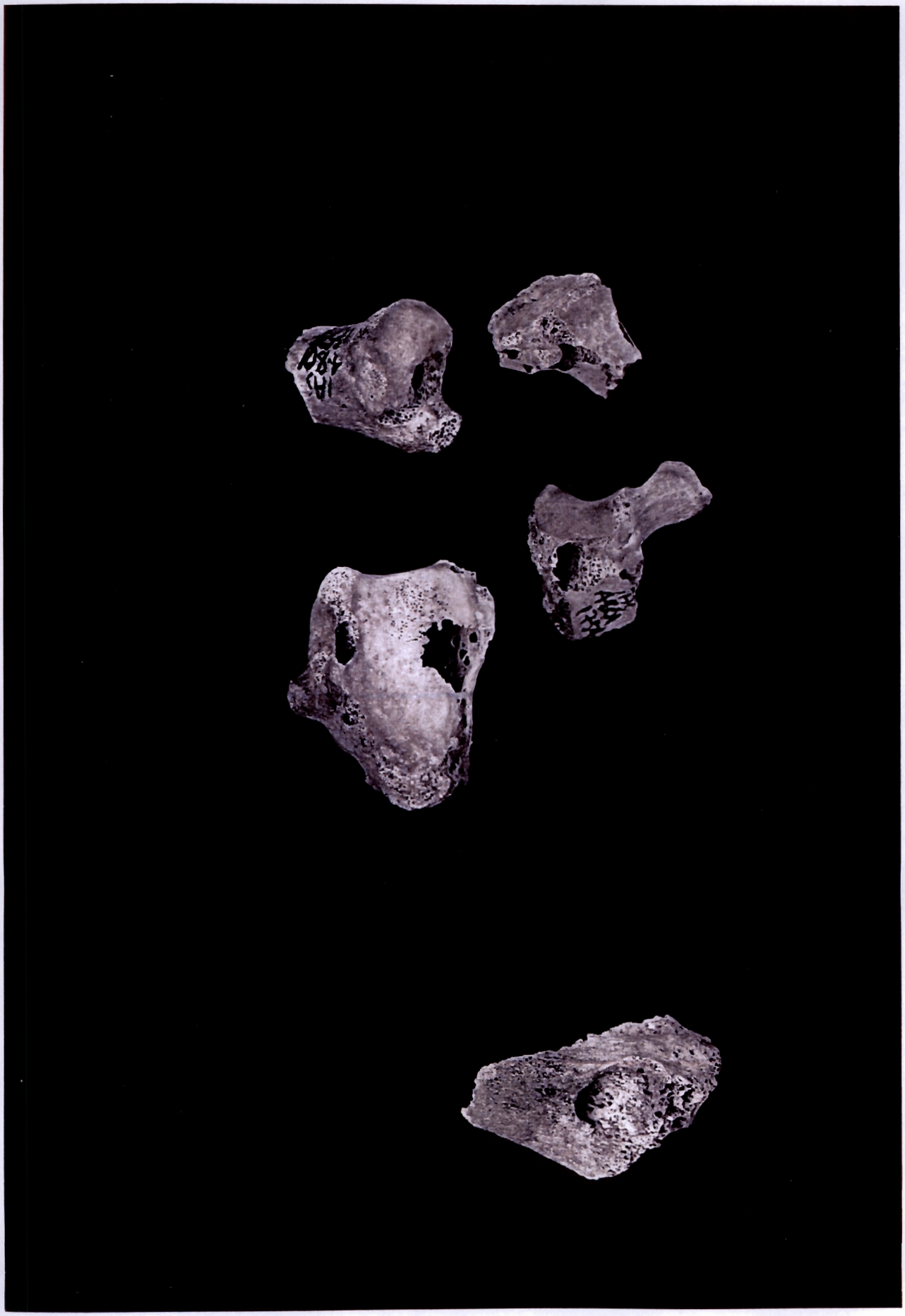


Plate 8. The ankylosed right sacro-iliac joint of burial 1827

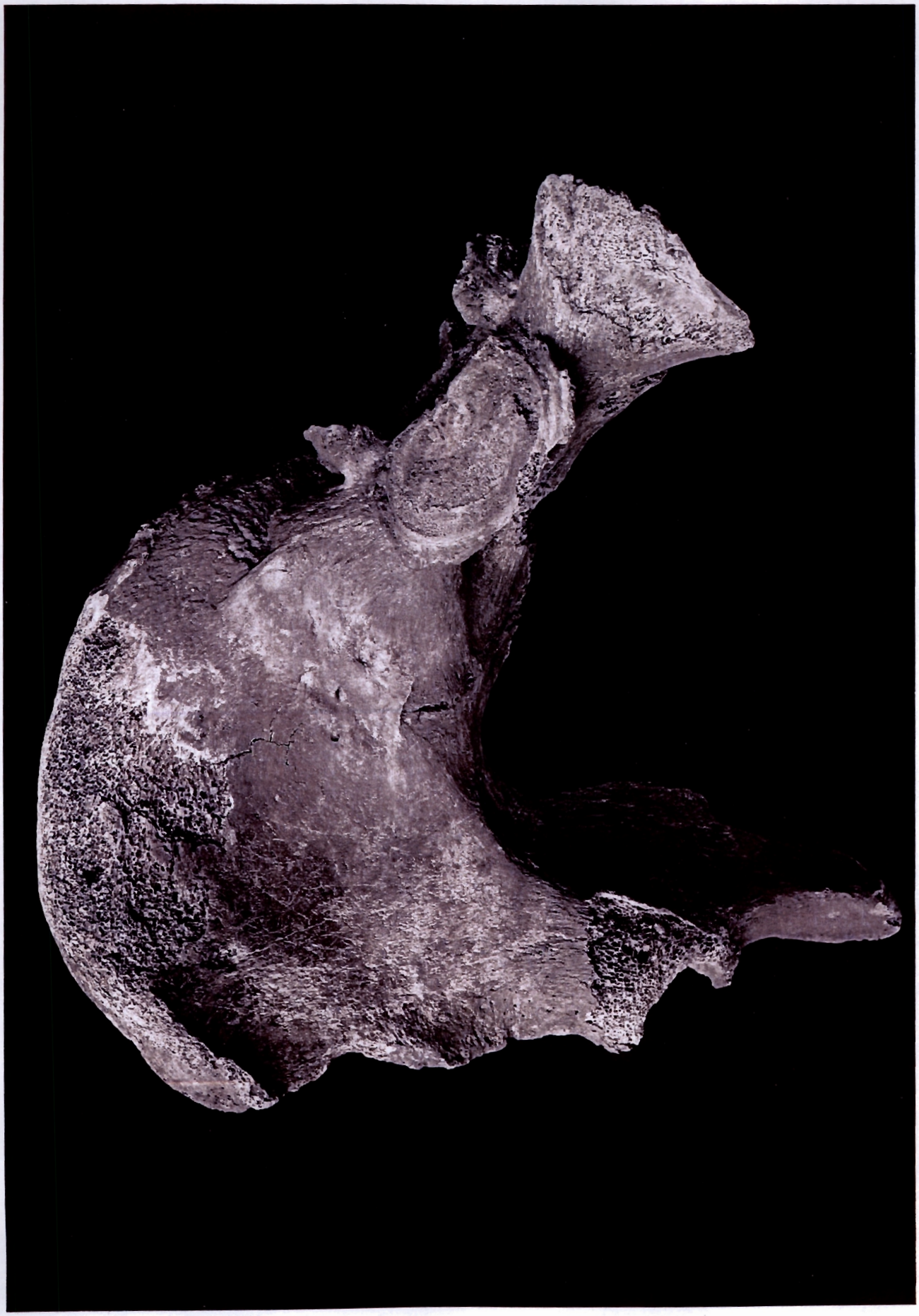


Plate 9. Two hand phalanges from burial 2466 showing erosive lesions at their distal ends



Plate 10. The foot bones from burial 2656 showing proliferative & erosive lesions

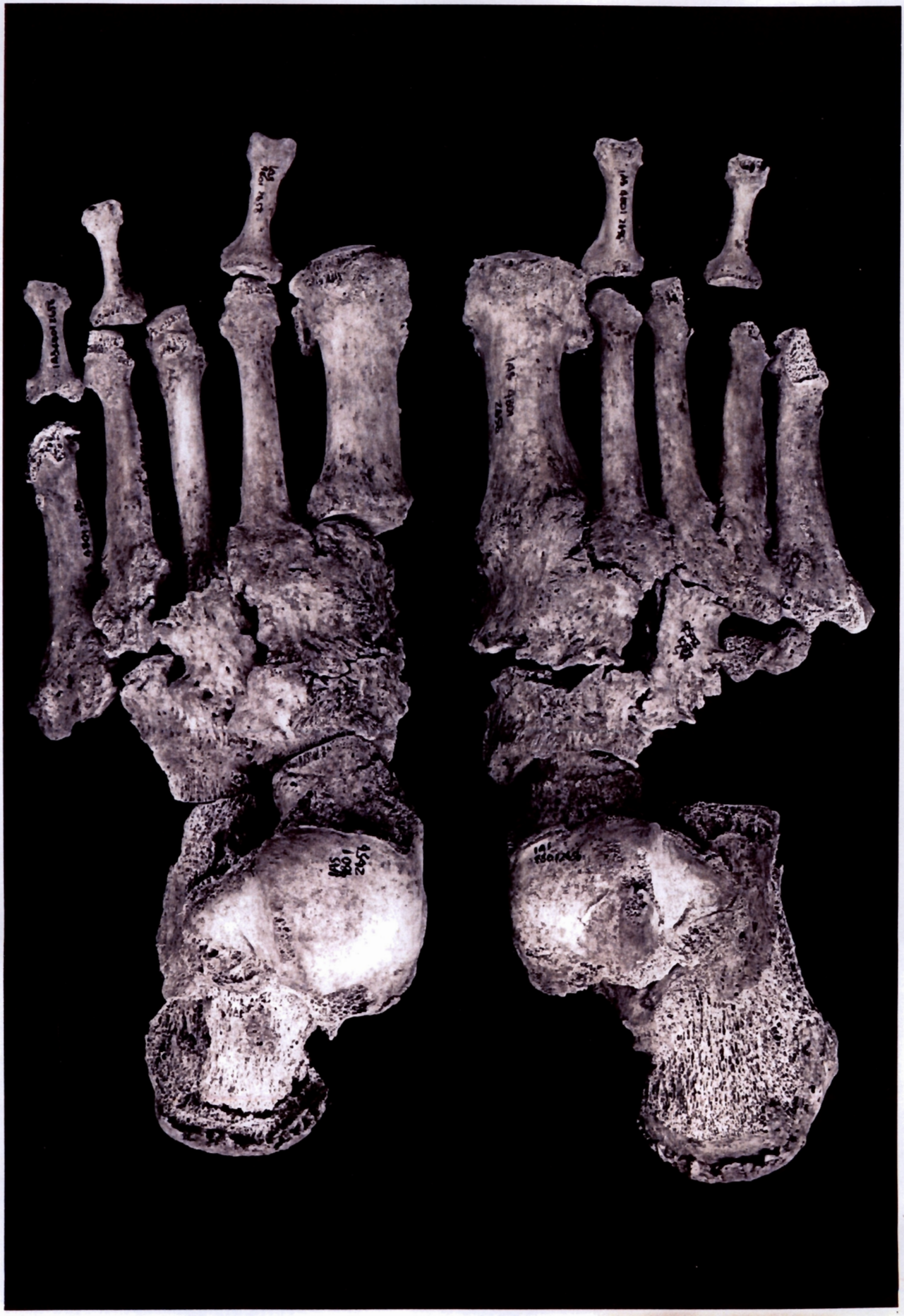


Plate 11. The left second and right fifth metacarpals of burial 2656, both showing erosions at their distal ends



Plate 12. The 12th thoracic and 1st lumbar vertebrae of burial 2458 showing erosions on their bodies suggestive of Scheuermann's disease

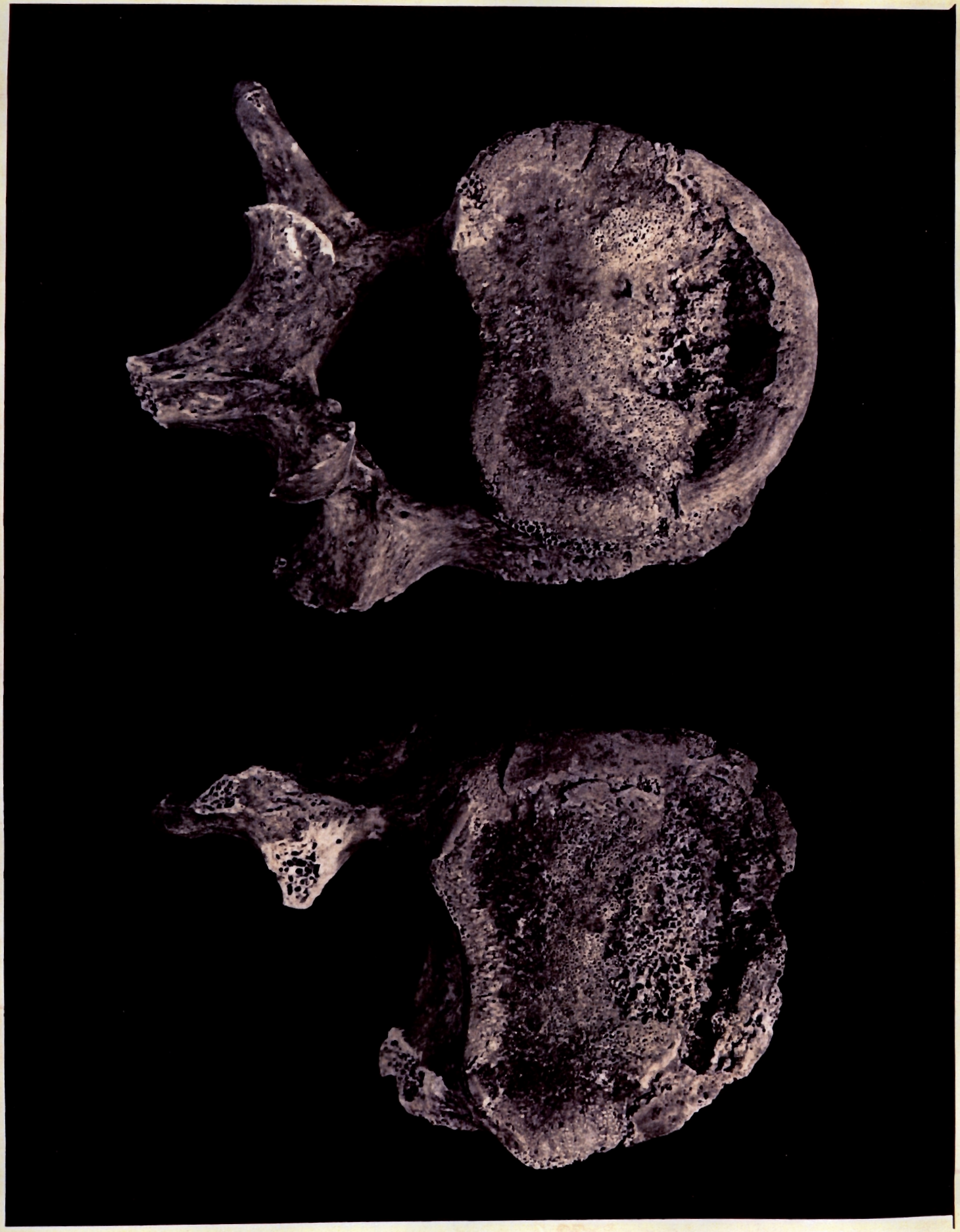


Plate 13. A radiograph of the left hip of burial 1917 (anterior view). The femoral head shows Perthes' disease and there is severe osteoarthritis, with the formation of large marginal osteophytes, on the femoral head and acetabulum



Plate 14. Metatarsals and hallucial phalanges of the right foot of burial 1962: there is marked lateral deviation of the proximal hallucial phalanx - hallux valgus. There is also osteoarthritis at the 1st metatarso-phalangeal joint



Plate 15. Burial 0938: ankylosis between the 4th and 5th lumbar vertebrae and the sacrum



Plate 16. Shoulder joints of burial 0938 showing severe osteoarthritis



Plate 17. Medial surface of an unhealed weapon injury on the cranial vault of burial 1749

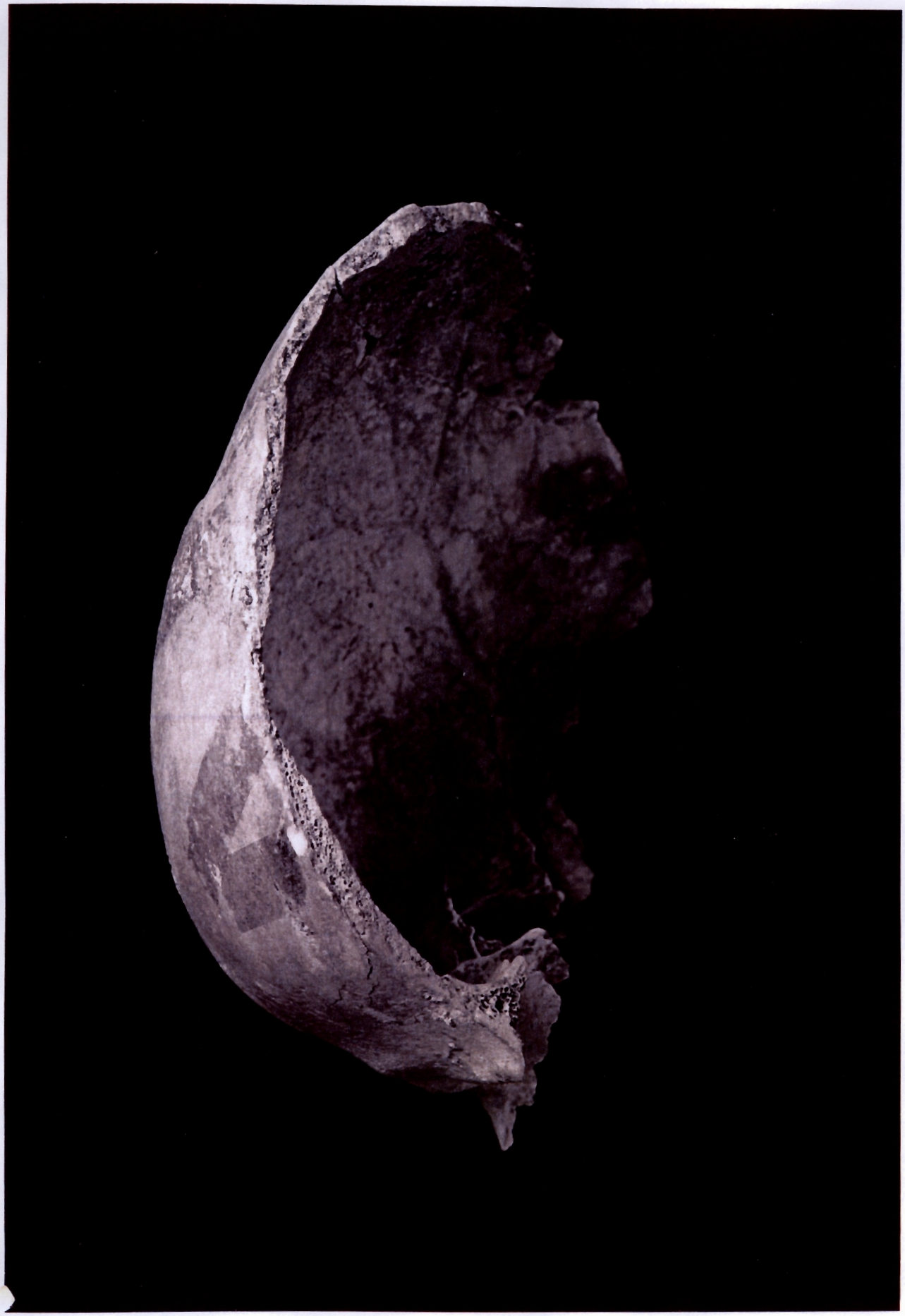


Plate 18. Superior/anterior view of the cranium of burial 0992. There is a healed weapon injury on the left frontal and parietal bones



Plate 19. The cranial vault of burial 2491 showing an iron fragment embedded in the left side of the frontal bone



Plate 20. Radiograph (superior view) of the frontal bone of burial 2491 showing the pointed shape of the iron fragment embedded in the left side of the frontal bone



Plate 21. Left lateral view of the skull of burial 2461. There is a healed blunt injury in the region of the left pterion



Plate 22. The forearm bones of burial 1904. The right ulna and radius end in a stump due to amputation of the right hand



Plate 23. The left forearm bones of burial 2628. There is an ununited fracture of the left ulna with formation of a pseudarthrosis



Plate 24. Radiograph of the femora of burial 0938 (posterior view). The left femur (on the left in the photograph) shows a slipped capital epiphysis

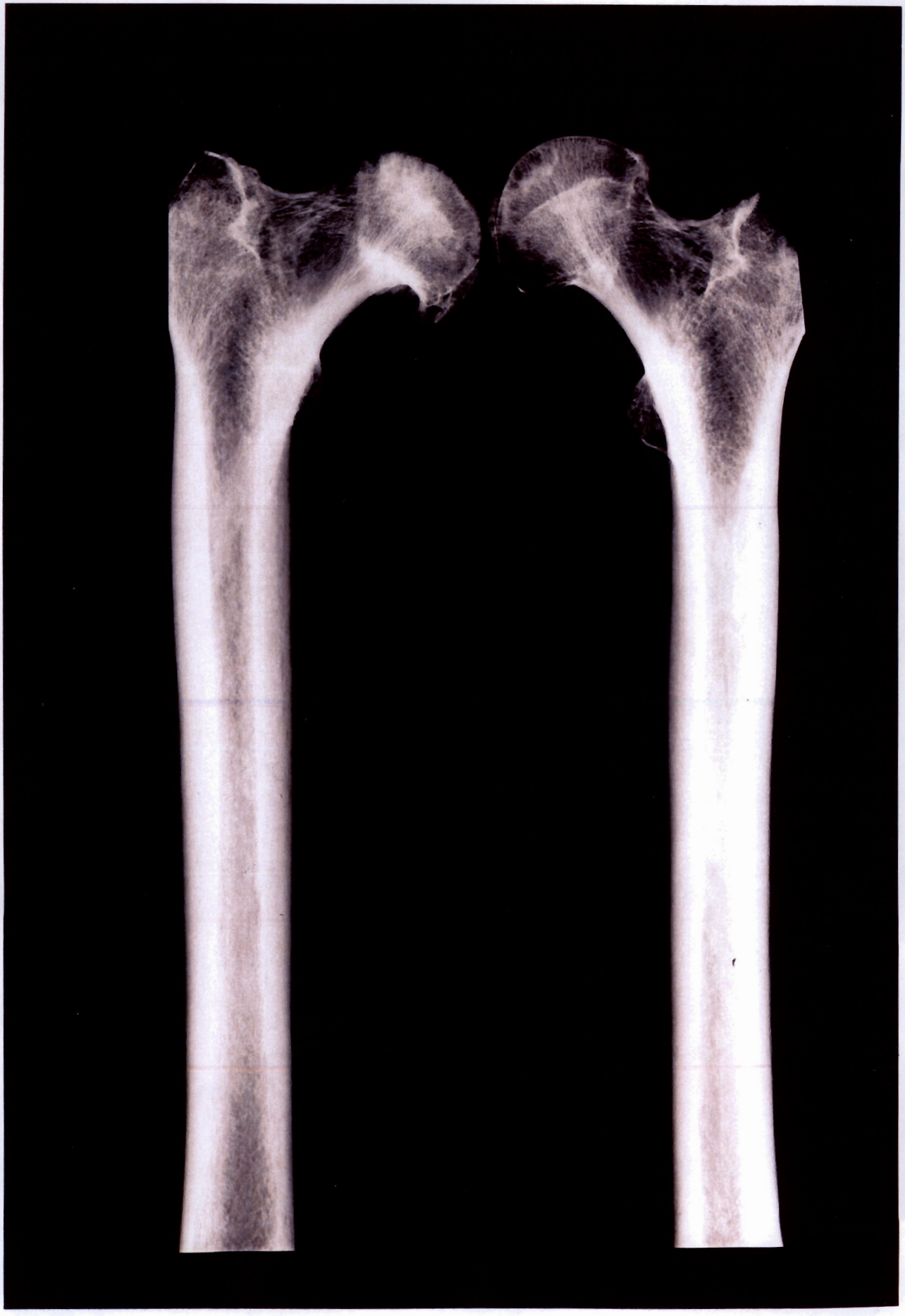


Plate 25. The tibiae (lateral view) of burial 1978 showing periostitis



Plate 26. Radiograph of the right femur of burial 1923 (posterior view) showing thickening of the cortex on the medial side near the junction of the middle and distal thirds with some irregularity of the endosteal cortex

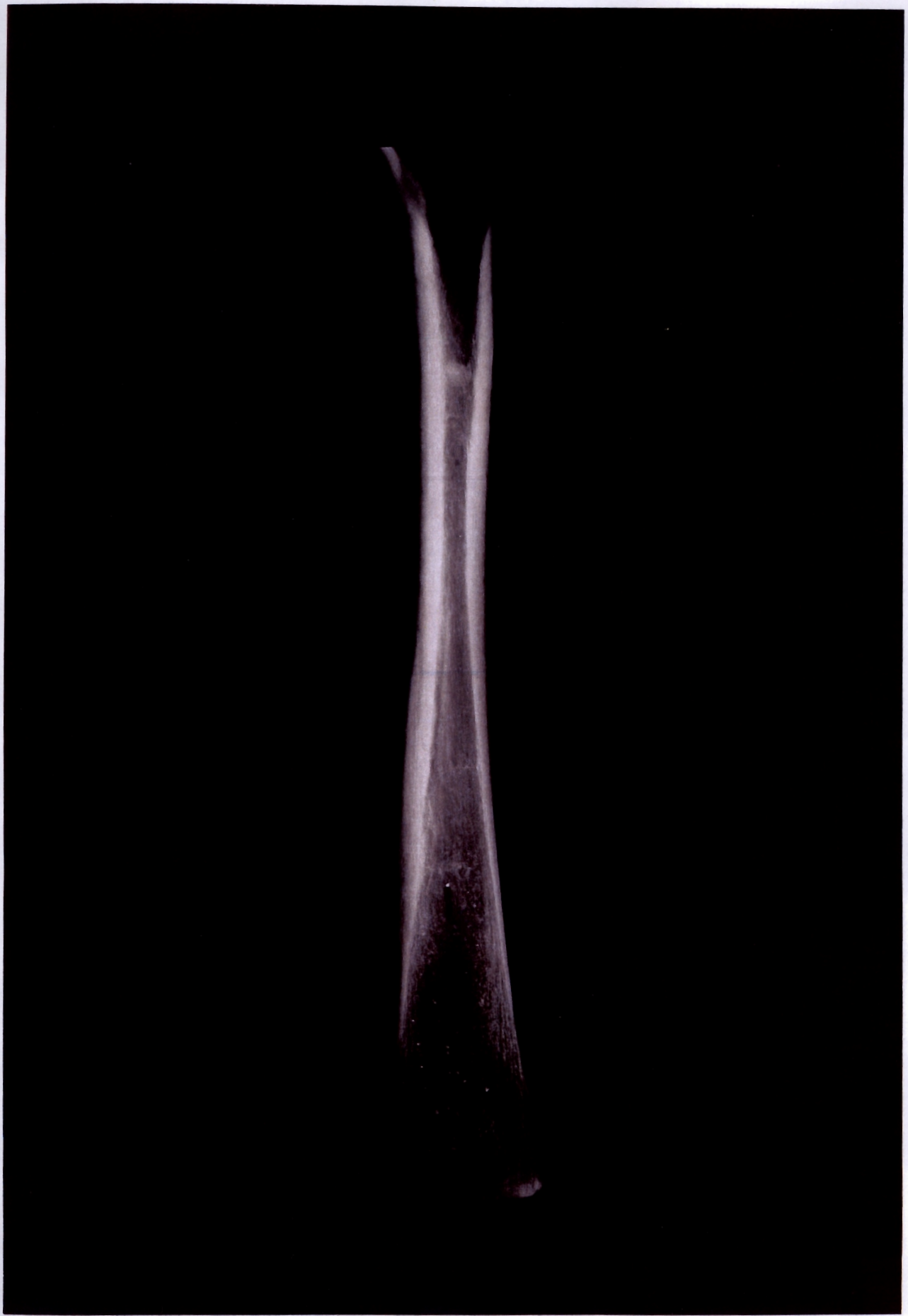


Plate 27. Left lateral view of the lumbar vertebrae of burial 2577; the bodies of the 2nd and 3rd are almost completely destroyed



Plate 28. Left sacro-iliac articulation of burial 1340. There is destruction of both the sacral and the iliac sides of the joint



Plate 29. The maxillae of burial 2593 showing destruction of the anterior nasal spine, rounding and erosion of the pyriform aperture and resorbtion of the maxillary alveolar process. The skull on the left (burial 1418) is a normal male for comparison



Plate 30. The foot bones of burial 1987 showing resorbtion of some of the metatarsals and phalanges



Plate 31. The lower leg bones of 2624 showing periostitis



Plate 32. The cranium of burial 1965. The frontal bone shows sclerotic thickening around the midline and irregular thinning to the left and right of this area.

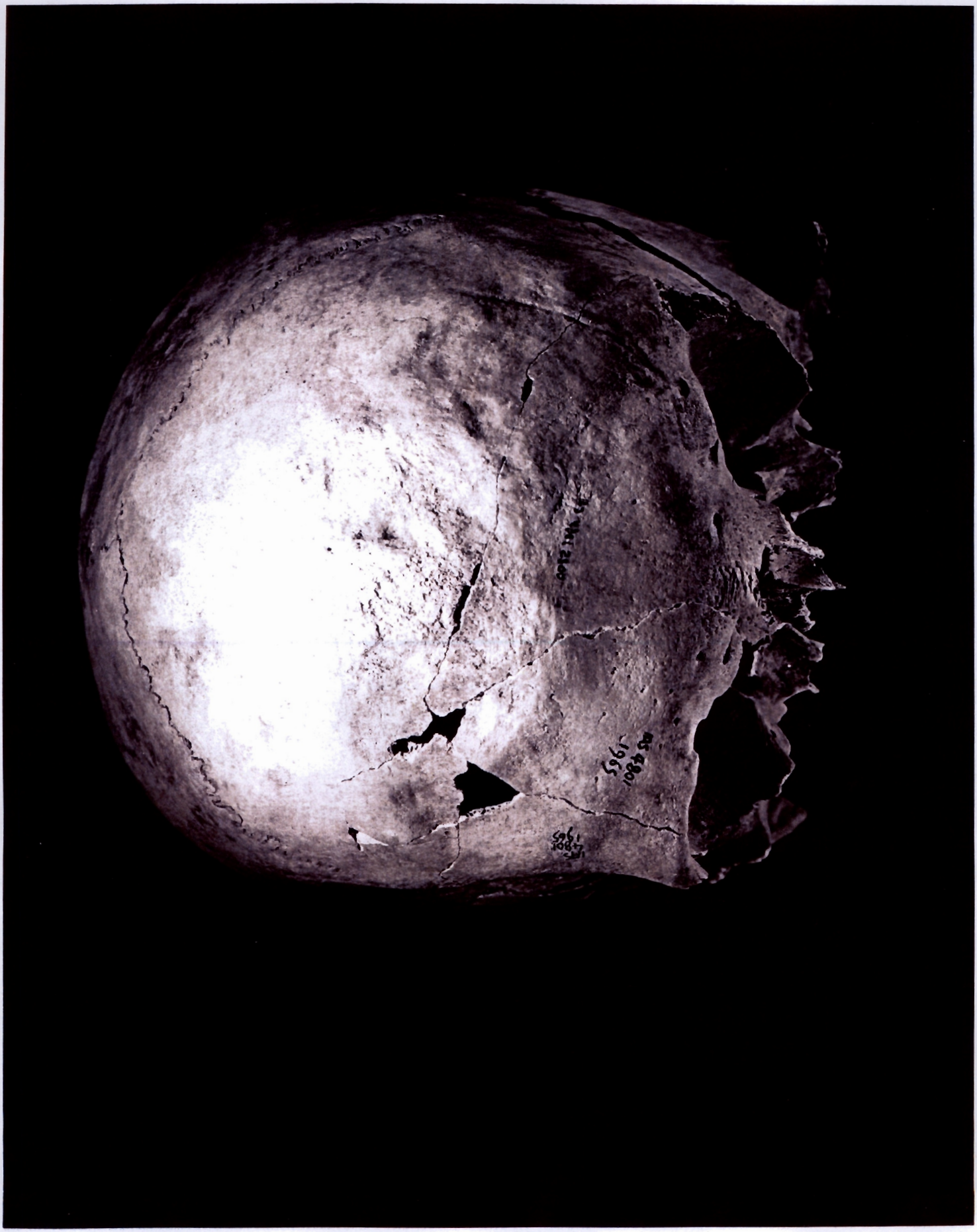


Plate 33. The long-bones of burial 1965 showing periostitis with marked concentric thickening



Plate 34. The tibiae of burial 1965 showing marked periostitis with concentric swelling, and raised plaques on the subcutaneous surfaces



Plate 35. The tibiae of burial 1965 showing the pattern of bone deposition on the lateral surfaces with apparent bridging over superficial blood vessels



Plate 36. Irregularly swollen and deformed long-bones from burial 0950



Plate 37. Radiograph of the left tibia of burial 0950 (lateral view). Note the sharp demarcation between the normal distal portion and the pathological proximal part which shows patchy rarefication, anterior bowing and increased cortical thickness



Plate 38. The surfaces of an un-united sub-trochanteric fracture of the right femur of burial 0950

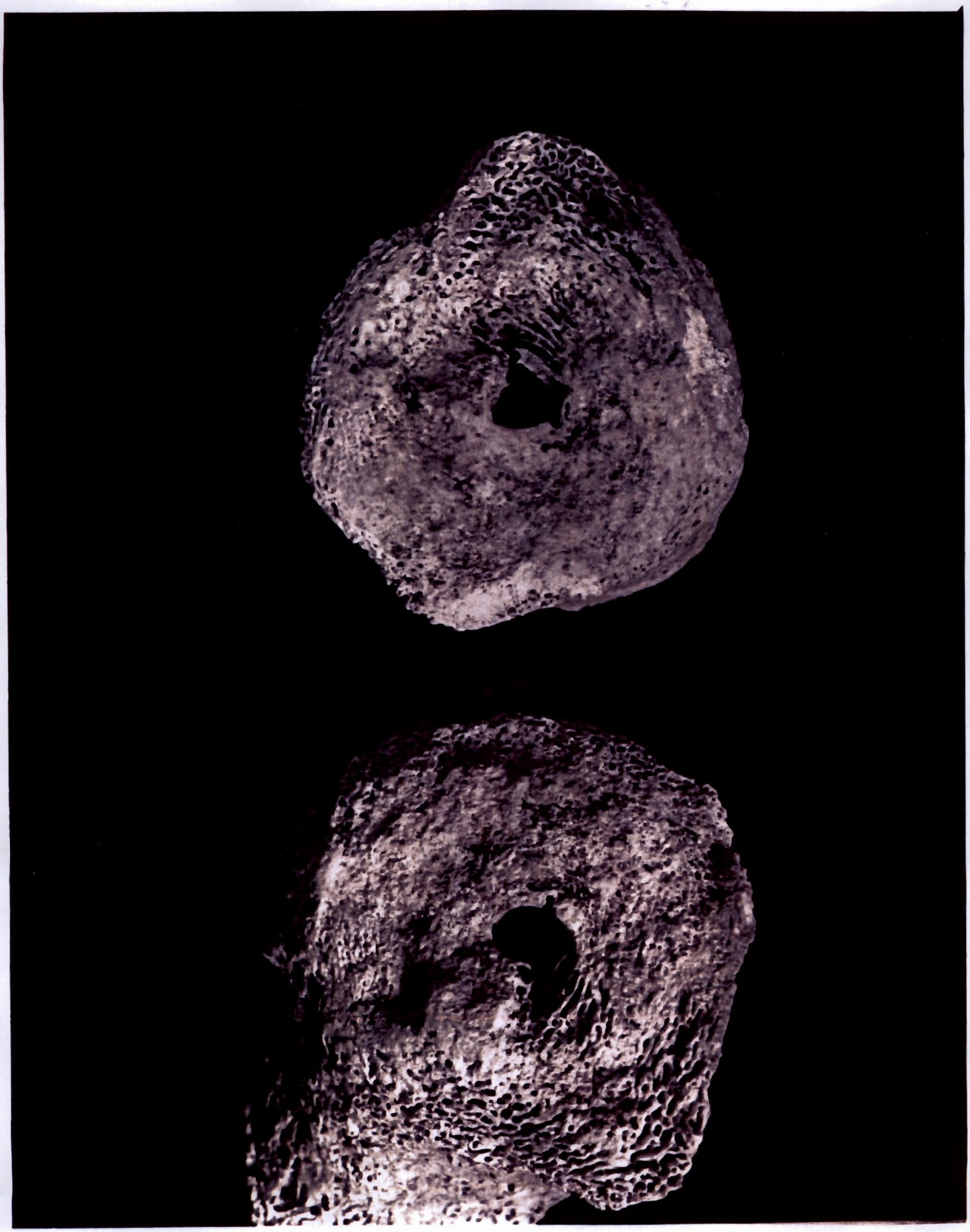


Plate 39. The joint surfaces of the left gleno-humeral articulation of burial 0950 showing eburnation

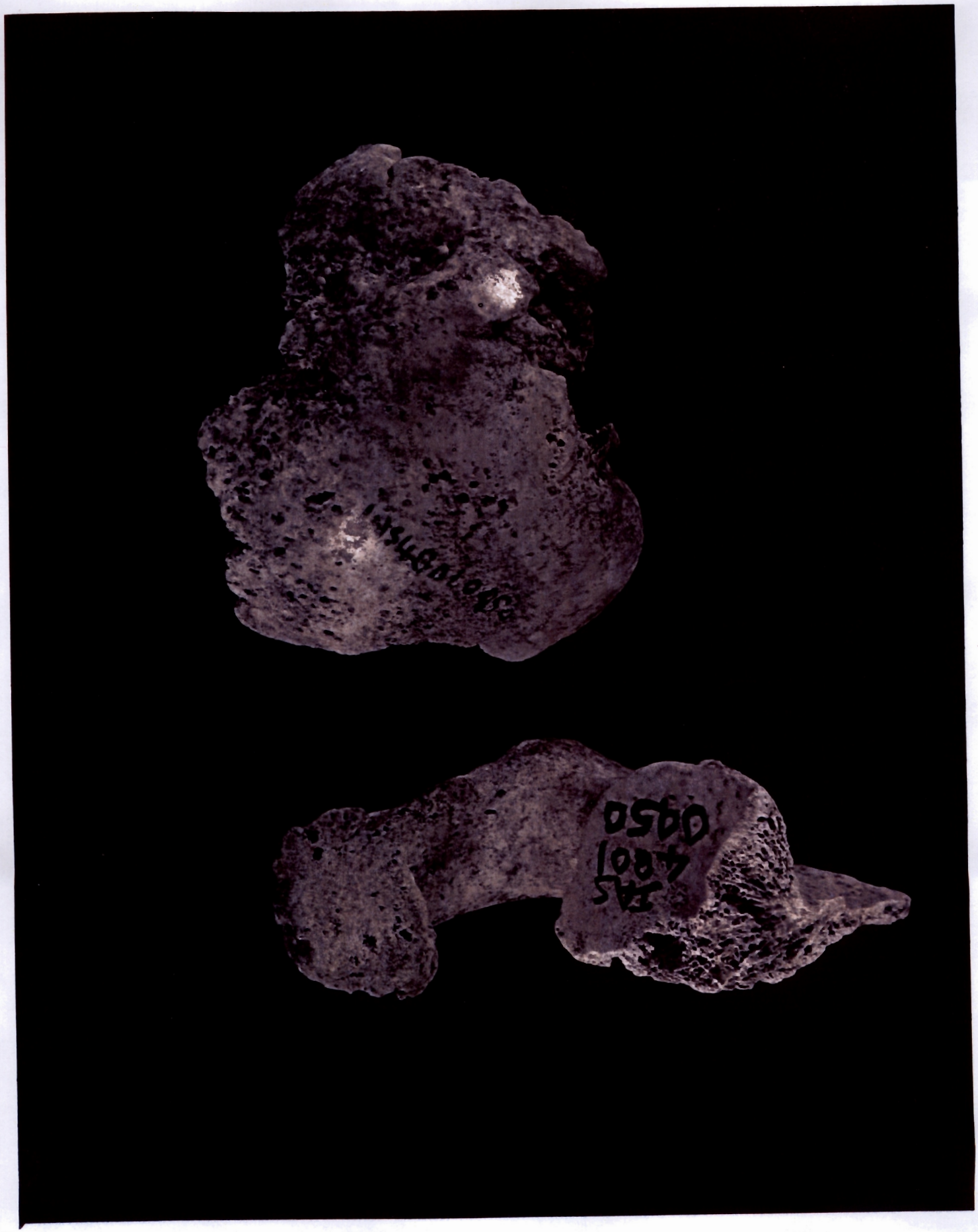


Plate 40. Burial 1455 in-situ, showing scoliosis of the thoracic spine



Plate 41. Posterior view of the vertebrae (7th cervical-9th thoracic) of 1455 showing severe scoliosis



Ancient Monuments Laboratory
Report 16/91 (PARTS I & II)

PART II: APPENDIX FOR THE MEDIEVAL BURIALS FROM THE BLACKFRIARS FRIARY, SCHOOL STREET, IPSWICH, SUFFOLK (EXCAVATED 1983-85)

S A Mays

SEE ALSO PART I: REPORT AND ILLUSTRATIONS

AML reports are interim reports which make available the results of specialist investigations in advance of full publication They are not subject to external refereeing and their conclusions may sometimes have to be modified in the light of archaeological information that was not available at the time of the investigation. Readers are therefore asked to consult the author before citing the report in any publication and to consult the final excavation report when available.

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APPENDIX: DATA FOR INDIVIDUAL BURIALS

CATALOGUE OF INHUMATIONS

Skeleton	Sex	Age	Stature	Preservation	Completeness	Location
0669	J	14	-	M	<20	C1S
0740	M	30-40	164.2	M	80+	C1S
0750	J	11	-	M	80+	C1S
0752	U	ADULT	-	M	20-40	C1S
0761	J	8	-	M	60-80	C1S
0775	?M	16-18	-	M	60-80	C1S
0780	?M	15-18	-	M	60-80	C1S
0938	M	50+	174.3	M	80+	CWP
0940	M	22-24	174.8	G	60-80	CWP
0943	M	35-45	175.7	M	80+	CWP
0950	M	60+	170.1	M	80+	CCh
0953	M	25-35	167.4	P	40-60	CCh
0954	M	25-35	167.5	G	80+	CCh
0956	F	ADULT	155.6	M	40-60	CCh
0962	F	50+	-	M	80+	CCh
0974	M	22-25	178.7	G	80+	CN
0984	M	50+	169.0	G	80+	CWP
0985	M	40-60	169.8	P	40-60	CWP
0989	J	3-4	-	M	<20	CN
0990	M	40+	-	P	<20	CWP
0992	M	25-35	169.9	G	80+	CN
1012	M	40-50	170.8	G	80+	CN
1068	M	35-45	-	P	40-60	CN
1305	F?	ADULT	160.1	M	<20	CCh
1306	M	ADULT	-	M	<20	CCh
1314	J	8MIU	-	G	80+	CCh
1321	J	0	-	G	80+	CCh
1323	J	0	-	G	80+	CCh
1333	M	ADULT	169.6	M	40-60	CCh
1340	F	21-23	160.2	G	80+	CCh
1361	M	45-60	169.4	G	20-40	CCh
1376	F	30-50	162.5	M	80+	CCh
1391	M	ADULT	166.7	G	60-80	CCh
1415	M	50+	169.1	P	60-80	CH
1416	M	25-35	-	P	20-40	CH
1417	M	60+	163.4	M	60-80	CH
1418	M	40-50	168.8	M	80+	CH
1421	U	25	-	P	<20	CH
1424	U	ADULT	-	P	<20	CH
1426	M	30-40	-	P	60-80	CH
1451	F	30-40	-	P	20-40	C1E
1455	M	18	-	M	80+	C1E
1457	F	35-45	155.6	M	80+	C1E
1459	M	25-35	170.9	M	80+	C1E
1464	M	25-35	177.7	G	80+	C1E
1469	M?	20-25	163.8	P	20-40	C1N
1471	M	30-40	176.1	P	20-40	C1E
1472	M	50+	171.8	G	80+	C1N
1477	U	ADULT	-	P	20-40	C1E
1483	M	30-40	173.3	M	80+	C1E
1492	M	50+	169.3	P	20-40	C1E
1494	M	21-30	174.1	P	40-60	C1N
1495	M	50+	173.4	P	80+	C1E

Skeleton	Sex	Age	Stature	Preservation	Completeness	Location
1497	M	35-45	-	P	20-40	C1E
1730	M	25	179.9	M	80+	CN
1731	J	6	-	P	60-80	CN
1738	F	50+	159.2	M	80+	CN
1740	M	ADULT	185.1	M	80+	CN
1746	F	30-40	154.3	G	80+	CN
1749	M	30-40	179.6	M	60-80	CN
1750	M	30-40	169.8	M	20-40	CN
1751	M	21-24	165.1	M	80+	CN
1754	F	30-40	-	P	40-60	CN
1757	M	40-50	168.3	P	60-80	CN
1762	M	35-45	179.7	M	80+	CN
1764	M	35-45	167.1	M	80+	CN
1779	F	21-25	159.1	P	40-60	CN
1780	M	25-35	174.7	M	60-80	CN
1782	M	25-30	167.8	M	80+	CN
1784	M	40-60	-	P	<20	CN
1786	M	35-45	170.9	M	60-80	CN
1789	M	35-45	173.7	G	40-60	CN
1795	F	45-60	165.0	M	80+	CN
1797	F	30-40	-	P	80+	CN
1799	M	50+	171.1	M	80+	CN
1813	J	2	-	G	80+	CN
1816	M	35-50	181.2	M	80+	CN
1819	J	11	-	M	60-80	CN
1827	M	40+	167.5	M	20-40	CN
1830	F	40-60	174.3	M	60-80	CWP
1834	M	50+	168.5	M	80+	CN
1837	J	6	-	G	80+	CN
1841	F?	25	168.0	G	80+	CN
1846	F	25-35	162.6	G	80+	CN
1855	M	22-25	173.6	P	80+	CN
1872	M	40+	174.8	M	40-60	CN
1873	U	ADULT	-	G	<20	CN
1874	F?	25-35	163.5	P	60-80	CN
1882	M	30-50	170.1	G	80+	CN
1890	F	22-40	158.7	G	20-40	CN
1892	M	ADULT	182.8	M	60-80	CN
1894	J	8	-	P	40-60	CN
1897	J	4	-	M	20-40	CN
1902	M	30-50	172.4	M	60-80	CN
1903	M	25-35	168.8	G	80+	CN
1904	M	30-40	168.8	M	80+	CN
1906	M	22-24	172.2	M	80+	CN
1908	M	25-35	170.6	G	80+	CN
1914	M	35-45	177.5	G	80+	CN
1917	F	50+	157.2	M	60-80	CN
1919	M	40-60	167.3	M	60-80	CN
1921	M	22-25	176.0	P	40-60	CN
1923	-M	16	-	M	40-60	CN
1925	F	40+	156.5	M	60-80	CN
1927	F	ADULT	158.8	G	40-60	CN
1932	F?	25-35	159.1	M	60-80	CN
1933	M	ADULT	179.6	M	60-80	CN
1935	M	22-50	175.3	M	40-60	CN

Skeleton	Sex	Age	Stature	Preservation	Completeness	Location
1937	F	21-25	162.4	M	60-80	CN
1942	F	ADULT	162.7	G	60-80	CN
1944	M	30+	170.0	M	60-80	CN
1945	F	17-19	158.8	G	80+	CN
1952	F	25-35	160.6	G	40-60	CN
1953	M	22-25	177.3	G	20-40	CN
1954	U	35-45	-	P	20-40	CN
1955	M	50+	175.3	P	20-40	CN
1962	M	22-50	179.4	G	80+	CN
1965	F	50+	158.5	M	60-80	CN
1967	F	22-25	163.1	M	60-80	CWP
1978	M	30-40	181.0	G	80+	CN
1980	M	40+	173.8	M	80+	CN
1983	M	40-50	175.5	M	60-80	CN
1985	M	35-45	175.2	G	80+	CN
1987	F	50+	154.3	M	80+	CN
1989	M	21-24	178.3	M	80+	CN
1992	M	ADULT	171.9	G	60-80	CN
1994	M	25-35	173.8	P	60-80	CN
1996	M	25-30	170.6	M	80+	CN
1999	M	21-24	181.7	P	60-80	CN
2005	M	35-45	173.9	M	60-80	CCh
2049	J	7MIU	-	G	60-80	CCh
2090	J	1.5-2	-	P	<20	CCh
2301	M	30-50	168.0	G	20-40	CN
2306	M	ADULT	173.2	M	40-60	CN
2307	F	50+	-	M	<20	CN
2313	M	21-25	163.4	G	20-40	CN
2316	F	22-25	165.4	G	80+	CN
2318	M	25-35	177.0	G	80+	CN
2320	F	40+	-	M	20-40	CN
2326	M	22-24	169.5	M	80+	CN
2327	F	50+	172.9	P	60-80	CN
2331	M	22-25	172.8	G	80+	CN
2332	M	40+	183.9	P	40-60	CN
2333	F	50+	152.9	M	60-80	CN
2334	M	30-40	-	P	20-40	CN
2336	F	25-35	163.0	M	20-40	CN
2343	M?	30-40	174.6	P	40-60	CN
2348	F	ADULT	171.5	M	60-80	CN
2349	M	21-25	171.2	M	80+	CN
2373	M	25-35	171.7	G	80+	CN
2384	M	35-45	-	P	60-80	CN
2386	F	35-45	160.6	P	60-80	CN
2388	U	ADULT	-	M	20-40	CN
2389	U	ADULT	-	M	<20	CN
2391	M	ADULT	174.0	M	40-60	CN
2396	M	40-60	182.1	G	80+	CN
2397	F?	ADULT	164.0	M	60-80	CN
2400	M	40-50	172.1	M	60-80	CN
2405	M	40-50	174.2	P	40-60	CN
2407	M	35-45	172.9	M	60-80	CN
2411	F	ADULT	155.0	M	60-80	CN
2418	F	ADULT	158.3	P	60-80	CN
2432	M	35-45	172.6	M	20-40	CN

Skeleton	Sex	Age	Stature	Preservation	Completeness	Location
2436	M	ADULT	176.6	P	<20	CN
2439	F?	30-40	176.9	M	40-60	CN
2441	U	ADULT	-	P	20-40	CN
2443	U	ADULT	-	P	<20	CN
2448A	M	25	172.2	G	60-80	CN
2448B	M	25-45	173.9	M	60-80	CN
2449	F	35-45	161.9	P	40-60	CN
2451	M	22-25	171.4	G	80+	CN
2452	F	40-50	154.9	M	80+	CN
2457	F	30-40	159.4	M	80+	CN
2458	M	21-24	173.3	M	80+	CN
2459	M	25-35	168.2	M	80+	CN
2461	M	40-60	169.3	M	80+	CN
2462	F	21-25	170.5	M	80+	CN
2466	M	40+	175.6	G	40-60	CN
2473	J	4	-	P	<20	CN
2474	M	50+	175.9	M	80+	CN
2476	M	25-45	171.3	G	80+	CN
2478	M	30-50	172.0	M	60-80	CN
2480	M	22-30	167.4	M	60-80	CN
2482	M	35-45	166.6	M	40-60	CN
2484	M	ADULT	-	M	<20	CN
2489	M?	25-35	173.0	G	60-80	CN
2491	M	50+	-	M	<20	CN
2492	F	21-25	154.6	M	80+	CN
2494	M	35-45	164.5	M	80+	CN
2496	M	45-55	165.4	P	60-80	CN
2499	M	ADULT	165.6	G	40-60	CN
2501	M	ADULT	-	M	<20	CN
2504	F	25-35	156.9	M	60-80	CN
2506	F	30-40	146.3	M	60-80	CN
2508	M	45-55	174.6	M	80+	CN
2511	U	40+	-	P	20-40	CN
2514	F	21-25	160.0	M	80+	CN
2527	F	25-35	165.4	P	40-60	CN
2533	F	25-35	159.0	M	80+	CN
2535	M	21-24	178.2	M	80+	CN
2537	F	60+	158.3	P	60-80	CN
2542	M	ADULT	171.0	M	60-80	CN
2546	M	50+	169.4	G	80+	CN
2548	M?	25-35	169.0	M	80+	CN
2556	F	25	169.1	G	60-80	CN
2574	J	4	-	M	20-40	CN
2575	J	10	-	M	80+	CN
2576	M	30-40	176.2	M	80+	CN
2577	?F	11	-	M	60-80	CN
2583	M	50+	175.3	G	80+	CN
2587	M	25-35	173.2	M	60-80	CN
2591	M	35-45	177.8	M	80+	CN
2593	M	25	162.3	G	80+	CN
2596	F	30-50	157.2	M	80+	CN
2612	F	35-45	161.0	M	60-80	CN
2614	F	45+	160.0	M	80+	CN
2616	F	25-40	161.8	G	60-80	CN
2617	M	30-40	-	P	20-40	CN

Skeleton	Sex	Age	Stature	Preservation	Completeness	Location
2620	M	30-40	173.6	M	80+	CN
2622	M	50+	172.6	M	80+	CN
2624	M	22-25	170.2	M	80+	CN
2626	M	21-24	-	M	20-40	CN
2628	F	50+	156.2	M	80+	CN
2631	F	22-30	160.1	P	60-80	CN
2632	U	ADULT	-	M	<20	CN
2636	M	35-45	175.7	M	60-80	CN
2638	F	50+	170.8	M	60-80	CN
2640	M	40-60	175.6	P	60-80	CN
2642	M	40-50	173.5	M	80+	CN
2644	M	ADULT	169.2	P	20-40	CN
2647	M	ADULT	169.5	M	60-80	CN
2650	M	35-45	168.3	M	60-80	CN
2654	M	50+	176.2	M	80+	CN
2656	M	ADULT	178.3	M	<20	CN
2658	F	50-60	158.6	M	80+	CN
2663	F	ADULT	159.6	P	20-40	CN
2671	M	ADULT	172.2	M	60-80	CN
3051	U	ADULT	-	P	20-40	ClE
3054	F	40-50	164.0	G	80+	ClE
3091	M?	30+	-	P	40-60	ClN
3095	M	25-35	173.3	G	80+	O
3101	J	10	-	G	80+	O
3105	M	25	179.3	M	80+	ClN
3107	M	50+	175.5	G	80+	O
3109	M	25-35	173.1	M	60-80	ClN
3111	?M	9-10	-	M	20-40	ClN
3118	F	ADULT	168.6	M	60-80	ClN
3126	M?	25	174.0	P	80+	ClN
3131	M?	30-50	-	P	20-40	ClN
3133	U	35-50	-	P	<20	ClN

Key. Sex: M=male, F=female, U=unsexed adult, J=unsexed juvenile, ? indicates probable sex. Age: in years (thus 0 denotes neonatal) except MIU=months in-utero; a single figure in this column does not imply a precise age, thus, for example, "25" means about 25 years. Stature: in centimetres. Preservation: G=good, M=moderate, P=poor. Completeness: approximate skeletal completeness (%). Location: CN=Church Nave, CCh=Church choir, ClE=East Cloister Range, ClN=North Cloister Range, ClS=South Cloister Range, CWP=Church Walking Place, CH=Chapter House, O=to south of Church Nave.

DENTITION

MAXILLARY TEETH

				LEFT								RIGHT				
SKEL	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
0669		.	.	ODc	.	.	.	.	.	.	.	.	.	.	.	O
0740	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.
0750	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.U
0761			.	.D	D.C	X	.	X	.	.	.DC	.DC	.D	.		
0775	O	.C	.	.	.CA	.	.	.	.	.	.	.	.	.C	.C	.U
0780									T	T						
0938	.	*	.	*	.	*	*	X	.	*A	*A	.AC	*	.	*	*
0940	O	.	.	.	X	X	X	X	X	X	X	X	X	.	.	O
0943	.CA	XA	.	.	.	.	.	.	.	.	.	X	.	X	.C	X
0950		.	XA	.AC	*A	*A	X	X	XA	X	.CA	*A	.A	.		T
0953		.C	.	.	.C	.	X	X	X	X	.	.	.	.	.	
0954	O	.	.CA	XA	.	.	.	.	.	.	.	.	.	.	.	O
0962		T				*	*	*	*	*	*	*	*	*	*	.
0974	.	.	.	.	.	.	.C	X	.	.	.	.	.	.C	.	.
0984	*	*	.C	XA	XA	XA	.	.	.	.	XA	X	*	*	*	*
0985		.	*	.	X	.	X	.	X	X	.	.C	.	.C	.C	
0989				.D	.D	XD	XD	XD	XD	XD	XD	.D	.D			
0992	X	.	X			X	.	X	X							
1012	*	.	.	.	.	.	.	X	X	.	.	.	.	.	.	.C
1068	.	.	.A	.	.	.	.	.	.	.	.	.	.	.	*	.
1321					UTD							UTD				
1323					.UD			.UD	UTD							
1340	.	.	.	X	.	.	X	.	.	.	X	.	.	.	.	.
1376									*	*	X	*	*	*A	*	
1415						XA	XA	X	XA	XA	.C	X	CT	*	*	*
1416	.	.	.	.	.	.		T	.	.	.	.	.	.	.	.
1417	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1418	.U	.	.	.CA	.	.	.	X	.	.	.	.	.	XA	.	O
1421																T
1426	X	X	.	*	X	X	X	X	X	X	X	X		X	X	X
1451		*A	.	.	.	.	.	.	.	.	.	.	.	.	.	
1455		.	.	.	.	.	T	T	T	.	.	.	.	.	.	.U
1457	O	.	*	.	.	.	*	*	*	*	.	.	*	*	.	O
1459	.	.	.	.	.	.	.	X	.	O	X	.	X	*	.C	O
1464	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.AC	.
1469	.C	.	.	.CA	.	.	.	.	.	.	.	.A	.C	XA	.	.C
1471	.	*		*A	.	.	.	.	.	.	.	.	.	CT	.	.
1472	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	.
1483			.C	.	.	.	.	X	*	.A	.	.	.	.	.C	
1492			.	.	X	.	X	X		X	*	X	.	T	T	
1494													T			
1495	*	.AC	*	*	.AC	X	.A	XA	.	XA	X	*	.C	*	*	*
1730		.	.CA	.	.	.	.	X	.	.	.	.	.	.CA	.	
1731								TD		UT	.D	.D	.D	T	UT	
1738		*	*	*	*	*	*	.	X	.C	*	*	*	*	*	
1746	O	.	X	X	X	.	X	.	X	X	.	.	*	.	.	O
1749	O	X	*	X	X	X	X	.	.	.	.	.	.	.	X	X
1750		TC	TC	T		T		T	T		T	T	T			T
1751	.E	.	.CA	.	.C	.	.C	.	.	.C	.C	.C	.C	.C	.C	.E
1754	O	.	.	*	.	.	.	.	.	.	.	.C	.	.	.	O
1757	*	*	.	.	.	.A	.	.	X	X	.	.	X	*	*	*

	LEFT								RIGHT							
SKEL	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
1762	.	.	.	.CA	.CA	.	.	.	X	.	.	.	.	*A	.C	.
1764	.	.	X	.C	.	.	.	X	.	.	.	.	.	.CA	.	.
1779	TC													T	T	T
1780	.	.	.	.	.	.	.	.	X	X	X	.	.	.	.	.
1782	.	.C	.C	.	.	*	.	X	X	X	.	.	.	.C	.	.
1786	XA	.C	*	.	.	.	X	X	X	.	.	.AC	.AC	.AC	.	*
1789	.	.	.	.	.	.	.	.	.A	.A	.	.	.	.CA	.	0
1795	.	.	XA	.	.	.	.	.	X	X	X	.	.A	.CA	.A	.
1797	0	.	*	.	.	.	.	.	.	.	.	.	.	.		
1799	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	.
1813			.U	.D	.D	XD	.D	.D	.D	.D	.D	.D	.D	.U		
1816			.C	*	.	.	.	.	X	.	.	*	X	.C	*	*
1819		.	.	.	.	.	.	.	.	.	.	.	X	.	.E	
1830	*	*	*	*	*	*	X	*	*	X	*	*	*	*	*	*
1834						T										
1837		UT	ET	.D	.D	.D	.D	.D	.E	DX	.D	XD	.D	.E	.U	
1841			XA	.	.	.	.	.	.	XA	.	.	.	.	.C	
1846	.E	.	.	.	.	.	X	.	.	.	.	.	.	.	.C	T
1855	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.
1872	*	*	X	X	*	X	*	*	*	*	XA	X	.	*	*	*
1874	.C	.C	*	*	.C	.	.	.	.	X	.	.	*A	.	.C	.
1882	*	*	*	*	*	*A	XA	X	X	*	*	*	*	*	.C	*
1894		UT	T	UT	DT	DT	UT				UT			T	UT	
1897			.U	.D	.D	.D	.D	.D	.D	.D	.D	.D	.D	.U		
1903	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.
1906			.	.	X	.	.	.	.	X	.	.	.	*	.C	T
1908	.	.	.	.	.	.	X	.	.C	.	.	.	.			
1914	*	XA	.	.	.	.	.	.	X	.	.	.CA	.C	.	.	.
1917							T		T		T					
1919					*	X	X	XA	X	X	X					
1921	T		T	T	T	.	X	T	T		.	.	.	.	X	
1932			*	*	.	.	.	X	.	.	.	.	*A	.	.	.C
1937	X	.	.	.	.	X	X	X	X	X	X	X	.C	.C	.	X
1945	TE	T	T	T	DTc	.	.	X	X	X	.	T	X	.	.	X
1952	0	.	.	.C	.	.	.	.			.	.	.	.	.	0
1953	.	.	.	.	.	.	.	.	X	X	.	.	.	.	.	.
1954				T	T	T	T			T	T					T
1962	.	.	.	.	.	.	.	.	X	.	.	.	.C	.	.	.
1965		*	*	*	*	*	*	*			X	*	*	*	*	
1967	.	.	XA	.C	.	.	.	X	X	.	.C	.	.	*	.	.
1978			.	.	.	.	X	.	.	X	.	*	*		*	.C
1980	*	*A	*	.C	*A	X	X	X	.	X	.	.	*	*	*	*
1983			*	.	.	X	X	X	.	X	.	.	.	*	*	X
1985		*	.	*	*	.	X	.	.	X	.	.	*	.	.	
1987	.	*	*	*	*	XA	.A	X	X	XA	X	*	*	*	*	*
1989	T	TC	T	T		TT	T	T	T	T	T	T	T	T	T	T
1992								T								
1994	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1996		T	T		X	.	X	.	X	.	.	.	.	.	.	.
1999	0	.	.	OD.	.	.	X	X	X	0	.	.	OD.	.	.	0
2005	.	.	.	.	.	.	.	.	.	.	.	.	.	*	.C	.
2313			T													
2316	.C	.	.	.	.	.	X	X	X	.	.	.	.	.C	.C	.
2318	0	X	X	X	X	.	.	X	.	.	.	.C	X	*	.	0

	LEFT								RIGHT							
SKEL	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
2326	.	.	.	.	.	.	X	.	.	.	.	.	.	.	T	T
2327			X	X	X	.C	.C	.C	X	X	X	X	X	.C	X	
2331	0	.C	*A	.C	.	.	.	.	.	.	.	.CA	XA	X	.	.
2333		.CA	.C	.	.	.	.	.	.	.	.	.	.	.	.	
2334	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2336		X	*	*	.	.	.	.	.	.	.	.	.	.	.	0
2343	.	.	.	.	.	.	.	.	.	.	.	.	.	.		
2348							T									
2349	X	.	.	.	.	X	X	X	X	X	X	X	.	.	.	X
2373	.C	.C	.	.C	.C	.	.	.C	.C	.	.C	.	.	.	.	.
2384	.	*	*	*	.	.	X	X	X	.	.	.	.	*		
2386						X	XA	XA							T	
2407			.	.	.C	.C	.	.	X	.	.	.CA	.	.		
2432	.	*	*	*	.	.	.	X	X	.	.	.	.CA	.CA	.	
2439	X	X	.	.	X	X	.	X	X	X	X	.	.	.	.	.
2449	T	TC	T			T		T			T	T		T	T	T
2451	.	.	.	.	.	.D	.	.	.	.	.D	.	.	.	.	.
2452	.	.	*	.C	.CA	X	X	X	X	X	.	.C	.	.CA	.	.
2457	.	.	.	.	.	.	.C	X				X	.	.	.	X
2458	X	.	.	.	.	.	.	X						T	T	T
2459	X	.C	.C	X	.	.	X	X	X	X	.	.	.	.	.	X
2462						T				T						CT
2473				.D	.D	XD	XD	XD	XD	XD	XD	.D	.D			
2474	.C	*	*	*	*	*	*	*	X	*	.C	*	*	*	T	
2478	.	.	*	.	.	.	X	X	X	X	.	.	.	.CA	.	X
2480	0	.	.C	.	.	.	.	X	X	X	.	.	.C	*	.C	*
2482	X	X	*	X	X	X	0	X	X	X	*	X	X	.	X	X
2489							T	T								X
2492	0	.	.	.	.	.	.	X	.	.	.	.	.	.	.C	0
2504		T	*	*	*	.	X	.	T					.	.	.
2506			.	.	.	.	.	.	.	.	.	.	.	.	.	*
2508		.	.	.	XA	XA	.	X	.	X	.CA	.CA	*	*	*	.
2514	0	.	.	.C	.	.	.	X	X	.	.	.C	.C	.	.	0
2527	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.
2533	0	.	.	.	.	.	.	.	X	X	.	.	.	.C	0	0
2535	.C	.	.C	.	.	.	.	X	X	.	.	.		.	.CA	TC
2537	0	.	.	.	.C	X	.	X	X	X	.C	.	.	.CA	.C	0
2542														*A	*A	*A
2546		*	*	*	*	.C	*	*	*	*	*	*	*	*	*	
2548	*	*	*	.	.	.	.	X	X	.	.	.	*	.	.C	X
2556	0	.C	.	.	.	.	0	X	.	.	X	.	.	.	*	*
2574			UT	.D	.D	.D	.D	XD	.D	.D	.D	.D	DT	UT		
2575	.U	.E	.	.DC	.D	.U	.E	X	.	.	.U	.D	.E	.	.E	
2576		.	.	.	.	.	0	.	.	.	.	.	.	.	.	
2577		T	T	T	T	T	T	T	.	.	.	.	.	.	T	
2583						TC					TC					
2587	.	.	*	.	XA	.	.	*	*	.	X	.C	.C	*	X	.C
2591		.	.	.	.	.	.	.	X	X	.	*	X	.	.	
2593	0	.	*A	X	X	X	X	X	X	X	.	.	.	.CA	.	0
2596			*	.	.	X	X	X	X	.	.	.	.			
2612	X	*	*	X	X	X	X	*	X	X	X	X	X	*		
2616	0	.	.	X	.	.	.	X	X	.	X	.	.	.	.	0
2617	X	.	.	.	.	0	.	.	X	.	.	.	.	.	T	T
2620	0	.	.	.	X	T	X	X	X	.	.	.	.	.	X	

				LEFT								RIGHT				
SKEL	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
2622		*	*A	*	*	*	*	*	*	*	*	*	*	*A	*	
2624	.	.CA	.C	.	X	.	X	X	.	X	.	.	X	.	.	.
2628	*	*	*	*	*	XA	*	X	*	*	*	*	*	*	*	*
2636	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.
2638			.A	.	.	.	.	.	.	.	.	.	.	X	X	0
2640		*	*	X	.	.	X	X	.	X	X	.	.	.	*	
2642	0	*	*	.	.	.A	.	.	*A	*A	.	.	.	*	*	0
2650		*	*	.	*	.	X	.	.	.	.	*	.	.	.C	
2654	*	*	*	*	*	*	XA	*			.	*	*	*	*	X
2658	0	.	*	A.	X	.	*	XA	XA	X	X	.A	.	*A	*	
3054	0	.C	.CA	.	.	.	.	X	X	.	.	.	.	.	.	0
3091						.CA	.	X		T	T					
3095	.	.CA	.	.	.	.	.	.	*A	.	.	.	.	.	.	.
3101			T	UT	.	.E	.	.	.	.	.E	.	X	.	.U	
3105	.	.CA	*	.	.	.	.	.	.	.	.	.	.C	.		
3107	AX	*	*	*A	*	.A	X	X	XA	XA	.	*	*	*	*	*
3109	0	.	.CA	.	.	.U	.	X	.	.	.	.	.	.	.CA	
3126					.	.	.	X								
3131	*	.	*	*	*	*	*	*	*	*	*	*	*	*	.	
3133		*	X	X	X	X	.	X	X	.	.	.	.			

Note: Burials 1917 and 2400 have 1 unidentified maxillary tooth each; that of 1917 is carious.

MANDIBULAR TEETH

				LEFT								RIGHT				
SKEL	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
0669	0	.	.	OD.	.	D.	.	.	.	.	.	.	OD.	.C	.	0
0740	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.
0750	.U	.	.	.E	.E	.	.	.	.	.	.	.D	.D	.	.	. U
0761		.U	.C	.D	.D	X	.	.	.	.	.D	.D	.D	.C	.U	
0775	.U	.C	.C	.	.	X	X	.	.	.	.	.	.	.	.C	.U
0780	0	.C	*	.	.	.	.	.		.	.	.	.	.	.CA	0
0938	*	*	*	*	.	.	.	.	.	.	.	.	.	*	*	*
0943			X	.	.	.	.	.	.	.	.	.	.	.AC	.AC	.
0950	*	*	*	.	.	.	X	X	X	.	.	.	*	*	*	*
0953		.	.	.	.	.	.	.	.	.	.	X	.	.	*	.C
0954	0	.	*	.	.	.	.	.	.	.	.	.	.	.	.	0
0962	*	*	*	.CA	.CA	.CA			*	.	.	*A	*	*	.CA	XA
0984	.C	*	*	*A	.	.	.	.	.	.	.	XA	*	*	*	.
0985	.C	XA	*	.	.	.	X	X	.	X	.					
0989			U.	TD								.D	.D	.U		
0992	.C	*	.	.	.	.	.	.	.	.	.	.	.	.C	.C	*
1012	*	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.
1068	*	.	.	.	.	.	.	.	.	.	.	.	.	.	*	.
1314				XUD	XUD	XUD	XUD	XUD								
1321				.UD	.UD	XD	.UD	XD	.UD	XD	.UD	.UD				
1323					.UD		.UD					.UD				
1340	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.C	.
1361		*	*	X	X	X	X			*	X	*	.C	*	*	*
1376	0	X	.CA	.	.	X	.	.	.	.	.	.C	.C	.CA	.	0
1415	*	*	*	*	*	X	X	*	*	X	.CA	XA	*	*	*	*

	LEFT								RIGHT							
SKEL	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
1416	.	.	.	.	.	X	.			.	.	.	.	.	.	.
1417	*	*	*	*	*	X	X	X	X	X	XA	*	*	*	*	*
1418	*A	*A	.C	*A	.	.	.	.	.	.	.	.	.	.CA	.CA	.
1421		.	.C	.	.	X										
1426	X	.	.	.	X	X	X	X	X	.	.	X	X	.	.	X
1451	0	.	.	.	.	.	.	X	.	.	.		.	.C	.	
1455	.U	.	.	.	.	.	T		T	X	.	.	.	.	.	.U
1457	0	.	*	XA	.	.	X	.	X	X	.	.	.	.CA	*	0
1459	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.C	.
1464	.C	.C	*	*	.	.	.	X	.	.	.	.	.	*	.	.
1469	.U	.	.	.	.	X	X	.	X	.	.	.	.	.	.	.U
1471	.C	.C	.	.	.	.	.	.	.	X	.	.	T	.	X	*
1472	.C	*	*	*	.CA	.C	.CA	XA	XA	.CA	.	*	XA	*	*A	*
1483	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
1492		T		X	.	.	.	.	.	.	X	.	X		X	.
1495	*	*	*	.	.AC	.	.	.	.	.	.A	.	*	*	*	*
1497	.	.	X													
1730	0	.C	*	.	.	.	.	.	.	.	.	.	.CA	*	.	0
1731			T	.D	.D	.D	.D	.D	.D	XD	XD	.D	.D	.	.U	
1738		*	*	*	*	.CA	*	*	X	X	X	*	*	*	*	
1746	0	.	.	.	.	.	.	*	X	.	.	.	X	.	.	0
1749	X	.	.	.	.	.	.	.	.	.	.	.	*	.		
1750	0	.	.	.	.	.	.	.	.	.	.	.	.	*	.	0
1751				.	.	.	.	.	.	.	.	.C	.C	*A	.C	.C
1754			T		T		T	T	T		T	T	T	T	T	
1757	*	*	*	.	.	.	.	X	X	0	.	.	X	*	*	*
1762	.C	.C	*	.	.	.	X	X	X	X	.	.	.C	.CA	.	.
1764	.	.	.	.	.	.	.	.	.	X	.	X	.	.	.	.
1779				X	X	X								T		
1780	.	.C	.	.	.	.	.	X	.	.	.	.	X	.	.	.
1782	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.
1784						X	X	X	X	X	X	X	X	X		
1789		*	*	.	.	.	X	X	.	.	.	.	.	.A	*	
1795	.	.CA	.	.	.	.	.	.	.	.	.	.	.	.A	.A	
1797	X	.	*	XA	.	.	.	.	.	.	.	.	.	XA	*	.C
1799		*	*	*	X	X	X	X	X	X	.AC	.	.	*	*	*
1813				.D	.D	.D	.D	XD	.D	.D	.D	.D	.D			
1816	*	*	*	.	*	.	.	.	.	.	.	.	.	*		
1819		.	.	.D	.U	.	.	X	X	.	.	.E	.D	.	.E	
1830		*	*	.C	.C	X	X	*	*	XA	.C	*	*	*	*	*
1834	.C	*	*	.	.	X	.	.	.	X	XA	X	.	.A	.	X
1837		.U	.E	.D	.D	.D	.D	.E	.D	.U	.U	.U	.DC	.E	.U	
1841	*	*	.C	.	.	.	.	.	.	.	.	.	*	.	*	*
1846	.U	.C	.C	.	.	.	X	X	.	.	.	.	.	.	.	.C
1855	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.	X
1872	*	*	*	.	.	.	.	X	X	X	.	.	.	XA	X	*
1874	.	.C	.	.	.	.	X	.	.	.	.	.	.	.	.C	.C
1882											T					
1894		UT	.	.D	.D	.U					.U	.D	.D	.	UT	
1897			UT	DT				DT	DT	DT	DT		DT	UT		
1903	.	.	.CA	.	.	.	X	.	X	.	.	.	.	*	.C	*
1904	X	.	.	.	.	.	.	.	.	.	.	X	X	.	.	
1906	*	*	*	.	.	X	X	X	X	X	.	.	.	.	*	.C
1908	.	.	.	.	.	X	X	.	X	.	.	.	.	.C	.	.

	LEFT								RIGHT							
SKEL	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
1914	.C	.	*	.	.	.	.	X	.	.	.	.	.	*	*	*
1917	*	*	*	*	.	.	.	X	X	.	.	.	*	*	*	*
1919	*	*	*	.	.	X	X	X	X	X	X	XA	X	*	*	*
1921		T	T		T		T			T	.		T	T	T	
1923		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.C	.U
1932	.	*	.	.	.	.	X	X	X	.	X	.	.C	*	.	*
1933	.	*	*	.	X	XA	X	X	X	X	X	X	X	*A	*	*A
1935																
1937	X	X	.C	.	.	.	.	X	X	.	X	.	.	.C	.C	*
1945	.U	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.U
1952	X	.	.	X	X	.	.	.	X	X	.	.	.	.	.	X
1954										T	T					
1962	0	.	.C	.	.	.	.	X	X	X	.	.	.	.	.	0
1965	*	*	*	*	*	X	*	*	*	*	*	*	*	*	*	
1967	.C	.	.	.	.	.	.	.	.	.	.	.	.	.	.	*
1978	.	.	.	.	.	.	.	X	.	X	.	.	.	.	.	.
1980	.					T					T	CT				
1983	.	*A	.	.	.	.	.	.	*A	X	.	.	.	.	.	.
1985	*	*A	X	.	.	.	X	X	X	X	X	X	*	.	*	*
1987	*	*	.	*A	.CA	X	X	X	X	.	.C	.C	.	.C	.	0
1989	.	.	.	X	.	.	.	X	X	X	.	.	.	.	.	T
1992																
1994	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.C	*
1996	.C	.	.	.	.	.	X	X	X	.	.	.	.	*	.C	0
1999	0	.	.	0cD	.	.	.	X	X	X	.	.	0cD	.	.	0
2005	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.
2313														T		T
2318	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2326	.		.C	.C	.	.	.	.	.	.	.	.	.	.C	*A	X
2327		*	*	*			.	X	X	.C	X	.C	X	*	*	*
2331	0	.	.	.	.	.	.	.	X	.	X	.	.C	*	.	0
2332		*	*										*	*	*	
2333	0	.	*	.	.	.	.	X	X	X	.	.A	.	.AC	.	0
2334	.	.	.	.	.	.	.	*	.	.	.	.	.	.	.	.
2336	0	.	.	X	.	.	.	.	.	.	.	.	.	*	.C	X
2343	.	.	.C	.	.	.	.	.	.	.	.	.	.	.	.C	.
2349	.	.	.	.	.	.	.	X	XA	X	.	X	.	.	.	X
2373	.C	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.C
2384	.	.A	.A	.A	.	.	.	.	.	.	.	.	.	*A	.	X
2407		.	*	T	.	.	.	.	.	.	X	X	.	*	.	*
2418							T			T				X	X	X
2432	*	*	X	.	.	.	.	.	.	.	.	.	.	.	.	*
2436																
2439	.	.	.	.	.	.	.	.	X	*	.	.	.	.	.	X
2448A									X	X	.	X	X	.	.	.
2449	T				T	T			T	T	T	T				T
2451	0	.	.	.	.	.	X	X	.	.	XD	X	.	.	.C	0
2452	.	.C	*	.	.	.	.	.C	X	.	.	.	.	*	.C	.
2457	*	.C	*	.	.	X	.	X	X	.	X	.	X	X	.	.
2458	.E	.	.	.	.	.	.	.	.	.	X	X			T	T
2459	.	.	.	X	X	.	.	.	.	.	.	.	.	*	.	.
2462									T		T	T				
2466											T	T	T			
2473			.U	.D	.D	XD	XD	XD	XD	XD	XD	.D	.D	.U		

	LEFT								RIGHT							
SKEL	8	7	6	5	4	3	2	1	1	2	3	4	5	6	7	8
2480	.	.C	*	X	X	X	X				X		.	.	.CA	.C
2489					T		T	T		T						
2492	0	*	.CA	.	.	.	X	.	.	X	.	.	.	.CA	.	0
2494		T					T	T		X	X	X	*	X	X	0
2496		.	.A	.	.	.	.	.	.	.	.	.A	.	.	.A	.C
2501	*	*	*													
2504	*	.	.C	.	.	.	.	X	.	X	X	X	X	.	*	*
2506	.	.	*A	.	.	.	.	.	.	.	X	.	.	.	.	0
2508	XA	*	*	*	.	.	.	X	.	.	.	.	.	*	*	.C
2514	0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0
2527	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	
2533	0	0	.	.	.	X	X	.A	X	.	X	X	.	.	0	0
2535	.	*	.	.	.	.	X	X		X	.	.	.	.C	.C	.C
2537	0	.CA	*	*	X	.	.	.	X	.	X	.	.C	*	XA	0
2546	*	*	*	.C	X	X	X	X	X	X	XA	*A	*A	*A	*	*
2548	.	.CA	.CA	.	.	.	.	X	.	.	.	.	*	.C	.CA	.
2556	0	.C	.	.	.	.	.	.	.	.	.	.	.	.C	.CA	0
2574				TD	TD	TD	TD	TD		TD	TD	TD	TD	UT		
2575	UT	.E	.	.D	.DC	.E	.	.	.	.	.E	.D	.D	.	.E	UT
2576	*	.	*	.	.	.	.	.	.	.	.	.	.	*	.	*
2577		.	.	.	.	.	.	.	.	.	X	.	.	.	.	
2583		*	*	*	*	X	X	*A	*A	X	X	X	*	*	*	*
2587	.	.C	*	.C	.	.	X	*	.	.	.	.	.C	*	*	.C
2591	.	*	*	.	.	.	.	.	.	.	.	.	.	*	.	*
2593	0	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.
2596	*A	*A	*	*A	*	*A	X	X	X	X	X	.C	*	*	*	*
2612	.	.	.C	.	.	.	.	.	.	.	.	.	.C	.CA	*	.
2614		*	*	.	*	X	X	*	*	*	X	.	.	*	*	*
2616	0	.	.	.	.	.	.	.	X	.	.	.	.	.	.	0
2617		.	.	.	.	.	.	X	.	X	.	.	.	.	T	T
2620	0	.	.	.	.	.	.	.	X	.	.	.	.	.	.	0
2622	*	*	*	.	XA	X	X	*	*	X	X	X	.	*	*	X
2624	.	.	.	.	.	.	X	X	.	.	.	.	.	.	.	.
2626	.	.	.	X	X	X	.	.	.	X	.	X	.	.	.	X
2628	*	*	*	*	XA	XA	XA	T	T	X	*	*	*	*	*	*
2631	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.C
2636	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2638			.	.	.	.	.	.	.	.	.	.	*	.A	.	
2640	.	.	.CA	.	X	.	.	.	.	.	*	.	*	*	.	.
2642	*	*A	.	.	.	.	.	*	.	.	.	.	.	.A	.	0
2650	0	.C	*	X	.	.	.	.	X	.	X	.C	.C	.	.	0
2654	*	*	*A	.C	X	XA	.C	X	.	.AC	.CA	XA	*	*	.C	*
2658	0	.	*	XA	.	X	X	*	*	X	X	.	.	*	.	0
3054	0	.A	*	*	.	.	.	.	.	.	.	.	*	*	*	
3091	*	*	*	*	.	.	.	X	.	.	.	.	.	*	*	*
3095	.	.	.	.	.	.	X	X	.	X	.	.	.	.	.	.
3101		.U	.	.D	.	.	.	.	.	.	.	.	.U	.	.U	
3105	.	.	.C	.	.	.	.	.	.	.	.	.	.C	.	.	.
3107	.C	*	*	.	.	.	X	X	X	X	.	.	*	*	*	.
3109	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3126	.C	.	.			X	.	.	.	.	.	.	.	.		
3131		*	.	.C	.	.	.	X	.	.	XA	X	*	*	*	
3133			*	*	.	X	X	X	X	X	.	.	.	X	.	0

Key: .=tooth present in socket X=tooth lost post-mortem
0=congenital absence of tooth T=socket missing or damaged but loose tooth present *=tooth lost ante-mortem A=alveolar abscess D=deciduous tooth C=carious tooth Blank space denotes missing data: both tooth and socket missing.

CRANIAL MEASUREMENTS

SKEL	SEX	BOL	XCB	BBH	BNL	XFB	ZMB	ZYB	FMB	PAC	OCC	MDH	FRC	ASB	NLB	OBB	OBH	FOL
0740	M	175.0	147.0	131.0	103.0	120.0	94.0	137.0	98.5	112.1	93.7	30.6	112.6	112.3	11.7	39.0	32.0	30.0
0938	M	193.0	149.0	131.0	103.0	131.0	-	-	108.0	121.9	91.0	32.9	114.3	116.5	13.1	41.9	37.0	40.8
0940	M	180.0	-	133.0	107.0	117.0	92.6	131.2	103.7	102.4	104.4	30.0	105.5	117.5	8.4	44.8	34.7	39.0
0943	M	185.0	136.0	136.0	101.0	121.0	-	-	-	112.2	99.4	28.3	107.4	111.3	8.2	41.5	32.2	38.1
0950	M	-	-	-	-	-	-	-	-	-	-	30.4	-	-	-	-	-	-
0953	M	-	-	-	-	114.0	-	-	-	-	-	34.3	106.2	-	-	-	-	-
0954	M	180.0	140.0	-	-	116.0	-	128.4	92.3	107.3	95.0	22.2	107.7	106.9	7.9	-	-	-
0962	F	-	-	-	-	-	-	-	99.4	-	-	29.5	-	-	-	-	-	-
0984	M	-	-	-	-	129.0	-	-	95.3	-	96.1	30.3	108.5	-	-	-	-	-
0985	M	-	-	-	-	118.0	-	-	95.5	-	95.0	-	111.8	-	-	-	-	37.0
0990	M	-	-	-	-	-	-	-	-	118.7	92.6	-	-	-	-	-	-	-
0992	M	-	-	-	-	-	-	-	-	-	-	27.3	-	-	-	-	-	-
1012	M	185.0	151.0	137.0	108.0	121.0	95.0	134.4	99.0	108.0	102.0	29.6	114.0	118.0	11.2	40.7	34.7	37.0
1068	M	191.0	-	-	-	127.0	-	-	-	109.8	-	34.9	112.6	106.3	-	-	-	-
1340	F	-	-	-	-	-	-	-	-	113.0	-	28.5	-	-	-	-	-	-
1376	F	-	-	-	-	-	-	-	-	-	-	30.6	-	-	-	-	-	-
1415	M	-	-	-	-	134.0	-	-	101.7	-	-	31.1	111.6	-	-	-	-	-
1416	M	-	148.0	-	-	124.0	-	-	-	110.7	95.0	-	-	119.9	-	-	-	-
1417	M	182.0	137.0	133.0	101.0	115.0	96.0	128.6	96.2	116.2	90.0	32.4	103.9	102.5	7.3	40.3	33.7	37.4
1418	M	177.0	154.0	134.0	103.0	126.0	83.9	-	100.0	110.8	96.2	30.0	106.8	120.6	11.3	42.0	32.4	35.9
1426	M	-	-	-	-	-	-	-	107.4	112.3	85.4	-	-	105.0	-	-	-	-
1451	F	181.0	149.0	126.0	97.1	122.0	-	-	99.3	120.0	92.7	27.8	103.7	106.8	-	-	-	36.3
1455	M	-	-	-	-	-	-	-	-	119.0	98.6	28.8	-	-	-	-	-	-
1457	F	174.0	-	125.0	95.0	128.0	83.4	-	96.7	112.3	83.8	29.8	112.2	106.0	8.8	40.3	36.2	-
1459	M	-	-	-	-	138.0	-	-	-	-	-	33.6	121.0	126.0	11.0	-	-	-
1464	M	-	-	-	-	-	-	-	103.6	-	-	31.0	-	-	-	-	-	-
1469	M?	-	-	-	-	-	-	-	-	117.4	86.7	31.8	110.8	-	9.4	-	-	-
1471	M	-	-	-	-	118.0	-	-	103.6	110.0	92.0	-	107.7	-	20.7	-	-	-
1472	M	195.0	144.0	144.0	109.0	123.0	87.6	130.5	99.0	126.0	100.5	29.0	117.7	112.6	11.4	40.2	32.3	38.5
1483	M	-	-	-	-	-	-	-	-	-	-	34.5	-	-	-	-	-	-
1492	M	190.0	145.0	-	-	120.0	-	-	-	118.9	106.8	-	111.4	116.0	14.5	-	-	-
1494	M	-	-	-	-	-	-	-	89.4	-	-	-	111.0	-	-	-	-	-
1495	M	196.0	145.0	-	-	126.0	98.9	137.7	105.2	120.0	108.0	24.1	118.5	115.2	4.8	43.1	31.9	-
1497	M	-	143.0	-	-	-	-	-	-	108.4	92.0	-	-	-	-	-	-	-
1738	F	184.0	149.0	-	-	124.0	-	-	95.6	113.3	-	-	108.4	115.5	-	-	-	-
1746	F	177.0	134.0	-	-	118.0	85.0	126.4	98.5	101.8	-	31.0	113.0	106.2	8.5	43.2	32.7	-
1749	M	-	-	-	-	-	-	-	-	-	95.0	31.8	106.6	-	-	-	-	-
1750	M	197.0	150.0	-	-	118.0	-	-	-	114.6	101.0	27.5	120.2	114.8	-	-	-	-
1751	M	-	-	-	-	-	-	-	-	-	-	32.0	-	-	-	-	-	-
1754	F	-	-	-	-	-	-	-	-	112.3	-	29.3	-	-	-	-	-	-
1757	M	182.0	143.0	-	-	123.0	-	-	98.0	-	-	29.8	115.2	-	-	-	-	-
1762	M	190.0	147.0	139.0	108.0	116.0	100.0	144.0	104.0	108.0	96.0	33.6	119.0	113.0	12.8	40.8	34.4	34.5
1764	M	-	-	-	-	125.0	-	-	-	106.6	-	32.3	116.2	-	-	-	-	-
1780	M	-	-	-	-	-	-	-	-	111.6	103.2	34.8	113.6	116.3	-	-	-	-
1782	M	-	-	-	-	-	-	-	-	-	-	34.8	-	-	10.3	-	-	-
1784	M	194.0	-	-	-	124.0	-	-	100.8	105.5	-	-	116.4	119.7	-	-	-	-
1786	M	-	-	-	-	-	-	-	-	-	-	31.5	-	-	-	-	-	-
1789	M	-	-	-	-	-	-	-	-	-	-	31.6	-	-	-	-	-	-
1795	F	-	-	-	-	-	-	-	-	-	-	31.3	-	-	-	-	-	-
1797	F	170.0	-	-	-	-	118.0	-	89.9	101.3	89.8	-	108.8	109.7	-	38.2	34.6	-
1799	M	-	-	-	-	123.0	98.0	-	98.6	114.6	-	27.9	118.0	-	9.6	40.8	35.0	-
1816	M	-	-	-	-	-	-	-	-	117.0	-	34.4	114.0	-	-	-	-	-

SKEL	SEX	GOL	XCB	BBH	BNL	XFB	ZMB	ZYB	FMB	PAC	OCC	MDH	FRC	ASB	MNB	OBB	OBH	FOL
1830	F	-	-	-	-	-	-	-	103.4	-	-	29.0	110.2	103.0	-	-	-	-
1834	M	183.0	-	-	-	130.0	-	-	107.0	117.0	-	24.0	105.0	-	-	-	-	-
1841	F?	-	-	-	-	-	-	-	-	-	-	31.2	-	-	-	-	-	-
1846	F	-	-	-	-	-	-	-	-	-	101.2	28.9	-	-	8.9	-	-	-
1855	M	-	-	-	-	116.0	97.0	-	99.0	-	-	32.0	114.0	-	-	-	-	-
1872	M	-	-	-	-	-	-	-	-	-	97.8	29.0	-	-	-	-	-	-
1874	F?	199.0	125.0	-	-	111.0	-	-	95.6	114.8	98.8	31.4	108.4	-	13.6	-	-	-
1882	M	170.0	151.0	133.0	96.0	132.0	-	-	-	110.0	96.6	29.9	113.0	111.0	-	-	-	35.6
1902	M	-	-	-	-	-	-	-	-	110.5	-	30.0	-	-	-	-	-	-
1903	M	-	-	-	-	-	-	-	101.4	-	-	34.0	-	-	-	-	-	-
1904	M	183.0	-	-	-	117.0	-	-	96.8	112.8	104.2	28.7	104.3	115.3	-	-	-	-
1906	M	-	-	-	-	-	-	-	-	-	-	30.6	-	-	8.8	-	-	-
1908	M	187.0	-	-	-	117.0	-	-	91.0	101.0	97.0	32.1	-	111.0	-	-	-	-
1914	M	190.0	154.0	145.0	106.0	133.0	-	-	98.8	117.8	108.3	30.0	-	120.5	-	-	-	35.8
1919	M	178.0	-	131.0	100.8	116.0	-	-	105.4	108.8	95.1	30.7	111.5	116.5	-	-	-	36.0
1921	M	-	-	-	-	-	-	-	-	-	-	30.7	-	-	-	-	-	-
1932	F?	-	-	-	-	-	-	-	-	-	-	24.0	-	-	-	-	-	-
1945	F	-	-	-	-	-	-	-	-	-	-	28.1	-	-	-	-	-	-
1952	F	-	-	-	-	119.0	-	-	105.5	-	-	23.6	-	-	-	-	-	-
1953	M	-	-	-	-	-	-	-	97.8	-	-	34.2	110.5	-	-	-	-	-
1955	M	-	-	-	-	-	-	-	-	-	-	-	-	112.0	-	-	-	-
1962	M	186.0	-	-	-	125.0	100.5	-	101.0	101.0	104.0	34.3	110.0	110.0	9.4	40.0	34.6	-
1965	F	-	131.0	-	-	114.0	-	-	-	119.0	89.0	31.0	-	108.0	-	-	-	38.5
1967	F	-	-	-	-	-	93.8	-	-	-	-	28.1	-	-	-	-	-	-
1978	M	-	-	-	-	-	-	-	-	-	-	35.3	112.6	-	-	-	-	-
1980	M	-	-	-	-	-	-	-	-	-	-	26.3	-	-	-	-	-	-
1983	M	-	-	-	-	-	-	-	-	-	-	35.7	-	-	-	-	-	-
1985	M	-	-	-	-	-	91.5	-	-	-	-	29.4	110.1	-	-	-	-	41.0
1987	F	-	-	-	-	126.0	-	-	96.7	-	-	30.5	-	-	9.7	-	-	-
1989	M	-	-	-	-	-	-	-	-	-	-	-	116.0	-	11.1	41.4	35.3	-
1994	M	-	-	-	-	-	-	-	101.7	-	-	25.4	104.2	-	8.7	-	-	-
1996	M	-	-	-	-	-	-	-	-	-	-	-	108.3	-	-	-	-	-
2005	M	-	-	-	-	-	-	-	-	-	97.9	31.8	-	-	-	-	-	-
2307	F	-	140.0	133.0	-	118.0	-	-	-	106.8	92.2	27.8	-	112.3	-	-	-	35.1
2316	F	178.0	131.0	130.0	102.0	106.0	89.0	-	91.3	108.4	94.8	26.7	106.4	104.6	10.1	39.9	33.8	36.0
2318	M	-	-	-	-	-	-	-	-	-	-	25.1	-	-	-	-	-	-
2320	F	180.0	-	-	-	117.0	-	-	-	108.3	88.7	-	110.0	-	-	-	-	-
2326	M	-	-	-	-	123.0	98.7	-	101.2	-	95.9	30.4	113.8	-	8.6	39.3	32.4	-
2327	F	-	-	-	-	-	-	-	-	111.0	-	-	-	110.0	-	-	-	-
2331	M	-	-	-	-	-	-	-	-	111.4	98.6	32.9	113.3	114.0	-	-	-	-
2333	F	-	-	-	-	-	-	-	97.1	-	-	27.3	104.8	-	-	-	-	-
2336	F	-	-	-	-	-	-	-	-	-	-	29.8	-	-	-	-	-	-
2343	M?	-	-	-	-	-	-	-	91.5	-	-	-	115.2	-	-	-	-	-
2348	F	-	-	-	-	-	-	-	-	-	-	29.9	-	-	-	-	-	-
2349	M	-	-	-	-	128.0	-	-	-	-	-	29.3	113.6	-	-	-	-	-
2373	M	-	153.0	-	-	-	122.0	-	95.3	118.3	-	30.0	118.7	-	-	-	-	-
2384	M	-	149.0	-	-	-	-	-	97.1	-	-	-	116.7	117.4	-	-	-	-
2386	F	-	-	-	-	-	-	-	-	-	-	26.8	-	-	-	-	-	-
2396	M	180.0	144.0	133.0	99.0	118.0	-	-	99.4	109.0	98.6	29.8	108.5	115.0	-	-	-	40.6
2397	F?	-	-	-	-	121.0	-	-	95.7	-	-	29.4	110.0	-	-	-	-	-
2400	M	-	-	-	-	127.0	-	-	100.1	-	96.0	-	107.2	-	9.5	-	-	-
2405	M	-	-	-	-	-	-	-	-	-	-	34.0	118.0	-	-	-	-	-
2407	M	191.0	144.0	132.0	108.0	131.0	-	-	100.2	122.8	92.8	26.8	110.6	108.3	10.8	-	-	36.3
2411	F	-	-	-	-	-	-	-	-	-	-	28.5	-	-	-	-	-	-
2418	F	181.0	147.0	-	-	119.0	-	-	-	111.6	100.6	31.1	-	-	-	-	-	-

SKEL	SEX	GOL	XCB	BBH	BNL	XFB	ZMB	ZYB	FMB	PAC	OCC	MDH	FRC	ASB	MNB	OBB	OBH	FOL
2432	M	-	-	-	-	-	-	-	-	109.4	-	26.6	-	109.7	-	-	-	-
2439	F?	173.0	146.0	135.0	93.0	123.0	82.4	-	93.8	109.2	96.7	31.6	114.4	115.7	9.4	39.1	35.8	37.1
2448B	M	187.0	136.0	-	-	126.0	-	-	107.1	117.8	-	31.3	111.6	110.2	-	-	-	-
2449	F	-	-	-	-	-	-	-	-	103.6	-	-	-	-	-	-	-	-
2451	M	-	-	-	-	-	-	-	109.6	-	92.5	31.3	108.4	120.5	-	-	-	-
2452	F	182.0	147.0	-	-	121.0	-	-	99.4	107.0	100.8	32.2	112.2	114.4	-	-	-	-
2457	F	-	-	-	-	-	-	-	-	-	-	28.6	-	-	-	-	-	-
2458	M	-	-	-	-	-	-	-	-	-	-	33.2	-	-	-	-	-	-
2459	M	-	-	-	-	-	-	-	-	111.5	-	25.3	-	-	-	-	-	-
2461	M	-	-	-	-	-	-	-	103.0	-	89.6	32.0	111.6	-	-	-	-	-
2462	F	-	-	-	-	118.0	-	-	98.4	-	-	24.4	111.5	-	8.0	-	-	-
2466	M	-	-	-	-	-	-	-	-	128.5	96.5	32.1	-	119.6	-	-	-	-
2474	M	180.0	144.0	-	-	128.0	-	-	98.5	111.4	96.3	28.8	108.7	112.8	-	-	-	-
2476	M	-	-	-	-	-	-	-	-	-	-	30.4	-	-	-	-	-	-
2478	M	183.0	159.0	131.0	99.0	136.0	92.6	131.3	105.5	115.9	88.5	32.4	116.4	117.3	10.8	43.8	35.4	35.6
2480	M	-	-	-	-	-	-	-	-	-	-	32.1	-	-	-	-	-	-
2482	M	182.0	131.0	-	-	115.0	-	-	99.8	112.5	97.9	29.1	108.0	108.8	-	-	-	-
2489	M?	-	-	-	-	125.0	-	-	103.2	-	-	31.4	110.7	-	-	-	-	-
2491	M	-	-	-	-	-	-	-	-	-	103.0	28.2	-	-	-	-	-	-
2492	F	173.0	-	120.0	98.7	116.0	-	-	89.2	-	-	19.6	106.5	-	-	-	-	-
2494	M	194.0	-	-	-	115.0	-	-	-	111.9	-	32.9	110.0	-	-	-	-	-
2501	M	-	-	-	-	-	-	-	-	-	-	30.0	113.0	-	-	-	-	-
2504	F	-	-	-	-	-	-	-	102.4	-	-	30.0	-	-	-	-	-	-
2506	F	-	-	-	-	-	-	-	-	-	-	26.3	-	-	-	-	-	-
2508	M	179.0	156.0	-	-	128.0	-	-	99.8	107.9	98.0	31.7	109.0	124.3	-	-	-	-
2511	U	-	148.0	-	-	125.0	-	-	-	-	-	-	-	114.6	-	-	-	-
2514	F	-	-	-	-	-	-	-	97.5	105.7	96.5	-	103.8	-	-	-	-	-
2527	F	-	-	-	-	-	-	-	98.5	-	-	-	113.3	-	10.5	42.3	32.9	-
2533	F	178.0	138.0	-	-	112.0	87.2	-	96.3	116.0	-	27.2	110.6	108.5	-	-	-	-
2535	M	-	-	-	-	-	-	-	95.2	-	-	29.8	108.2	-	7.7	37.8	30.8	-
2537	F	-	-	-	-	-	-	-	-	109.2	-	-	-	-	-	-	-	-
2546	M	180.0	154.0	-	-	120.0	-	-	95.0	104.0	-	31.4	110.8	116.2	-	-	-	-
2548	M?	-	-	-	-	-	-	-	-	112.1	99.3	26.7	-	-	-	-	-	-
2556	F	170.0	131.0	126.0	97.0	114.0	86.8	114.0	90.0	100.1	98.2	30.0	104.2	99.0	6.4	38.0	33.8	36.0
2576	M	185.0	152.0	-	-	129.0	-	-	107.0	119.7	98.2	31.3	107.8	113.5	-	-	-	-
2583	M	-	-	-	-	-	-	-	-	-	-	34.7	-	115.0	-	-	-	-
2587	M	191.0	131.0	127.0	105.0	112.0	-	-	99.9	115.8	96.2	27.6	109.2	114.6	-	-	-	38.1
2591	M	198.0	147.0	-	-	127.0	-	-	102.0	121.0	102.6	30.8	115.0	115.7	9.7	-	-	-
2593	M	-	-	-	-	119.0	-	-	95.8	114.3	99.5	27.1	108.6	99.8	-	-	-	-
2596	F	-	-	-	-	-	-	-	-	108.5	-	26.0	-	-	-	-	-	-
2612	F	185.0	134.0	131.0	99.0	118.0	-	-	94.6	119.9	96.5	27.4	112.2	108.2	9.7	41.2	32.9	36.6
2616	F	168.0	146.0	128.0	91.0	118.0	94.3	128.8	92.5	108.2	-	28.5	113.6	108.6	4.6	39.7	32.6	-
2617	M	-	-	-	-	-	-	-	94.8	-	-	-	115.7	-	-	-	-	-
2620	M	-	-	-	-	-	-	-	102.0	102.0	-	35.8	107.0	-	-	-	-	-
2622	M	181.0	135.0	141.0	110.0	119.0	-	-	107.4	114.5	93.6	-	114.4	112.0	12.1	-	-	33.4
2624	M	176.0	144.0	-	-	120.0	-	-	96.0	114.0	-	30.5	103.0	110.8	-	-	-	-
2628	F	177.0	151.0	-	-	134.0	-	-	102.3	109.3	96.5	30.8	118.2	112.2	-	-	-	-
2636	M	188.0	148.0	135.0	102.0	126.0	-	-	97.6	117.5	100.3	27.4	109.6	114.8	-	-	-	39.4
2638	F	-	-	-	-	-	-	-	100.1	-	-	28.2	-	-	-	-	-	-
2640	M	169.0	-	-	-	121.0	-	-	97.8	99.7	98.4	28.0	105.8	103.9	7.9	-	-	-
2642	M	171.0	141.0	-	-	118.0	-	-	97.3	97.2	105.4	24.0	105.0	112.8	-	-	-	-
2650	M	-	145.0	-	-	134.0	-	-	102.2	114.0	-	33.6	-	-	-	-	-	-
2654	M	186.0	139.0	130.0	106.0	121.0	100.3	-	107.6	107.6	91.4	29.5	112.0	106.6	9.0	43.2	35.4	48.2
2658	F	-	-	-	-	-	-	-	-	108.0	102.5	25.4	-	-	8.6	-	-	-
3054	F	179.0	136.0	135.0	98.0	120.0	96.4	130.0	104.8	103.3	98.3	24.0	108.5	109.7	7.0	39.4	35.2	39.8

SKEL	SEX	GOL	XCB	BBH	BNL	XFB	ZMB	ZYB	FMB	PAC	OCC	MDH	FRC	ASB	MNB	OBB	OBH	FOL
3091	M?	166.0	-	-	-	120.0	-	-	-	98.9	95.8	-	107.0	111.7	-	-	-	-
3095	M	-	153.0	137.0	-	-	-	-	-	113.2	102.8	28.8	-	122.4	-	-	-	40.3
3105	M	-	-	-	-	-	-	-	100.4	-	-	-	-	-	-	-	-	-
3107	M	196.0	151.0	-	-	130.0	-	-	102.3	123.5	-	30.6	117.4	127.3	-	-	-	-
3109	M	179.0	-	-	-	132.0	-	-	97.6	106.1	89.0	29.2	109.8	-	6.2	-	-	-
3131	M?	186.0	-	-	-	121.0	-	-	100.0	111.0	-	-	110.0	-	9.1	-	-	-

Key: the symbols are those of Howells (1973). Measurements were only taken on adult skulls.

LONGBONE LENGTHS

SKEL	SEX	LFeL1	RFeL1	LTiL1	RTiL1	LFiL1	RFiL1	LHuL1	RHuL1	LRaL1	RRaL1	LUlL1	RUlL1	LClL1	RClL1
0740	M	428	425	351	355	344	-	310	311	-	239	-	261	145	-
0750	J	-	358*	273*	278*	-	-	-	-	-	-	-	-	-	-
0775	?M	414*	415*	329*	335*	-	-	-	-	-	217*	230*	-	-	-
0780	?M	377*	375*	-	303*	-	-	274*	-	-	-	223*	226*	-	-
0938	M	452	463	381	384	381	379	334	338	260	259	-	283	162	166
0940	M	471	471	-	-	-	-	318	323	230	234	242	249	-	-
0943	M	475	-	-	-	-	-	-	339	-	-	274	-	-	160
0950	M	-	-	-	-	364	-	-	-	-	-	-	-	144	-
0953	M	-	-	-	353	-	-	-	-	-	-	-	-	-	-
0954	M	440	440	354	358	-	357	332	332	232	234	254	256	132	135
0956	F	395	397	339	342	-	-	-	-	-	-	-	-	-	-
0974	M	492	495	393	392	-	-	-	360	263	266	-	-	161	-
0984	M	452	445	357	363	-	-	322	325	238	238	256	256	150	156
0985	M	-	-	-	363	-	-	-	-	-	-	-	-	-	-
0989	J	167	167	-	-	-	-	-	-	-	-	-	-	-	-
0992	M	458	458	368	363	360	355	322	321	238	-	261	264	137	129
1012	M	456	457	365	360	-	-	327	336	-	244	256	-	142	139
1305	F?	-	-	340	-	-	-	-	-	-	-	-	-	-	-
1314	J	62*	62*	55*	55*	52*	52*	56*	56*	56*	-	52*	52*	-	-
1321	J	79*	78*	68*	68*	-	66*	-	-	-	-	-	-	-	-
1323	J	69*	69*	61*	61*	58*	58*	60*	60*	48*	47*	54*	54*	43*	43*
1333	M	465	461	359	355	350	-	-	-	-	-	-	-	-	-
1340	F	432	428	347	345	335	335	293	296	-	218	232	232	-	119
1361	M	-	-	365	367	-	361	331	-	-	-	-	-	-	-
1376	F	438	432	360	356	-	-	295	302	-	-	-	-	-	-
1391	M	452	453	343	342	339	339	-	-	-	238	250	-	-	-
1415	M	-	-	-	-	-	-	-	315	-	-	-	-	-	-
1417	M	424	420	-	-	-	-	311	314	-	-	-	-	-	-
1418	M	-	-	359	-	-	-	315	-	-	-	-	-	-	-
1455	M	441*	-	-	-	-	-	-	-	-	-	-	-	-	-
1457	F	415	409	334	332	-	-	277	282	212	215	229	-	-	125
1459	M	467	465	364	359	360	353	-	348	250	-	-	-	147	147
1464	M	494	496	384	382	-	-	345	345	251	252	270	271	154	158
1469	M?	-	432	356	350	-	337	-	312	-	240	-	-	-	-
1471	M	-	-	389	-	-	-	-	-	-	-	-	-	-	-
1472	M	468	467	371	367	364	362	343	351	260	-	281	-	152	144
1483	M	468	474	-	372	-	-	-	347	-	-	279	271	157	159
1492	M	-	-	-	361	-	-	-	-	-	-	-	-	-	-
1494	M	-	468	-	-	-	-	-	-	-	-	-	-	-	-
1495	M	464	-	380	-	-	-	336	345	248	250	269	271	-	136
1730	M	491	491	410	411	401	-	344	342	264	-	286	-	-	134
1738	F	431	433	339	337	-	-	289	290	-	-	227	230	-	-

SKEL	SEX	LFeL1	RFeL1	LTiL1	RTiL1	LFiL1	RFiL1	LHuL1	RHuL1	LRaL1	RRaL1	LUlL1	RUlL1	LClL1	RClL1
1740	M	516	511	429	430	418	-	355	353	267	-	290	-	-	-
1746	F	408	410	322	318	-	316	285	290	211	214	227	230	134	131
1749	M	-	-	402	405	-	-	354	357	-	255	-	275	-	-
1750	M	456	-	359	-	-	-	318	319	-	-	252	-	155	160
1751	M	435	435	344	342	-	-	-	312	-	-	-	-	134	-
1754	F	-	-	-	-	-	-	-	-	-	-	-	-	139	-
1757	M	-	433	-	370	-	-	-	323	-	241	-	-	139	-
1762	M	487	490	406	404	-	-	348	348	253	260	277	284	150	149
1764	M	444	439	351	354	-	-	318	321	242	-	264	-	144	142
1779	F	-	422	-	340	-	-	-	-	-	-	-	-	-	-
1780	M	484	480	373	369	370	-	348	-	253	-	271	-	-	-
1782	M	-	448	351	351	-	-	-	328	-	-	-	270	-	167
1786	M	469	-	348	344	354	-	-	-	-	-	261	258	-	-
1789	M	480	479	367	367	-	-	-	-	-	-	-	-	-	-
1795	F	451	-	359	-	-	342	307	-	236	239	-	257	-	146
1797	F	-	-	-	-	-	-	-	-	-	-	-	-	-	123
1799	M	458	-	375	375	367	-	330	337	250	246	270	268	-	-
1813	J	153*	153*	123*	122*	-	-	116*	117*	88*	-	-	-	-	-
1816	M	506	-	400	-	-	-	350	358	260	260	277	278	-	-
1819	J	-	-	-	-	-	-	227*	230*	161*	164*	179*	182*	-	-
1827	M	-	-	-	-	354	-	-	-	-	-	-	-	157	145
1830	F	472	470	399	-	-	-	341	341	-	256	-	272	-	-
1834	M	458	-	356	362	347	-	313	312	229	228	255	254	-	-
1837	J	247*	246*	-	-	199*	-	177*	181*	132*	-	-	-	86*	-
1841	F?	453	447	380	383	-	-	312	316	242	246	252	256	142	139
1846	F	438	438	342	339	-	-	320	328	222	226	240	-	-	138
1855	M	-	-	375	383	-	-	-	-	260	261	280	279	-	-
1872	M	-	-	-	-	382	-	345	-	-	-	-	268	-	-
1873	U	-	-	-	-	-	-	-	326	-	244	-	262	-	-
1874	F?	437	434	357	352	-	-	316	322	227	-	249	-	-	138
1882	M	463	464	358	360	354	-	330	337	247	252	263	261	154	151
1890	F	416	415	342	345	-	337	-	-	-	-	-	-	-	-
1892	M	-	505	-	413	-	-	-	-	286	287	-	306	169	-
1902	M	459	-	377	-	-	-	-	323	258	257	-	278	145	145
1903	M	454	450	-	360	-	355	331	336	231	234	251	256	149	148
1904	M	-	451	365	362	-	356	339	-	242	-	-	-	-	153
1906	M	460	465	380	383	368	373	330	330	242	246	261	268	-	-
1908	M	471	471	364	361	-	350	350	352	240	236	-	254	-	155
1914	M	491	484	389	-	-	-	351	357	-	275	291	294	-	-
1917	F	-	413	-	335	-	-	298	-	214	-	232	-	-	134
1919	M	436	-	359	-	-	-	296	-	-	222	-	246	-	-
1921	M	479	-	-	385	-	-	-	-	-	-	-	-	-	-
1923	-M	421*	-	-	-	-	-	-	-	-	212*	-	-	-	-
1925	F	414	416	327	330	314	-	-	-	-	-	231	-	-	-
1927	F	420	414	344	346	-	334	296	299	224	-	243	-	138	135
1932	F?	424	422	339	-	-	-	-	-	226	-	258	-	-	-
1933	M	488	-	407	403	-	-	352	-	-	-	-	-	-	-
1935	M	474	472	389	-	384	-	-	-	-	252	-	280	-	-
1937	F	439	441	334	336	-	-	324	332	220	221	-	235	-	126
1942	F	440	441	342	340	339	-	321	-	231	-	-	-	141	-
1944	M	451	-	366	365	-	-	305	-	236	-	257	264	-	-
1945	F	433	-	327	327	322	320	-	-	-	-	-	-	130*	126*
1952	F	-	-	-	-	-	-	305	306	-	-	-	-	-	-
1953	M	-	-	-	394	-	-	-	336	-	251	-	261	-	-
1954	U	-	475	358	366	-	-	-	-	-	-	-	-	-	-

SKEL	SEX	LFeL1	RFeL1	LTiL1	RTiL1	LFiL1	RFiL1	LHuL1	RHuL1	LRaL1	RRaL1	LUlL1	RUlL1	LClL1	RClL1
1955	M	-	473	386	-	-	-	-	-	-	-	-	-	-	-
1962	M	509	512	379	377	-	378	355	-	265	265	288	-	162	161
1965	F	-	417	338	-	-	-	-	304	208	-	-	-	-	-
1967	F	441	444	349	348	-	344	311	-	-	233	246	252	144	139
1978	M	501	494	410	406	404	402	346	348	269	270	-	-	153	159
1980	M	465	468	-	-	-	-	-	-	-	260	-	275	157	153
1983	M	-	-	-	-	-	-	-	337	-	-	-	-	-	-
1985	M	482	484	376	374	-	-	347	352	242	248	268	-	-	158
1987	F	411	414	317	312	-	312	-	-	-	-	236	235	-	-
1989	M	492	490	390	393	-	-	338	342	258	-	280	-	-	-
1992	M	471	-	360	362	-	-	331	332	-	243	-	260	146	149
1994	M	484	479	384	379	-	363	-	327	-	244	259	269	-	-
1996	M	452	-	368	371	-	-	320	-	233	236	253	256	155	-
1999	M	512	507	400	400	-	-	-	346	-	264	278	-	-	-
2005	M	-	467	-	-	-	-	-	-	-	-	-	272	161	155
2049	J	53*	53*	47*	47*	45*	45*	-	49*	41*	42*	-	-	35*	34*
2301	M	-	-	356	355	-	-	-	319	-	-	-	-	-	-
2306	M	459	-	383	-	-	-	-	-	-	-	269	-	-	-
2313	M	-	425	-	339	-	-	-	-	-	-	-	-	-	-
2316	F	442	444	342	342	-	338	315	318	231	-	250	254	-	-
2318	M	-	-	-	-	-	-	344	344	-	-	-	274	-	-
2326	M	450	449	367	360	-	-	-	332	252	250	271	272	-	153
2327	F	-	483	378	378	-	-	-	-	-	-	-	-	-	-
2331	M	462	464	380	383	371	379	325	328	246	253	262	268	150	150
2332	M	510	-	-	-	-	-	355	350	-	-	-	-	-	-
2333	F	404	406	312	-	-	-	-	-	-	-	-	-	-	-
2336	F	-	-	-	-	-	-	-	-	228	-	-	-	-	-
2343	M?	-	-	383	-	-	-	-	-	-	-	-	-	-	-
2348	F	476	475	-	-	-	-	-	355	-	244	-	-	-	-
2349	M	450	445	380	377	-	-	318	326	243	241	271	-	-	124
2373	M	467	466	364	364	-	-	320	-	242	247	-	269	144	144
2386	F	-	-	-	-	-	-	-	310	223	-	244	-	-	-
2388	U	-	-	-	-	-	-	-	-	-	257	-	276	-	-
2389	U	-	-	-	-	-	-	-	-	-	238	-	262	-	-
2391	M	466	469	-	-	-	-	319	-	247	243	264	262	-	-
2396	M	504	502	410	410	-	-	-	361	260	266	282	288	150	147
2397	F?	440	439	357	358	352	-	-	-	229	232	-	252	-	-
2400	M	-	474	360	359	-	-	-	340	-	-	-	-	-	-
2405	M	461	457	385	397	-	-	343	-	261	-	-	-	-	-
2407	M	466	463	378	374	-	374	332	331	-	255	279	-	-	-
2411	F	-	415	310	313	-	-	297	305	-	213	-	232	-	-
2418	F	-	-	-	-	-	-	-	-	-	-	-	236	134	-
2432	M	-	-	-	-	-	-	327	-	-	-	-	-	-	-
2436	M	-	-	-	391	-	-	-	-	-	-	-	-	-	-
2439	F?	-	488	402	-	-	-	-	-	-	-	-	-	161	159
2448A	M	471	467	368	373	364	-	341	344	245	-	-	269	-	-
2448B	M	480	-	363	362	-	366	339	348	-	256	283	278	-	-
2449	F	-	-	-	346	-	-	-	-	-	-	-	-	-	-
2451	M	462	464	371	373	364	366	342	346	262	-	282	278	-	-
2452	F	-	-	-	322	-	-	-	-	216	-	-	239	134	-
2457	F	427	428	338	342	-	-	294	298	-	-	-	254	-	-
2458	M	-	-	380	375	-	-	335	-	-	-	263	262	-	-
2459	M	452	450	359	360	352	-	322	326	234	239	248	253	134	136
2461	M	457	450	361	355	-	-	316	315	243	243	262	262	-	-
2462	F	455	456	370	370	365	-	326	327	241	-	-	-	152	152

SKEL	SEX	LFeL1	RFeL1	LTiL1	RTiL1	LFiL1	RFiL1	LHuL1	RHuL1	LRaL1	RRaL1	LUlL1	RUlL1	LClL1	RClL1
2466	M	-	-	-	387	-	-	-	-	-	-	-	-	-	-
2473	J	183*	-	-	-	-	-	-	-	-	-	-	-	-	-
2474	M	-	-	-	-	-	-	-	-	-	-	265	269	-	-
2476	M	461	461	366	-	-	-	325	-	243	-	-	270	-	-
2478	M	473	468	376	377	-	361	-	-	-	-	-	-	-	-
2480	M	-	447	348	351	-	-	314	-	-	237	-	-	-	-
2482	M	-	-	-	-	-	-	-	-	230	-	-	-	-	-
2489	M?	461	465	373	382	-	-	320	321	247	-	-	263	139	-
2492	F	414	408	327	322	-	-	277	283	204	204	224	225	127	128
2494	M	432	437	343	340	-	340	309	313	228	232	247	250	141	137
2496	M	-	-	-	345	-	-	-	-	-	237	-	-	-	-
2499	M	-	-	353	342	349	344	-	-	-	-	-	-	-	-
2504	F	-	-	-	-	-	332	-	-	-	216	-	-	-	-
2506	F	-	380	289	290	-	-	-	-	192	199	-	217	-	-
2508	M	484	485	374	371	-	367	332	337	251	256	271	-	-	175
2511	U	-	-	368	367	-	-	-	-	-	-	-	-	-	-
2514	F	438	-	329	332	-	-	-	-	-	-	-	-	-	-
2527	F	448	440	-	363	-	-	-	-	-	-	-	-	-	-
2533	F	436	429	332	323	325	-	300	305	220	220	238	238	135	136
2535	M	487	-	397	393	-	-	330	-	249	254	-	-	146	-
2537	F	422	-	-	-	-	-	-	-	-	218	236	242	-	-
2542	M	460	-	369	369	362	366	331	-	-	-	-	-	-	-
2546	M	459	460	370	368	-	352	324	327	-	-	-	261	-	-
2548	M?	-	-	-	-	-	-	-	324	231	-	253	-	-	141
2556	F	-	-	372	370	-	-	308	319	235	235	-	254	131	-
2574	J	-	-	163*	-	162*	-	154*	-	-	-	127*	-	-	-
2575	J	376*	371*	313*	-	-	-	-	-	-	-	-	-	-	-
2576	M	493	495	379	385	-	-	350	-	251	252	-	-	-	-
2577	?F	-	-	-	-	-	-	221*	-	-	-	-	187*	-	-
2583	M	490	481	374	373	-	-	350	351	250	252	272	273	155	155
2587	M	-	-	-	-	-	-	329	-	-	-	-	263	-	-
2591	M	495	496	381	386	-	-	347	348	262	263	282	285	-	-
2593	M	437	437	331	334	-	321	-	-	-	234	-	248	-	136
2596	F	410	413	337	-	-	-	-	-	215	218	231	236	132	-
2612	F	430	426	347	348	-	-	-	-	-	-	-	-	-	-
2614	F	419	425	348	344	-	-	-	-	229	230	247	-	-	-
2616	F	436	-	-	-	-	-	-	306	-	220	-	-	-	-
2620	M	466	470	380	375	-	-	316	330	-	254	271	274	-	-
2622	M	465	469	371	371	369	-	328	-	253	-	274	274	152	-
2624	M	455	451	368	362	-	-	320	327	-	242	-	262	-	-
2628	F	-	409	334	329	-	-	-	296	-	220	-	-	-	-
2631	F	431	-	339	337	342	343	-	-	-	217	-	238	-	-
2632	U	-	-	-	-	-	-	-	-	206	-	-	233	-	-
2636	M	475	-	-	-	-	-	-	-	-	-	-	-	-	-
2638	F	474	-	372	-	-	-	-	-	-	-	-	262	-	-
2640	M	477	472	-	-	-	-	340	338	251	-	-	-	-	162
2642	M	479	473	369	368	-	-	327	329	242	241	262	263	-	-
2644	M	-	-	-	-	-	-	313	317	241	-	-	-	-	-
2647	M	-	458	-	355	-	-	-	-	-	-	-	-	-	-
2650	M	-	443	-	-	-	-	-	312	-	-	257	-	-	-
2654	M	-	-	396	383	-	-	-	-	-	246	-	267	-	160
2656	M	-	-	-	-	-	-	-	-	-	261	-	289	-	-
2658	F	424	421	343	334	-	-	294	297	223	225	248	249	129	129
2663	F	-	-	-	338	-	-	-	-	-	-	-	-	-	-
2671	M	464	459	-	373	-	-	-	-	-	-	-	-	-	-

SKEL	SEX	LFeL1	RFeL1	LTiL1	RTiL1	LFiL1	RFiL1	LHuL1	RHuL1	LRaL1	RRaL1	LUlL1	RUlL1	LClL1	RClL1
3054	F	-	447	-	350	-	-	-	-	222	223	-	241	143	135
3095	M	472	475	371	368	368	367	342	343	247	249	-	272	161	161
3101	J	347*	345*	276*	277*	265*	-	241*	243*	-	170*	-	185*	106*	104*
3105	M	-	-	401	404	-	-	363	363	273	-	293	-	146	-
3107	M	475	473	386	388	384	385	341	-	237	-	260	-	160	162
3109	M	-	-	-	-	-	-	329	329	250	247	269	-	-	-
3111	?M	329*	328*	-	261*	-	-	-	-	-	-	-	-	-	-
3118	F	457	-	-	362	-	-	347	342	244	-	260	-	-	150
3126	M?	-	-	-	-	-	-	-	-	249	250	270	272	-	-

Key: the symbols are those of Brothwell (1981). * indicates unfused epiphyses - measurement for diaphysis only.

MISCELLANEOUS POST-CRANIAL MEASUREMENTS

SKEL	SEX	LHHD	RHHD	LHEW	RHEW	LFHD	RFHD	LFeD1	LFeD2	RFeD1	RFeD2	LFeE1	RFeE1	LTiD1	LTiD2	RTiD1	RTiD2
0740	M	45.8	-	60.2	64.3	-	44.7	27.3	32.0	27.6	30.4	77.6	-	33.9	25.6	34.9	26.4
0750	J	-	-	-	-	-	-	21.3	26.8	-	-	-	-	29.2	23.2	27.8	24.0
0752	U	-	-	-	-	-	48.2	-	-	-	-	-	-	-	-	33.7	22.8
0761	J	-	-	-	-	-	-	16.3	21.4	16.0	21.0	-	-	21.6	17.8	-	-
0775	?M	-	-	-	-	-	-	23.7	30.8	24.3	30.5	-	-	31.7	24.0	31.8	24.0
0780	?M	-	-	-	-	-	-	24.0	26.7	24.2	28.9	-	-	29.5	23.0	28.3	23.4
0938	M	-	-	64.9	-	-	-	30.1	37.6	29.6	34.8	85.5	86.9	37.5	27.7	37.8	26.5
0940	M	-	-	57.7	60.2	48.6	49.0	27.7	31.4	27.8	29.7	81.1	-	-	-	-	-
0943	M	49.3	49.1	-	67.2	51.8	50.0	26.6	33.6	26.6	35.2	82.6	-	-	-	-	-
0950	M	-	-	-	66.5	47.4	-	28.3	34.7	-	-	-	-	-	-	-	-
0953	M	-	-	-	-	-	-	-	-	-	-	-	-	32.6	23.6	31.6	24.4
0954	M	49.7	49.7	62.3	64.8	48.2	50.0	26.0	33.9	25.0	33.8	86.5	-	32.8	27.6	33.7	26.0
0956	F	-	-	-	-	-	-	-	-	22.7	29.6	-	-	27.8	20.6	28.7	20.4
0962	F	-	-	-	55.4	41.1	40.8	23.2	27.2	22.8	26.0	-	-	-	-	30.3	20.4
0974	M	-	53.3	-	-	51.8	53.0	29.3	39.4	29.1	39.6	86.1	87.0	36.4	26.2	36.4	26.5
0984	M	41.6	43.3	61.3	62.4	45.6	45.7	27.2	30.5	26.4	31.2	79.5	78.1	35.1	24.0	34.5	23.5
0985	M	-	-	-	-	-	-	-	-	-	-	80.6	-	33.4	23.9	-	-
0989	J	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.4	13.0
0990	M	-	52.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0992	M	44.8	45.8	65.6	-	47.4	47.5	28.8	33.0	28.6	35.4	82.1	82.2	37.5	28.6	40.2	31.4
1012	M	41.5	45.0	63.4	65.1	46.3	-	28.3	32.5	28.0	34.0	76.6	76.9	37.0	25.3	36.5	26.4
1068	M	-	-	-	-	-	46.7	30.4	34.4	-	-	-	-	-	-	39.3	27.0
1305	F?	-	-	-	-	-	-	-	-	-	-	-	-	29.3	21.5	-	-
1333	M	-	-	-	-	-	48.0	-	-	-	-	80.0	80.0	-	-	36.1	27.4
1340	F	40.3	39.0	50.3	51.7	40.3	40.2	-	-	22.1	27.6	-	72.1	26.2	21.6	26.2	22.3
1361	M	47.0	-	58.4	-	-	46.2	-	-	26.4	28.9	-	-	33.9	24.2	33.6	24.4
1376	F	41.3	43.8	-	55.2	45.1	44.3	26.0	31.4	26.4	31.4	-	-	30.1	21.0	30.3	21.8
1391	M	-	-	-	-	50.9	51.5	28.0	34.6	27.8	36.2	83.6	85.0	34.0	25.7	38.5	28.8
1415	M	-	47.6	-	-	-	47.2	-	-	-	-	-	-	37.0	24.4	34.2	23.4
1417	M	-	47.0	60.6	-	-	-	26.6	32.6	26.5	34.4	-	-	-	-	-	-
1418	M	44.2	-	-	-	-	46.6	28.3	33.1	28.0	34.7	-	-	35.4	24.8	36.0	24.8
1424	U	-	-	-	-	-	-	-	-	-	-	-	-	34.6	27.3	-	-
1426	M	-	-	-	-	42.0	-	-	-	-	-	-	-	-	-	32.0	22.2
1451	F	-	-	-	-	-	-	-	-	22.2	31.5	-	-	-	-	-	-
1455	M	-	-	-	-	50.6	-	-	-	24.6	29.0	-	-	29.7	23.9	31.4	25.2
1457	F	-	46.4	-	-	44.4	44.9	25.1	33.5	24.2	36.8	-	77.1	35.0	21.7	33.2	21.2
1459	M	-	-	-	-	-	-	26.1	35.5	-	-	82.2	-	-	-	33.8	21.9
1464	M	52.5	52.5	63.1	65.0	52.5	54.0	29.9	34.0	28.2	36.0	-	-	35.7	27.6	35.5	25.9

SKEL	SEX	LHHD	RHHD	LHEW	RHEW	LFHD	RFHD	LFeD1	LFeD2	RFeD1	RFeD2	LFeE1	RFeE1	LTiD1	LTiD2	RTiD1	RTiD2
1469	M?	43.0	44.0	-	-	-	-	-	-	-	-	79.4	79.7	30.2	27.1	-	-
1472	M	49.8	51.3	69.0	71.5	54.8	55.1	30.8	36.6	30.2	36.5	86.9	89.0	37.3	26.8	37.6	25.6
1483	M	-	46.3	59.5	58.7	47.5	-	30.8	36.8	31.3	36.4	82.2	82.2	38.8	30.3	38.4	30.0
1494	M	-	-	-	-	46.6	-	-	-	-	-	-	-	-	-	-	-
1495	M	48.7	-	-	-	49.6	-	29.1	37.4	27.6	35.7	87.2	86.8	37.4	26.0	36.8	25.4
1497	M	-	-	-	-	-	-	-	-	26.0	31.0	-	-	29.2	24.8	31.4	26.5
1730	M	49.3	-	57.6	60.6	46.6	-	30.4	30.9	30.3	30.5	83.6	82.0	34.7	27.5	33.5	27.8
1738	F	-	48.7	56.0	56.6	-	45.4	26.4	31.8	27.0	32.2	79.6	80.0	32.0	21.7	33.2	21.7
1740	M	46.7	-	63.6	-	48.4	-	32.0	32.4	33.8	32.4	84.5	84.9	43.9	29.0	41.6	28.6
1746	F	41.2	41.9	53.0	56.5	40.8	40.9	22.9	29.7	22.7	29.8	-	-	30.1	20.5	29.3	20.7
1749	M	-	49.6	64.7	67.4	-	-	-	-	-	-	-	-	39.6	28.4	-	-
1750	M	-	43.3	59.0	-	45.9	-	26.1	31.6	-	-	76.9	-	-	-	-	-
1751	M	-	49.1	-	58.9	48.4	47.8	26.3	32.0	26.2	31.1	81.0	80.5	33.2	22.9	33.0	22.0
1754	F	-	-	-	-	-	-	25.0	31.8	-	-	-	-	30.1	22.2	30.2	23.0
1757	M	47.5	47.6	-	-	48.8	49.0	25.9	36.2	26.0	35.6	-	84.2	33.8	25.1	35.4	27.0
1762	M	-	-	-	-	55.5	-	31.9	35.8	32.3	35.6	89.6	-	39.5	32.6	39.5	31.7
1764	M	47.8	-	64.2	65.6	49.2	49.9	30.0	35.3	30.2	35.1	81.2	80.6	35.7	29.3	37.0	29.9
1779	F	-	-	-	-	41.5	40.8	21.8	29.4	22.9	30.4	-	-	28.6	20.9	30.2	21.2
1780	M	45.7	47.4	59.0	-	-	50.3	28.3	32.7	29.9	31.5	82.9	-	39.1	27.1	38.2	27.0
1782	M	-	-	-	61.9	-	50.6	-	-	27.8	34.7	-	83.4	-	-	40.0	26.4
1786	M	-	-	65.6	66.4	49.7	-	29.9	34.5	31.4	36.4	80.8	-	37.8	26.0	38.0	25.0
1789	M	-	-	60.7	-	49.1	-	28.5	35.6	27.5	32.2	82.6	83.3	35.9	25.9	37.5	25.2
1795	F	42.1	-	60.5	61.2	-	44.5	24.8	34.9	-	-	76.9	78.2	33.3	23.8	35.5	23.9
1797	F	-	-	-	-	-	-	-	-	24.2	28.1	-	-	29.2	23.0	-	-
1799	M	48.8	49.7	63.5	65.7	47.7	48.8	29.4	37.8	-	-	83.6	-	37.2	22.9	36.0	24.6
1813	J	-	-	-	-	-	-	12.7	16.4	12.8	15.7	-	-	15.0	12.4	15.0	12.5
1816	M	48.4	50.3	67.0	70.2	-	-	29.5	35.5	29.5	34.8	86.9	-	38.8	27.6	36.8	28.2
1830	F	44.4	44.3	-	-	-	45.1	-	-	26.9	33.0	76.5	77.5	36.1	24.1	-	-
1834	M	45.6	-	66.2	68.2	-	-	25.0	36.0	25.3	37.7	-	-	-	-	-	-
1837	J	-	-	-	-	-	-	17.0	21.4	17.0	22.3	-	-	18.4	17.8	17.5	17.3
1841	F?	44.4	45.1	62.5	63.0	46.3	45.6	27.8	34.1	30.5	33.9	-	-	36.5	27.5	37.2	27.8
1846	F	42.2	43.0	57.0	58.0	44.3	45.3	25.9	32.3	24.2	31.3	77.1	76.2	30.0	22.0	28.3	22.4
1855	M	-	-	62.1	-	-	-	25.9	36.4	27.2	36.2	-	-	34.3	23.1	36.4	23.0
1872	M	-	-	-	-	-	-	28.3	42.8	-	-	-	-	-	-	-	-
1873	U	-	47.1	-	66.0	-	-	-	-	-	-	-	-	-	-	-	-
1874	F?	45.0	45.8	-	-	45.9	46.8	27.9	33.8	28.6	33.6	-	-	37.0	26.0	38.6	25.7
1882	M	48.0	48.9	64.4	-	50.0	50.9	25.4	36.5	27.0	35.7	82.3	83.7	37.6	25.4	37.4	25.6
1890	F	-	-	-	-	40.8	41.1	26.8	30.4	26.2	31.2	72.6	73.4	31.8	27.3	32.0	26.7
1892	M	-	-	68.3	-	-	-	-	-	28.7	35.0	-	84.7	36.3	26.5	37.1	28.0
1894	J	-	-	-	-	-	-	18.1	22.3	18.9	23.8	-	-	21.8	17.6	23.2	17.6
1897	J	-	-	-	-	-	-	-	-	-	-	-	-	15.4	13.2	-	-
1902	M	-	46.0	65.1	67.7	47.7	49.2	28.0	33.8	28.7	36.9	78.2	-	34.8	29.8	35.6	29.8
1903	M	46.4	48.8	67.4	67.6	49.1	48.6	28.0	37.8	28.0	38.1	83.1	82.5	-	-	38.6	27.7
1904	M	48.0	48.5	67.8	-	50.8	50.5	28.3	38.6	28.2	38.3	-	86.8	39.2	25.4	38.9	26.0
1906	M	48.3	46.9	62.2	63.7	47.0	48.0	26.9	34.4	27.5	35.2	78.6	78.9	35.8	23.5	36.5	24.2
1908	M	48.7	48.5	65.2	64.6	47.8	49.2	29.6	35.0	29.7	34.6	-	81.5	35.2	27.2	34.2	26.1
1914	M	50.5	50.5	71.5	72.2	54.2	57.6	29.9	37.2	30.1	38.0	88.8	88.1	35.7	28.7	35.9	29.3
1917	F	37.2	-	-	-	-	41.1	-	-	23.0	30.9	-	-	28.0	23.4	29.7	23.6
1919	M	42.6	43.5	59.0	-	43.8	-	27.8	34.3	27.4	34.6	-	-	33.7	25.1	-	-
1921	M	-	-	-	-	-	-	26.3	31.4	-	-	-	-	31.0	25.8	-	-
1925	F	-	-	-	54.4	44.1	44.6	25.0	32.0	25.4	30.3	75.8	76.2	34.4	26.2	31.0	25.3
1927	F	40.8	41.8	59.3	61.5	-	41.2	25.6	32.0	24.9	31.2	-	72.5	30.2	23.0	31.6	23.5
1932	F?	-	-	59.0	-	46.2	46.6	25.3	34.8	25.7	34.8	-	-	30.8	22.2	32.6	24.1
1933	M	50.6	-	-	71.0	-	54.4	31.3	39.7	29.8	40.8	-	-	36.8	30.2	36.8	30.5
1935	M	-	-	65.4	-	48.0	48.6	30.0	34.0	28.9	33.7	82.6	82.8	40.7	27.6	37.3	27.4

SKEL	SEX	LHHD	RHHD	LHEW	RHEW	LFHD	RFHD	LFeD1	LFeD2	RFeD1	RFeD2	LFeE1	RFeE1	LTiD1	LTiD2	RTiD1	RTiD2
1937	F	42.2	-	-	52.6	-	45.7	27.4	32.1	26.4	31.3	72.0	72.1	32.3	28.0	33.0	28.0
1942	F	42.4	-	57.6	-	45.2	45.5	25.7	32.7	25.3	31.8	76.0	75.8	34.0	23.0	33.0	24.0
1944	M	44.8	-	60.0	-	46.4	-	29.2	32.4	-	-	-	85.5	38.4	29.1	40.2	27.6
1945	F	41.1	-	50.4	51.1	40.8	-	24.5	25.8	23.8	27.8	71.9	-	26.8	21.7	25.4	21.6
1952	F	40.9	41.3	53.4	53.8	-	-	-	-	-	-	-	-	-	-	-	-
1953	M	-	50.4	-	63.8	-	-	-	-	-	-	-	-	-	-	40.7	32.4
1954	U	-	47.9	-	-	-	-	-	-	-	-	-	-	34.8	23.2	-	-
1955	M	-	-	-	-	-	-	-	-	-	-	-	-	40.5	27.4	-	-
1962	M	54.9	-	63.4	65.0	52.2	52.6	28.2	40.3	32.0	38.6	-	87.8	38.0	28.4	36.5	25.8
1965	F	41.5	41.2	56.0	56.4	41.5	42.6	26.5	31.9	26.5	32.9	-	-	-	-	-	-
1967	F	41.3	-	52.1	53.0	40.8	-	23.4	30.9	-	-	70.0	-	29.1	20.5	28.1	22.0
1978	M	50.7	50.7	69.0	69.7	52.9	54.0	29.1	39.0	29.4	36.0	86.7	86.3	-	-	-	-
1980	M	-	-	60.9	-	-	-	30.4	34.7	28.7	35.9	78.7	79.2	36.0	25.3	35.4	25.6
1983	M	-	-	64.7	50.0	-	-	26.4	36.1	27.0	35.0	-	84.7	-	-	-	-
1985	M	50.4	50.8	74.8	72.3	52.9	52.0	31.8	39.2	32.4	35.8	-	88.6	-	-	42.0	28.6
1987	F	-	-	64.6	66.1	45.7	45.5	27.1	35.7	26.3	33.7	86.8	87.4	35.3	24.6	34.1	25.5
1989	M	48.4	48.2	65.9	65.2	50.0	50.4	28.1	33.0	27.4	33.6	84.3	83.4	36.7	31.8	36.5	27.1
1992	M	46.1	-	69.0	69.3	48.1	-	27.0	33.4	26.5	33.7	-	-	33.4	23.5	37.6	26.8
1994	M	-	46.3	-	61.1	47.0	48.2	25.1	33.2	24.6	32.7	-	78.3	38.2	25.3	37.0	25.3
1996	M	-	-	-	61.8	45.0	45.3	28.9	37.5	28.0	37.9	-	77.5	35.7	24.4	36.9	25.6
1999	M	47.9	48.6	-	-	-	-	28.6	33.7	28.7	33.6	-	-	35.2	26.4	35.9	28.8
2005	M	-	-	70.4	72.0	-	-	-	-	27.8	34.5	-	-	-	-	38.4	23.9
2301	M	-	47.2	-	64.6	-	46.4	-	-	27.6	35.0	-	-	37.7	24.7	38.7	23.8
2306	M	-	-	67.3	-	-	-	29.1	33.9	-	-	82.3	-	38.7	26.8	-	-
2313	M	-	-	-	-	-	44.3	26.5	29.4	27.1	29.4	-	-	-	-	34.2	26.5
2316	F	43.0	43.1	53.5	55.6	45.7	46.2	26.3	32.0	26.0	30.9	76.4	76.4	30.6	24.4	30.5	24.4
2318	M	-	-	-	-	50.4	50.4	27.3	36.5	26.5	34.7	-	85.7	35.4	25.4	36.2	26.5
2320	F	-	-	-	-	-	-	-	-	-	-	-	-	29.0	23.4	28.5	22.2
2326	M	-	48.4	64.9	-	47.4	47.6	30.0	36.8	30.8	36.4	79.9	80.1	38.4	25.8	39.8	27.1
2327	F	-	-	58.7	-	47.8	-	26.1	36.1	25.9	34.7	-	-	31.4	24.3	29.3	25.7
2331	M	-	49.0	59.7	62.9	-	51.1	-	-	25.8	31.8	84.9	85.8	34.6	25.9	35.5	26.3
2332	M	-	-	-	67.6	-	-	27.6	34.6	27.1	35.1	-	-	37.6	27.2	37.7	28.5
2333	F	-	42.2	-	-	44.2	-	24.2	33.1	25.3	32.9	-	-	32.3	22.8	30.4	22.9
2334	M	-	-	-	-	-	-	29.4	36.0	-	-	-	-	-	-	-	-
2336	F	-	-	-	-	-	44.2	-	-	26.3	33.7	-	-	-	-	-	-
2343	M?	-	-	-	-	-	-	-	-	-	-	-	-	39.5	27.8	40.4	28.2
2348	F	-	44.4	59.5	58.4	45.6	44.7	29.1	32.2	27.8	32.4	76.3	76.2	-	-	-	-
2349	M	45.6	47.0	66.4	-	49.3	50.2	26.5	38.5	27.0	38.9	-	81.5	35.2	25.2	36.0	24.1
2373	M	48.0	49.7	63.8	66.1	49.0	-	25.4	31.8	25.5	32.9	81.3	81.1	36.2	25.2	34.8	23.8
2384	M	48.2	48.7	-	-	-	-	28.5	35.2	-	-	-	-	36.0	28.6	36.0	29.0
2386	F	-	41.8	55.6	56.2	42.6	43.4	23.0	33.8	23.9	34.7	-	-	31.0	22.3	-	-
2388	U	-	-	62.7	-	-	-	-	-	-	-	-	-	-	-	-	-
2391	M	45.7	-	65.0	-	-	48.0	32.6	32.5	31.8	32.3	-	83.3	-	-	-	-
2396	M	-	-	-	66.7	54.0	54.8	29.4	39.5	29.9	40.0	-	88.3	39.0	30.2	37.1	32.0
2397	F?	-	-	59.3	61.4	46.0	47.0	26.6	34.7	27.4	34.5	80.5	80.7	35.4	27.9	35.4	28.0
2400	M	-	-	-	43.6	-	49.0	28.0	33.1	29.4	34.3	-	-	39.5	27.4	39.0	27.7
2405	M	49.2	48.3	67.4	66.4	-	-	29.0	32.5	-	-	84.3	83.4	33.5	28.9	34.3	27.6
2407	M	46.4	46.3	63.8	-	-	47.4	27.4	30.7	27.6	31.8	-	-	38.0	27.6	36.4	26.8
2411	F	43.3	45.1	56.7	59.5	45.5	45.9	23.5	31.8	23.2	32.0	-	76.4	29.7	23.3	28.8	23.1
2418	F	41.4	-	-	-	-	-	-	-	24.4	31.2	-	-	-	-	-	-
2432	M	-	-	-	-	46.2	46.4	-	-	-	-	-	-	-	-	-	-
2436	M	51.9	-	-	-	-	-	-	-	-	-	-	-	38.5	27.7	-	-
2439	F?	45.7	-	-	-	-	46.9	25.0	35.5	25.4	35.7	-	-	-	-	34.8	25.2
2441	U	-	-	-	-	-	41.1	-	-	-	-	-	-	-	-	-	-
2448A	M	50.2	50.0	64.7	66.4	51.6	51.2	27.5	37.7	27.5	38.9	84.1	83.9	34.2	27.2	34.2	26.9

SKEL	SEX	LHHD	RHHD	LHEW	RHEW	LFHD	RFHD	LFeD1	LFeD2	RFeD1	RFeD2	LFeE1	RFeE1	LTiD1	LTiD2	RTiD1	RTiD2
2448B	M	48.0	-	69.2	70.6	-	-	27.1	36.3	-	-	84.8	-	40.4	26.2	36.4	24.4
2449	F	-	-	-	-	-	-	26.5	31.6	-	-	-	-	29.3	23.1	28.6	23.5
2451	M	50.0	51.9	67.5	68.1	48.8	48.2	26.6	34.5	26.4	34.1	85.9	86.3	34.1	28.4	33.7	27.3
2452	F	-	-	58.2	-	43.7	43.8	-	-	28.1	31.8	-	-	30.5	21.8	31.8	22.4
2457	F	41.2	41.5	-	-	42.1	42.4	-	-	24.9	34.1	72.3	-	34.8	23.3	33.5	23.4
2458	M	-	-	-	-	51.0	50.8	30.1	32.5	30.0	31.9	80.1	81.6	33.8	26.1	32.7	25.3
2459	M	48.4	-	68.0	69.0	46.3	47.7	24.3	32.3	24.2	33.4	76.5	77.0	30.8	22.6	31.9	22.1
2461	M	50.5	48.8	70.1	72.1	50.0	50.0	27.4	36.9	27.5	37.3	83.0	-	35.4	24.9	35.3	25.3
2462	F	40.1	-	-	-	41.2	41.3	25.0	29.4	26.3	29.7	68.9	-	28.3	25.4	30.1	25.9
2466	M	-	53.4	69.6	-	-	53.5	-	-	27.9	38.0	-	-	-	-	-	-
2474	M	-	-	66.6	66.5	47.0	-	26.0	34.9	24.6	33.8	-	-	30.5	26.8	29.0	27.3
2476	M	51.0	-	68.7	69.0	52.1	54.2	28.6	38.4	28.4	37.0	87.9	89.9	-	-	33.7	28.3
2478	M	-	-	-	-	49.0	50.8	-	-	28.7	34.5	80.7	81.5	35.3	24.9	33.3	23.5
2480	M	-	-	59.6	60.3	-	-	24.5	37.9	24.6	38.3	82.6	80.6	-	-	35.1	24.2
2482	M	-	-	61.0	-	-	-	24.4	33.8	24.5	35.0	77.0	77.0	33.3	23.4	-	-
2484	M	-	-	-	-	-	-	-	-	-	-	-	-	39.9	28.0	40.4	28.5
2489	M?	49.4	50.0	66.2	68.7	49.8	49.2	29.9	37.4	29.4	36.2	85.5	-	37.9	29.0	38.5	32.7
2491	M	-	-	-	-	-	-	-	-	-	-	-	-	35.7	28.8	-	-
2492	F	39.4	39.2	-	-	45.2	-	-	-	-	-	68.1	-	29.6	21.6	31.0	21.6
2494	M	44.7	45.5	62.5	64.3	46.0	46.6	25.0	32.1	25.0	31.7	77.7	78.5	33.4	27.2	35.0	27.2
2496	M	49.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2499	M	-	-	-	-	-	48.1	28.5	30.9	28.3	32.0	80.7	-	35.9	24.8	36.6	26.0
2501	M	-	46.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2504	F	-	-	-	-	-	-	-	-	-	-	75.2	-	-	-	-	-
2506	F	-	-	-	-	41.0	40.2	-	-	22.7	29.6	69.7	-	28.6	21.2	29.1	20.8
2508	M	53.9	54.2	68.3	68.6	-	53.3	27.7	36.5	26.3	36.6	90.0	90.1	39.0	28.3	38.0	28.5
2514	F	-	-	-	-	-	-	27.9	32.2	27.4	30.8	76.0	-	29.7	25.0	29.0	25.6
2527	F	-	-	-	-	-	-	-	-	-	-	75.0	-	31.8	23.2	31.5	23.0
2533	F	39.4	39.8	49.7	50.1	-	-	24.9	28.5	24.5	29.5	67.7	69.0	30.5	21.9	31.3	22.0
2535	M	-	44.5	-	-	48.4	-	27.4	34.0	27.1	33.2	78.2	-	36.3	26.0	34.9	25.4
2537	F	-	-	55.5	-	-	-	26.9	32.2	27.2	33.6	-	-	36.5	23.3	37.0	26.0
2542	M	-	-	63.0	-	-	-	26.8	36.6	26.7	34.9	82.4	-	39.8	24.7	38.6	23.7
2546	M	47.2	47.4	63.0	65.8	48.2	48.2	26.8	32.0	26.5	31.5	80.4	80.5	33.4	22.9	32.1	22.5
2548	M?	-	-	60.8	-	47.6	47.8	27.8	35.0	-	-	-	-	34.3	25.8	35.0	26.1
2556	F	39.0	-	57.0	59.3	44.7	45.7	24.5	32.5	25.7	33.6	-	-	30.7	23.3	31.5	24.8
2574	J	-	-	-	-	-	-	14.2	17.7	-	-	-	-	15.6	15.3	15.6	15.0
2575	J	-	-	-	-	-	-	23.6	30.5	24.0	29.8	-	-	31.1	29.3	31.3	28.3
2576	M	-	50.3	66.3	70.9	53.8	53.3	26.9	36.0	28.1	37.2	89.0	87.9	39.6	27.8	38.5	28.3
2577	?F	-	-	-	-	-	-	21.0	24.6	20.3	23.8	-	-	24.7	22.1	25.6	22.6
2583	M	48.8	50.2	66.5	64.0	49.6	-	29.1	33.0	31.1	32.2	-	-	36.2	25.9	40.1	27.6
2587	M	-	-	64.5	65.2	47.7	-	32.6	35.5	32.0	35.0	-	-	-	-	-	-
2591	M	51.6	52.9	69.2	70.1	54.1	-	32.1	35.3	32.4	35.3	88.2	87.8	40.4	28.7	41.3	28.4
2593	M	46.2	-	-	66.7	51.4	54.5	25.0	33.8	24.5	34.5	78.7	80.9	34.1	23.5	-	23.2
2596	F	41.7	-	56.2	58.0	-	44.4	26.3	33.1	25.0	32.9	76.0	-	32.8	23.0	31.6	23.2
2612	F	44.2	44.7	-	-	-	42.0	22.1	31.7	23.3	30.6	75.8	-	31.1	24.0	31.4	23.6
2614	F	-	-	64.0	-	44.6	45.4	24.4	32.8	24.6	32.9	79.4	79.9	28.5	23.2	28.4	23.5
2616	F	-	42.4	54.0	58.2	-	-	26.0	31.9	26.8	31.7	-	-	31.0	20.9	-	-
2620	M	-	49.8	-	69.3	50.4	50.6	28.2	36.4	28.3	33.9	79.1	-	37.4	25.7	38.4	25.8
2622	M	51.9	-	69.3	-	50.6	50.6	27.7	33.9	29.9	34.0	88.7	-	37.9	29.1	38.5	29.9
2624	M	-	-	65.8	67.7	-	-	26.0	32.5	25.8	31.3	80.0	81.3	40.5	26.3	-	-
2626	M	-	-	-	-	-	-	-	-	27.1	31.8	-	-	-	-	-	-
2628	F	-	-	-	60.9	-	45.2	24.2	33.2	24.7	33.8	-	-	31.8	23.2	31.3	22.5
2631	F	-	-	-	-	-	-	-	-	24.2	32.0	73.0	-	32.4	22.5	32.7	22.7
2636	M	48.2	-	67.5	-	-	47.0	27.0	32.5	28.0	33.3	-	-	35.0	23.6	35.5	24.1
2638	F	-	-	-	66.0	46.8	47.2	26.9	34.5	27.9	33.1	80.5	-	34.5	26.0	-	-

SKEL	SEX	LHHD	RHHD	LHEW	RHEW	LFHD	RFHD	LFeD1	LFeD2	RFeD1	RFeD2	LFeE1	RFeE1	LTiD1	LTiD2	RTiD1	RTiD2
2640	M	47.8	44.9	60.9	-	46.8	47.0	30.1	31.8	30.1	32.8	-	-	41.5	28.2	-	-
2642	M	-	50.6	63.5	-	50.3	-	28.3	31.9	29.0	35.0	82.8	80.7	35.3	26.4	34.5	27.4
2644	M	44.5	-	55.8	57.9	-	-	-	-	-	-	-	-	-	-	-	-
2647	M	-	-	69.5	-	-	49.7	27.1	37.4	28.3	36.5	-	81.8	39.3	24.2	39.2	26.3
2650	M	-	-	63.9	-	48.2	48.2	27.8	32.7	27.5	33.2	-	-	34.8	28.8	34.3	27.2
2654	M	-	-	69.5	70.6	-	53.9	26.1	34.5	27.8	33.4	-	-	35.3	30.0	33.8	29.0
2658	F	41.0	-	56.8	56.4	43.7	44.4	24.8	33.0	25.6	33.8	-	78.0	31.4	22.2	31.2	22.0
2663	F	-	-	-	-	-	40.9	-	-	25.7	30.8	-	-	-	-	-	-
2671	M	-	-	64.6	67.5	-	-	-	-	29.0	37.9	-	-	37.5	27.4	38.2	27.0
3051	U	-	-	-	-	-	-	-	-	-	-	-	-	39.5	28.1	39.1	26.7
3054	F	-	48.2	61.2	61.1	48.5	48.1	28.3	34.0	27.8	35.2	80.3	-	-	-	33.4	22.5
3095	M	49.6	49.8	-	-	49.0	49.5	25.0	35.4	26.3	34.6	86.3	86.3	37.1	26.0	36.6	25.3
3101	J	-	-	-	-	-	-	19.9	24.2	19.0	24.6	-	-	25.3	21.4	26.0	21.6
3105	M	-	45.9	66.0	-	-	-	29.5	32.7	28.4	34.6	78.5	-	32.8	24.9	36.1	26.1
3107	M	50.3	-	70.1	-	50.4	52.0	28.4	34.2	26.5	35.4	86.9	87.5	39.7	25.3	38.4	24.6
3109	M	48.3	-	64.0	-	-	-	-	-	-	-	-	-	-	-	-	-
3111	?M	-	-	-	-	-	-	20.2	25.4	21.9	26.6	-	-	-	-	26.5	20.7
3118	F	47.8	-	58.2	59.6	45.8	-	27.9	33.8	28.5	34.3	79.3	78.2	30.4	22.6	33.8	23.4
3126	M?	-	-	62.8	-	-	-	-	-	25.8	32.2	-	-	-	-	-	-

Key: L=left R=right HHD=maximum humeral head diameter HEW=humeral epicondylar width FHD=vertical femoral femoral head diameter. Otherwise abbreviations from Brothwell (1981).

CRANIAL NON-METRIC TRAITS

SKEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
0740	0	0	0	0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0		-/0	0	0	0/1	0/0	0/0	0/1	0/0	1/0	0/0	1/0	0/0	0/0	-/0	1/0	0/0	0/0	1	1/1
0938	0	0	1	0	0	0	0	0/0	0/0	0/0	0/1	0/0	0/0	0/0			0	0	0/1	0/0		0/1	0/0	1/1	0/0	0/0	0/0	0/0		0/0	0/0	0/0	0	0/0
0940	0	0	0	0	0	0	0	0/0	0/0		0/0	0/0	0/0	0/0		0/0	0	0	1/1	0/0	0/0	0/1	0/0	1/1	0/0	1/0	0/0	0/0	0/0	0/0	1/1			
0943	0	0	1	0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0		0/0	0	0	1/1	0/0	0/0	1/1	0/-	-/1	0/0	1/1	0/0	0/0	1/-	0/0	0/0	-/0		-/0
0950	0	0	0	0		0	0			0/-	0/-	-/0	-/0	0/0			0		1/0	0/0	-/0	0/0	1/-	1/1	-/0	1/0						0/0	0	0/0
0953	0				0	0/-	0/0	0/0	-/0	0/0	0/0	-/0					0	0	0/0	0/1	0/0		-/0	1/1	1/-				0/0		-/0	0	0/0
0954	0	0	1	0	0	0	0	0/0	0/0	0/0	0/0			0/1			0	0	0/1	1/0	0/0	1/0	0/0	1/1	0/0	0/1	0/0			0/0	1/1	1/1	0	0/0
0956																																		-/1
0962	0				0	0	0/0	0/0	0/0	0/1	0/0	0/0	0/0						1/1	0/0	-/0				0/P	1/1		-/0	-/1	-/1	-/0	0/0		-/0
0984	1	1	1	0	0	0	0	0/0	0/0	0/0	1/1	0/0	1/0	1/1			0	0	0/0	0/0	0/-	0/1	-/1	1/1	0/0	0/0		0/0	1/-	1/P	0/0	0/0	0	0/0
0985	0	0	0	0	0	0	1	0/0	0/0	0/0	0/-	0/0	0/0	0/-			0	0	1/1	0/0	0/0	1/0		1/1	0/0	1/1	0/0	-/0		0/0		0/-	0	0/-
0990	0	0	1	0		0	0				0/-			0/-						0/-		1/1								1/-				
0992	0	0	1	0	0	0				0/-	0/0	0/0	0/0	0/-			0		1/1	0/0	0/0	1/0		1/0	0/0	1/0	0/0			1/0	0/-	0/0	0	1/0
1012	0	0		0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0		0/1	0	0	1/0	0/1	0/0	1/0	0/0	1/1	1/0	1/0	0/0	0/0	1/1	1/1	0/0	0/0	0	1/1
1068	0	0	1	0	0	0	0	0/-	0/-			0/0	0/0	1/0			0	0	0/0	0/1		0/0	-/0	1/1			0/0			0/0	0/0	0/0	0	0/-
1340	1	0	0	0	0	0	0	0/0		0/0	0/0	0/0	0/0	0/0			1	0	0/1	1/0	0/-	1/1	0/0	1/1	0/0	0/-	0/0		0/-	0/0	0/0	1/0	0	0/0
1361																						0/-										-/0	0	0/0
1376	1			0	0	0					-/0	-/0		-/0			0		-/0	-/0		1/1										1/1	0	-/0
1415	1	0	1		0	0	0				-/0	0/0	0/0	-/0					0/0	0/0		0/0	0/-	0/1	-/0	-/1				0/0	-/0	0/0	0	0/-
1416	0	0		0		0	0	0/-		0/0	0/0	0/0	0/0	0/1				1	1/0	0/0		1/1									0/-	0/0	0/0		
1417	0				0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			0/0	0	0			0/0	0/0	0/0	0/1	0/0	1/1	0/0	0/0	1/0	0/0	0/0	0/0	0	0/0
1418	0		1	0					0/0	0/0	0/0	0/0	0/0	0/0			0	0	-/0	0/0	1/1	0/0	0/0	0/1	0/0	1/1	0/0	0/0	1/1	0/1	0/1	0/0	0	-/1
1426	0	1	1	0	0	0	0	0/0	0/0	0/0	0/0	-/0	-/0	1/1			1	0	1/0	0/0		0/0		1/1				-/0	1/-	0/0	0/0	0/0	0	
1451	0	0	0	0	0	0	0	0/0	0/0	0/0	-/0	0/0	0/0	0/0			1	0	1/1	0/0	0/-	0/0	0/0	1/1	0/P	1/1	0/-	0/-		0/0		1/-		
1455	0	0	0	0	0					-/0	-/0	0/0	0/0	-/0				0	1/1	0/0		1/1	-/0	-/1		-/0				P/P	-/0	0/0		0/0
1457	0	0	1	0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			0	0	1/1	0/0	0/0	0/0	0/1	1/1	1/1	1/0	1/0	0/0	1/1	0/0	1/1	1/1	0	1/1
1459	0	0	1	0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			0	0	0/0	0/0	0/0	0/0	1/-	1/1	-/0	-/1	-/0	-/0	-/0	0/0	0/1	0/0	0	1/0
1464	0	0	0	0					-/0	-/0	-/0	0/0	0/0	-/0					1/1	0/0	-/0	0/0	0/0	1/1	-/0	-/0	1/1			1/1	0/0	0/0	0	0/0
1469	0	0	0	0	0	0	0			-/0	-/0	0/0	0/0	0/0			0	0	0/0	0/0	0/-	0/0	0/0	0/0	0/-	0/1	0/0		0/-	0/-	0/0	0/0	0	0/0
1471	0			0		0	0	-/0	-/0	0/0	0/0	0/0	0/0	0/0			0		0/0	0/0	-/0	1/1	0/-	1/-	-/0			0/-		1/0	0/0	0/0	0	
1472	0	0	0	0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			0	0	0/0	0/0	0/0	0/0	0/0	1/1	0/0	1/1	0/0	0/0	1/1	0/0	0/0	0/0	0	-/0
1477	0																																	
1483	0	0	0	0		0	0	-/0	-/0	0/0	0/0	-/0	-/0	0/0					1/0	0/0	0/-	1/1	0/-	1/1	0/-	0/-	0/-			0/-		0/1	0	0/0
1492	0	0	1	0					0/0	0/0	0/0	0/0	0/0	0/0			0		1/1	0/0		0/0		-/1	-/0		0/0			0/0		-/0		
1494	0	0	0		0	0	0														0/0			1/-	0/0	1/1				0/0				
1495	0	0	1	0	0	0	0	0/0	0/-	0/0	0/1	0/0	0/0	0/0			0	0	0/1	1/0		0/1	0/0	1/1				0/-	1/1	0/0	0/0	0/0	0	0/0
1497	0	0	0	0		0	0		0/-	0/-	0/-	0/-	0/-	0/-					0/-	0/-		0/0								-/0		0/-		
1730	1		1			1	-/0	-/0	0/0	0/0									-/1	-/0	-/1	0/-	0/-	1/1				0/-		0/0		1/1	0	1/0
1738	0	0	1	0	0	0	0	0/0	1/-	0/0	0/0	0/0	0/0	0/0			0		1/0	0/0		0/0		1/1						0/0		0	0/0
1746	0	0	0	0			0/0	0/0	0/0	0/0	0/1	0/0	0/0	0/0		0/0	0	0	1/0	0/0		0/1	0/0	1/1			0/0		1/1	1/0	1/1	1/1	0	1/0
1749	1	1	1	0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			0	0	1/1	0/0		0/1	-/0	-/1				0/-		0/-	1/0	0/0	0	0/0
1750	0	0	1	0		0	0	0/0	0/0	0/0	0/0	0/-	0/-	0/0					1/1	0/0		1/1		1/-						0/0		1/1	0	0/-
1751	0	0	1	0		0	0	0/-	0/-	0/-	0/1	0/-	0/-	-/0			0	0	0/0	0/0	0/0	1/1		0/0	-/0	-/1				0/-	0/0	-/0		
1754	0	0			0	0	-/0	-/0	0/0	0/0	0/-	0/-	0/0				0		1/1	0/0		1/1	1/-	1/1	-/0		-/0		0/0	1/1				
1757	0		0		0	0	0/0	-/0	0/-	0/0	0/0	0/0	0/0	0/0			0	0	0/1	0/0	-/0	0/0	0/0	1/1			-/0	-/0	1/0	0/0	0/0	0/0	0	1/0
1762	0	0		0		0	0			0/0	0/0	0/0	0/0	0/0			1	0	0/0	0/0	0/0	0/0	0/0	1/1	1/0	1/1	0/0	0/0	1/1	1/P	0/0	0/0	0	0/0
1764	0	0	0	0	0	0	0	0/0	0/-	0/0	0/-	0/0	0/0	0/0			0	1	1/1	0/0		1/1	1/1	1/1					1/1	0/0	0/0	0/0	0	-/0
1780	0	0		0		0		0/-	0/-	0/0	0/0	0/0	1/-	0/0			0	0	1/0	0/0	0/-	0/0		1/-	0/-	0/-	0/0			0/P	0/0	0/0		0/-
1782	0			0	0	-/0	-/0	-/0	0/0	-/0	-/0	0/0	0/0	0/-			0	0	0/1	0/0	0/0		-/0	1/1	1/0	0/0	1/0	0/0	1/0	0/0	0/0	0/0	0	0/0
1784	0	0	0	0		0	0	0/-	0/-	-/0	-/0			0/-					1/1	0/0		0/1								0/0				
1786												0/0	0/0				0	1	0/0	0/0								-/0	1/1		0/0			
1789	0		1	0		0				0/-	0/0	0/0	0/0	1/1			0	0	0/0	0/0				1/1					1/-	0/0	0/1		0	
1795	0	0		0		0					0/-	0/0	1/0	0/-			0	0	1/1	0/0		0/0	-/0	-/0				-/0	-/1		0/0	0/-	0	1/-

SKEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
1797	0	0	0	0		0		0/0	0/0	0/0	0/0	0/-	0/-	0/-			1		0/-	0/-		1/1		1/0	0/-	1/1				0/0	1/-	0/0	0	0/0
1799	0	1		0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	-/1		0/0	0	0	-/0	-/0	0/-	0/0	0/0	0/0	0/0	1/-	0/0	0/-	0/0	0/0	0/0	-/0		-/0
1816	0	0	1	0		0		0/-	0/-	0/0	0/0	0/0	0/0	0/0			0	0	1/0	0/1	1/0	1/1		-/1	P/0		0/0			0/0	-/0	0/-	0	1/-
1827																								-/1										
1830	0	0	1	0		0	1			-/1	0/-	0/0	0/0	1/0			1	0	1/0	0/0		0/0		1/1				0/0	1/1	0/0	0/0	-/0		-/1
1834	0	0			0				-/0	-/0	-/0	-/0		-/0						-/0		1/1		1/1						0/0		0/0	0	0/0
1841	0	0	0	0	0	0	0	0/-	0/-	0/-	0/0	0/0	0/0	0/0			1		0/0	1/1		1/1		1/0	0/0	-/1	0/0	-/0		-/0		0/0	0	0/0
1846		0		0						0/0	0/0	0/0	0/0	0/0			0	1	0/0	0/0	0/0	0/0	0/-	1/1	0/0	1/-	0/0		1/-		0/0	0/0	0	0/1
1855	0	0	1	0		0				0/0	0/0	0/-	0/-	0/-			1	0	0/0	0/0		0/0	-/0	1/1					1/1	0/0	0/0	0/0	0	1/-
1872	0	0	0	0		0	0				0/0	0/0	0/0	0/0			0	0	1/1	0/0	0/0	1/1		1/1		1/1				1/1	0/0	0/0	0/0	0	0/0
1874	0	0			0		-/0	-/0	0/0	0/0	0/0	0/0	0/0	0/0			0	0	1/1	0/0		0/1	-/0	0/0	0/0		-/0	0/0	1/-	0/0	0/0	0/0	0	0/0
1882	0	0	1	0		0	0	0/0	0/0	0/0	0/1	0/0	0/0	0/1			0	0	0/0	0/0	0/0	1/1		1/1	1/0	0/1	0/0	0/-	1/1	-/1	0/0			
1902	0	0	1	0		0	0	0/0		0/0	0/-	0/0	0/0	1/0					0/1	1/0	0/0	1/0		-/1	0/1		0/0			1/0				
1903	0	0		0		0	0	-/0	-/0	0/0	0/0	0/0	1/0	0/0			0	0	1/0	0/0	0/0	0/0	0/0	1/1	0/0	-/0	0/0			0/0	0/0	0/0	0	0/0
1904	0		0		0	0			0/-	0/0	0/0	0/0	0/0	0/0					1/0	0/0	0/-	1/0		1/-	0/-	1/-	0/-			1/1		0/-		0/-
1906	0		0									0/0	0/0						0/-	0/-		0/0		1/-					1/0	-/0	0/0	0	0/0
1908	0	0	1		0	0		-/0	-/0	-/0	-/0	0/0	0/-				0		0/0	0/0	0/-	1/1	0/-	1/1	0/-		0/0	0/-		1/1	0/-	0/0	0	0/P
1914	0	0	1	0	0	0	0	0	0/0	1/0	0/0	0/0	0/0	0/0	0/0		0	0	0/1	0/0	0/0	0/0		1/1	0/0	0/0	0/0	-/0		0/0	0/0	0/0	0	0/1
1917																																0/0	0	0/0
1919	0	0	0	0	0	0	0	0	0/-	0/-	0/-	1/-	0/-	0/-	0/0		1		1/1	0/0	0/0	0/0		1/1	0/1	-/1	0/0	0/-		0/0		0/0	0	1/0
1921	0	0	0	0							-/0	-/0	-/0	-/0			0		-/1	-/0		0/1			-/P	-/0								
1932	0				0						0/0	0/0	0/0	0/-			0		1/1	0/0		0/1		-/1				-/0		0/0	-/0	0/0	0	0/0
1937	1		0								0/-	0/0	0/0				0	0	0/-	0/-		0/0		1/1	-/0	-/0			0/-	0/0	0/0	0/0		
1945	0	0	0	0	0					-/0	0/0	0/0	0/0	0/0					0/0	1/1	0/0	1/1		1/-	0/0	1/1	0/0		-/1	0/0	-/0	0/0	0	0/0
1952	0	0	0	0	0	0	0	0	-/0	-/0	0/0	0/0	-/0	-/0	0/0		0	1	0/0	-/0		0/1	-/0	1/1						1/0	1/1	0/0	0	0/0
1953	0		0		0	0					0/0	0/0	0/0	0/0			1	0	1/1	0/0	-/0	0/0	-/0	1/1	-/0		0/0		1/1	0/0	0/0			
1955	1		1		0	0					0/0			-/1								1/1												
1962	0	0	0	0	0	0	0	0	0/0	0/0	0/0	0/1	0/0	1/0	0/0		0	0	1/1	0/0	0/0	0/0	1/1	1/1	1/0	0/0	0/0	0/-	1/-	0/0	0/0	1/1	0	0/0
1965	0	0		0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			0		1/1	0/0	0/0	0/0		1/-	0/0	1/1	0/0	0/0	-/1	1/0		0/-		
1967	0				0							-/0	-/0					1	-/0	-/0		-/1		1/1	P/-		0/-			0/0	0/0	0/0	0	-/0
1978	0	0	0	0		0				0/-	0/-	0/0	0/0	0/-			0		0/1	0/0		1/0		1/1						1/0	-/0	0/0	0	0/0
1980	0	0	1	0	0	0	0			-/0	0/0	0/0	0/0	0/0			0	0	1/1	0/0	0/0	1/1		1/1	0/0	1/-	0/0			-/1	0/0	0/-		1/-
1983	0	0	0	0		0				-/0	0/1	0/0	0/0	1/1			1	0	0/1	0/0	0/-	0/1		-/1	1/0	0/-	0/0	0/-	-/1	1/1	-/0	0/0	0	0/0
1985	0	0	1	0	0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0			0	0	0/0	0/0	0/0	1/0	0/0	1/1	0/0	0/-	0/0	0/0	0/-	0/0		0/0	0	0/0
1987	0	1	1	P		0	0	-/0	-/0	0/0	0/0	0/0	0/0	0/1			0	0	0/1	0/0		0/0		1/1					-/1	0/0	0/0	0/-	0	
1989	0	0	0	0		0	0	-/0	-/0		0/-			1/-								0/-	0/-	1/-						0/0		0/-		
1994	0		1	0		0	0	-/0	0/-	0/0	0/0	0/0	0/0				0	0	1/0	0/0		1/1	0/-	1/1	-/0	-/1	-/0			0/0	0/0	0/0		-/0
1996	1	0	1	0		0	0	-/0	-/0	-/0	0/0	0/-	0/-	0/0			0		0/-	0/-		-/0		1/1					-/1	0/0	-/0	0/1	0	0/-
1999			0			-/0	-/0	-/0	0/0					-/0			0	0	-/0	-/0				1/-						0/-	1/1	1/1		0/0
2005	0	0	1	0	0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	-/0		0	0	0/0	0/0	0/0	0/0	0/0	0/-	0/0	1/1	0/0	-/0		0/0	0/0	0/0	0	0/0
2301																	0						-/0	-/1			-/0							
2307	0			0		0	0	1/0	0/0	0/0	0/0	0/0	1/1	0/0					1/1	0/0	0/0	1/1		1/1	0/0	1/1	0/0	0/0						
2313		1																																
2316	0	0	1	0	0	0	0	0	0/0	0/0	0/0	0/1	0/0	-/1	0/0	-/0	1	0	0/0	1/1	0/0	1/0	0/0	1/1	0/0	1/1	0/0	0/-	1/1	1/0	0/0			
2318	0										0/-	0/0	0/0						0/0	1/0	0/-	0/-	0/0	1/0	1/-	1/-	0/0	-/0	1/1	0/0	1/1	1/1	0	1/0
2320	0	0	0	0						0/0	0/0	0/0	0/0	0/0					0/1	0/0		0/0		-/1						0/1				-/P
2326	0	0	1	0			0/-		0/-	0/0	0/-	0/-							-/1	-/0		0/0	0/0	1/1	-/1		0/0			1/0	0/-	0/0		0/-
2327	1	1	1	0		0	1										0	0			0/-	1/1	-/1	1/1	0/-					-/1		-/0		
2331	0	0	1	0	0	0	0				0/-	0/0	0/0	1/1			0	0	1/0	0/0	0/0	0/0		1/0	0/0	-/1	0/0	0/-	1/-	-/0	1/0	1/1	0	0/0
2332	0	0	0	0		0				0/-	0/0			0/-					1/-	0/-		0/1		-/1						-/1				-/0
2333	0		0		0	0					0/-	0/0	0/0					0	0/0	0/0	0/-			1/1	0/-	0/-	0/0	1/1		0/0		1/1	0	0/-
2334																	0	0													0/0	0/0	0	
2336	0			0	0	1	0/-	0/-	0/0	-/0	0/0	1/0					0	0	-/0	-/1	0/0	1/1		1/-	0/0	0/0	0/0	-/0	-/1	-/0	-/1	1/0	0	1/0
2343	0				0	0			0/-	0/0				0/0			1		1/1	0/0			-/0	1/1						0/0	0/-	0/0		
2348	0	1	1	0	0	0					0/-	0/0	0/0	0/0					1/1	0/0	0/0	1/1		1/1	0/0	1/1	1/1	0/-		1/1				

SKEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
2349	0	0	1	0	0	0	0	0/0		0/0	0/0	0/0	0/0	-/0			0	0	0/0	0/0	-/0	1/1	0/-	0/1	1/-	1/1	-/0	0/0	1/1	0/0	0/0	0/0	0	0/0
2373	0	0	0	0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			1	1	-/0	-/0	0/0	0/1	1/1	1/1	0/1	-/1	0/0		1/0	0/0	0/0	0/0	0	0/0
2384	0		1	0		0	0	0/-	0/-	0/0	0/0	0/-	0/-	0/0			0		0/0	1/0				0/0						P/0	0/-	0/0	0	
2386	0	0		0		0		-/0		0/0	0/0	0/0	0/0	0/0		0/0	0		0/0	0/0	0/-	1/1		1/-	0/-		0/-	0/0		P/1				
2396	0	0	0	0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0					1/1	0/0	0/0	1/1		1/-	0/0	1/1	1/0			0/0				
2397	0			0		0	0	0/-	0/-	0/-	0/-	0/-	0/-	0/-					0/-	0/-		1/0		1/0						0/0				
2400	0	0	1	0	1	0	0	-/0	-/0	0/0	-/0	-/0	-/0	1/0					0/1	0/0		0/1		1/1						0/0				
2405	0			0		0	0				0/0	0/0							0/1	0/0		1/1		1/-	-/0	-/1				0/0				
2407	0	0	0	0		0	0	0/0	0/0	0/0	1/0	0/0	0/0	0/0			0	0	0/0	0/0	0/0	0/1		1/1	0/0	1/-	0/0	0/0		0/0		-/0	0	0/0
2411	1		1	0		0				0/0	-/1	0/0	0/0						1/1	0/0				1/0						1/0				
2418	1	0	0	0	0	0	0	0/-	1/-	0/-	0/0	0/0	0/0	0/-					0/0	0/0		0/0			0/-					0/1				
2432	0	0	0	0	0	0	0	-/0	-/0	0/0	0/0	0/0	0/0	0/0			0		0/0	0/0		0/1		1/-	-/0	-/1		0/-		-/1	0/-	0/0	0	-/0
2439	0	1	1	0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0		0/0	1	0	0/0	0/0	0/0	1/1	0/0	1/1	1/1	0/0	0/0	0/0	1/0	0/1	0/0	0/0	0	0/0
2448B	0	0	1	0	0	0	0			0/-	0/0	0/0	0/-								0/0	1/0		1/-	1/0		0/-			0/0				
2449	0	0	0	0		0														-/0		0/0												
2451	0	0	0	0		0	0	0/-	0/-		0/-	0/0	0/0	0/0			0	0	1/1	0/0	-/0			1/1	-/0	-/1	1/0		0/1	0/-	0/0	1/1	0	0/-
2452	0	1	1	0		0	0				0/-	0/0	0/0	0/-			0	0	0/0	0/0	0/0	0/0		1/0	0/0	1/1	0/0	0/-	1/1	0/1	0/0	0/0	0	0/0
2457	1	0	1	0	0	0	0			0/-	0/-	0/0	0/0					0	0/1	0/0		0/1	0/-	1/-		1/-			1/-		0/0	0/0	0	1/0
2458	0			0	0						-/0	0/0	0/0	-/1					0/0	0/0	-/0	-/1		0/0	0/0	-/0				0/-	0/0	-/0		0/1
2459	0	1	0	0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			1	0	1/1	0/0		0/0		0/1	-/0		-/0		0/0	0/0	0/0	0/0	0	0/0
2461	0	1	1	0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0					1/0	0/0		1/1		1/-			0/0		0/P				
2462	0	0	0	0	0	0	0	-/0		-/0	-/0	0/0	0/0	0/0					0/0	1/1	-/0	0/0			-/1		0/0	-/0		1/0				
2466	0	1	1	0		0	1	0/-	0/-	0/-	0/0	0/0	0/-	0/0					1/1	0/0	0/0	1/0		-/0	0/0		0/0			0/0				
2474	0	0	0	0		0		-/0	-/0	0/-	0/-	0/-		1/0	1/-		0	0	0/0	0/0		0/0	0/0	1/1	-/0	-/1		-/0	1/-	1/1	0/-			
2476	0	0	1	0		0	0			0/-	0/0	0/0	0/0	0/0					1/1	0/0	0/-	0/0			1/-	1/-	0/-	0/0		0/0				
2478	0		0		0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0		0/-	0	0	1/1	0/0	1/1	0/0	0/0	1/1	0/0	1/1	0/0	0/0	1/1	0/0	0/0			
2480	0	0	1	0		0				0/-	0/0	0/0	0/-				0	0	1/1	0/0		-/1		1/1						0/0	1/0	0/0	0	-/0
2482	0	0		0		0	0	0/0	0/0	0/-	0/0	0/0	0/0	0/0			0	0	0/1	0/0		1/1	0/0	1/1			0/0	0/-	1/1	1/0				
2489	1		1	0	0	0	0			0/-	0/0	0/0	0/0	0/0			0		-/0	0/0	-/0	1/1		1/1	-/1		1/1			1/0	-/0			
2491	0			0							0/0	0/0	0/0	0/0					0/1	0/0	0/0	1/1			1/0	0/1	0/0	-/0		1/1				
2492	0	1		0		0	0	0/-	0/-	-/0	0/0	0/0	1/0	0/0	-/1		1		1/1	0/0	0/0	-/0		1/-	0/0	1/-	0/0	0/-		1/1	1/1	1/1	0	0/0
2494	0	0			0	0				0/0		-/0	0/0						0/0	0/1		0/1								0/0		-/1		-/1
2501	0	0	1	0	0	0	0	0/-	0/-		-/0	0/0	0/0	-/0					1/0	0/0		0/0		-/1				-/0		0/0		0/-		0/-
2504	0					0/-			0/-	0/-	0/-	0/-	0/-						1/-	0/-			0/-	1/-						0/0	-/0	0/0	0	0/0
2506	0	0	1		0		-/0		0/0	0/0	-/0		0/0	-/0		0			0/0	0/1	-/0	0/1		1/1	0/0	0/1	-/0			1/P	-/0	0/1	0	-/1
2508	0	0	1	0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			0	0	1/0	0/0		0/0	-/0	1/1	0/0	1/-		1/-		0/0	-/0	0/0	0	0/0
2511	0	0		0		0	0				0/0		1/0						0/1	0/0		0/0								0/-				
2514	0	0	0	0	0	0	0	0		-/0	-/0	0/0	0/0	-/0			0	0	-/0	0/0		1/0	0/-	0/0				-/0	-/0	0/1	1/1	1/1	0	-/0
2527	1				0	0		0		0/-	0/-	0/-	0/-				1	1	0/-	0/-			0/0	0/-						0/0	0/0	0/-		
2533	0	0	0	0	0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0			0	0	0/0	0/0		1/1	0/0	1/1						0/0	1/1	1/1	0	0/0
2535	0	0	1	0	0	0	0				0/0	0/0	0/0	-/0			0	0	1/1	0/0	0/0	0/0	0/0	1/1	0/0	1/1	0/0			0/0	0/-	-/0		-/0
2537	0		0		0					0/0	0/0	0/-	0/-				0	0	1/0	0/0		1/1	-/0	-/1					0/1	1/1	1/1	1/1	0	0/0
2542																			-/1	-/0			-/1											
2546	0	1	1	0	0	0	0			0/0	0/0	0/0	1/1	1/0			0		0/0	0/0	0/0	0/0		1/1	0/0		0/0	0/0	-/1	1/1				
2548	0	0	1	0	0	0	0	0/0		0/0	0/0	0/0	1/1	0/0			0	0	1/0	0/0		1/0				-/0				-/0	0/0	0/0	0	0/0
2556	0	0	1	0	0	0	0	1/1	1/0	0/0	1/1	0/0	0/0	0/0		0/-	1	0	0/0	1/0	0/0	0/0	0/0	1/1	P/1	1/1	0/0	0/0	0/-	0/0	1/0	1/1	0	
2576	0		0		0	0	0	1/1	0/0	0/0	0/0	0/0	0/0	0/0			0	0	1/1	0/0	0/0	0/0		1/1	1/1	1/1	0/0	0/-		1/1		0/0	0	0/0
2583	0		1	0		0				0/0	0/0	0/0	0/0	0/0	0/0				0/0	0/0	1/0	0/0		1/1	0/0	0/0	0/0			-/0			0	0/0
2587	0	1	0	0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			0	0	1/1	0/0	0/0	0/0		0/-	0/0		0/0	0/0	1/1	0/0	0/0	0/0	0	0/0
2591	0	0	0	0		0	0	0/0	0/-	0/0	0/0	0/0	0/0	0/0			0	0	0/0	0/0	-/0	0/0	0/1	1/1	1/0	-/0				0/0		0/0	0	0/0
2593	0	0	1	0	0	0	0	0/0	0/0	0/-	0/0	0/0	0/-	0/-			0	0	1/0	0/0		0/0	0/0	1/1	0/0	0/-	-/0	0/-	1/0	0/P	1/1	1/0	0	P/1
2596	0	0	0	0		0	0			-/0	-/0	0/0	1/1	-/0			0		1/0	0/1		1/0		1/1	P/-		0/0			0/0		0/0	0	-/0
2612	0	0	1	0	0	0	1		0/0	0/0	0/0	0/0	0/0	0/0		0/-	0	0	0/0	0/0	-/0	0/0	0/-	1/1	1/0	1/1	0/0	0/0	1/-	P/0	0/-	0/0	0	0/0
2614																																		-/0
2616	0	0	1	0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			0	0	0/0	1/0	0/-	1/1	1/0	1/1	0/0	1/1	0/0	1/0	-/0	0/1	1/1	1/1	0	0/0

SKEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
2617	0	0	1	0		0				-/0	1/0	0/0	0/0	0/0			0		1/0	0/0		1/1	0/-	1/1	0/0	0/0				0/0				
2620	0	1	1	0		0	0	0/0	0/0	0/0	0/0	0/-	0/-	0/0			0	0	1/-	0/-		1/1	-/0	0/0	0/0		0/0			0/0	1/0	1/1	1	0/1
2622	0	0	0	0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			0		0/1	0/0	0/0	0/0	-/0	-/1	1/1	1/-	0/0	0/0	1/1	1/-		0/0	0	0/0
2624	0	0	1	0	0	0	0	0/0	0/-	0/0	0/0	0/0	0/0	0/0			0	0	0/0	0/0	0/0	1/1	0/0	1/1	0/-	1/-	0/-	0/0		0/0	0/0	0/0	0	0/0
2626																																		0/-
2628	0	0	1	0	0	0	0	0/0	0/0	0/1	0/0	0/0	0/0	0/0					0/0	0/1	0/0	0/1	-/0	0/1	1/1	1/1	0/0	0/-		1/1	0/0	0/0	0	0/0
2631																																	0	
2636	0	0	0	0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			0	0	0/-	0/0		1/0	1/0	1/0	0/0	-/0	0/0			0/0	0/0	0/0	0	0/0
2638	0		0		0	0				-/0	0/0	-/0	-/0	0/0			0		1/0	0/0											-/1			
2640	0	0	1	0		0	0	-/0	-/0	-/0	0/0	-/0	-/0	0/-			0		1/1	0/0		0/0		1/1						0/0		0/0	0	-/1
2642	0	0	1	0	0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0		0/-	0	0	0/1	0/0	0/0	0/0	0/0	1/1	0/1	1/-	0/0	0/-		1/0	1/1	0/1	0	1/1
2650	1	0	1	0		0	0	0/0	0/0	1/0	0/0	0/0	0/0	1/1			0		1/1	0/0	0/0	1/0		-/1			0/0			1/0		1/1	0	0/0
2654	0	1		0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0		0/0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	1/1	0/0	-/1	1/0	0/0	1/1	0/0	0/0	0/0	0	0/0
2658	0	0	1	0	0	0	0	-/0	-/0	-/0	-/0	0/0	0/0	-/0			1	0	1/0	0/0	-/0	1/1	-/0	1/1	-/0	-/0	-/0	0/0		0/0			0	0/0
3054	0	0	0	0	0	0		0/-	0/0	0/0	0/0	0/0	0/0	0/0		0/0	1	0	0/0	0/0	0/0	0/0	0/0	1/1	0/1	1/1	0/0	0/0	0/0	0/0	1/1	1/-	0	0/0
3091	0	0	1	0	0	0	0			0/-	0/-	0/-	0/-	0/0					0/1	0/0		0/1		0/1						0/0		0/0	0	
3095	0	1	1	0	0	0	0	0/0	-/0	0/0	0/1	0/0	0/0	0/1			0	0	1/0	0/0	0/0	1/1	-/0	1/0	0/0	0/0	0/0	-/0	-/0	0/-	0/0	0/0	0	0/0
3105	0		0		0		0/-	0/-	0/-	0/-			0/-				0	0	1/1	0/0			-/0	1/1						0/0	0/-	-/0	0	
3107	0	0	1	0	1	0		0/0	0/0	0/0	0/0	0/0	0/0	0/0			0	0	0/1	0/0	0/0	1/1	0/0	1/1	0/0	1/1	0/0	0/-	1/0	P/0	0/0	0/0	0	0/0
3109	0	0	1	0	0	0	0	-/0	-/0	-/0	0/0	0/0	0/0	0/0	0/-		0	0	1/0	0/0	0/0	1/1	0/0	0/0	0/0	0/0			1/-	1/0	1/-	0/0	0	0/0
3126	0																							-/1										1/-
3131	0	0		0		0	0			-/0							0						0/0	1/1						0/0	0/-			
3133	1	0	0		0			0/-	0/-	0/-	0/-			0/-			0		1/1	0/0	0/-	0/0		-/1	0/-	1/-			1/-	0/1		-/1		

Key: 1=Metopic suture 2=Ossicle at Lambda 3=Lambdoid ossicle 4=Inca bone 5=Sagittal ossicle 6=Ossicle at bregma 7=Coronal ossicle 8=Fronto-temporal articulation 9=Epipteric bone 10=Squamo-parietal ossicle 11=Parietal notch bone 12=Auditory torus 13=Foramen of Huschke 14=Ossicle at asterion 15=Clinoid bridging 16=Pterygoid bridging 17=Palatine torus 18=Maxillary torus 19=Extra-sutural mastoid foramen 20=Mastoid foramen absent 21=Double condylar facet on occipital 22=Parietal foramen 23=Accessory lesser palatine foramen 24=Zygomatic-facial foramen 25=Divided hypoglossal canal 26=Posterior condylar canal patent 27=Precondylar tubercle 28=Foramen ovale incomplete 29=Accessory lesser palatine foramen 30=Supra-orbital foramen incomplete 31=Maxillary M3 absent 32=Mandibular M3 absent 33=Mandibular torus 34=Hylohyoid bridging.

1=Trait present 0=Trait absent P=partial trait presence -=No observation possible. Scores are presented as score for left side/score for right side.

POST-CRANIAL NON-METRIC TRAITS

SKEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0740			0/-	0/0	0/0	1/0	0/0	0		0/0	0/0	0/0	1/0	0/0	0/0	0/0	0/0	0/0	P/0	0/0
0752	-/0	-/0	-/1													1/1	0/0			
0938	0/0		1/1	0/0	0/0	0/0	0/0	0		0/0	0/0	0/0	-/1	-/0	-/0	1/1	0/0	0/0	0/0	0/0
0940	0/0	0/0	1/1	0/0	0/0	0/-	0/-	0	1	0/0	0/0	0/0	-/0	-/1	-/0	1/0	0/0	0/0	0/0	0/0
0943	0/0	0/0	0/0	0/0	1/0	0/0	0/0	0	0	0/0	0/0	0/0						0/0	0/0	0/-
0950	0/-	1/-	1/-	-/0	-/0	-/0						0/0				1/0	0/0	0/0	0/0	0/0
0953				0/0	0/-					0/-	0/-		0/0	0/0	0/0	0/0	0/0			
0954	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	1/1	1/0	0/0	0/0
0956	-/0	-/1				1/1	0/-						0/0	0/0	0/0	0/0	0/0			
0962			1/1	0/0	-/0	0/0	0/0	0	0	0/-	0/-	0/0	0/0	0/-		0/0	0/0	0/0	-/0	0/0
0974	0/0	0/0	0/0	0/0	0/0	0/0		0	0	-/0	-/0	0/0	-/0	-/0	-/0	0/0	0/0			
0984	0/0	1/1	1/1	0/0	0/0	0/0	0/0	P		0/0	0/0	0/0	0/1	0/1	0/0	0/0	0/0	0/0	0/0	0/0
0985														1/-	0/-	1/1	0/0			
0990				-/0	-/0															
0992	0/0	1/1	0/0	0/0	0/0	0/0		0		0/0	0/0	0/0				1/1	0/0	1/0	0/0	0/0
1012	0/0	0/-	1/1	0/0	0/0	0/0		0	0	0/0	0/0	0/0	1/1	0/0	0/0	1/1	0/0	0/0	0/0	0/0
1068	0/0	1/1	1/-	-/0	-/0	0/-		0										0/1	0/1	0/0

SKEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1305													-/1	-/0	-/0	0/0	0/0			
1306			.			1/-	0/-	0	0											
1333	-/0	-/1				0/1	0/0	0	0				0/0	0/0	0/0	0/0	0/0			
1340	1/1	1/1	0/0	0/0	0/0	0/0	-/0	0	0	0/0	0/0	0/0	0/-	0/-	0/-	0/0	0/0	0/1	-/0	-/0
1361	-/0	-/0	-/1	0/-	0/-	0/0	0/0			0/0	0/0							0/0	0/0	0/0
1376	0/0	1/0	1/1	0/0	0/0	0/0	0/-	0	1	0/0	0/0	0/0	-/0	0/0	0/0	-/0	-/0	0/0	0/0	-/0
1391	-/0	-/1	1/1			0/0	0/0	1	0				1/-	0/-	0/-	1/1	0/0			
1415	-/0	-/1		-/0	0/0							0/-	0/1	0/1	0/0	1/1	0/0	0/0	0/0	
1416																0/0	0/0			
1417			1/1	0/0	0/0	0/0	0/0	0				-/1				-/0	-/0	0/0	0/0	0/0
1418	0/0	0/0	-/1	-/0	0/-			0	0			0/0	0/0	1/0	0/0	1/1	0/0	0/1	1/0	0/0
1424				0/-	0/-															
1426	0/0	0/1										0/0						0/-	0/-	0/-
1451																0/0	0/0	1/-	0/-	0/-
1455	1/1	-/0		0/0	0/0	0/0						0/0	1/1	0/0	0/0	1/1	0/0	0/0	0/0	0/0
1457	0/0	0/0	1/1	0/0	0/0	0/0				0/0	0/0	0/0	0/1	0/0	0/0	0/0	0/0	-/0	-/0	-/1
1459	1/1	1/1	1/1	-/0	-/0	0/0				0/0	0/0	-/0	1/1	0/0	0/0	1/0	0/0	1/0	0/0	0/0
1464	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0	1	0/0	0/0	0/0	1/0	1/1	0/0	0/0	0/0	0/0	0/0	0/0
1469			-/0		-/0					0/-	0/-	0/-				1/1	0/0			
1471	0/-	0/-		0/-	0/-	0/-							1/-	1/-	0/-	1/1	0/0	-/1	0/0	-/0
1472	-/0		1/1	0/0	0/0	0/0	0/0	0	1	0/0	0/0	0/0	0/1	0/0	0/0	1/1	0/0	0/0	0/0	0/0
1477																0/0	0/0			
1483	0/0	0/0	-/1	0/0	0/0	0/1	0/0	0	1	0/0	1/0	0/0	-/0	-/1	-/0	0/0	0/0		0/0	
1492				-/0	-/0	0/0										1/1	0/0			
1494						-/0		0								-/1	0/0	0/0	0/0	
1495			1/1	0/0	0/0	0/0	0/0			0/0	0/0	0/0	1/1	0/0	0/0	0/1	0/0	-/1	-/0	
1497						0/0										0/0	0/0			
1730	1/1	0/0	1/1	0/0	0/0	0/0	0/-	0		0/0	0/0	-/0	0/0	0/0	0/0	0/0	0/0			
1738	0/1	0/0	1/1	0/0	0/0	0/0		0		0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	-/1	-/0	
1740	0/0	1/1	1/1	0/0	0/0	0/0	0/-	0		0/0	0/0	-/0	0/0	0/0	0/0	1/0	0/0			
1746	0/0	0/0	1/1	0/0	0/0	0/0	0/0	0	0	0/0	0/0	0/0	1/0	0/0	0/0	0/0	0/0	0/0		0/0
1749				0/0	0/0	-/0				-/0	-/0		1/0	0/0	0/0	1/1	0/0			
1750	0/-	0/-	1/-	0/0	0/0	0/-	0/-			0/0	0/0	0/0								
1751	1/1	0/0	1/1	0/0	0/0	0/0	0/0	0	0	0/-	0/-		0/0	1/0	0/0	0/0	0/0	0/0	0/0	0/0
1754	0/-	0/-	1/-			0/-							-/0	-/0	-/0					
1757	0/0	1/1	-/1	0/0	-/0	0/0		0				-/0				1/1	0/0	0/0	-/0	-/0
1762	0/0	1/-	1/1	0/0	0/0	0/0		0		0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
1764	0/0	1/1	1/1	0/0	0/0	0/0		0	0	0/0	0/0	-/0	0/-	0/-	0/-	0/0	0/0	-/0	-/0	-/0
1779	0/1	-/0	-/1	0/0	0/0	-/0	-/0						0/-	0/-	0/-	0/0	1/1			
1780	0/0	0/0	-/0	0/0	0/0	0/0		0	P	-/0	-/0	0/0	0/-	0/-	0/-	1/1	0/0			
1782	-/0	1/1	-/1	0/0	0/0	0/0				-/0	-/0	0/0				1/1	0/0			
1784																1/1	0/0			
1786	0/-	0/-	-/1	0/0	0/0					0/-	0/-		1/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
1789	1/1	0/0	1/1	0/-	1/-								1/-	1/-	0/-	0/0	0/0			
1795	0/1	0/1	1/1	0/0	0/0	0/0	0/0	0	0	0/0	0/0	0/0	1/-	0/-	0/-	0/0	0/0	-/0	-/P	-/0
1797				0/0	0/0	0/0		0				0/0	0/-	0/-	0/-	1/1	0/0			
1799	0/0	0/0	1/1	0/0	0/0	0/0		0		0/0	0/0	P/0	0/1	0/0	0/0	1/0	0/0	0/0	0/0	0/0
1816	0/0	1/1	1/-	0/0	0/0	0/0	0/0	0	0	1/0	0/0	0/0	1/0	0/0	0/0	1/1	0/0	1/-	0/-	0/-
1827						-/0		0					1/-	0/-	0/-	1/-	0/-			
1830	0/-	1/1		0/0	0/0	-/0				-/1	-/0	0/1				0/0	0/0			
1834	0/0		1/1	0/0	0/0	0/0	0/0	0	0	0/1	0/0	-/1	0/0	0/0	0/0	1/1	0/0			
1841	-/0	-/1	1/0	0/0	0/0	0/0	0/0	0	1	0/0	0/0	0/0	1/1	0/0	0/0	0/0	0/0	0/-	0/0	
1846	0/1	0/0	1/1	0/0	0/0	1/0	0/0	0	0	0/0	0/0	0/0				1/-	0/-	0/0	0/0	0/0
1855	0/0	0/1	0/0	0/0	0/0	0/0	0/0	0	0				1/1	1/1	0/0	0/0	0/0			
1872	0/-	0/-	0/-		0/-	0/0		0	0	0/0	1/1	0/-				1/1	0/0	0/0	0/0	0/0

SKEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1873				-/0	-/0															
1874	0/0	0/0	1/1	0/0	0/0	0/0				-/0	-/0		0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
1882	0/1	0/0	1/0	0/0	0/0	1/1	0/0	P	0	0/0	0/0	0/0	1/1	0/0	0/0	0/0	1/1	0/0	0/0	0/0
1890	1/1	0/0	0/0													1/0	0/0			
1892	-/0	-/0	-/1	0/-	0/-			0	0	0/-	0/-	0/-	0/0	0/0	0/0	1/1	0/0			
1902	0/0	0/1	1/1	0/0	0/0	0/0				0/0	0/0	0/0				1/1	0/0	1/-		0/-
1903	0/0	1/1	0/0	0/0	0/0	0/-	0/0	0	0	0/0	1/1	0/0	-/0	-/0	-/0	1/0	0/0	0/0	0/0	0/0
1904	0/0	1/1	0/1	0/0	0/0	0/0	0/0	0		0/0	0/0	0/0				0/0	0/0	0/0	-/0	-/0
1906	1/1	0/1	1/1	0/0	0/0	0/0		0	0	0/0	0/0		0/0	0/0	0/0	0/0	0/0			
1908	0/0	1/0	0/0	0/0	0/0	0/0	0/0	0	1	0/0	0/1	0/0	-/0	-/0	-/0	1/1	0/0	0/0	0/-	0/-
1914	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0	0	0/0	0/1	0/0	0/0	0/0	0/0	1/1	0/0	1/0	0/0	0/0
1917	-/0	-/0	0/0	0/-	0/0	-/0	0/0	0	0			0/0	-/1	-/0	0/0	0/0	0/0	0/0	0/0	0/0
1919			0/0	0/0	0/0	0/0	0/0	0	0	0/-	0/-	0/0				0/0	0/0	0/0	0/0	0/0
1921			0/-	0/-	0/-	0/-				0/-	0/-	0/0	1/1	1/0	0/0	-/0	-/0			
1925	0/0	0/0	1/1	-/0	-/0	0/-	0/0	0	1				1/-	1/-	0/-	0/0	0/0			
1927	0/0	0/1	1/1	0/0	0/0			0	0	0/0	0/0							0/0	0/0	0/0
1932	0/0	1/1	0/0	0/0	0/0	1/1	-/0			0/0	0/0	-/0				0/1	0/0	0/0	0/0	0/0
1933	0/0	0/0	1/1	0/0	0/0	0/0	0/0	0	1			P/-	-/0	-/0	-/0	0/0	0/0	0/0	0/0	0/0
1935	0/-	0/-	1/1	0/-	0/-	0/1	0/0	0	0							1/1	0/0			
1937	0/0	0/0	1/0	0/0	0/0	0/0	0/0	0	0			0/0				-/0	-/0			
1942	0/0	0/0	1/1	0/-	0/-	0/0	0/0	0	0	0/-	0/-		1/0	1/1	0/0	1/1	0/0			
1944	0/0	0/-	1/-	0/-	0/-	0/0	0/0	0					0/0	0/0	0/0	0/0	0/0			
1945	1/1	0/0	0/0	0/0	0/0	0/0	0/0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
1952				0/0	1/0					0/-	0/-	0/0								
1953				-/0	-/0					-/0	-/0		-/0	-/1	-/0	-/1	-/0			
1954			-/0	-/0	-/0					-/1	-/0	-/0				-/0	-/0			
1955			-/1	-/0	-/0	1/1							1/-	0/-	0/-	0/0	1/1			
1962	0/1	0/0	1/1	0/0	0/0	0/0	0/0	0	0	0/0	0/0	0/0	1/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
1965	0/0	0/0	1/1	0/0	0/0	0/0										0/0	0/1	0/0	0/0	0/0
1967	1/1	0/0	1/1	0/0	0/0	0/-				0/0	0/1	0/0	0/0	0/0	0/0	1/1	0/0			
1978	0/0	1/1	0/1	0/0	0/0	0/0	0/0	0	0	1/1	0/0	0/-	-/1	-/0	-/0	1/1	0/0			
1980	0/-	1/-	1/1	0/0	0/0	0/0				0/1	0/0	0/-				0/0	0/0	0/0	0/0	0/0
1983	0/-	0/-	1/-	0/0	0/0							0/0	0/-	0/-	0/-	0/0	0/0			
1985	0/0	1/1	1/1	0/0	0/0	0/0	0/0	0	0	0/0	0/0	0/0	1/0	0/0	0/0	0/0	0/0	1/1	0/0	0/0
1987	0/0	0/1	0/0	0/0	0/0	0/0		0		0/-	0/-		1/0	0/0	0/0	0/0	0/0			
1989	0/0	0/0	0/0	0/0	0/0	0/0		0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			
1992	0/-	1/0	1/-	0/0	0/0	-/0	0/-	0	0	0/0	0/0	0/0	1/-	0/-	0/-	0/0	0/0	0/0	0/-	0/0
1994	0/0	0/0	0/0	0/0	0/0	0/0		0					0/1	0/0	0/0	1/0	0/1			-/0
1996	0/0	0/0	0/0	0/0	1/1	0/0		0		0/-	0/-	0/0	-/0	-/0	-/0	1/1	0/0	1/-	0/-	0/-
1999			0/0	0/0	-/0	0/0						0/-	0/0	0/0	0/0	0/1	0/0	0/-	1/-	0/-
2005	-/0	-/1	-/0	0/0	0/0	-/0		0		-/0	-/0		-/0	-/1	-/0	1/0	0/0	0/0	0/0	0/0
2301	-/0	-/1	-/0	-/0	-/0	1/1										1/0	0/0	-/0	-/0	
2306	0/-	1/-	0/-	0/-	0/-	0/-										1/1	0/0			
2307										0/-	0/-		0/-	0/-	0/-					
2313	-/0	-/0				0/0										-/0	-/0			
2316	0/0	0/0	0/0	0/0	0/0	0/0	0/-	1		-/0	-/0	-/0				0/0	0/0	0/0	0/0	0/0
2318	-/0	-/1	-/1	0/0	0/0	0/0	0/-	0		0/-	0/-		-/0	-/0	-/0	1/1	0/0			
2320													1/1	1/1	0/0	0/-	0/-			
2326	0/0	0/0	0/0	0/0	0/0	0/0	-/0	0	0	-/0	-/0	0/0	1/1	1/0	0/0	0/0	1/1	0/0	0/0	0/-
2327	1/1	0/0	1/1	0/0	0/0	0/0	0/-					0/0	-/1	0/0	-/0	1/1	0/0			
2331	0/0	1/1	-/1	0/0	0/0	-/0	0/0	0	0	0/0	0/0	0/0	0/0	0/0	0/0	1/1	0/0	-/0	0/0	-/0
2332	-/0	-/0	1/1	0/0	0/0	0/-						0/0								
2333						0/0						-/1	1/1	0/0	0/0	1/1	0/0	0/-	0/-	0/-
2334			1/-	0/-									0/-	1/-	0/-					
2336			-/1	0/0	0/0			0										0/1	0/0	0/0

SKEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2343	-/0												0/-	0/-	0/-	1/1	0/0			
2348	0/0	0/0	1/1	0/0	0/0	0/0	0/0	0		0/0	0/0	0/0						0/0	1/0	0/0
2349	0/0	0/0	0/0	0/0	0/0	0/-		0	0			0/0	0/-	0/-	0/-	0/0	0/0			
2373	0/0	1/1	0/1	0/0	0/0	1/1		0	1	0/0	0/0	0/0				0/1	0/0	0/1	0/0	0/0
2384					-/0	-/0				-/0	-/0	0/0	0/-	1/-	0/-	0/0	0/0			
2386	0/0	0/0	1/1	0/0	0/0	0/0				0/0	0/0	-/0				0/0	0/0	0/0	0/0	0/0
2388				-/0	-/0															
2391	1/1	0/0	1/0	0/-	0/-	0/0		0				0/-								
2396	0/0	0/1	1/1	-/0	0/0	0/0	0/1	0	0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/1	0/0	0/0
2397	0/0	1/1	-/1	0/0	0/0	0/0	0/0	1					0/0	0/0	0/0	1/0	0/0			
2400	-/0	1/1	1/1	0/0	0/0	0/0	-/0						1/0	1/0	0/0	0/1	1/0			
2405	1/-	0/-	1/-	0/0	0/0	0/-										0/0	0/0			
2407	-/0	1/1	1/0	0/0	0/0	1/1	0/1	1		0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0			
2411	1/1	0/1	1/1	0/0	0/0	1/1							1/1	1/1	0/0	1/1	0/0			
241B	-/0	-/0		0/0	0/0		-/0			0/-	0/-	0/-				1/0	0/0		0/-	
2432				0/0	0/-			0		0/-	0/-	0/-						0/-	0/-	0/-
2436				0/-	0/-		-/0													
2439					0/0	-/1				-/0	-/0	0/0	1/1	0/0	0/0	1/1	0/0	0/0	0/0	0/0
244BA	0/0	1/0	1/1	0/0	0/0	0/0						0/-				1/1	0/0			
244BB		1/-	1/-	0/0	0/0	0/0	0/-			0/0	0/0	-/0	1/1	0/0	0/0			0/0	0/0	0/0
2449	0/-	0/-	1/1	0/0	0/0	0/0	0/0	0					1/1	0/0	0/0	0/0	0/0			
2451	0/0	0/0	1/1	0/0	0/0	0/0	0/0	0	P	0/-	0/-	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
2452	0/0	1/1	1/1	0/0	0/0	-/0	1/0	0		0/-	0/-	-/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
2457	-/0	0/0	-/0	0/0	0/0	1/1		0		1/-	1/-	0/0	0/1	0/0	0/0	1/1	0/0	1/-	0/0	0/0
2458	0/0	0/0	1/0	0/0	0/0	0/-	0/-	0					0/0	0/0	0/0	0/0	0/0	-/0	-/0	
2459	0/0	0/0	1/0	0/0	0/0	0/0	0/0			0/-	0/-	0/0	0/0	0/0	0/0	0/0	0/0			
2461	0/0	1/-	1/1	0/0	0/0	0/0		0	0	-/0	-/0	0/0	0/0	0/0	0/0	1/1	0/0	-/0	-/0	-/0
2462	0/0	0/0	1/0	0/0	0/0	0/0	0/0	0		0/-	0/-	0/0	0/0	0/0	0/0	0/0	0/0	-/0	-/0	
2466	-/0	-/1	-/1	0/-	0/-	0/-	0/-			0/0	0/0	0/-						0/0	0/0	0/0
2474	0/0	1/1	1/-	0/0	0/0	0/0				0/0	0/1	0/0	0/0	0/0	0/0	0/0	0/0		0/0	
2476	0/0	1/1	0/0	0/0	0/0	0/0	0/0	0	0			-/0	0/0	0/0	0/0	1/1	0/0	0/0	0/-	0/-
2478		1/1	1/1							-/0	-/0	-/0	0/1	1/1	0/0	0/0	0/0			
24B0	-/0	-/0	0/1	0/0	0/0	-/0						-/0	0/0	0/0	0/0	-/0	-/0	-/0	0/0	
24B2			1/1	0/-	0/-	0/0	0/1	0				0/-								
24B4																1/-	0/-			
24B9	0/0	0/0	0/0	0/0	0/0	0/0	1/0	0	0	0/0	0/0							0/0	0/0	0/0
2492	0/1	-/1		0/0	0/0			0		0/0	0/0	0/0				0/0	0/0	0/0	0/0	0/0
2494	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0	1	0/0	0/0	0/0				0/0	0/0	1/0	1/0	-/0
2496					0/0	0/-						0/-				-/1	-/0			
2499	0/0	0/1	0/0			0/0		0	0				1/1	0/0	0/0	1/1	0/0			
2504	-/0	-/0	-/1	0/-	0/-	0/-	0/-	0					1/0	0/0	0/0	0/0	1/1	-/0	-/0	
2506	0/0	0/0	-/0	0/0	0/0	0/1	0/0	0		-/0	-/0	0/0	0/1	0/1	0/0	0/0	0/0	-/0	-/0	-/0
2508	-/0	0/0	0/0	0/0	0/0	0/0	-/0	0		0/0	0/0	-/0	1/1	1/0	0/0	0/0	0/0			
2511																0/0	0/0			
2514	0/-	0/-		0/0	-/0	0/0	-/1	0	0			0/0	1/1	0/0	0/0	1/1	0/0			
2527			1/1					0					1/1	0/0	0/0	0/0	1/1			
2533	0/-		1/0	0/0	0/0	0/0	0/0	0	0	-/0	-/0	0/0	0/0	1/1	0/0	0/0	0/0	0/0	1/1	0/0
2535	0/0	0/0	-/0	0/0	0/0	0/0		0		0/0	0/1	0/0	0/0	0/1	0/0	1/1	0/0	1/1	0/0	0/0
2537	0/-	1/-	1/-	0/0	0/0					0/-	0/-		1/0	1/0	0/0	-/0	-/0			
2542			-/1	0/0	0/0	0/0				0/0	0/0	0/0	-/0	-/0	-/0	0/0	0/0	0/0	0/0	0/0
2546	0/0	0/0	1/1	0/0	0/0	0/0		0	0	1/1	0/0	0/0				0/0	0/0	1/0	0/0	0/0
2548	0/1	0/0	0/0	0/0	0/0	0/0		0		0/-	0/-	0/0	0/0	0/0	0/0	0/0	0/0		0/0	
2556	1/0	0/0	0/0	0/0	0/0	-/0	-/1	0	1	-/0	-/0	0/-	0/0	0/0	0/0	0/0	1/1	0/-	0/0	0/-
2576	0/0	0/0	0/0	0/0	0/0	0/0		0	0	0/0	0/0	-/0	0/1	0/0	0/0	1/1	0/0	1/1	0/0	0/0
2583	0/0	1/0	1/1	0/0	0/0			0	1	0/0	1/0	0/0				0/1	0/0	1/0	P/0	0/0

SKEL	1	2	3	4	5	6	7	B	9	10	11	12	13	14	15	16	17	18	19	20
2587	0/0	0/0	1/1	0/0	0/0	0/0		0	0			0/0						0/0		0/0
2591	0/0	1/1	1/1	0/0	0/0	0/0	0/-	0		0/0	0/0	0/-	0/0	0/0	0/0	1/0	0/0	-/0	-/0	-/0
2593	-/0	0/0	0/0	0/0	-/0	0/0	0/0	0	0			0/0				0/0	0/0		0/-	
2596	-/0	1/1	1/1	0/0	0/0	0/0	0/0					0/0				0/1	0/0		0/-	
2612	-/1	-/1	1/-	0/0	0/0	1/0		0	0	0/-	0/-	0/0	1/1	0/0	0/0	1/1	0/0			
2614	0/1	0/0	1/1	0/0	1/0	0/0	-/0	0								1/1	0/0			
2616	0/-	0/0	1/1	0/0	0/0	0/0	-/0	0	0	1/1	0/0	0/0						0/0	0/0	0/0
2617																0/-	0/-		0/P	
2620	0/0	1/1	1/1	0/0	0/0	1/1		0	0			0/0	1/1	0/0	0/0	0/1	0/0	1/1	0/0	
2622	0/0	0/0	1/1	0/-	0/-	0/0		0	0	0/-	0/-	0/-	0/1	0/0	0/0	0/0	1/1	0/0	0/0	0/0
2624	1/0	0/0	0/0	0/0	0/0	0/0	0/-	0	1	0/0	0/0	0/0				1/0	0/0	0/0	0/0	0/0
2626	-/1		-/1											-/0	-/0	0/-	1/-			
2628	-/0		1/1	0/0	0/0	0/0				0/-	1/-	-/0				0/0	0/0	0/0	0/0	0/0
2631	0/0	0/0	0/1	0/0	0/0	0/1		0	0			1/0	0/0	0/0	0/0	1/1	0/0	1/1	0/0	0/0
2636	-/0	-/1	0/0	0/0	0/0	0/0	1/-	0		0/0	0/0	0/0						-/1	-/0	-/0
2638	0/1	0/-	1/-	0/0	0/0	0/0		0				0/-	0/-	0/-	0/-	0/0	0/0			
2640				0/0	0/0	0/0		0		0/0	0/0	0/1	0/0	1/1	0/0			0/0	0/0	0/-
2642	0/0	0/0	1/1	0/0	0/0	0/0	0/0	0	0	0/0	0/0	0/0				1/1	0/0	0/0	-/0	0/1
2644				0/0	0/0	0/-				0/-	0/-									
2647			1/1	0/-	0/-	-/0	-/0	0							-/0	1/1	0/0			
2650	0/0	1/1	1/1	0/0	0/0	0/-							-/0	-/1	-/0	0/0	0/0	0/1	0/-	
2654			1/1	0/0	0/0	0/0		0		0/0	0/0	0/0	-/1	-/0	0/0	1/1	0/0	0/0	0/0	0/0
2656																1/1	0/0			
2658	0/0	0/0	1/1	0/0	0/0	0/0		0	0	0/0	0/0	P/0	0/-	0/-	0/-	0/0	0/0			-/0
2663																0/0	0/0			
2671	0/-	0/-	1/1	0/0	0/0	0/0		0								1/1	0/0			
3051																0/0	0/0			
3054	0/0	0/0	1/1	0/0	0/0	0/0	0/0	0		0/0	0/0	0/0				0/0	0/0	0/0	0/0	0/0
3095	0/0	0/0	1/1	0/0	0/0	0/0	-/1	0	0	0/0	0/0	0/0	1/1	0/0	0/0	1/1	0/0	0/0	0/0	0/0
3105	0/0	1/1	0/-	0/0	0/0	0/0		0	0	0/0	0/1	0/-				1/1	0/0			
3107	0/0	1/1	1/0	0/-	0/-	0/0	0/0	0	1	0/0	0/0	0/-				1/1	0/0	0/0	0/0	1/0
3109			1/-	0/0	0/0	0/-		0				0/0	0/-	1/-	0/-	0/0	0/0	0/1	0/0	0/0
3118	0/0	0/1	1/-	0/0	0/0					0/-	0/-	-/0	0/0	0/0	0/0	1/1	0/0			
3126	0/-			0/0	0/0							-/0				1/1	0/0	1/1	0/0	0/0
3131																1/1	0/0			

Key: 1=Fossa of Allen 2=Plaque formation 3=Exostosis in trochanteric fossa 4=Supra-condyloid process 5=septal aperture 6=Acetabular crease 7=Accessory sacral facets on ilium 8=Sacral spina bifida 9=6th sacral segment 10=Acromial articular facet 11=Os acromiale 12=Supra-scapular foramen 13=Vastus notch 14=vastus fossa 15=Emarginate patella 16=Anterior calcaneal facet double 17=Anterior calcaneal facet absent 18=Atlas facet double 19=Posterior atlas bridging 20=Lateral atlas bridging

CRIBRA ORBITALIA, DENTAL CALCULUS & DENTAL ENAMEL HYPOPLASIA

SKEL	CRIBRA	CALC	DENTAL ENAMEL HYPOPLASIA
0669	O	1	1 3.8mmCEJ ON MAND I2
0740	O	2	O
0750	O	1	O
0761	O	1	1 SEE PATH SECTION
0775	O	1	O
0780	-	2	O
0938	O	1	-
0940	O	O	-
0943	O	1	1 LINE 4.5MM CEJ MAX I2
0950	T	3	-
0953	O	2	O
0954	O	1	O
0962	O	O	-
0974	-	O	1 LINE 4.9MM CEJ MAXI2
0984	T	O	-
0985	O	1	1 FEINT LINE 6.7MM CEJ ON MANC
0989	C	O	-
0990	O	-	-
0992	O	3	O
1012	O	3	-
1068	O	1	O
1321	O	-	-
1323	O	-	-
1340	O	1	2 FEINT LINES 4, 6MM CEJ MANC
1376	-	3	2 LINES 1, 2MM CEJ MANPM1
1415	O	-	-
1416	-	1	2 LINES, 3.5 & 4.5MM CEJ MAXI2
1417	O	-	-
1418	O	2	2 LINES, 4.6 & 3.2MM CEJ ON MAXC
1426	O	1	O
1451	O	1	O
1455	O	1	2 LINES 4.5, 2.5MM FROM CEJ ON MANDI2
1457	C	3	O
1459	O	2	O
1464	O	1	O
1469	O	1	1 BAND OF PITTING 5-2MM CEJ MANC & ON OCCL M1S
1471	O	1	O
1472	C	O	O
1483	O	1	1 QUITE FEINT LINE 2.7MM CEJ MAXC
1492	O	2	-
1494	O	-	-
1495	O	1	-
1497	-	1	-
1730	P	1	3 FEINT LINES 2.5, 3.6, 5.3MM CEJ MANC
1731	O	O	-
1738	P	-	O
1746	O	2	O
1749	O	2	O
1750	O	2	O
1751	P	1	O
1754	P	1	O
1757	O	O	2 FEINT LINES 3 & 4.5MM CEJ MANI2
1762	O	1	1 LINE 2MM CEJ MAXC

SKEL	CRIBRA	CALC	DENTAL ENAMEL HYPOPLASIA
1764	O	2	1 LINE 4.5MM CEJ MAXC
1780	O	1	1 LINEAR DEPRESSION 4-5MM CEJ MANC
1782	O	1	O
1784	P	-	-
1786	-	2	O
1789	O	O	O
1795	O	2	O
1797	O	O	2 LINES 1.5, 2.5 CEJ MAXI2
1799	O	1	O
1813	C	O	-
1816	P	1	O
1819	P	O	1 LINE 6.5MM CEJ MAXC
1830	C	-	O
1834	O	2	-
1837	O	O	O
1841	O	2	2 LINES 5.5, 4.0MM CEJ MAXC
1846	-	1	1 FEINT LINE 4MM CEJ MANI1
1855	P	O	2 LINES 3 & 2MM, & BAND 4MM CEJ MANC
1872	P	2	O
1874	O	O	O
1882	P	2	-
1894	-	O	O
1897	O	O	1 BAND 2-4MM CEJ MANM1
1902	O	-	-
1903	O	2	1 FEINT LINE 4MM CEJ MAXPM2
1904	T	2	O
1906	O	O	2 FEINT LINES 5.5, 4.5MM CEJ MAXC
1908	O	1	O
1914	P	O	O
1917	-	3	3 LINES 2.0, 3.4, 4.9MM CEJ MAXI1
1919	O	O	
1921	-	O	O
1923	-	1	O
1932	O	1	O
1933	-	O	-
1937	O	O	O
1945	O	O	O
1952	O	3	O
1953	O	1	O
1954	-	1	O
1962	O	O	3 FEINT LINES 3.0, 4.5 & 5.5MM CEJ MANC
1965	O	-	-
1967	O	2	2 LINES 2, 4MM CEJ MANC
1978	O	3	O
1980	O	2	3 FEINT LINES 5.1, 5.8 & 6.1MM CEJ MAXI1
1983	O	1	1 LINE 5.4MM CEJ MAXC
1985	O	1	O
1987	C	1	-
1989	O	1	O
1992	-	-	1 LINE 3.2MM CEJ MAXI1
1994	T	3	O
1996	C	1	2 HEAVY LINES 6.5, 4.1MM CEJ MANC
1999	O	O	O
2005	C	2	1 MARKED LINE 4.6MM CEJ MANI2
2049	C	-	-

SKEL	CRIBRA	CALC	DENTAL ENAMEL HYPOPLASIA
2307	O	-	-
2316	O	3	-
2318	O	2	1 LINE 6.5MM CEJ MAXC
2320	O	-	-
2326	O	1	1 LINE 4.3MM CEJ MAXI1
2327	O	O	O
2331	O	1	O
2333	O	2	O
2334	-	2	O
2336	O	1	O
2343	P	2	1 LINE 4.3MM CEJ ON MANPM1
2348	O	-	O
2349	P	1	O
2373	O	1	O
2384	O	1	O
2386	C	-	-
2396	O	-	-
2397	O	-	-
2400	O	-	-
2405	P	-	-
2407	O	1	-
2411	T	-	-
2418	O	1	O
2432	O	2	1 LINE 2.4MM CEJ MAXC
2439	P	3	O
2448A	-	2	3 LINES 2.5, 3.6 & 4.9MM CEJ MANC
2448B	O	-	-
2449	-	O	2 LINES 3.0, 4.5MM CEJ MANI2
2451	P	1	O
2452	O	O	2 LINES 3.0, 2.1MM CEJ MAXI2
2457	-	3	O
2458	P	O	2 LINES 6.0, 4.0MM CEJ MANC
2459	O	2	O
2461	O	-	-
2462	O	1	O
2466	O	3	O
2473	O	O	-
2474	O	-	-
2476	O	-	-
2478	O	2	O
2480	O	3	O
2482	O	-	-
2489	T	2	O
2491	O	-	-
2492	O	4	-
2494	O	2	O
2496	-	2	-
2501	-	O	-
2504	O	1	1 LINE 2.5MM CEJ MANC
2506	O	1	-
2508	O	1	O
2514	O	O	O
2527	P	2	O
2533	O	2	O
2535	O	O	O

SKEL	CRIBRA	CALC	DENTAL ENAMEL HYPOPLASIA
2537	O	1	O
2542	P	-	-
2546	C	-	-
2548	-	2	1 FEINT LINE 2.8MM CEJ MANC
2556	O	1	O
2574	-	O	O
2575	O	O	O
2576	O	3	1 LINE 5.9MM CEJ MAXC
2577	O	O	2 LINES:2.5MM CEJ MAXI2,O-O.8MMCEJ MAXM2
2583	O	2	O
2587	O	2	3 LINES 5.6-6.O, 6.7 & 7.4MM CEJ MANC
2591	O	1	O
2593	C	3	O
2596	O	O	O
2612	O	1	O
2614	-	O	O
2616	O	1	O
2617	O	O	O
2620	P	2	O
2622	O	-	-
2624	O	2	O
2626	-	1	O
2628	O	1	-
2631	-	1	O
2636	O	1	1 LINE 3.5MM CEJ MAXC
2638	O	O	1 FEINT LINE 4.2MM CEJ MANC
2640	O	2	O
2642	P	1	1 LINE 3.4MM CEJ MAXC
2650	O	2	2 LINES 3.2, 4.4MM CEJ MANPM1
2654	O	1	2 FEINT LINES 3.4, 5.2MM CEJ MANI1
2658	O	O	-
3054	O	4	O
3091	O	O	O
3095	O	2	O
3101	O	1	1 LINE 2.3MM CEJ MAXI2
3105	P	1	O
3107	P	O	-
3109	O	3	O
3126	O	1	1 LINE 5.OMM CEJ MAXC
3131	O	O	O
3133	O	-	-

Key: Cribra: O=absent, P=porotic type, C=cribriotic type, T=trabecular type (classified according to Brothwell 1981). Calculus: scored on the scale of Dobney & Brothwell (1987). Dental enamel hypoplasia: O=absent.

SPINAL OSTEOPHYTOSIS

SKEL	Cervical grades				Thoracic grades				Lumbar grades			
	0	1	2	3	0	1	2	3	0	1	2	3
0740	4	2	0	0	2	6	0	0	1	4	0	0
0940	1	0	0	0	7	0	0	0	4	0	0	0
0943	1	1	0	0	4	4	0	0	4	0	0	0
0950	1	0	0	4	0	6	5	0	0	4	0	0
0954	6	0	0	0	3	9	0	0	3	2	0	0
0956	0	0	0	0	0	1	0	0	3	2	0	0
0962	5	0	0	0	8	2	0	0	4	1	0	0
0974	0	0	0	0	8	3	0	0	5	0	0	0
0984	3	0	1	2	3	8	1	0	0	5	0	0
0992	5	0	0	0	12	0	0	0	5	0	0	0
1012	0	2	3	1	2	10	0	0	0	0	4	1
1068	1	0	0	0	1	10	0	0	0	3	0	0
1306	0	0	0	0	0	0	0	0	0	1	0	0
1333	0	0	0	0	1	0	0	0	4	1	0	0
1340	6	0	0	0	9	0	0	0	5	0	0	0
1361	0	0	0	0	1	0	0	0	0	1	1	0
1376	0	5	1	0	4	6	0	0	5	0	0	0
1391	0	0	0	0	1	0	0	0	3	3	0	0
1415	3	1	1	0	0	3	0	0	0	0	0	0
1416	1	0	0	0	0	0	0	0	1	0	0	0
1418	0	2	0	0	4	3	0	0	1	1	0	0
1426	3	0	0	0	10	1	0	0	4	1	0	0
1451	0	0	0	0	0	0	0	0	1	1	0	0
1455	6	0	0	0	6	0	0	0	4	0	0	0
1457	0	3	1	0	0	0	0	0	0	0	0	0
1459	2	0	2	0	2	6	0	0	0	0	0	0
1464	6	0	0	0	9	3	0	0	3	2	0	0
1471	0	0	0	0	0	0	0	0	2	0	0	0
1472	0	2	4	0	0	11	0	0	0	5	0	0
1483	1	2	0	0	1	9	0	0	0	5	0	0
1494	1	0	0	0	5	3	0	0	1	0	0	0
1495	1	1	3	1	12	0	0	0	2	0	0	0
1730	2	0	0	0	9	0	0	0	5	0	0	0
1738	4	0	0	0	3	0	0	0	3	1	0	0
1740	1	0	0	0	1	10	0	0	2	3	0	0
1746	4	2	0	0	2	10	0	0	0	4	1	0
1749	0	0	0	0	0	5	0	0	0	1	0	0
1750	0	3	0	0	5	3	0	0	0	0	0	0
1751	5	0	0	0	12	0	0	0	5	0	0	0
1762	1	0	1	0	3	9	0	0	1	4	0	0
1764	5	1	0	0	1	11	0	0	3	2	0	0
1779	0	0	0	0	2	0	0	0	4	0	0	0
1780	1	0	0	0	5	4	0	0	5	0	0	0
1782	3	0	0	0	3	6	0	0	5	0	0	0
1786	1	2	3	0	4	7	0	0	0	5	0	0
1789	0	0	0	0	1	5	0	0	1	0	0	0
1795	0	1	0	3	0	11	1	0	0	1	4	0
1797	1	1	0	0	5	0	0	0	1	0	2	0
1816	0	0	0	0	0	10	0	0	1	4	0	0
1830	0	0	0	0	0	0	0	0	2	0	0	0

SKEL	Cervical grades				Thoracic grades				Lumbar grades			
	0	1	2	3	0	1	2	3	0	1	2	3
1841	5	0	0	0	4	8	0	0	4	0	0	0
1846	6	0	0	0	4	7	0	0	1	4	0	0
1855	1	0	0	0	5	0	0	0	5	0	0	0
1874	2	0	0	0	1	0	0	0	0	0	0	0
1882	0	2	4	0	2	7	3	0	2	3	0	0
1902	0	3	2	0	9	3	0	0	5	0	0	0
1903	5	1	0	0	2	9	1	0	2	3	0	0
1904	1	1	2	0	5	6	0	0	5	0	0	0
1906	1	0	0	0	6	2	0	0	3	1	0	0
1908	4	2	0	0	6	4	0	0	3	2	0	0
1914	6	0	0	0	1	4	3	0	1	4	0	0
1917	4	0	2	0	3	9	0	0	2	3	0	0
1919	0	0	0	0	1	3	0	0	0	2	2	0
1921	0	0	0	0	6	0	0	0	5	0	0	0
1925	0	0	0	0	3	3	0	0	0	2	0	0
1927	6	0	0	0	8	2	0	0	5	0	0	0
1932	4	0	0	0	1	1	0	0	0	0	0	0
1933	0	0	0	0	2	8	0	0	0	3	2	0
1935	0	0	0	0	0	2	0	0	1	3	0	0
1937	0	0	0	0	12	0	0	0	5	0	0	0
1942	1	0	0	0	11	0	0	0	4	1	0	0
1944	0	0	0	0	0	0	0	0	0	4	0	0
1945	3	0	0	0	11	0	0	0	6	0	0	0
1952	0	0	0	0	3	9	0	0	2	3	0	0
1962	5	0	0	0	12	0	0	0	4	1	0	0
1965	3	1	0	0	2	3	2	0	2	1	0	0
1967	0	0	0	0	4	0	0	0	2	0	0	0
1978	2	0	0	0	12	0	0	0	3	2	0	0
1980	3	3	0	0	1	11	0	0	1	4	0	0
1983	4	1	0	0	3	9	0	0	3	2	0	0
1987	0	1	4	1	0	0	0	0	0	2	3	0
1989	0	0	0	0	12	0	0	0	5	0	0	0
1992	6	0	0	0	8	0	0	0	5	0	0	0
1994	1	0	0	0	1	0	0	0	1	0	0	0
1996	6	0	0	0	8	4	0	0	3	1	0	0
1999	0	0	0	0	12	0	0	0	5	0	0	0
2005	4	2	0	0	0	0	0	0	0	0	0	0
2313	0	0	0	0	3	0	0	0	1	0	0	0
2316	6	0	0	0	12	0	0	0	5	0	0	0
2318	2	0	0	0	12	0	0	0	5	0	0	0
2326	6	0	0	0	12	0	0	0	5	0	0	0
2327	1	0	0	0	2	3	0	0	1	4	0	0
2331	5	0	0	0	11	1	0	0	5	0	0	0
2332	1	2	0	0	1	9	0	0	0	0	1	0
2333	0	1	0	0	0	0	0	0	0	0	0	0
2334	0	0	0	0	0	2	0	0	2	3	0	0
2336	0	0	0	0	0	7	1	0	4	1	0	0
2343	0	0	0	0	0	0	0	0	3	0	0	0
2348	2	4	0	0	2	6	0	0	0	1	0	0
2349	1	0	0	0	4	1	0	0	4	0	0	0
2373	5	1	0	0	1	7	0	0	0	4	0	0
2384	0	0	0	0	2	9	0	0	0	0	0	0

	Cervical grades				Thoracic grades				Lumbar grades			
SKEL	0	1	2	3	0	1	2	3	0	1	2	3
2386	2	1	1	1	3	3	0	0	0	0	2	1
2388	2	0	0	0	6	0	0	0	0	0	0	0
2391	0	1	0	0	0	10	0	0	0	3	0	0
2396	1	2	3	0	2	2	0	0	0	5	0	0
2397	2	2	0	0	1	3	0	0	2	3	0	0
2400	1	2	1	0	1	10	0	0	0	3	2	0
2405	0	0	0	0	1	3	0	0	0	0	0	0
2407	0	0	0	0	0	2	0	0	0	4	0	0
2411	1	1	0	0	2	2	0	0	2	3	0	0
2418	0	0	0	0	0	0	0	0	4	0	0	0
2432	2	0	3	0	0	0	0	0	0	1	0	0
2439	2	1	0	0	1	2	0	0	0	0	0	0
2441	0	0	0	0	0	0	0	0	0	5	0	0
2448A	4	0	0	0	5	0	0	0	5	0	0	0
2448B	1	0	1	0	2	7	0	0	1	2	0	0
2451	6	0	0	0	12	0	0	0	5	0	0	0
2452	1	3	2	0	0	11	0	0	0	5	0	0
2457	4	2	0	0	1	11	0	0	0	4	0	0
2458	5	0	0	0	12	0	0	0	3	0	0	0
2459	5	0	0	0	10	2	0	0	4	0	0	0
2461	0	0	2	0	2	1	0	0	0	2	0	0
2462	5	0	0	0	12	0	0	0	5	0	0	0
2474	2	1	2	0	1	11	0	0	1	4	0	0
2476	1	2	2	0	5	6	0	0	0	5	0	0
2480	6	0	0	0	2	0	0	0	2	0	0	0
2482	0	0	0	0	0	2	0	0	0	3	2	0
2489	5	0	0	0	9	0	0	0	5	0	0	0
2492	6	0	0	0	12	0	0	0	5	0	0	0
2494	3	3	0	0	3	9	0	0	1	3	0	0
2504	3	2	0	0	1	0	0	0	0	3	0	0
2506	0	1	0	0	5	5	2	0	1	3	1	0
2508	0	3	0	0	0	0	0	0	0	3	0	0
2514	2	0	0	0	8	2	0	0	5	0	0	0
2527	0	0	0	0	0	1	0	0	0	2	0	0
2533	3	0	0	0	10	0	0	0	5	0	0	0
2535	0	0	0	0	8	0	0	0	5	0	0	0
2537	1	1	3	1	2	9	0	0	0	1	0	0
2542	1	3	1	0	1	0	1	6	2	0	1	0
2546	3	3	0	0	1	8	0	0	2	3	0	0
2548	1	3	0	0	1	8	0	0	1	4	0	0
2556	6	0	0	0	10	2	0	0	3	2	0	0
2576	2	4	0	0	2	6	0	0	0	5	0	0
2583	0	0	5	1	0	12	0	0	1	4	0	0
2587	6	0	0	0	3	0	0	0	2	0	0	0
2593	3	0	0	0	12	0	0	0	5	0	0	0
2596	5	1	0	0	0	12	0	0	0	5	0	0
2612	1	0	0	0	0	3	0	0	0	5	0	0
2614	1	0	0	0	0	9	0	0	0	5	0	0
2616	4	2	0	0	10	2	0	0	2	3	0	0
2620	3	0	2	0	2	5	0	0	2	3	0	0
2622	2	3	1	1	1	4	6	0	0	0	4	1
2624	6	0	0	0	11	1	0	0	5	0	0	0

SKEL	Cervical grades				Thoracic grades				Lumbar grades			
	0	1	2	3	0	1	2	3	0	1	2	3
2626	0	0	0	0	1	0	0	0	0	0	0	0
2628	1	1	0	4	7	2	0	0	2	0	0	2
2631	2	0	0	0	4	1	0	0	4	1	0	0
2632	0	0	0	0	0	0	0	0	1	2	0	0
2636	1	4	1	0	1	4	2	0	0	3	2	0
2638	0	1	0	0	0	3	0	0	0	0	1	0
2640	0	0	0	0	2	5	0	0	0	0	0	0
2642	4	0	0	0	0	0	0	0	1	4	0	0
2644	0	0	0	0	2	0	0	0	3	1	0	0
2650	3	2	0	0	1	0	0	0	0	2	0	0
2658	1	0	5	0	5	5	0	0	0	5	1	0
2671	0	1	0	0	2	7	0	0	4	1	0	0
3054	0	0	5	0	0	9	3	0	2	4	0	0
3095	3	0	1	2	4	6	0	0	0	4	1	0
3105	5	0	0	0	10	0	0	0	5	0	0	0
3107	2	1	1	2	3	8	0	0	2	3	0	0
3109	4	1	1	0	3	1	0	0	3	1	0	0
3118	3	0	0	0	0	5	0	0	2	0	0	0
3126	2	0	0	0	6	3	0	0	0	1	0	0
*** Total ***	348	114	77	24	658	599	31	6	348	269	37	5

SPINAL OSTEOARTHRITIS

SKEL	Cervical grades				Thoracic grades				Lumbar grades			
	0	1	2	3	0	1	2	3	0	1	2	3
0740	7	0	0	0	10	2	0	0	6	0	0	0
0940	2	0	0	0	8	0	0	0	4	0	0	0
0943	1	2	2	0	12	0	0	0	5	0	0	0
0950	0	0	0	3	6	0	0	2	2	0	1	1
0954	7	0	0	0	12	0	0	0	5	0	0	0
0956	0	0	0	0	1	0	0	0	5	0	0	0
0962	7	0	0	0	4	1	1	6	5	0	0	0
0974	0	0	0	0	9	0	0	0	5	0	0	0
0984	1	1	0	5	6	2	1	3	5	0	0	0
0992	6	0	0	0	12	0	0	0	5	0	0	0
1012	1	0	1	5	8	4	0	0	4	1	0	0
1068	2	1	0	0	5	5	2	0	4	0	0	0
1306	0	0	0	0	0	0	0	0	1	0	0	0
1333	0	0	0	0	1	0	0	0	5	0	0	0
1340	7	0	0	0	12	0	0	0	4	0	0	0
1361	0	1	0	0	0	0	0	1	0	0	2	0
1376	4	3	0	0	7	1	3	1	1	0	0	4
1391	0	0	0	0	1	0	0	0	6	0	0	0
1415	5	0	1	1	4	2	0	0	0	0	0	0
1416	0	0	0	0	3	0	0	0	0	0	0	0
1418	4	1	2	0	5	0	0	0	4	1	0	0
1426	4	0	0	0	5	0	0	0	3	0	0	0

SKEL	Cervical grades				Thoracic grades				Lumbar grades			
	0	1	2	3	0	1	2	3	0	1	2	3
1451	2	0	0	0	0	0	0	0	5	0	0	0
1455	7	0	0	0	4	1	5	0	5	0	0	0
1457	6	0	0	0	8	1	0	0	1	1	0	0
1459	6	1	0	0	11	1	0	0	2	3	0	0
1464	7	0	0	0	12	0	0	0	5	0	0	0
1471	2	0	0	0	0	0	0	0	0	0	0	0
1472	1	3	2	0	9	2	0	0	3	0	0	2
1483	7	0	0	0	12	0	0	0	5	0	0	0
1494	4	0	0	0	3	0	0	0	3	0	0	0
1495	0	1	1	5	0	5	0	0	1	0	0	0
1730	2	0	0	0	10	0	0	0	5	0	0	0
1738	7	0	0	0	11	1	0	0	3	2	0	0
1740	1	0	0	0	10	0	0	0	5	0	0	0
1746	7	0	0	0	10	2	0	0	5	0	0	0
1749	0	0	0	0	0	0	0	0	1	0	0	0
1750	3	0	0	0	8	1	0	0	0	0	0	0
1751	4	0	0	0	12	0	0	0	5	0	0	0
1762	6	1	0	0	8	0	0	0	4	1	0	0
1764	6	1	0	0	8	1	0	0	3	2	0	0
1779	0	0	0	0	1	0	0	0	5	0	0	0
1780	1	0	0	0	0	0	0	0	0	0	0	0
1782	5	0	0	0	5	0	0	0	5	0	0	0
1786	0	2	0	2	11	1	0	0	1	4	0	0
1795	4	0	2	0	7	2	0	0	2	3	0	0
1797	1	0	0	0	5	0	5	1	1	1	0	1
1816	1	1	0	0	4	7	1	0	1	1	1	0
1830	0	0	0	0	0	0	0	0	1	0	0	0
1841	7	0	0	0	10	2	0	0	5	0	0	0
1846	7	0	0	0	10	2	0	0	5	0	0	0
1855	3	0	0	0	12	0	0	0	5	0	0	0
1872	5	0	0	0	12	0	0	0	5	1	0	0
1882	4	3	0	0	4	1	5	2	3	0	0	2
1892	3	2	0	0	8	2	2	0	5	0	0	0
1902	7	0	0	0	8	2	0	0	5	0	0	0
1903	7	0	0	0	12	0	0	0	5	0	0	0
1904	5	2	0	0	7	2	1	0	5	0	0	0
1906	4	0	0	0	6	0	0	0	1	0	0	0
1908	7	0	0	0	9	3	0	0	5	0	0	0
1914	6	0	0	0	10	2	0	0	2	3	0	0
1917	7	0	0	0	10	2	0	0	5	0	0	0
1919	7	0	0	0	9	2	1	0	1	0	0	0
1925	0	0	0	0	7	0	0	0	5	0	0	0
1927	7	0	0	0	12	0	0	0	5	0	0	0
1932	4	1	0	0	8	2	0	0	0	0	0	0
1933	2	1	0	0	8	2	0	0	3	1	1	0
1935	0	0	0	0	3	0	0	0	5	0	0	0
1937	0	0	0	0	10	0	0	0	5	0	0	0
1942	1	0	0	0	11	0	0	0	5	0	0	0
1944	0	0	0	0	0	0	0	0	3	0	1	1
1945	7	0	0	0	11	0	0	0	6	0	0	0
1952	0	0	0	0	7	0	0	5	2	0	0	3
1954	0	0	0	0	1	0	0	0	0	0	0	0

	Cervical grades				Thoracic grades				Lumbar grades			
SKEL	0	1	2	3	0	1	2	3	0	1	2	3
1962	7	0	0	0	12	0	0	0	5	0	0	0
1965	5	0	0	0	8	0	2	0	3	0	0	0
1967	0	0	0	0	6	0	0	0	0	0	0	0
1978	2	0	0	0	12	0	0	0	5	0	0	0
1980	7	0	0	0	12	0	0	0	5	0	0	0
1983	5	0	0	0	8	0	0	0	2	0	0	0
1987	2	0	0	4	9	0	0	0	3	1	0	0
1989	0	0	0	0	11	0	0	0	5	0	0	0
1992	7	0	0	0	12	0	0	0	5	0	0	0
1994	2	1	0	0	6	0	0	0	3	0	0	0
1996	7	0	0	0	8	0	0	0	5	0	0	0
1999	2	0	0	0	12	0	0	0	5	0	0	0
2005	7	0	0	0	9	3	0	0	5	0	0	0
2301	1	0	0	0	0	0	0	0	0	0	0	0
2307	1	1	0	0	0	0	0	0	0	0	0	0
2313	0	0	0	0	1	0	0	0	1	0	0	0
2316	7	0	0	0	12	0	0	0	5	0	0	0
2318	3	0	0	0	2	0	0	0	1	0	0	0
2326	7	0	0	0	11	0	0	0	4	0	0	0
2327	4	0	0	0	6	1	3	0	4	1	0	0
2331	7	0	0	0	6	0	0	0	5	0	0	0
2332	2	0	0	0	7	3	2	0	1	2	0	0
2333	2	0	0	0	0	0	0	0	0	0	0	0
2336	2	0	0	0	8	0	0	0	0	0	0	0
2348	5	0	2	0	12	0	0	0	4	1	0	0
2349	3	0	0	0	12	0	0	0	5	0	0	0
2373	7	0	0	0	8	4	0	0	5	0	0	0
2384	0	1	0	0	2	0	0	0	0	0	0	0
2386	2	0	2	3	3	2	0	7	0	2	1	1
2388	2	0	0	0	5	1	0	0	0	0	0	0
2391	2	1	0	0	11	0	0	0	3	2	0	0
2396	0	5	2	0	7	3	2	0	1	4	0	0
2397	3	0	0	0	6	0	0	0	5	0	0	0
2400	4	0	0	0	9	0	0	0	3	0	0	0
2405	0	0	0	0	2	1	2	0	0	0	0	0
2407	0	0	0	0	5	0	0	0	3	0	0	0
2411	1	0	0	0	6	1	0	0	1	1	1	0
2418	1	0	0	0	5	0	0	0	5	0	0	0
2432	1	1	1	1	0	0	0	0	2	0	0	0
2439	1	1	1	2	0	0	0	0	0	0	0	0
2441	0	0	0	0	6	1	1	2	0	0	0	0
2448A	4	0	0	0	3	0	0	0	5	0	0	0
2448B	4	0	0	0	7	1	2	0	2	0	0	0
2449	0	0	0	0	0	0	0	0	2	0	0	0
2451	7	0	0	0	12	0	0	0	5	0	0	0
2452	6	1	0	0	7	0	2	3	2	3	0	0
2457	2	2	0	2	7	0	1	2	5	0	0	0
2458	7	0	0	0	7	0	0	0	3	0	0	0
2459	6	0	0	0	12	0	0	0	3	1	0	0
2461	0	2	1	0	8	3	0	0	1	0	2	2
2462	7	0	0	0	12	0	0	0	5	0	0	0
2474	2	0	0	0	12	0	0	0	4	1	0	0

	Cervical grades				Thoracic grades				Lumbar grades			
SKEL	0	1	2	3	0	1	2	3	0	1	2	3
2476	5	2	0	0	4	3	0	5	2	1	0	2
2480	6	1	0	0	7	0	0	0	3	0	0	0
2482	0	0	0	0	2	0	0	0	5	0	0	0
2489	7	0	0	0	10	0	0	0	5	0	0	0
2492	7	0	0	0	12	0	0	0	5	0	0	0
2494	5	1	0	0	10	2	0	0	4	0	0	0
2504	0	1	0	0	9	3	0	0	5	0	0	0
2506	6	1	0	0	9	1	2	0	2	1	0	0
2508	3	2	0	0	9	3	0	0	2	3	0	0
2514	4	0	0	0	10	2	0	0	5	0	0	0
2527	0	0	0	0	3	0	0	0	5	0	0	0
2533	3	0	0	0	12	0	0	0	5	0	0	0
2535	2	0	0	0	2	0	0	0	4	0	0	0
2537	3	1	0	0	3	1	1	1	0	0	0	0
2542	3	0	1	2	3	0	0	0	0	0	0	0
2546	6	1	0	0	12	0	0	0	5	0	0	0
2548	3	0	2	2	10	0	0	0	2	1	0	2
2556	7	0	0	0	3	7	0	0	5	0	0	0
2576	6	0	0	0	12	0	0	0	5	0	0	0
2583	0	4	0	2	4	3	5	0	0	3	2	0
2587	0	1	0	0	8	0	0	0	3	0	0	0
2593	5	0	0	0	12	0	0	0	4	0	0	0
2596	7	0	0	0	12	0	0	0	0	0	2	0
2612	1	0	0	0	4	2	0	0	5	0	0	0
2614	1	0	0	0	10	2	0	0	4	1	0	0
2616	7	0	0	0	10	2	0	0	5	0	0	0
2617	2	0	0	0	0	0	0	0	0	0	0	0
2620	2	1	1	3	6	1	0	0	3	0	0	0
2622	0	1	2	4	0	1	1	10	3	2	0	0
2624	7	0	0	0	12	0	0	0	5	0	0	0
2626	0	0	0	0	1	0	0	0	0	0	0	0
2628	2	1	0	4	7	1	2	2	0	3	1	1
2631	5	0	0	0	5	0	0	0	2	0	0	0
2632	0	0	0	0	0	0	0	0	2	0	0	0
2636	3	2	0	1	5	4	1	0	1	4	0	0
2638	1	0	0	0	5	2	1	0	5	0	0	0
2640	0	0	1	0	2	1	0	0	0	0	0	0
2642	2	1	0	0	7	3	0	0	2	2	1	0
2644	0	0	0	0	1	0	0	0	0	0	0	0
2650	2	2	0	0	4	0	0	0	0	0	0	0
2658	3	2	2	0	9	1	0	0	0	6	0	0
2671	2	0	0	0	6	5	0	1	5	0	0	0
3054	0	0	0	4	11	0	0	1	5	1	0	0
3095	7	0	0	0	11	1	0	0	5	0	0	0
3105	5	0	0	0	2	0	0	0	4	0	0	0
3107	3	3	1	0	8	3	1	0	5	0	0	0
3109	6	0	0	0	8	0	0	0	3	0	0	0
3118	1	0	0	0	8	0	0	0	3	0	0	0
3126	1	0	0	0	0	0	0	0	0	0	0	0
*** Total ***												
	565	72	30	55	1189	144	58	55	541	72	16	22

GRADE I OSTEOARTHRITIS

0740 1R RIB
0943 1L RIB, 2R RIBS, LAT LCLAV, LAT RCLAV, P LFEMUR, L ACETABULUM
0950 1L RIB, 1R RIB, P RULNA, D RULNA, D RRADIUS, D LRADIUS, P RRADIUS, 1R CARPAL (TRIQUETRAL), 1R MC1, 1R HPHAL, R ACETABULUM, D RFEMUR, D LFEMUR
0954 1L RIB, P RULNA, L HPHALANX, R HPHALANX
0956 2R HPHALANGES, 2L FPHALANGES
0962 1L RIB, 2R RIBS, MED LCLAVICLE, MED RCLAVICLE, L ACETABULUM, P LFEMUR
0984 1L RIB, 1R RIB, LAT LCLAVICLE, LAT RCLAVICLE, D LULNA, 1L MC1, LMC, RMC, L ACETABULUM, 1L MT1
1012 5L RIBS, 5R RIBS, L GLENOID, R GLENOID, MED LCLAVICLE, MED RCLAVICLE, D LFEMUR
1068 2L RIBS, 4R RIBS, R GLENOID, LAT RCLAVICLE
1305 P LTIBIA, P RTIBIA, R PATELLA, 1L FPHALANX, 1R FPHALANX, 1R MT4
1333 1R RIB
1361 2L RIBS, 4R RIBS, MED LCLAVICLE, MED RCLAVICLE, L ACETABULUM, R ACETABULUM
1376 7L RIBS, 8R RIBS, L GLENOID, MED RCLAVICLE, P LTIBIA, P RTIBIA, L ACETABULUM, R ACETABULUM, 2L MT2+4
1391 1L RIB, 1R RIB, P LULNA, 2R HPHALANGES
1418 3L RIBS, 4R RIBS, 2L HPHALANGES, 2R HPHALANGES, P LTIBIA, L PATELLA, R PATELLA, 1L MT1
1426 1L RIB, 1R RIB
1455 1R RIB
1457 P LULNA, P RULNA, D LHUMERUS, D RHUMERUS, 3R RIBS, 1L CARPAL (TRAPEZIUM), 1R CARPAL (TRAPEZIUM), 1L HPHALANX, R GLENOID, 2R HPHALANGES, D RFEMUR, P RTIBIA, L PATELLA, R PATELLA, R CALCANEUS
1459 2L RIBS, 2R RIBS
1472 3L RIBS, 2R RIBS, 1L HPHALANX, 1L MC1, 2U HPHALANGES, P LULNA, P RULNA, R ACETABULUM
1477 L TALUS, R TALUS, R CALCANEUS
1483 2L RIBS, 2R RIBS, L PATELLA, D RFEMUR
1492 L ACETABULUM, R ACETABULUM
1495 1L RIB, D RHUMERUS, P RULNA, LAT LCLAVICLE, LAT RCLAVICLE, L GLENOID, R GLENOID, 2L HPHALANGES, 1R MC1, 6U HPHALANGES, R ACETABULUM
1497 1R MC1
1738 LMC, D LFEMUR, D RFEMUR, R PATELLA, L ACETEBULUM, R ACETABULUM
1740 P LULNA, P RULNA, D LRADIUS, D RRADIUS, 1L MT1, 1L FPHALANX, 1R MT1
1746 1L RIB, 1R RIB
1749 L GLENOID, R GLENOID, D RRADIUS, 1L HPHALANX, L PATELLA, R PATELLA, LMC, R ACETABULUM
1750 2L RIBS, 2R RIBS
1762 1L FPHALANX,2L MTS(1+2),P LFEMUR,P RFEMUR,D LFEMUR,P LFIBULA,R PATELLA,1R FPHALANX,2L TARSALS(NAVICULAR,MEDIAL CUNEIFORM),1R CARPAL(LUNATE),P RULNA,D RHUMERUS,2R RIBS,2L RIBS,L ACETABULUM,R ACETABULUM,L GLENOID,R GLENOID,D LRAD,P LULNA,D LHUM, 2L HPHAL

1764 2L RIBS, 3R RIBS, 1L CARPAL (SCAPHOID), R GLENOID, LAT LCLAVICLE, LAT RCLAVICLE, D LRADIUS, P LULNA, R ACETABULUM

1780 D LTIBIA

1782 P RULNA, 1L MT1, L FPHALANX

1784 1L TARSAL (NAVICULAR)

1786 4L RIBS, 4R RIBS, P LULNA, P RULNA, D RRADIUS, 2R HPHALANGES, L PATELLA, L ACETABULUM

1795 4L RIBS, 3R RIBS, P LULNA, L GLENOID, R GLENOID, P LHUMERUS, 1L MC1, 1L HPHALANX, 1R MC1, 1R CARPAL (TRAPEZIUM), LAT RCLAVICLE, MED LCLAVICLE, R ACETABULUM, P LFEMUR, D LFEMUR, D RFEMUR, P RFIBULA, L TALUS

1797 MED LCLAVICLE, MED RCLAVICLE, R GLENOID, 2L RIBS, 1L CARPAL (LUNATE)

1816 P RULNA, D LULNA, D LRADIUS, L GLENOID, R GLENOID, 3L RIBS, 3R RIBS, 3L HPHALANGES, 1L CARPAL (TRAPEZIUM), L PATELLA, D LFEMUR

1830 P RULNA, D RULNA, 3R CARPALS (HAMATE, LUNATE & TRAPEZIUM), L ACETABULUM, L GLENOID, R GLENOID, 2L CARPALS (TRAPEZIUM & HAMATE), 1R MT1

1846 1L RIB, 2R RIBS, D LFEMUR, P LTIBIA

1855 1R FPHALANX

1882 S1,L GLEN,D RHUM,P RULNA,P RRAD,R GLEN,LAT RCLAV,4L CARP(PISIFORM,LUNATE,HAMATE &CAPITATE),4L HPHAL,5R CARP(HAMATE,TRIQUETRAL,PISIFORM,TRAPEZIUM,TRAPEZOID),3R HPHAL,R ACET,D RFEM,P RTIB,R PATELLA,P RFIB,3R RIBS,2L RIBS,P LFIB,D LFEM,L PAT,1R FPHAL,R CALC

1892 1L RIB, 1R RIB, P LULNA, P RULNA, L GLENOID, 1L CARPAL (TRAPEZIUM), RPATELLA

1903 P RTIBIA, D LFEMUR, D RFEMUR, 1L MT1

1904 4L RIBS, 6R RIBS

1908 2L RIBS, 3R RIBS

1914 4L RIBS, LAT LCLAVICLE, LAT RCLAVICLE, L ACETABULUM, R ACETABULUM, P RFEMUR, 1R MT1, 1R FPHALANX

1917 1R RIB, MED LCLAVICLE, MED RCLAVICLE

1919 LAT RCLAVICLE, D RULNA, 1R MT1

1925 1U HPHALANX

1927 1L RIB

1932 2L RIBS, 3R RIBS, P RULNA, 1R HPHALANX

1933 3L RIBS, 4R RIBS, R PATELLA, R ACETABULUM, 1R TARSAL (MEDIAL CUNEIFORM) 1R MT1, FACET JOINTS OF S1

1935 1L RIB, 1R RIB, P LULNA, D LULNA, 1R MT1

1942 3L RIBS, 2R RIBS

1944 1L CARPAL (TRAPEZOID), L PATELLA, R PATELLA, P LULNA, P RULNA, D LRADIUS, L ACETABULUM

1952 4L RIBS, 2R RIBS

1953 R PATELLA

1955 L PATELLA, L ACETABULUM, R ACETABULUM, P LFEMUR, P RFEMUR

1962 1L RIB

1965 4L RIBS, 3R RIBS, D RFEMUR, R TALUS, 1R TARSAL (NAVICULAR), 1R HPHALANX, P RTIBIA

1978 P RULNA, 1R RIB, P LULNA, R PATELLA

1983 1L RIB, 2R RIBS, P LULNA, P RULNA, LMC

1987 R GLENOID, L ACETABULUM, R ACETABULUM, LAT LCLAVICLE

1994 P RULNA, 1L MC1, 1R MC1

1996 1L RIB, 1R RIB, LAT LCLAVICLE

2005 1R RIB, MED LCLAVICLE, LAT LCLAVICLE, D RRADIUS

2301 1L HPHALANX
2316 1L RIB
2327 2R RIBS, L ACETABULUM, R ACETABULUM, 1R HPHALANX
2332 1R RIB, L GLENOID, MED LCLAVICLE, MED RCLAVICLE, D LULNA, P RULNA, PLULNA, D LTIBIA, L ACETABULUM, R ACETABULUM
2333 L ACETABULUM, 1R RIB, L PATELLA
2334 D RULNA, L PATELLA
2348 D LULNA, L GLENOID, R GLENOID, 2L CARPALS (SCAPHOID & LUNATE), 2L RIBS, 2R RIBS, D RFEMUR, R ACETABULUM
2373 R GLENOID, 2L HPHALANGES, 1R MC4, L ACETABULUM, R ACETABULUM, D RTIBIA, 1R TARSAL (CUBOID)
2384 D LULNA, L ACETABULUM, R ACETABULUM, D LFEMUR, L PATELLA
2386 3L RIBS, 4R RIBS, D RRADIUS, P RULNA, PLULNA, L GLENOID, R GLENOID, MED RCLAVICLE, 1R HPHALANX, R ACETABULUM, R CALCANEUS
2389 P RULNA
2391 4L RIBS, 3R RIBS, P LULNA, P RULNA, L ACETABULUM, R ACETABULUM
2396 4L RIBS, 4R RIBS, D RRADIUS, D RULNA, R GLENOID, LAT RCLAVICLE, D RFEMUR, D LFEMUR, R PATELLA
2400 P RTIBIA, 1R RIB, L PATELLA, R PATELLA
2405 P LULNA
2411 1L RIB, L GLENOID, MED RCLAVICLE, 2R HPHALANGES, L ACETABULUM, R ACETABULUM
2432 R GLENOID, P RULNA
2439 1L RIB, 1R RIB, L GLENOID, R GLENOID, P LULNA, LAT LCLAVICLE, LAT RCLAVICLE, R ACETABULUM, P RFEMUR, D LFEMUR, D RFEMUR, L PATELLA, R PATELLA, P RTIBIA, P LTIBIA
2448B 1L RIB, LAT RCLAVICLE, P RTIBIA, 1R RIB, 1R MT1, 1L TARSAL (CUBOID)
2452 2L RIBS, 1R RIB, D RTIBIA, MED RCLAVICLE, LAT LCLAVICLE, P RHUMERUS, 1L HPHALANX, 1R HPHALANX, L ACETABULUM, 1U FOOT SESAMOID
2457 3L RIBS, 1R RIB, D LULNA, D RULNA, R PATELLA
2459 3L RIBS, 1R RIB
2461 1R RIB,L GLEN,R GLEN,LAT RCLAV,P LULNA,P RULNA,D LRAD,D RRAD,2L HPHAL,3L CARP (SCAPHOID, LUNATE, TRIQUETRAL),2R CARP (PISIFORM, TRIQUETRAL),L ACET,R ACET,P LFEMUR,P RFEMUR,P LTIB,P RTIB,L PAT, R PAT, 1L TARSAL (NAVICULAR), 1L MT1,1L FPHAL,1R MT1
2462 1L RIB, 1R RIB
2474 1R RIB, P RULNA, P RRADIUS, 2L HPHALANGES, 2R HPHALANGES
2476 4L RIBS, 3R RIBS, P LULNA, P LRADIUS, P RRADIUS, D LHUMERUS, P RULNA, 1U HPHALANX
2478 P LFEMUR, P RFEMUR, L PATELLA, R PATELLA
2480 2L RIBS, 3R RIBS, L ACETABULUM
2482 L ACETABULUM, R ACETABULUM, 1R RIB, 1L MC1, 4R HPHALANGES, 1U HPHALANX, P RULNA, P LULNA
2492 1L RIB, 2R RIBS
2494 2L RIBS, 3R RIBS, R ACETABULUM, MED RCLAVICLE
2496 L GLENOID
2499 L PATELLA, D LFEMUR, D RFEMUR
2501 LAT RCLAVICLE
2504 1R RIB, R ACETABULUM, L PATELLA, R PATELLA
2506 3L RIBS, P RFEMUR, L PATELLA, R PATELLA

2508 L GLENOID, P LULNA, P RULNA, L ACETABULUM, R ACETABULUM, P RFIBULA
2511 D LFEMUR, D RFEMUR, 1R MT1
2514 2L RIBS
2537 P LULNA, P RULNA, D LULNA, D RULNA, L GLENOID, R GLENOID, LAT LCLAVICLE, LAT RCLAVICLE, P LFEMUR, P RFEMUR, L ACETABULUM, R ACETABULUM, 1L RIB
2542 L ACETABULUM
2546 1L RIB, L GLENOID, MED LCLAVICLE, MED RCLAVICLE, 1R MC1, 2R HPHALANGES, 1L MC1, L ACETABULUM, R ACETABULUM
2548 P RTIBIA
2556 4R RIBS, P LTIBIA, P RTIBIA
2576 LAT RCLAVICLE
2583 5L RIBS, 3R RIBS, LMC, L GLENOID, R GLENOID, 5L HPHALANGES, 3R CARPALS (SCAPHOID, PISIFORM, & TRIQUENTRAL), 1L TARSAL (MEDIAL CUNEIFORM), 1R MT1, D LHUMERUS, P LRADIUS, D LRADIUS, P LULNA, D RFEMUR
2587 P LULNA, P RULNA, 2L RIBS, 2R RIBS
2593 LAT RCLAVICLE
2596 5L RIBS, 3R RIBS, 3R HPHALANGES, L ACETABULUM
2612 1L HPHALANX, 1L MC1, 1R MC1, 1U HPHALANX, P LULNA, P RULNA, D LULNA, D RULNA, D RHUMERUS, LAT LCLAVICLE, L ACETABULUM, D RFEMUR, P LTIBIA, P RTIBIA
2614 2L RIBS, 3R RIBS, P LULNA, P RULNA
2616 1L RIB, 1R RIB
2620 2L RIBS, 1R RIB, LAT RCLAVICLE, L ACETABULUM, R ACETABULUM
2622 L GLENOID, P LHUMERUS, P LULNA, P RULNA, D LULNA, D RULNA, 1L CARPAL (TRAPEZIUM), 1L MC1, 4L HPHALANGES, 2R HPHALANGES, L ACETABULUM, R ACETABULUM, 2R TARSALS (NAVICULAR & CUBOID), R TALUS, R CALCANEUS
2624 R GLENOID
2628 4L RIBS, D LRADIUS, R GLENOID, LAT LCLAVICLE, LAT RCLAVICLE, RACETABULUM, P LFEMUR, P RFEMUR, R CALCANEUS, R TALUS, 1L MC1, 1L HPHALANX, 5R HPHALANGES
2631 2L RIBS
2632 D LULNA, D LRADIUS
2636 4L RIBS, 1R RIB, L GLENOID, R GLENOID, MED LCLAVICLE, LAT RCLAVICLE, D RFEMUR, P LTIBIA, P RTIBIA, 1L MC1, L ACETABULUM, R ACETABULUM
2638 P LTIBIA, 1L HPHALANGES, 3U HPHALANGES
2640 L GLENOID, R GLENOID, L ACETABULUM, R ACETABULUM, P LULNA, P RULNA
2642 P LFEMUR, P RFEMUR, P LULNA, P RULNA, D LRADIUS, D RRADIUS, 1L HPHALANX, 1R MC1, 2R HPHALANGES, LAT LCLAVICLE, LAT RCLAVICLE, D LHUMERUS, D RHUMERUS
2644 P RULNA
2650 R GLENOID
2658 L ACETABULUM, R ACETABULUM, 1R HPHALANX, 1U HPHALANX, 1L RIB, 2R RIBS, LAT LCLAV, LAT RCLAV, MED RCLAV, P LULNA, P RULNA, D LULNA, D RULNA, P LRADIUS, D LHUMERUS, 2L TARSALS (CUBOID & INTERMEDIATE CUNEIFORM), P LFEMUR, P RFEMUR, D RFUMUR, P RTIB, R PAT
2671 1L RIB, 1R RIB
3054 3L RIBS, 2R RIBS, L ACETABULUM, R ACETABULUM, R FPHALANX
3095 2L RIBS, 1R RIB
3107 1L RIB, 1R RIB, 1R MC1, 1R HPHALANX, 2L MTS 3 & 4

3109 P LULNA
3126 R GLENOID, 2R CARPALS (CAPITATE, TRAPEZIUM), 1L CARPALS (TRAPEZOID)

GRADE II OSTEOARTHRITIS

0938 2L RIBS, MED LCLAV, LAT LCLAV, MED RCLAV, LAT RCLAV, D LHUMERUS, D LULNA, P LULNA, 1L MC1
0950 2L RIBS, 3R RIBS, P LULNA, 1L MC1, 1L CARPAL (TRAPEZOID), 1R MT1
0956 4R HPHALANGES, 2L FPHALANGES
0962 2L RIBS, 1R RIB
0984 1R MT1
1012 1L RIB, 2R RIBS, LAT RCLAVICLE, D RFEMUR, P LTIBIA, P RTIBIA, R PATELLA
1376 1R RIB, LAT LCLAVICLE, LAT RCLAVICLE
1417 P RULNA, D LTIBIA, L TALUS,
1418 1R MT1, 1R FPHALANX, LAT R FOOT SESAMOID
1451 R ACETABULUM
1455 2R RIBS
1457 P LFIBULA
1459 RMC
1472 P RFEMUR, L ACETABULUM
1754 1L RIB, LAT RCLAVICLE
1757 P RRADIUS, P RULNA
1762 1R CARPAL (TRAPEZOID)
1795 5L RIBS, 6R RIBS, D LHUMERUS, P LRADIUS, 1U HPHALANX, L ACETABULUM, D RFIBULA, L PATELLA
1797 1R MT1, 2R RIBS, 2L RIBS, FACET JOINTS OF S1
1799 1L HPHALANX, 1L RIB, 1R RIB, LAT LCLAVICLE, LAT RCLAVICLE
1827 3L RIBS, 1R RIB, LAT LCLAVICLE, LAT RCLAVICLE, MED LCLAVICLE
1830 LAT LCLAVICLE, LAT RCLAVICLE
1882 1R CARPAL (LUNATE), 1R RIB, 3L RIBS
1914 1R RIB, 1L MT1, 1L FPHALANX
1944 1L CARPAL (TRAPEZIUM), 1L MC1, 1L HPHALANX, 2R MCS (1 & 2), 1R HPHALANX, R ACETABULUM, 2R MTS (1 & 2), 1R TARSAL (INTERMEDIATE CUNEIFORM), P RFEMUR
1952 2R RIBS, LAT RCLAVICLE
1985 LAT LCLAVICLE, LAT RCLAVICLE, 2L HPHALANGES, 1R FPHALANGES
1987 1L MC1
2005 MED RCLAVICLE, LAT RCLAVICLE
2306 L ACETABULUM, 1L HPHALANX
2327 1L MT1, 1R MT1
2386 1R RIB, MED LCLAVICLE, 2R CARPALS (TRAPEZIUM & HAMATE), 3R MCS(1, 2 & 5)
2391 1L RIB
2396 L ACETABULUM, R ACETABULUM
2407 LAT LCLAVICLE, LAT RCLAVICLE
2411 1R HPHALANX, 1R RIB, 1R MT1
2432 LAT RCLAVICLE
2448B R TALUS, 2R TARSALS (CUBOID & NAVICULAR)
2452 5L RIBS, 4R RIBS, FACET JOINTS OF SACRUM
2457 LAT LCLAVICLE
2461 2L MCS1&2, 1L HPHALANX
2476 1U FPHALANX

2482 IR MT4
2508 LAT LCLAVICLE, LAT RCLAVICLE
2527 1L MT1, 1R MT1, 1R TARSAL (MEDIAL CUNEIFORM)
2542 1L RIB, 2R MTS1&4
2548 FACET JOINTS ON S1
2556 D RFEMUR, R PATELLA
2583 3L RIBS, 3R RIBS, L ACETABULUM, 1R CARPAL (HAMATE), 1R MC5, 2R HPHALANGES, P RULNA, D RULNA
2587 1L RIB
2614 1L RIB, 2R RIBS, 1L MT2, 3L TARSALS (INTERMEDIATE & LATERAL CUNEIFORMS & CUBOID)
2620 1L CARPAL (TRAPEZOID)
2622 LAT LCLAVICLE, 1L CARPAL (LUNATE), 1R CARPAL (TRAPEZIUM), 2R MC1 & 2, 2R HPHALANGES, L TALUS, 3L TARSALS (NAVICULAR, CUBOID & LATERAL CUNEIFORM)
2624 L GLENOID
2628 1R RIB, P RHUMERUS, 1R MC1
2636 1R RIB, D LFEMUR
2638 1U HPHALANX
2642 MED LCLAVICLE, R GLENOID
2658 1L RIB, 1R RIB, L PATELLA
3107 2R RIBS, LAT LCLAVICLE, LAT RCLAVICLE, 1R MT1, 1R FPHALANX
3109 L TALUS, D LTIBIA

GRADE III OSTEOARTHRITIS

0938 L GLENOID, R GLENOID, P LHUMERUS, P RHUMERUS, L ACETABULUM, R ACETABULUM, P LFEMUR, P RFEMUR, 1R MT1, 1R FOOT SESAMOID
0950 L GLENOID, R GLENOID, L CORACOID, R ACROMION, D LHUMERUS, P LHUMERUS, MED LCLAV, LAT LCLAV, MED RCLAV
0956 3R CARPALS (SCAPHOID, TRAPEZOID & TRAPEZIUM), 2R HPHALANGES
0962 3L RIBS, 1R RIB
1305 1L MT1, 1R MT1
1376 L PATELLA, R PATELLA, D LFEMUR, D RFEMUR, FACET JOINTS OF S1
1417 D RHUMERUS, 1L MT1, 1L FPHALANX, 1R MT1, 1R FPHALANX
1424 1L MT1, 1R MT1
1457 P LTIBIA, D LFEMUR
1472 P LFEMUR
1757 1R MT1, 1R FPHALANX
1786 P RFEMUR
1795 1R MT2, 1R TARSAL (LATERAL CUNEIFORM), R TALUS, P RHUMERUS, 7L HPHALANGES, 2U HPHALANGES
1799 1L HPHALANX
1882 D LRADIUS, D RRADIUS, 1L CARPAL (SCAPHOID), 1L HPHALANX, 2R CARPAL (SCAPHOID & CAPITATE), 1R RIB, 1R TARSAL (NAVICULAR)
1892 LAT LCLAVICLE, L ACETABULUM, R ACETABULUM, P LFEMUR, P RFEMUR
1917 P LFEMUR, L ACETABULUM
1944 R FACET JOINT OF S1, 3L HPHALANGES, 1U HPHALANX, 1R HPHALANX, 1L MT1
1952 LMC, FACET JOINTS OF S1
1962 1R MT1, 1R FPHALANX
1987 1L CARPAL (TRIQUETRAL), 1R CARPAL (TRAPEZOID), 1R MT1, 1R FPHALANX
2306 2L CARPALS (TRAPEZIUM & SCAPHOID), 1L MC1
2386 R TALUS, D RTIBIA

2556 L PATELLA, D LFEMUR

2583 1L RIB, 1R RIB, R ACETABULUM, 4L CARPALS (TRAPEZOID, TRAPEZIUM, SCAPHOID, & CAPITATE), 1R CARPAL (TRAPEZIUM), 2R MCS (1 & 4), 1R HPHALANX, D RHUMERUS, P RFEMUR

2628 FACET JOINTS ON SACRUM, 1R RIB, D LHUMERUS, P LULNA, D LULNA, P LRADIUS, 2R HPHALANGES

2638 2R HPHALANGES

2642 P LHUMERUS, L GLENOID

2658 1L MC1, 1L HPHALANX, 1R HPHALANX, 2L TARSALS (LATERAL CUNEIFORM & NAVICULAR), 1L MT4, D LFEMUR, P LTIBIA

NOTES ON INDIVIDUAL BURIALS

0669. In addition to both maxillary and the left mandibular M3, there is congenital absence of both maxillary PM2s and of the R mandibular PM2 (although the left mandibular PM2 is present). Where the premolars are missing the deciduous molars are retained.

On the tabula externa of the left frontal bone there is a gully, with 2 separate bridges of bone over it for part of its length, which communicates with the left orbit.

0740. There is porosis and concavity of the interdental septa and some show initial stages of infra-bony pocket formation. There is also very slight alveolar resorbtion. Periodontal disease.

Vertebral anomalies: C3 & 4 are completely fused at their bodies and facet joints, and there is almost complete ankylosis of the neural arches and neural spines.

The bodies, facet joints and the right sides of the neural arches of C5 & 6 are fused together and there is some scoliosis at this point: the combined height of the two vertebrae at the left pedicle is 15.5mm and at the right it is 21mm. In addition C5 & 6 show failure of fusion of their neural arches in the midline; in life the defect would have been bridged by fibrous tissue - spine bifida occulta.

T3 & 4 are fused at their bodies, facet joints and neural arches.

T6 shows a supernumary facet joint on the ventral aspect of its neural spine; this articulates with a similar facet on the posterior aspect of the neural arch of T7.

There are 6 lumbar vertebrae; it is impossible to ascertain whether the 6th is an extra vertebral segment or is a lumbarised S1. L6 shows spina bifida occulta and is partially sacralised; there are diarthrodial joints between the sacral alae and L6's transverse processes.

The bodies of T5 & 6 and 8 & 9 show large, smooth, R sided interlocking osteophytes. These originate from the walls of the centra not from the disc margins. There are similar osteophytes on the body of L6 and there is marked capsular ossification around the diarthrodial joint for the left sacral ala.

Many ribs show ossifications adjacent to the joint surfaces which articulate with the vertebral transverse processes. There is bony spurring on the olecranon process of the left ulna, left patella and at the insertions of the Achilles tendons on both calcanei. There is also ossification of throat and costal cartilages. Probably early DISH.

Both tibiae show pitted, striated bone on the middle thirds of their shafts, confined to the subcutaneous surfaces. These lesions represent well remodelled periosteal reactions.

There is green staining on the manubrium and black staining on some hand bones.

0750. Large skull for an 11 year old, but no signs of pathology. There is the beginning of a sutura mendosa at the R asterion, extending 17-18mm across the occipital.

0752. Upper parts of body removed by a later feature. The foot bones are well preserved, the preservation of the remainder of the skeleton is rather poor, particularly nearest to those parts cut by the later feature.

There is a cleft on the proximal joint surface of the L proximal hallucial phalanx. Probably not pathological.

0761. The crowns of the M1s are malformed; the occlusal surfaces show many more than the usual numbers of ridges and clefts, and these are rather irregular in form. The crowns of the M2s, visible in their crypts, are normal. There is a broad band of heavily pitted enamel, 5.4mm from the CEJ of the mandibular, and 5.6mm from the CEJ of the maxillary M1s. The maxillary central incisors (the lateral ones are missing post mortem) and all 4 mandibular incisors show areas denuded of enamel near the tips of their crowns. These areas are from 8.8mm from the CEJ to the tip of the crown in the case of the maxillary I1s; from 7.8mm from the CEJ to the tip of the crown in the case of the mandibular I1s and 8mm from the CEJ to the tip of the crown in the case of the mandibular I2s. Both mandibular M1s show caries, probably precipitated by the defective enamel.

Using Goodman et als' (1980) methodology, the disturbances to dental enamel formation probably occurred during the period from birth to one year of age. The fact than none of the deciduous dentition shows hypoplasias indicates that the condition causing the developmental disturbances in the tooth enamel was not present congenitally.

The inner table on the anterior part of the frontal bone, superior parts of the orbits, lower parts of the parietals, temporal bones, R sphenoid bone (the L is damaged post-mortem), and, to a lesser extent, the occipital bone, show very prominent markings of the cerebral convolutions, suggestive of increased intra-cranial pressure. The skull does not seem particularly large for an 8 year old by the standards of the Ipswich group. There is no evidence for any asymmetry in the development of the skull or post-cranial skeleton.

Perhaps the cranial and dental lesions are the results of the same disease/stress episode, occurring during the first year of life. Hydrocephalus is one possible cause of increased intra-cranial pressure. In modern populations most cases are acquired rather than congenital, and in most instances the condition develops in the first 6 months of life (refs in Manchester 1980). In modern groups 50% of cases of untreated hydrocephalus die in the first 18 months of life, but in 46% of cases the disease arrests spontaneously at the age of 9 months - 2 years. Hence on chronological grounds, if one accepts a common cause for the hypoplasias and the cranial lesions, hydrocephalus, which spontaneously arrested, allowing survival of the child, might be suggested as a tentative explanation for the lesions seen in 0761, however increased cranial capacity could not be demonstrated in the present case.

There are epiphyses at the distal ends of the 1st metatarsals;

these are just fusing to the shafts.
The right foramen transversarium of the atlas is incomplete (the corresponding area on the L is missing post-mortem).

0780. There is a periapical abscess at the mandibular R M2 which drains through a sinus in the medial wall of the mandible. There is marked periostitis in this area indicating infection of the bone. The abscess appears to be a result of infection of the pulp cavity of the second molar, which was exposed by a carious lesion.
The R femur shows a 3rd trochanter.
There is cystic cavity, approximately 8mm diameter, at the inferior/posterior border of the iliac face of the L sacro-iliac joint. The sacral face of the joint is normal. Probably not pathological.

0938. There is greatly increased pitting on the inferior surface of the hard palate, confined to the medial surfaces of the alveolar processes - very probably infection from one or more of the alveolar abscesses.
Many vertebrae show accretions of sclerotic, porotic new bone upon the superior and/or inferior surfaces of their centra. 5 thoracic and 1 lumbar vertebra show Schmorl's nodes; some of these are very large, e.g. one on the inferior surface of T10 was 10mm deep by 10mm wide. Vertebral osteophytes were present but were generally rather small. Generally, the cervical vertebrae showed rather more in the way of osteophytes, and rather less in the way of sclerotic new bone on the centra than the lower vertebrae.
L4 & 5 are fused to the sacrum at their bodies (the anterior parts of which have suffered post-mortem damage) by calcified material similar to that found on other vertebral centra, and at their R facet joints. The R transverse process of L5 is fused to the sacral ala (the corresponding area on the L side of these bones is missing). This last has the appearance of a supernumary articulation which subsequently ankylosed. The disc space between L5 and S1 appears rather narrow but perhaps this is a function of the partial sacralisation of the last lumbar vertebra; the disc space between L4 & 5 appears normal.
There is very severe osteoarthritis of both shoulder joints, with eburnated, flattened humeral heads and eburnated glenoid cavities which show massive osteophytic lipping. The changes at the R shoulder are slightly more marked than those at the L. There is some sub-periosteal new bone around the glenoid cavities and on the coracoid processes (more particularly on the R scapula), presumably as a result of the irritation of the periosteum by the massive osteophytes.
There is, likewise, very severe osteoarthritis of both hips. Both acetabula show destruction of most of their joint surfaces so that only sclerotic bone, together with a few eburnated parts of the original joint surface, remains. The floors of both acetabula are filled with new bone. Both femoral heads show eburnation, sclerosis and heavy marginal lipping. The left shows superior flattening and inferior displacement so that it lies inferior to the greater trochanter: X-ray suggested a diagnosis of slipped capital epiphysis. Consistent with this the

osteoarthritic changes at the L hip were slightly more marked than those at the R. There is slight sub-periosteal new bone on the bone near the hip joints, presumably as a result of irritation of the periosteum by the large osteophytes.

The pubic symphyses show irregular, sclerotic new bone growth, as do the iliac crests.

There is marginal lipping and some irregularity of the joint surfaces of the femoral condyles.

The remainder of the skeleton is fairly free from osteoarthritic changes, although the head of the R 1st metatarsal and the distal surface of the L humerus both show slight eburnation.

In addition to the thyroid cartilage, there are a number of other soft tissue calcifications.

No joints show any evidence for erosive changes.

Although it seems inconceivable that the lesions in 0938 are simply a result of primary degenerative joint disease, diagnosis is difficult. Intervertebral calcification, formation of Schmorl's nodes, fusion of lower vertebrae, marked osteoarthritis at major joints with little involvement of peripheral joints and irregular sclerosis of the pubic symphysis are all features of ochronotic arthropathy (O'Brien et al. 1963; Schumacher 1989; Martin et al. 1955), however the radiograph of the lumbar and sacral vertebrae did not really support such a diagnosis (P.B. Guyer pers. comm. 1989).

There is a white, crystalline deposit, presumably derived from the soil water, on the anterior surface of the posterior arch of the atlas.

There is a slight periosteal reaction on both tibiae, mainly on their anterior-medial surfaces.

0940. The first coccygeal vertebra is fused to S5.

The L 5th metatarsal is thickened on its shaft, just distal to the articulation with the 4th metatarsal, particularly on the lateral side. In addition the distal end shows lateral bending. X-ray of the 5th metatarsal shows cortical thickening in the area just distal to the articulation with the 4th metatarsal but no evidence for fracture. Probably distortion of the bone as a result of constricting footwear. The R 5th metatarsal is missing.

Some bones have black markings on them; those that do are rather poorly preserved and fragile.

0943. Upper body well preserved, lower legs poorly preserved. Black staining on sacrum.

R mandibular I1 shows ante-mortem chipping.

0950. The L humerus, R femur, distal half of the L femur, R tibia, the proximal half of the L tibia, R talus, R calcaneus, 4th lumbar vertebra, sacrum and pelvic bones are swollen and irregularly deformed. X-ray and gross inspection show that the trabeculae of these bones are very irregular and coarsened. The R femoral head is rather flattened and there is some lateral bowing of the shaft. There is anterior bowing of the L tibia; the R tibia is very fragmentary so it is difficult to assess the degree of distortion to this bone. All the pathological bones

are more poorly preserved and fragmentary than their normal counterparts; the sacrum and pelvic bones, in particular, are very fragmentary.

The pathological vertebra (L4) shows a healed compression fracture of its body. There is a healed oblique fracture of the L humerus just above the olecranon depression. There is an un-united fracture of the sub-trochanteric area of the R femur; the fracture is orientated transversely to the long axis of the bone and the surfaces of the break show varying degrees of remodelling, being in some places almost smooth and in others the coarse trabeculae, although somewhat remodelled, are still clearly visible. Comparison with modern specimens (Barber 1929) suggests that this represents a few weeks healing, although the possibility that the pathological bone heals at a different rate than normal bone should not be forgotten (Dove 1980).

There is severe and widespread osteoarthritis, especially at the shoulders and vertebral facet joints.

X-ray shows a sharp V-shaped demarcation between normal and pathological bone on the L tibia and L femur. Irregular increases in cortical thickness, and patchy rarefication and new bone formation of the pathological bones were evident on X-ray. Paget's disease.

0953. Reduced maxillary M2s.

0954. Porosity and pitting of some interdental septa, with slight alveolar resorbtion. Periodontal disease.

There is an 10x9mm area of new bone, raised 3mm above the surface of the R maxilla near the nasal aperture. The edges of the lesion are slightly pitted but is otherwise smooth. The surface of the lesion is slightly broken away post-mortem, revealing a cavity with spiculated bone within. Possibly a neoplasm.

There is partial sacralisation of L5 - the R transverse process was probably united with the sacral ala by fibrous tissue (the articulating surfaces here present a porotic appearance). The L transverse process is normal.

There is a fragment of what appears to be calcified pleura. Calcification of pleurae may be caused by inhalation of dust particles and are frequently a feature of pulmonary tuberculosis.

0956. Both proximal hallucial phalanges have a single pit in their proximal joint surfaces. Non pathological.

0962. Pitting on anterior/left side of palate - probably infection from one or more of the dental abscesses.

Depressed oval area (4x5mm) of sclerotic trabeculae on proximal joint surface of L radius - probably osteochondritis dissecans.

The calvarium is quite thick but shows some biparietal thinning.

Bilateral frontal foramina.

0974. The distal and intermediate phalanges of the R little toe are fused (those from the left little toe are missing).

Pitting of interdental septa and slight alveolar resorbtion. There is an infra-bony pocket at the mesial/buccal root of the R maxillary M1. Periodontal disease.

L5 shows spondylolysis. No sign of spondylolisthesis.

Both medial cuneiforms are bipartite, consisting of superior and inferior parts. The adjoining surfaces are mainly smooth but are roughened and sclerotic in their anterior/lateral parts, suggesting that there was fibrous union here.

A R lower rib has a large, spicular exostosis above the facet for articulation with the vertebral transverse process; there is a probable healed fracture through the articular facet.

There is a healed fissure fracture of the posterior part of the greater tuberosity of the R humerus.

0984. Gracile skeleton.

L5 shows spondylolysis, no sign of spondylolisthesis.

S2 has an incomplete neural arch, other sacral vertebrae normal.

There is a small cystic defect in the head of a 5th metatarsal - probably not pathological.

Super-eruption of some teeth.

0985. There is a small infra-bony pocket on the lingual side of the L mandibular canine and on the distal side of the maxillary L PM1. There is alveolar resorbtion and pitting of the alveolus around the R maxillary M2. Periodontal disease.

The R radius shows a fracture across the distal metaphysis; it is firmly healed with slight dorsal angulation of the distal end.

Periostitis of the tibiae and fibulae: L tibia shows 2 longitudinal strips of reactive bone on its lateral surface, one follows the ridge for attachment of the interosseous membrane. There is also some periostitis on the medial surface, more marked towards the distal end. A similar pattern of new bone deposition exists of the R tibia. The periosteal reaction on the L fibula covers most of its surface but is most pronounced in the midshaft area on the posterior surface and near the distal end on the lateral surface. Only a midshaft fragment of the R fibula exists; it shows periostitis. The R femur shows slight periostitis of its posterior surface, just above the condyles.

There is eburnation of the lateral parts of the joint surfaces of both patellae, and of the lateral condyles of both femora.

The intermediate and lateral cuneiforms of both feet show dorsal exostoses and periostitis. The other tarsals are rather damaged but appear normal.

The L 1st metatarsal shows a small erosion on the dorsal/lateral margin of its distal joint surface. It is difficult to assess the extent of pathological changes to this bone due to post-mortem damage. The L 2nd metatarsal shows some pitting and marginal lipping of its distal joint surface (which suffers rather from post-mortem damage). The L 2nd and 3rd metatarsals show periostitis of their shafts.

The R 1st metatarsal is about 1.5cm shorter than the L. The head is extensively destroyed by erosive lesions. The R 2nd, 3rd and 5th metatarsals show periostitis of their shafts, but the

distal ends of 2 & 3 and damaged post-mortem. The distal part of the R 4th metatarsal is missing ante-mortem; it tapers from the sides with a "knife edge" deformity. The shaft shows periostitis.

Three proximal foot phalanges are present and normal. No foot bones show osteoporosis. The tip of the anterior nasal spine is broken, but the remainder is normal, and there is no sign of rhino-maxillary infection. A few hand bones are present and are normal.

This appears to be an erosive arthropathy. The incomplete and rather poorly preserved nature of the remains inhibits more precise diagnosis; the absence of the spine and sacro-iliac joints is particularly unfortunate.

Purple/black/grey staining on the bones.

0990. Preservation very poor, shown as a partial shadow burial on the site plan. Large bones.

0992. T12 has lumbar-type facet joints.

A thin spit of bone forms an incomplete bridge between the L transverse process and posterior arch of the atlas vertebra.

Both 1st metatarsals have cystic cavities on the medial margins of their distal joint surfaces. The R proximal hallucial phalanx shows slight lateral deviation. Bilateral hallux valgus.

There is a healed wound from an edged weapon on the L frontal and parietal bones. The wound lies across the coronal suture 4.5cm to the left of the bregma and is oval with its long axis almost parallel to the sagittal plane. It measures 39mm long by 10mm wide at its widest point. The edges are smooth and bevelled and no trabecular bone is visible. Grooves run from the front and rear edges of the hole, forwards to about 2.5cm above the L orbital margin and back onto the left parietal for about 3.5cm. These represent united fractures. The orientation of the hole suggests a blow from a fairly sharp-edged weapon from above and to the right of the head. It is probable that the blow resulted in some fragmentation of the bone and that during healing these fragments were resorbed, leaving the hole. The impact resulted in 2 radiating fractures from the edges of the main lesion. It seems that the weapon used was sufficiently sharp to cut the bone but not sharp enough so that only a clean cut resulted; the earlier suggestion that there was some shattering of the bone, and the existence of the 2 radiating fractures support this idea. The state of healing suggests that the injury occurred a long time before death and there is no suggestion of infection on the inner or outer tables of the skull.

1012. There is bilateral bridging between the transverse processes and the posterior arch of the atlas vertebra.

Seven middle true L ribs show 8 healed fractures, all in the area one third - one half way from the sternal ends. All are healed with minimal deformity.

C3 & 4 are fused at their facet joints. There is only fusion at the margins of the joints. The joint margins show lipping, perhaps suggestive of osteoarthritis, implying that ankylosis occurred during adult life. No evidence of trauma. Cause unknown.

1068. The L sacro-iliac joint was probably fused: a thick osteophyte arises from the superior/posterior part of the iliac face; there is much post-mortem damage and only about 2cm of the osteophyte remains, but it seems likely that it was united with the (missing) sacral face of the joint. Some of the rest of the iliac face is present and normal. Of the R sacro-iliac joint only a small fragment of the iliac face is present; it is normal.

T9-12 show thick, short osteophytes on the anterior/right sides of their bodies. They arise away from the disc margins and are quite different from the osteophytes characteristic of degenerative disc disease shown by many of the other vertebrae. T4 & 5 bear similar osteophytes. All vertebral facet joints present are normal and no joint in the skeleton shows any evidence for erosive changes. There is some spurring on the L linea aspera. Probably early DISH.

The frontal bone shows a small (6mm diameter) "button" osteoma, on the midline, 3cm above the glabella.

The anterior part of the atlas vertebra shows a large osteophyte on the R side of its anterior arch.

Skeleton very fragmentary, all bones are very eroded.

1305. Lower legs only present.

There is a small exostosis on the lateral/plantar surface of the R 4th metatarsal. Probably traumatic myositis ossificans. This would appear consistent with the osteoarthritic changes at the proximal end of this bone, the only metatarsal of the complete set present to show osteoarthritis at its proximal end.

1306. 1 lumbar vertebra, sacrum and pelvic bones only present. Drawn as complete from the lumbar area down on the site plan.

1314. Considerable periosteal reaction on endocranial surface, and, to a lesser extent, on the roof of the R orbit.

1321. Periostitis of the diaphyses of femora, humeri, tibiae, fibulae, ulnae, the ectocranial surface of a few calvarium fragments, and on the mandible.

1323. Periostitis on the endo- and ectocranial surfaces of the skull.

1333. Fusion of distal and intermediate phalanges of both little toes.

Lower arm bones are very poorly preserved. The lower down the body one goes, the better the bone preservation. Top part of body cut away by a later feature.

1340. The atlas shows an incomplete foramen transversarium on the R side (L side damaged).

Both the sacral and the iliac faces of the L sacro-iliac joint have been destroyed. The iliac face shows coarse, very sclerotic trabeculae. There is a cavity about 1cm diameter, partly plugged with new bone, near the superior margin of the joint. Two smaller cavities adjacent to this in the wing of the ilium were revealed by X-ray. The lateral (outer) surface of the ilium

shows slight pitting and swelling in the area adjacent to the lesions.

The sacrum in the region of the sacro-iliac joint has been destroyed to about half way to the 1st sacral foramen. Sclerosis of trabeculae in this area is less marked than on the iliac face. There is slight sub-periosteal new bone formation on the anterior surface of the sacrum (which, incidentally, lacks its normal curvature), but bony regeneration in the region of both sacral and iliac lesions is negligible. The R sacro-iliac joint is normal. A radiographic study of the rest of the skeleton failed to reveal further lesions. Very probably tuberculosis.

Gracile skeleton.

1361. Osteophytes on posterior parts of iliac crests, soleal lines, linea asperae, spiral lines on femora, anterior borders of distal joint surfaces of fibulae, on the bases of the 2nd and 5th metatarsals.

There is a pit (5mm diameter, 4mm deep) lined with sclerotic trabeculae on the distal joint surface of the L tibia. The R glenoid cavity has an area 7x12mm of sclerotic, coarse trabeculae, depressed 1-2mm below the joint surface. The L acetabulum bears a pit 4x2mm & 8mm deep. All 3 lesions are probable examples of osteochondritis dissecans.

The L mandibular canine has twin roots.

There is a small eroded area 5x5mm on the plantar part of the proximal joint surface of the R 3rd metatarsal. It communicates with a cystic defect 1mm deep in the bone. There is slight osteophytic lipping at the margin of the lesion. Probably non-pathological.

1376. C6 & 7 are fused at their centra, the line of fusion is marked by a shallow groove. Probably a congenital variant.

A middle R rib shows a healed fracture 5-6cm from its sternal end.

1391. Lumbarisation of the last thoracic vertebra; it has typical lumbar apophysial joints and bears transverse processes which are not fused to the body but articulate with the pedicles. The left transverse process/lumbar rib is larger than the right. The 10th and 11th ribs are normal. This appears to be lumbarisation of T12 with rudimentary lumbar ribs.

There is an irregular pit lined with sclerotic trabeculae on the plantar part of the proximal joint surface of the R 3rd metatarsal. There is a similar lesion on the corresponding area of the R lateral cuneiform. The L 3rd metatarsal and lateral cuneiform bear similar, smaller lesions. Probably not pathological.

1415. Spurring on patellae and near anterior margins of distal joint surfaces of fibulae.

1416. Preservation very poor. There is an odd post-mortem effect on the frontal and anterior parts of the parietal bones involving lifting away of the tabula externa. There is a "tide mark" inside the skull suggesting that it may be due to the action of water - i.e. the anterior parts of the skull being wet.

There is slight alveolar resorbtion and porotic changes to the interdental septa, some of which have a concave profile. Periodontal disease.

A L frontal foramen is present.

1417. Nine vertebrae (T3-11) are united by a thick, R-sided, paravetebral osteophyte. Disc spaces and facet joints are normal. T12 has a large R-sided osteophyte which interlocks with a similar one on T11. The inferior parts of T12 are damaged and all the lumbar centra are missing, as are those for T1 & 2. A fragment of the centrum of S1 bears a thick, R-sided osteophyte. The bodies of C2 & 3 are normal, but one cervical vertebra (?C4) shows a thick paravertebral osteophyte on its body. The remaining cervical vertebral bodies are missing. The fused section of the thoracic spine shows some L-sided scoliosis.

The R sacro-iliac joint is fused at its anterior-superior margin by a thick, smooth osteophyte. Post-mortem damage reveals that there is some calcification in the joint space, however its width is normal and it showed no evidence for erosive changes.

Many joints show capsular ossifications: some ribs, R glenoid, acetabula, 4L & 3R tarsals and L & R 2nd metatarsals. There is spurring on the iliac crests, soleal lines and at the insertions of the Achilles tendons on the calcanei. Several costal cartilages are ossified to the sternum. DISH.

This individual has a very thin mandible, and a fragile and very highly resorbed maxilla, suggesting that most of the teeth were lost a long time ante-mortem. Looks like the skeleton of a very old individual - probably well over 60 years.

1418. Large infra-bony pocket around the mandibular R PM1; many interdental septa are porotic and have a concave profile, and there is slight-moderate alveolar resorbtion. Periodontal disease.

The 1st coccygeal segment is fused to S5.

There are rough exostoses on the plantar aspects of the proximal ends of both 3rd metatarsals, and on the corresponding areas of both lateral cuneiforms. The changes are more marked on the R foot.

Two lower thoracic vertebrae are united at their centra by a large paravertebral osteophyte. A few other vertebrae have similar, smaller osteophytes. All facet joints are normal. Bony spurring on patellae, lesser trochanter of R femur and at the insertion of the Achilles tendon on the R calcaneus. Early DISH.

The centra of 2 middle thoracic vertebrae are fused. The facet joints, neural arches and neural spines from these vertebrae are missing. The line of fusion shows as a slight ridge anteriorly; it is not discernible in the posterior parts. Probably congenital fusion.

Some very sandy soil adhering to bones.

1421. Preservation very poor: a small bag of bone fragments and teeth is all that remains of this skeleton. Shown as a partial shadow burial on the plan.

1424. Quite large bones - ??male.

1426. Synostosis between manubrium and body of sternum.
Bilateral frontal foramina.
Quite a gracile skeleton for a male.
Size of socket suggests that the L maxillary M3 was reduced in size.

1455. Incomplete R foramen transversarium on axis. Small pit on R superior articular surface of axis - non-pathological.
The thoracic vertebrae are asymmetrical, the asymmetry being most pronounced on the mid-thoracic region. The L facet joints are reduced in size, the left transverse processes are more slender than their counterparts on the right side and the height of the centra is less on their left than on their right sides; there is 90-100 degree scoliosis to the left. At the point of greatest scoliosis T5 & 6 are fused at the left facet joints. The facet joints between the vertebrae in the mid-thoracic region show Gr 2 osteoarthritis.
There is slight asymmetry of the cervical facet joints; this asymmetry is more pronounced in the lower cervical spine. Of the The lumbar vertebrae appear normal but are somewhat damaged post-mortem. There is no scoliosis in the lumbar or thoracic spines.
As a response to the scoliosis in the thoracic region the R ribs (on the convex side of the curve) show increased curvature and those on the left are slender and show reduced curvature. The changes to 1455 probably represent a congenital malformation. There is Gr 2 osteoarthritis on the joints of the vertebrae around the point of maximum curvature - osteoarthritic changes are highly unusual in an 18 year old and testify to the increased stress imposed on the joints by the spinal deformity. There is no asymmetry of the appendicular skeleton.

1457. Three middle-lower thoracic vertebrae are united by a thick, flowing, paravertebral, R-sided osteophyte. The disc spaces are normal. A fragment of the body of a superior neighbour of the group has a thick R-sided osteophyte, as does T12. Six cervical vertebrae and 5 upper thoracic vertebrae are present and are normal except for slight degenerative disc disease. Four lumbar centra are present and show thick, R-sided osteophytes, as does S1. All facet joints are normal.
There is bilateral fusion of the sacro-iliac joints by large thick osteophytes on their anterior/superior parts. No evidence for erosive changes.
There is exuberant bony spurring on the iliac crests, soleal lines, linea asperae, lesser trochanters of femora, radial tuberosities and olecranon processes of the ulnae. There is also extensive ossification around the proximal articulation between the L fibula and tibia. Ossified costal cartilages. DISH.

1459. Congenital absence of maxillary RI2, and the maxillary L12 is reduced (MDW=4.9mm, BLW=5.0mm, CH=8.5mm).
Moderate alveolar resorbtion around molar teeth and porosis of interdental septa. Periodontal disease.

1464. The maxillary LM3 is erupting at a slight angle towards the buccal side of the mouth.
The 6th sacral segment present is an extra vertebra.
L1 has T12-type facet joints.
The proximal and intermediate phalanges of the left ring finger are fused in 90 degree flexion. The appearance of the ankylosis suggests some soft tissue ossification on the palmar aspect. The L thumb phalanges have large exostoses on their dorsal aspects near the interphalangeal joint.
Both the above lesions are probably a result of trauma, but X-ray failed to shed further light on this.
Parts of the scapulae and claviculae are stained purple.

1469. The crowns of the M1s are malformed, having many more than the usual numbers of pits and fissures: disturbance to enamel formation between birth and about 9 months old. There is also a wide band of depressed enamel on the mandibular canine 2-5mm from the CEJ and further bands on other anterior dentition. This disturbance probably occurred between about 3.2 and 5 years of age.
The mandibular M3s are impacted against the M2s. There is an abscess at the socket of the R maxillary M1 (which has been lost post-mortem) which penetrates the antrum of Highmore where a small amount of reactive bone indicates infection.
Very large incisive fossa (a-p width: 7-8mm, t-v width: 6mm, measured at surface of palate).

1471. Alveolar resorbtion and porosis around the L mandibular M3 - periodontal disease.
Very thick cranium, very broad nose.

1472. L1 has facets on its transverse processes for (lumbar) ribs. They are not a 13th pair of ribs as T1 only has demi-facets below.
The bodies of L3 & 4 are fused by a massive L-sided osteophyte. The L facet joints are fused, the R are normal. It does not appear to be a DISH-type osteophyte. No evidence for trauma. The disc space is normal. All vertebrae save T2 are present and are normal. There is capsular ossification at some joints and some spurring on soleal lines, linea asperae, greater and lesser trochanters, near superior borders of acetabula, ischia and slight on iliac crests.
There is a cleft in the capitate facets of both scaphoids. There is a cleft in the distal joint surfaces of both tibiae at the base of the medial malleoli. Non pathological.
There is a large, irregular exostosis on the lateral border of the L tibia towards the distal end, near the top of the V-shaped groove for the fibula. There is a small area of periostitis immediately posterior to the exostosis. There is a small facet of bone on the corresponding portion of the fibula. Traumatic myositis ossificans.

There is a smooth ossified nodule 5x1.5cm on the L femur near the lower end of the linea aspera. A similar plaque of bone exists on the posterior surface of the L humerus 7-8cm above the olecranon fossa. These lesions are probably ossified sub-periosteal haematomas.

The L acetabulum has an os acetabuli, a sesamoid or unfused epiphysial centre, at its superior border. The joint surface of this ossicle is eburnated, as is the area on the articular surface of the femoral head with which it articulates. Both hips show severe osteoarthritis.

There are 6 sacral segments, the 6th being an extra vertebra. In addition the 1st coccygeal segment is fused to S6.

Skeleton is well preserved except for the R foot bones which are poor.

1477. Slight hyperostosis frontalis interna. The remainder of the skull is very thick, but does not appear to be pathological.

Skull fragments and leg bones only present, foot bones are best preserved.

1483. There is ante-mortem chipping of the R maxillary I2. This has exposed the pulp cavity leading to a periapical abscess. The adjacent I1 was lost ante-mortem, perhaps in the same traumatic incident.

Large, thick, short osteophytes on the R sides of the bodies of T12 and L1, and on the L sides of L2 & 3. They originate away from the disc margins and appear to be DISH-type ones - a "bone former".

Skull rather distorted by soil pressure.

1492. Porosity of interdental septa and considerable alveolar resorbtion. Periodontal disease.

Small pit (3-4mm diameter) lined with sclerotic trabeculae in proximal joint surface of R hallucial proximal phalanx. Metatarsal head normal. Probably osteochondritis dissecans.

Patches of black staining on many bones.

1494. Periosteal reaction on L fibula, on the lateral surface, towards the distal end.

Bilateral frontal foramina.

1495. A small fragment of a lumbar or lower thoracic vertebral centrum shows a small lytic lesion, with sclerosis of surrounding trabeculae. The anterior surface of the centrum shows some periosteal new bone formation, as does another fragment of this, or a different, vertebral body. The remainder of the vertebral column is in very poor condition, but seems normal. The rest of the skeleton was X-rayed for further lesions; none were found except 2 small areas of radiolucency in the distal diaphysis of the R femur; their edges were poorly defined and lacked sclerosis.

The vertebral lesions seem to be the result of infection. A more precise diagnosis is difficult but tuberculosis is a possibility, as is osteomyelitis.

The bones are quite soft and friable. Many have a light, very sandy soil adhering to them. The base of the skull, posterior

parts of the palate and the proximal end of the R femur are stained black/purple and are very fragile.
There is pitting on the greater tuberosities of both humeri, especially the R. Rotator-cuff disease.

1497. Small cleft on facet for capitate facet of R scaphoid. Non-pathological.
Light coloured, very sandy soil adhering to many bones.

1730. S1 has inferior facet joints which articulate with superior facet joints on S2. Fusion between the bodies of S1 & 2 is incomplete. Probably partial lumbarisation of S1, but only sacral segments present.
There is a small pit on the superior side of the L acetabulum. Probably non-pathological.
The root of the R maxillary I1 is very short (length=8mm).

1738. Skull is bathrocephalic, with many wormian bones in the lambdoid suture. It also shows biparietal thinning.
The bones are all light and osteoporotic.

1740. R fibula shows a marked degree of post-mortem bending.
The L 1st metatarsal shows 2 cystic defects near the medial margin of its head. The metatarso-phalangeal joint shows Gr1 osteoarthritis and the 1st hallucial phalanx deviates laterally. Hallux valgus. Both 5th metatarsals show similar cystic cavities on the lateral margins of their heads; probably constriction of the little toes by footwear. The R 1st metatarsal was normal except for Gr1 osteoarthritis.
Legs and feet well preserved, trunk poor. Black staining on some bones. No skull.

1746. There is porosis and concavity of interdental septa. There are infra-bony pockets at the maxillary R PM1 & 2 and L PM2, and at the mandibular L canine, R I1 and R PM1. There is moderate alveolar resorbtion. Periodontal disease.
Some teeth (e.g. maxillary R PM2, L I1 and L canine) have rather short, thick roots.
T12 has lumbar-type facet joints, except for the R superior one which is a normal thoracic-type. The L inferior facet joint on T11 faces laterally.
Dark staining on sternal ends of many ribs.
Distal and intermediate phalanges of little toes fused together.

1749. A fragment of a thoracic vertebra has a thick, smooth osteophyte on the anterior surface of its body, originating away from the disc margin. There is slight bony spurring around the R acetabulum, on patellae, soleal lines and at the insertions of the Achilles tendons on the calcanei.
There is an unhealed cut on the L side of the skull. It starts at the orbital margin, crosses the coronal suture 40mm to the L of the bregma and terminates in the area of the sagittal suture 57mm from the bregma. The 2 halves of the cut do not fit together well due to post-mortem distortion of the skull as a result of soil pressure. There is a second, smaller cut on the R

parietal. It runs approximately parallel to the main cut, is 23mm long and lies 5-6cm posterior to the coronal suture and 75-85mm to the R of the sagittal suture. The posterior centimetre of the cut does not completely penetrate the skull. The surfaces of both cuts present a fairly smooth, polished appearance; this is most marked on the medial surface of the main lesion.

Inspection of the cut surface of the main lesion under low power binocular microscope using raking light reveals vertically orientated scratches; these were most clearly visible in the supra-orbital region of the cut. This observation suggests that the blow came from directly above the individual.

There is no evidence for healing at the edges of either cut. The cuts are very clean with no fragmentation of the bone at their edges, implying that a very sharp weapon was used.

The left facial bones are missing post-mortem, so it is not possible to ascertain whether this area, too, was injured.

Since there is no healing to either cut they must have occurred at or around time of death and it is highly probable that the massive cerebral injury caused by the blow which resulted in the main cut was cause of death.

Some parts of the calvarium show slight green or purple staining.

1751. Rather early closure of sagittal suture. This doesn't seem to have led to a very long, narrow skull, but post-mortem damage makes it impossible to be sure.

Retention of an open petrous-squamosal suture on R temporal bone, and the zygomatic process of the R temporal bone is present as a separate ossicle.

A fragment of the R lateral wall of the mandible (including the mental foramen) shows pitting in the region of the socket of M2, suggestive of infection (?possibly as a result of drainage from a periapical abscess).

Gracile skeleton for a male.

1754. Erosive changes to the wrists and hands. Much of the distal joint surface of the L radius is destroyed by a large (6mm across, 15mm deep) erosion. There is a smaller cavity near the dorsal border of the joint surface. There are similar, smaller erosions on the distal joint surface of the L ulna, all 8 L carpals and the proximal joint surfaces of the L 2nd-5th metacarpals. Of the distal ends of the L metacarpals only that of the 4th is present - it is normal. Of 4 proximal L hand phalanges present the distal ends of 2 show erosions. Two distal L hand phalanges are present and normal. In addition the proximal phalanx of the L thumb is present and seems normal, but is rather damaged post-mortem.

A small fragment of the distal joint surface of the R radius is present and shows destruction of its ulnar facet and most of the joint surface for the lunate and scaphoid. The distal ends of 3 R metacarpals are present and normal. Of the R carpals only the hook of the hamate is present; there is also a fragment of a proximal R hand phalanx - these are normal.

In general these erosions show little or no sclerosis at their margins, their internal dimensions are greater than those where

they breach the joint surface and they are lined with trabecular bone. The remainder of this poorly preserved and incomplete skeleton, including most of the vertebral column and the sacro-iliac joints, shows no further erosive changes. A few foot bones are present and are normal. An erosive arthropathy, probably rheumatoid arthritis.

1757. Many interdental septa show pitting and porosis, and some show concave or flattened profiles. There is moderate alveolar resorbtion. Periodontal disease.

There is marked lateral deviation of the R proximal hallucial phalanx and severe osteoarthritis, with eburnation, of both faces of the metatarso-phalangeal joint. The L 1st metatarso-phalangeal joint is normal. Unilateral hallux valgus.

There is what appears to be a R lumbar rib. It seems too small for a 12th rib, but the areas upon T12 and L1 with which it may have articulated are damaged post-mortem, so it is not possible to identify it for certain.

T2-5 are fused at their centra by a flowing R sided osteophyte. The disc spaces are normal. T6 is missing, but from the appearance of the osteophyte on T5 it seems probable that it too was fused to this block. T10-12 are also united by a R-sided, flowing osteophyte. A similar osteophyte on L2 articulates with one on L1 and there are large osteophytes on L5 and S1.

Most of the above vertebrae are present as centra only, their neural arches having broken away post-mortem; the isolated neural arches which are present generally show normal facet joints. The exception is a group of 3 thoracic ones which are fused together at their facet joints; due to post-mortem damage it is not possible to assess which thoracic vertebrae these belong to. There was no evidence for any erosive changes in any of the spinal facet joints, sacro-iliac joints or anywhere else in this fairly complete skeleton.

There is bony spurring on the R greater trochanter, lesser trochanters, linea asperae, olecranon process of R ulna, near distal joint surfaces of fibulae, R iliac crest, and at insertions of Achilles tendons on the calcanei. There are capsular ossifications at many joints and ossified xiphoid and costal cartilages.

The above changes are probably due to DISH, although the fusion of vertebral facet joints is atypical.

The R femur shows a square hole near its distal end, probably excavation damage.

The L side of the skeleton is more poorly preserved than the R; the L arm is especially poor.

Congenital absence of R mandibular I2.

1762. Slight alveolar resorbtion around mandibular molars, and porosis of interdental septa, mainly around posterior teeth. Periodontal disease.

R capitate and trapezoid fused together. No sign of trauma, almost certainly a congenital anomaly.

Slight periostitis of tibiae and fibulae; mainly on the lower parts of the bones, on the medial surfaces of the tibiae and anterior surfaces of the fibulae.

Tufts of bone at many tendonous insertions, especially on the

calcanei and patellae.

1764. The R foramen transversarium on the atlas is incomplete (L side missing). The intermediate and distal phalanges of the L little toe are fused together.

1780. Partial sacralisation of L5. Adjoining surfaces of the L sacral ala and the L transverse process of L5 have a roughened, porotic appearance suggesting that fibrous union existed between them.

Small exostosis on the lateral margin of the distal joint surface of the L tibia (which also shows osteoarthritis) - probably due to trauma of the L ankle joint.

Top half of the body poorly preserved, bottom half well preserved.

1782. Very small, probably non-pathological, pit on the distal joint surface of L tibia.

Porosis and concavity of interdental septa around the molar teeth and slight alveolar resorbtion. Periodontal disease.

Cystic defect on medial margin of head of L 1st metatarsal. Both faces of the L metatarso-phalangeal joint show osteoarthritis and the proximal phalanx deviates laterally. Hallux valgus.

1784. L talus shows a cystic defect, lined with smooth cortical bone, on the margin of its articular surface for the navicular. The proximal joint surface of the L 3rd metatarsal shows a small area of coarse trabeculae communicating with a cystic cavity within the bone. The corresponding area of the R lateral cuneiform shows a similar defect. The R 3rd metatarsal and the L lateral cuneiform are missing. Unknown cause.

Black staining on base of skull. Skull and lower legs only present.

1786. An abscess cavity at the base of the lingual root of the maxillary R M1 has penetrated the maxillary sinus, within which there is new bone formation indicative of infection. There is also slight osteitis on the external surface of the maxilla near the socket of the R PM2.

The appearance of the gross specimen shows that the head of the R femur is somewhat distorted and the femoral neck appears to be abnormally short. The superior margin of the femoral head is lower than the greater trochanter. There is osteoarthritis with abundant marginal osteophytes, and slight eburnation on the superior part of the joint surface. The R acetabulum is mainly missing post-mortem, but a small fragment does survive and shows osteophytic lipping. There is some damage to the R femoral head and it is not possible to determine whether or not the site for attachment for the ligamentum teres in normal. X-ray confirms that there is shortening of the femoral neck. Differential diagnosis is between slipped capital epiphysis and Perthes' disease; both the gross and the radiological appearance of the lesions favour the former diagnosis.

1789. Slight super-eruption of teeth.

There are 2 abscess cavities at the R maxillary M1, one at the lingual root and one at the buccal roots. Although there is some post-mortem damage in this region the cavity at the buccal roots certainly penetrates the antrum of Highmore, as, probably, does that at the lingual root. There is some pitting in the antrum of Highmore, suggestive of infection.

There are 2 small pits in the distal joint surface of the L tibia: non-pathological.

1795. Manubrium fused with sternal body.

Osteoarthritis at R ankle joint: there is porosis and/or eburnation at the articulations between the talus and fibula, lateral and intermediate cuneiforms and the lateral cuneiform and 2nd metatarsal. There is a large exostosis near the distal joint surface of the R fibula. Osteoarthritis, probably sequential to trauma of the ankle joint. The L foot shows only slight osteoarthritic changes.

Large, irregular exostosis on medial/plantar surface of L 1st metatarsal, just behind the distal joint surface. Probably traumatic myositis ossificans.

Two rib fragments show fractures, both well healed.

The cortices of the radii and humeri are very thin, and the bones are rather light and brittle; the leg bones also have rather thin cortices, but the changes are less marked here. The thickness of the cortex at the site of a post-mortem break in the midshaft area of the R humerus was 1.4mm at the thinnest point; it also measured 1.4mm at the thinnest point at a post-mortem break in the sub-capital region. Osteoporosis.

The 1st coccygeal segment is fused to S5.

There is very slight lumbarisation of S1. There is incomplete fusion between the neural arches of S1 & 2. In addition the L ala is slightly smaller than the R.

The axis and C3 are fused. Only the R halves of the vertebrae are present. No trace of trauma or disease, almost certainly congenital. There is Gr 2 osteoarthritis of the inferior facet joints of C3, implying extra stress on the C3-4 articulation as a result of long-standing fusion between C2 & 3.

1797. There is osteitis on the lateral surface of the mandible, adjacent to a large abscess cavity at the socket of the L PM2.

The mandibular M3s are reduced in size.

L3 & 4 are fused by a thin, smooth osteophyte over the anterior parts of their bodies. The posterior parts of the centra are fused by fine, pitted bone. The facet joints, neural spines and the L parts of the neural arches are also fused. The disc space is normal. The apophysial articulations between L4 & 5 show marked osteoarthritis, suggesting additional stress on this articulation as a result of long-standing ankylosis between L3 & 4. Unknown cause.

Both tibiae show periostitis on their sub-cutaneous surfaces.

There is a smooth exostosis adjacent to the R acetabulum, near the iliac spine, and there is also some new bone formation on the anterior iliac border. There is a similar exostosis on the anterior surface of the R femur, 2-3cm inferior to the head, on the spiral line, orientated 45 degrees to the surface of the bone, pointing upwards towards the hip. Probably myositis

ossificans following trauma to the hip.

1799. A thin spicule of bone connects the L transverse process with the posterior arch of the atlas vertebra.
The 3rd, 4th & 5th metatarsals of both feet have extended facets on the inter-metatarsal articulations at their proximal ends.
There is a slight swelling on the lateral/anterior surface of the L tibia about 1/4 of the way from the distal end. There is slight pitting and striation in the area of the lesion. Probably periostitis following injury (consistent with the localised nature of the lesion).
Four thoracic vertebrae (?T9-12 - only the anterior parts of the centra remain) are fused on the anterior/right side of their bodies by a large, thick, flowing osteophyte. The osteophyte is damaged at the inferior edge of T9, but it seems probable that T8 was also fused to this block. Disc spaces between the fused vertebrae are normal. A fragment of bone shows that 2 additional vertebral bodies were fused by a similar osteophyte. All the vertebrae are very damaged post-mortem and it seems that only the thick osteophytes, and the bone immediately adjacent to them survived in the above vertebrae, the normal parts having been destroyed by aggressive soil conditions.
Centra of 3 other thoracic vertebrae (T1-3) are present and normal.
Fragments of 5 lumbar vertebrae are present and show thick, smooth, paravertebral osteophytes on their bodies. Seven cervical vertebrae are present and are normal, except for degenerative joint disease.
Fragments of many neural arches and facet joints are present and are normal. Of the sacro-iliac joints only the iliac face of the L is present, and is normal except for degenerative changes.
The following locations show bony spurring: L iliac crest, linea asperae, calcanei, patellae, and the L tibia, near distal joint surface. Thyroid cartilage and some costal cartilages are ossified. DISH.

1816. The L maxillary canine shows ante-mortem chipping on its mesial surface, the adjacent I2 on its distal surface.
There is partial sacralisation of L5 - the L transverse process articulates with a facet on the L sacral ala.
The bodies of T6-10 bear thick, smooth R-sided osteophytes, originating away from the disc margins, but none are fused together. Other thoracic vertebrae show similar, smaller osteophytes. The facet joints are normal except for slight capsular ossification. There is bony spurring on the iliac crests, patellae, around the acetabula, on the linea asperae, greater and lesser trochanters, soleal lines, near distal joint surfaces of fibulae, on iliac faces of sacro-iliac joints and on radial tuberosities. Early DISH type changes.
Sternal foramen present.
Green staining on R elbow area, midshaft of L forearm bones and on L iliac crest.

1819. There is a pit 5mm diameter & 4mm deep on the posterior part of the distal joint surface of the L tibia. Probably

osteochondritis dissecans.

1827. The R sacro-iliac joint is fused. There is a thin osteophyte over the upper third of the joint, blending smoothly with both bones. There is also some bony fusion of the joint surfaces themselves. The joint space is normal in the upper portion but appears somewhat narrowed in the lower part of the articulation. X-ray revealed no evidence for erosive lesions in either face of the joint. Only the sacral face of the L sacro-iliac joint is present, and is normal.

There is periostitis on the shafts of the R metatarsals 4 & 5. The head of the 5th shows some post-mortem damage, but certainly suffered some erosive destruction ante-mortem; part of the joint surface remains and is eburnated. The proximal phalanx of the R little toe also shows erosive lesions: its base has been destroyed and there is a small marginal erosion at its distal joint surface.

The R fibula shows periostitis about 1/3 of the way from the distal end. The L fibula is normal in this respect and the tibiae are missing.

Only 2 vertebrae are present, and are normal except for degenerative changes. Other than the feet which are quite complete, the rest of the skeleton is rather sparse (although it was drawn as a complete skeleton on the site plan).

Probably an erosive arthropathy.

The L fibula shows a healed fracture 1/3 of the way from the proximal end.

There is a small cavity with a pitted internal surface near the margin of each face of the left calcaneo-cuboid joint - probably non-pathological.

1834. The centra of 4 cervical vertebrae show large, thick, smooth osteophytes than sometimes cover the whole height of the centra.

The bodies of T5-9 are fused by a large, thick flowing, R-sided osteophyte (although T5 & 6 have broken away post-mortem). T10-12 have large R-sided osteophytes; it is possible that these 3 may also have originally been fused together, but post-mortem damage makes it impossible to be certain. The 5 lumbar vertebrae show large, thick osteophytes on their centra. In all cases the osteophytes originate away from the disc margins. All facet joints are normal, as are the sacro-iliac articulations.

Many joints show marginal spurring and/or capsular ossifications. There is bony spurring on the iliac crests, around the acetabula, on the greater and lesser tuberosities and medial and lateral epicondyles of the humeri, on the olecranon processes of the ulnae, radial tuberosities, tibial tuberosities, soleal lines, near distal joint surfaces of fibulae, greater and lesser trochanters, linea asperae, medial margin of the R tibia, insertions of Achilles tendons on calcanei, on both patellae and slightly on the medial epicondyle of the R femur. There is ossification of some costal cartilages. DISH.

1841. A 6th sacral segment is present; it is an extra vertebra, not sacralisation of L5.

1846. The L mandibular M3 is reduced and peg-like in form. The R mandibular M3 is erupting at a 30 degree angle, directed bucally.

1855. Periostitis on lateral surfaces of tibiae; fibulae normal.
Porotic hyperostosis: mainly in the form of "labyrinth" type, confined to the inner table of the skull. Changes are most marked upon the occipital bone, the posterior parts of the parietals and on the frontal bone, near the midline. Cause unknown, but possibly an anaemia. Slight cribra orbitalia also present.
Ninety degree rotation of mandibular L PM2 so that the lingual surface faces distally.

1872. Left (unilateral) os trigonium.
Spurring on iliac crests, L radial tuberosity, near distal joint surface of L fibula and on tuberosities of some ribs.
Small infra-bony pocket around mandibular R I2 and R PM2. Many interdental septa show porotic changes and irregular profiles. Periodontal disease.
Only about half the skeleton was received, but it is drawn as near complete on the plan.

1873. R arm and hand bones only. Large bones.

1874. Probable scaphocephaly. Rather elongated skull - cranial index=62.8 - with prominent frontal eminences. Closure of all vault sutures seems rather advanced compared with dental attrition age.
Bridge of bone between the L transverse process and the posterior arch of the atlas vertebra.

1882. Probable healed fracture of the neural spine of L2.
There is a depressed area of pitted bone on the posterior surface of the R tibia, adjacent to the facet for the proximal joint surface of the fibula. Infection - periostitis/osteitis.
T11 & 12 were united at their centra by a large, paravertebral osteophyte (although they have broken apart post-mortem). The osteophyte originates away from the disc margins. All facet joints are normal.
Bony spurring on radial tuberosities, iliac crests, linea asperae, greater trochanters and medial epicondyles of femora. Also ossification of xiphoid, costal, thyroid and ?tracheal cartilages. Probably early DISH.
There is an extra facet joint between the neural spine of T4 and the dorsal surface of the neural arch of T5.

1890. Slight periosteal reaction on medial (sub-cutaneous) surface of R tibia.
Lower parts of body only.

1892. T4 shows a healed fracture of its neural spine, about 2cm from the end.
The bodies of T8 & 9 are fused by a thick, flowing, R-sided osteophyte. T8 has a Schmorl's node on its inferior surface - it must have formed before fusion to T9 occurred. L4 & 5 show

large, thick, R-sided osteophytes on their bodies. All facet joints normal except for osteoarthritis. The L 8th rib shows a large capsular ossification on its head and there is bony spurring on the iliac crests, olecranon process of the R ulna and both radial tuberosities. There is ossification of thyroid and costal cartilages. Early DISH.

The sternabrae are not fused together.

There is a small pit in the proximal joint surface of the intermediate cuneiform; the corresponding joint surface of the L navicular shows a similar lesion. Unknown cause.

Slight bony overgrowth on the medial part of the joint surface of the L patella. Cause unknown but could conceivably be osteochondritis dissecans. Corresponding area of L femoral condyles normal.

L femur shows periostitis on the anterior aspect of the shaft, just above the condyles.

There is marked flattening of both femoral heads and severe osteoarthritis, with marginal osteophytosis, sclerosis and porosis of weight bearing areas, and granulation tissue on lower (non-weight bearing) portions. There is obliteration of the depressions for the ligamentum teres. There are severe osteoarthritic changes in both acetabula, with infilling of the acetabula fossae with new bone. There is new bone formation on the femoral necks and around the acetabula, presumably as a result of local irritation of the periosteum by the large osteophytes at the margins of the hip joints. All the above changes are more pronounced on the left hip. X-rays show no displacement of the femoral heads relative to the axis of the necks, confirm the flattening of the heads and show that the necks are of fairly normal length. Probably Perthes' disease, with consequential severe osteoarthritis of the hip joints. It is interesting to note that both sciatic notches are very wide for what is a robust, undoubtedly male skeleton; perhaps this is connected with the pathological changes at the hip joints.

1894. Third trochanter on L femur (unilateral).

1902. Sternal body and manubrium are fused together.

Upper neck bones, occipital, sphenoid and facial bones are very fragile and stained black.

1903. Slight alveolar resorbtion, porotic interdental septa. Periodontal disease.

1904. There are 3 foramina on the superior wing of the R scapula. The corresponding section on the L scapula is damaged, but it shows at least one elongated foramen.

The R hand has been amputated. The ulna is cut 215mm from its proximal end; comparison with the left forearm bones suggest that it was amputated about 43mm from the distal end. Comparing the radii it seems probable that the R was amputated about 73mm from its distal end. The hand must thus have been severed by a diagonal cut removing more of the radial than the ulnar side of the forearm. The forearm bones are united in a supinated position at their mutilated ends by 2 bridges of callus. There is no pitting suggestive of infection of the stump. No trace of

a prosthesis was found in the grave. Comparing 1904 with bones from modern amputees (Barber 1929) suggests that this was a quiescent stump with healing completed. Amputation probably occurred a long while prior to death.

In general the ridges for muscle attachment on all the left arm bones are more marked than those on the R, consistent with greater use of the L hand to compensate for the loss of the right. An exception to this was the ridge for attachment of the pronator teres on the lateral side of the radius; this was much more pronounced on the R side. Normally the function of this muscle is to pronate the forearm. In the R arm the ankylosis of radius and ulna would have prevented pronation; contraction of the pronator teres would instead have flexed the arm at the elbow. That the muscle was used in this way might explain the greater rugosity of its attachment on the R radius.

Measurement shows that the dimensions of the forearm bones at their midpoints were rather less on the R than the L side, but there was no difference in the measurements for the claviculae and humeri:

		L	R			L	R
Ulna	ap	15.2	13.0	Humerus	ap	23.6	23.4
	tv	17.1	14.8		tv	22.7	22.0
	dm	56	50		dm	75	76
Radius	ap	17.6	16.0	Clavicle	ap	12.4	11.5
	tv	14.2	12.8		tv	13.1	13.2
	dm	55	50		dm	45	44

Radiographs showed that the R forearm bones are rather less radiodense than their counterparts on the left-hand side. For the humeri the difference is less marked but still noticeable, but for the claviculae no difference is discernible. Rarefication of the arm bones on the mutilated side thus seems to be fairly slight overall, the changes being greater in the forearm bones. This is consistent with modern studies showing that in amputations through the forearm there is only a limited degree of atrophy in the mutilated limb (Barber 1934).

The L tibia shows several discrete periosteal reactions on its medial and lateral surfaces, in various stages of remodelling from freshly deposited woven bone to smooth, well remodelled lesions. The L fibula, too, shows periostitis, on its anterior surface. These lesions are probably a result of repeated local infection perhaps as a result of local trauma. The R leg bones are normal.

The L part of the frontal bone shows a groove on the outer table which communicates with a frontal foramen.

1906. The R tibia shows a swelling on its lateral border, 10-12cm from the distal end. The bone in the area of the lesion is pitted and striated. The R fibula is normal. The L tibia shows a slight swelling on the lateral parts of its posterior surface, 14cm from the distal end, together with periostitis on the L tibia and fibula. Probably infection following local trauma.

1914. Pitting of interdental septa, some of which also show flattening of their profiles. Slight alveolar resorbtion.

Periodontal disease.

T11 & 12 have compression fractures of their bodies, firmly healed with slight kyphosis. Superior surface of L5 shows anterior disc herniation.

Small exostosis on dorsal border of R scaphoid, near joint surface for radius.

The R 2nd metatarsal shows a fracture through its distal joint surface, and the proximal phalanx which articulates with it shows a fracture through its proximal joint surface. Both are healed leaving clefts in the joint surfaces.

The R acetabulum is missing a fragment 3-3.5cm long from its superior rim. There is a large cystic defect about 3cm deep beneath the missing area. There is another defect about half the size anterior to this one. These holes are smooth-walled. There is a slight roughened area on the ilium adjacent to where the fragment of the acetabular rim is missing. The corresponding area of the L acetabulum shows smaller, smooth-walled cavities penetrating the bone, but the acetabular rim is largely intact.

The fragment missing from the R acetabular rim probably represents a fracture of the acetabular rim (Bedbrook 1982)The defects within the ilium are similar to the "supra acetabular cysts" of Wells (1976); their cause in not known for certain but it seems highly probable that in this case they are associated with the trauma suffered to the hips.

The superior surface of the hard palate shows pitting and reactive new bone formation; the latter is also present on the internal surfaces of the nasal processes of the maxillae.

There is III (Moller-Christensen 1961) resorbtion of the anterior nasal spine, and also destruction of the remainder of the nasal spine. The margins of the pyriform aperture are rounded and eroded. There is I (Moller-Christensen 1961) resorbtion of the anterior maxillary alveolar process. There is increased pitting of the inferior surface of the hard palate.

There is slight bilateral cribra orbitalia.

The hand bones are normal.

Feet: all tarsals are normal. The L 1st metatarsal shows a subchondral cystic defect in its head which communicates with the joint surface. There is GrII osteoarthritis of the proximal joint surface of the L hallucial proximal phalanx. There is a similar cystic defect on the R 1st metatarsal head, and X-ray reveals some osteoporosis of the R hallucial metatarsal and phalanges. Slight periostitis of distal parts of lower leg bones. Leprosy.

1917. Both tibiae show periostitis of their medial and posterior surfaces.

The L femoral head is very flattened and shows eburnation and cystic cavitation of its head. The pit for the ligamentum teres is obliterated. There is some sub-periosteal new bone on the femoral neck and in the trochanteric region probably due to lifting of the periosteum by the large osteophytes around the head.

The L acetabulum is also porotic and eburnated, and the central fossa is filled with new bone. Osteophytes at the margins have lifted the periosteum with consequent new bone deposition around the acetabulum.

X-ray demonstrates no displacement of the femoral head with respect to the axis of the neck; the neck seems to be of fairly normal length. Perthes' disease.

There is an area of exposed trabeculae (3x4mm) on the lateral part of the joint surface of the L patella, with some new bone standing proud of the joint surface. Cause unknown but could conceivably be healed osteochondritis dissecans.

No skull, although the drawing on the site plan shows one as present.

1919. The R inferior facet joint of T11 faces laterally, and the superior R facet joint of T12 is also of "lumbar" type.

T7 shows an extra articular facet on the dorsal surface of the neural arch. The neural spine of T6 is missing but presumably bore a facet to articulate with that on T7.

T7 & 8 bear large, thick R-sided osteophytes on their bodies.

There are some "blood vessel" impressions running transversely across the lateral surface of the L tibia.

Bones quite small for a male.

1921. The joint between the manubrium and the sternal body is not horizontal but is oriented about 40 degrees to the horizontal.

1923. The distal metaphysis and the distal half of the diaphysis of the R femur is swollen. The surface of the bone in this area is normal except for slight periostitis near the distal end, on the anterior aspect only. X-ray reveals that this thickening is mainly thickening of the cortex on the medial aspect of the bone, and that there is some irregularity of the endosteal surface of the cortex on this side. These lesions are consistent with the early changes of osteomyelitis.

1925. Slight periostitis on the internal aspect of a R rib, near the vertebral end. A further 7R and 4L ribs are present and are normal, as is the rest of the skeleton, which is missing from the upper thorax upwards.

Bones quite light and osteoporotic.

1927. Small (5mm dm), slightly depressed area of sclerotic, irregular bone on the proximal joint surface of the L radius. A similar, smaller area exists on the R radius. Probably osteochondritis dissecans.

There is a thin bridge of bone between the posterior arch and the R transverse process of the atlas. There is an incomplete bridge on the L side.

The 1st coccygeal segment is fused to S5.

The skeleton lacks a skull, mandible, hands and feet, although a complete skeleton is shown on the plan.

1932. Marked super-eruption of the mandibular L M1. The roots of the maxillary R M3 are fused into one.

Light bones - osteoporosis.

Dental attrition age is 25-35, but the sutures suggest a rather older age.

1933. Small exostosis at the proximal end of the R 2nd metatarsal. Possibly traumatic. Also unilateral osteoarthritis of R ankle joint - perhaps this supports the trauma theory.

L5 shows spondylolysis; no evidence for spondylolisthesis. The sacrum has 6 segments, the 6th being an extra segment, rather than sacralisation of L5. S1 is incompletely sacralised: S2 has superior facet joints, but post-mortem damage makes it impossible to ascertain whether S1 bears posterior apophysial joints articulating with these.

Many carpals have small, smooth-walled cystic defects at their joint margins. The first metatarsals show similar defects near the medial margins of their heads. The cause of these changes is unclear (Rogers 1989), but they are probably not pathological.

Slight spurring of the tibial tuberosities, ischia and iliac crests.

There is a small cleft in the distal joint surface of the R humerus - non-pathological.

Black staining on the pelvic bones and femoral heads.

Skeleton lacks a skull, although one is shown as present on the drawing on the site plan.

1935. Green stain on R distal femur.

Lower parts of body only present.

T11 shows a healed compression fracture of its body and a large Schmorl's node on its superior surface.

The L radius shows a fracture 1/4 of the way from the distal end, firmly healed, with slight dorsal angulation of the distal part. Fracture of the styloid process of the ulna; the styloid has been resorbed leaving a pitted, roughened area.

Both tibiae show well remodelled periosteal reactions, most marked on their lateral surfaces. Similar lesion on the L fibula, most marked near the proximal end.

1937. T11 has T12-type facet joints, T12 has lumbar-type joints.

1944. The L 1st metatarso-phalangeal joint shows Gr3 osteoarthritis, with eburnation. The proximal phalanx deviates laterally and there is a cystic defect on the medial margin of the head of the metatarsal. The R 1st metatarsal shows a similar

defect and Gr2 osteoarthritis. Bilateral hallux valgus.
There is a fracture of the R femoral neck. The head is displaced inferiorly, by about 29mm, assuming an initial height similar to the L femur, and also slightly posteriorly and laterally. The fracture is strongly united but there is a large amount of callus and sub-periosteal new bone formation on the shaft, adjacent to the fracture. This last is most marked on the posterior side of the shaft, presumably due to the posterior displacement of the head lifting the periosteum more on this side. There are osteophytes around the depression for the ligamentum teres on the femoral head. There is a small eburnated area on the superior surface of the neck adjacent to the joint surface of the head. There is Gr2 osteoarthritis of the R femoral head and of the R acetabulum, with some infilling of its floor with new bone. The posterior displacement of the head on healing of the fracture would have meant that the knee faced outwards at 45 degrees instead of straight ahead.

1945. There are 11 thoracic and 6 lumbar vertebrae, and only 11 pairs of ribs.
There is a foramen penetrating the R scapula just beneath the coracoid process.
There is 90 degree rotation of mandibular L PM2 so that the lingual surface of the tooth faces distally.

1952. T12 has no rib facets on its body. Its R transverse process shows a facet for a detached portion of transverse process or a lumbar-type rib. The L transverse process appears normal but is rather damaged.
T5 & 6 are fused at the anterior/left parts of their centra by a small osteophyte. There is slight ossification in the disc space. There is slight kyphosis and leftward scoliosis. At the articulation between the 2 vertebrae only the left facet joints are present, and are normal. There is severe osteoarthritis of the superior facet joints of T5, implying extra stress to the T4-5 articulation as a result of long-standing ankylosis of T5 & 6. No trace of trauma or disease; very probably congenital fusion.
Small (8mm dm) benign osteoma on the R parietal bone 42-43mm from the sagittal and 46-46mm from the coronal suture.

1953. Small, smooth-walled cystic cavities on some carpals, adjacent to the joint surfaces. Cause unclear (Rogers 1989), but probably not pathological.
Skull poorly preserved, rest quite good. R side of skeleton only.

1954. Skeleton rather less complete than the drawing on the plan would suggest.

1955. Slight bathrocephaly.
X-ray and gross inspection show that there is inferior displacement of both femoral heads relative the the necks - the tops of the femoral heads are about level with the greater trochanters. The femoral necks appear slightly shorter and thicker than normal. The depressions for the ligamentum teres

are very deep and show bony lipping and are much nearer the inferior border of the femoral heads than normal. Both femoral heads are distorted and flattened. The R acetabulum shows a large, thick, irregular osteophyte on its superior margin. It seems that part of the superior margin broke away at this point, probably due to trauma. There is no evidence for sub-luxation of the joint and little osteoarthritis. L acetabulum normal.

This is probably bilateral slipped capital epiphysis. The lesions on the R acetabular rim are consistent with trauma and presumably occurred in the same incident which caused slippage of the epiphyses. The amount of slippage is relatively small, and the relative lack of osteoarthritic changes (despite the fairly advanced age of this individual) suggests that disruption to the hip joints was not severe.

Well remodelled periosteal reaction on the medial and lateral surfaces of the R tibia, towards the proximal ends.

1962. L5 shows spondylolysis. The pars interarticularis tapers at the site of the defect, almost coming to a point. Of all the vertebrae only L5 and S1 show osteophytosis; perhaps this reflects decreased stability of the joint between these 2 vertebrae as a result of the spondylolysis - however there is no trace of spondylolisthesis.

There are cystic cavities at the medial margins of the heads of both 1st metatarsals. Both proximal hallucial phalanges deviate laterally, and the R metatarso-phalangeal joint shows Gr3 osteoarthritis. Bilateral hallux valgus.

In addition to the normal 4 foot sesamoids associated with the 1st metatarso-phalangeal joints there are 2 further, very much smaller foot sesamoids which presumably belong to other metatarso-phalangeal joint(s).

There is a fragment of iron adhering to the L ulna.

The neck vertebrae and base of the skull are stained white.

1965. Two lower thoracic vertebrae show healed compression fractures of their bodies.

The R facet joints between T2 & 3 are fused (L side ones are missing). The body of T3 is reduced in height and slightly wedge shaped - possible compression fracture. Perhaps the fused facet joints are associated with this putative fracture. An upper thoracic vertebra shows a cod-fish type deformity.

Probable healed fracture of L clavicle, 1/3 of the way from the lateral end.

A rib fragment shows a healed fracture. The fracture is united by cancellous bone - the break probably occurred after those described above, shortly before death.

All bones are very light and osteoporotic.

Lesions on frontal bone. About 5cm above the glabella in the midline there is an area of very sclerotic, irregular bone standing slightly proud of the outer table. To the R of this area the bone is markedly thinned; there is a post-mortem defect in this region and here the cranium is reduced to only 1.5mm thick. Here too the surface of the outer table is rather bumpy showing the irregular nature of the thinning. There is another area of bumpy, irregularly thinned bone to the left of the sclerotic area. The surface of the inner table is normal.

There is pitting of the lachrymal groove of the left maxilla. The palate is near complete and is normal.

The following bones show osteitis/periostitis, generally with marked concentric thickening of their diaphyses: both tibiae, R fibula (L is missing), distal parts of both femora, distal parts of both humeri, distal R radius (only the distal 1/4 is present), L ulna, L radius and the R 3rd metacarpal.

The most marked changes are on the tibiae. They show several large raised plaques of bone on their sub-cutaneous surfaces, suggestive of overlying skin ulcers. There is some spicular bone and many spicules appear to be bridging over superficial blood vessels. There is associated undercutting of periosteal bone. This pattern is particularly marked on the lateral surfaces of the tibiae, but is also present on the fibula. Post-mortem damage shows that the medullary cavities are partly clogged with cancellous bone. The surfaces of the tibiae are mainly pitted and roughened, but in a few places are smooth. There is a flattened area on the spine of the left scapula, suggestive of an overlying skin ulcer.

Due to the general osteoporotic rarefication of the skeleton all bones are rather radiolucent, but X-rays of the pathological long-bones show a pattern of irregular sclerosis and rarefication, and the endosteal surfaces of the cortices are rather irregular. In many cases there are small radiolucencies within the deposition of new bone.

Probably treponemal disease, probably venereal syphilis.

1967. Some dental crowding on R side of mandible.
Fusion between manubrium and sternal body.
A fragment of an upper thoracic vertebra shows a healed compression fracture.
Skeleton very fragmentary.

1978. The distal 3/4 of the L tibia is irregularly swollen and pitted. Some sections have a longitudinally striated appearance. The changes cover the lateral, posterior and medial surfaces but are most marked on this last. There is a smooth oval area on the posterior surface, near the distal end; this is probably the site of an overlying skin ulcer. Similar but less marked changes exist on the R tibia. The fibulae show pitted, striated new bone formation on their distal thirds. There is a slight swelling with a pitted appearance on the posterior surface of the L femur, just above the condyles.
X-ray shows that the swelling of these bones is a result of new bone deposition upon the outer surfaces of the cortices; the endosteal surfaces and medullary cavities are normal.
Probably chronic periostitis due to long term infection of the lower legs, with ulceration.
The L part of the frontal bone shows a shallow linear depression about 18mm long and 5mm wide, orientated about 35 degrees to the sagittal plane, about 4-6cm above the L supra-orbital notch. Probably a healed, relatively superficial injury from an edged weapon.
The distal joint surface of the R humerus shows a raised, irregular area (13x8mm) of sclerotic bone on the lateral part of the joint surface. Probably healed osteochondritis dissecans.
The mandible shows porosis of interdental septa and marked alveolar resorbtion. Periodontal disease.

1980. Moderate alveolar resorbtion and porotic changes to interdental septa. Periodontal disease.
There is a well defined facet on the tuberosity of each cuboid, possibly for articulation with an os peroneum.
Both medial cuneiforms show incomplete horizontal clefts - the joint surfaces have clefts but the central portion of the bone is normal.
Gracile skeleton for a male.
Dark staining near base of skull.
Abscess at maxillary L M2 pierces antrum of Highmore.

1983. Marked super-eruption of R mandibular M2.
Very thick skull and massive jaw.
Porosity of interdental septa, some of which also have concave profiles. Slight alveolar resorbtion. Periodontal disease.
Tibiae and fibulae show well remodelled periosteal reactions with pitted and striated appearances. On the tibiae these tend to be localised in discrete areas on the medial and lateral surfaces. As only a little of the fibulae are present it is difficult to discern the distribution of lesions on these bones. The patchy, localised distribution of changes observed on the tibiae argues for local infections as the cause of the lesions.
Slight spurring near anterior border of distal joint surface of R fibula.

1985. Porosis and flattening of interdental septa, severe alveolar resorbtion. Periodontal disease.

A L proximal hand phalanx shows an area of sclerotic bone on its distal joint surface, which also shows an exostosis at its margin. The articulating intermediate phalanx shows spurring and irregularity of its proximal joint surface. Probably degenerative joint disease secondary to trauma.

The L talus has a pit (7x4mm) lined with sclerotic trabeculae on the medial side of its trochlear joint surface. Probably osteochondritis dissecans. The R talus shows a few small pits in the same area.

There is marked periostitis of the entire shaft of the L tibia; the surface is pitted and irregular with some nodular depositions of new bone. The changes are most marked on the lateral side. The L fibula is fragmentary but its diaphysis, too, shows much pitted, striated new bone. The R tibia shows slight periostitis, the R fibula is normal. The L femur shows 2 nodular deposits of new bone near its distal end. The R femur and both patellae are normal. X-ray revealed that the medullary cavities and endosteal surfaces of the cortices are normal: the pathological changes consist of the deposition of new bone upon the outer surface of the cortices. Periostitis as a result of chronic infection of the lower legs.

T11 has T12-type facet joints; T12 has lumbar-type facet joints.

T7-9 have large, thick, interlocking R-sided osteophytes. The osteophytes cover the entire height of the vertebral bodies and originate away from the disc margins. The other 9 thoracic vertebral centra are all rather damaged post-mortem, but appear normal. All vertebral facet joints are normal, except for osteoarthritis.

The R sacro-iliac joint is united by a massive, smooth osteophyte at its upper extremity (but has broken apart post-mortem). The joint surfaces of both faces of the joint are normal, showing no evidence for erosive changes. The R sacro-iliac joint shows some peripheral ossification, mainly at the upper parts of the joint.

Many joints show smooth capsular ossifications. The R 1st rib is fused to the manubrium by ossification of the costal cartilage. Other costal cartilages and the xiphoid cartilage are ossified. There is marked bony spurring on patellae, linea asperae, greater and lesser trochanters, soleal lines, iliac crests, R radial tuberosity and lesser tuberosities of the humeri. Early DISH.

The R humerus has a small ridge of bone in the region where the supra-condyloid process is, if present. It does not appear to be a supra-condyloid process; it may be traumatic, or it may merely be a result of the DISH-type bone forming changes seen in this individual.

1987. Some interdental septa have concave profiles and many show pitting. Periodontal disease.

Fragments of several middle-lower thoracic vertebrae show large, thick R-sided osteophytes on their bodies. No vertebrae are fused together but some osteophytes interlock. There is

spurring on linea asperae, greater trochanters, iliac crests, radial tuberosities, patellae and at insertions of Achilles tendons on the calcanei. Early DISH.

Three rib fragments show healed fractures - probably 3 neighbouring ribs.

The L capitate shows an exostosis on the dorsal margin of the joint surface which articulates with the 3rd metacarpal. Probably traumatic - consistent with the marked osteoarthritis on other L hand bones.

The anterior nasal spine shows I (Moller-Christensen 1961) resorbtion. There is rounding and erosion of the margins of the pyriform aperture. The inferior and superior surfaces of the hard palate are normal. There is I (Moller-Christensen 1961) resorbtion of the anterior maxillary alveolar process, with slight pitting on the anterior aspect.

There is bilateral cribra orbitalia.

The lower leg bones show periostitis, mainly towards their distal ends, most marked on the interosseous borders. The L leg is more severely affected than the R.

L foot: lateral cuneiform, navicular and cuboid show dorsal exostoses of the type described by Anderson & Manchester (1988). There is slight osteitis of some tarsals. The heads and distal parts of the shafts of metatarsals 1-4 are destroyed ante-mortem. The bones taper transversely in a "knife-edge" deformity. The 1st metatarsal has lost the most, its distal half has been destroyed. The remaining parts of these metatarsals are pitted and irregular through osteitis. The shaft of the 5th metatarsal shows periostitis, otherwise the bone is normal. One phalanx is present (a proximal one from the 2nd toe) and shows destruction of its distal joint surface.

R foot: lateral cuneiform shows a dorsal exostosis. Metatarsals 2-5 are normal. The head of the 1st metatarsal shows eburnation, with subchondral cystic cavities. The proximal hallucial phalanx is "collar stud" shaped with only the proximal joint surface (which is eburnated) and a little of its shaft remaining. Three other phalanges are present: one shows osteitis.

The hands appear normal but no terminal phalanges are present for study.

Leprosy.

The L mandibular canine is missing post-mortem but its socket shows that it was twin rooted.

Short, rather robust bones.

There are the beginnings of a sutura mendosa visible at the asterions.

1989. The end of the L transverse process of L1 is not fused to the rest of the vertebra.

1992. Lacks skull and mandible, although these bones are shown as present in the drawing of the skeleton on the site plan.

Two thoracic vertebrae show clefts in their left posterior facet joint surfaces.

Manubrium fused to sternal body.

The subcutaneous surface of the R tibia has a striated appearance in the middle part of the diaphysis; there is a

similar area on the lateral part of the tibial tuberosity. There is also a similar area 1/3 of the way from the proximal end of the R fibula. Well remodelled periosteal reactions.

There is a pitted area on the distal joint surface of the L 5th metatarsal, with destruction of 1/2-2/3 of the joint surface by 3 smooth erosions. Only 2 other metatarsals are present, and are normal, as are all other foot bones.

This does not have the appearance of an erosive arthropathy (the erosions are smooth-walled and the changes are confined to one joint), there is no shortening of the metatarsal or other changes one might expect in Freiberg's disease (Ortner & Putschar 1985: 244). There is no evidence for infection or trauma. It is possible that this could be a bunion-type erosion associated with constriction of the little toe by poorly fitting footwear. 1740 showed bunion erosions of the 5th metatarsals, these were confined to the lateral margins of the metatarsal heads. The lesions on 1992 are mainly on the superior/lateral margins; perhaps they, too, are a result of constricting footwear.

1994. Resorbtion of interdental septa between maxillary M2s & M3s, with porosis and slight alveolar resorbtion. Periodontal disease.

1996. There is a gully on the L frontal bone communicating with a L frontal foramen.

Pitting and some concavity of interdental septa. Slight alveolar resorbtion. Periodontal disease.

Sternal foramen.

Small triangular indentation on distal joint surface of L humerus. Non-pathological.

Large, smooth-walled cavity on medial margin of the head of R 1st metatarsal. Hallux valgus.

1999. Congenital absence of all 4 PM2s, R maxillary I2 and all 4 M3s. The deciduous M2s are retained in place of the absent PM2s.

There is a deposit of woven bone upon the lateral surface of the R tibia in the midshaft area; there is a similar area on the R fibula. Periostitis. The L 4th metatarsal shows periostitis on its shaft. Other L & R metatarsals seem normal, although they are much eroded post-mortem. The anterior nasal spine and hard palate are normal.

2005. Infra-bony pocket formation around several teeth, flattening of interdental septa and moderate alveolar resorbtion. Periodontal disease.

T9-11 and T6 & 7 are fused at their centra by thick, smooth, R-sided osteophytes. T1 & 12 have interlocking R-sided osteophytes, as do T5 & 6, T7 & 8, T8 & 9 and L3 & 4. Other lumbar vertebrae and S1 have similar, smaller osteophytes on their bodies. All facet joints normal. Spurring on R linea aspera, iliac crest and ischium, and at the insertions of the Achilles tendons on the calcanei. Ossification of thyroid and costal cartilages. DISH.

Slight periostitis on the anterior border of the L fibula, 1/2-1/3 of the way up the shaft.

Cleft in the distal joint surface of the R femur, between the

condyles. Non-pathological.

2049. Slight periostitis on the roofs of the orbits.

2090. Slight periosteal reaction on medial side of R tibia.

2301. Small pit at medial margin of the head of the R 1st metatarsal - not pathological.
There is a L os trigonium - the bone is partly fused to the L talus.
Both navicular bones show a roughened, pitted area on their posterior parts of their tuberosities. These appear to be sites for fibrous attachment of os tibiale externae.
The medial margin of the trochlear surface of the L talus shows an irregular pit 7x5mm and 5mm deep, lined with irregular, sclerotic trabeculae. There are similar, slightly smaller pits on the same location on the R talus, and on the posterior facet of the R calcaneus. Probably osteochondritis dissecans.
2301 is shown as a fairly complete skeleton on the plan, although only about 1/3 of a skeleton was received.

2306. Two middle thoracic vertebrae are fused at their facet joints, and at the anterior margins of their bodies by a thin osteophyte which projects little from the surfaces of the centra. A small fragment shows that 2 other thoracic centra were fused in a similar fashion. A total of 8 vertebrae are represented by fragments and a fragments of 10 left and 1 right ribs are present; several costo-vertebral articulations show erosive changes. The eroded areas are of sclerotic trabecular bone. Several ribs show bony proliferation at their heads.
A small fragment of an upper thoracic vertebral body shows the head of a rib fused to it; this fusion is mainly at the periphery of the joint.
Only the L iliac face is present of the bones making up the sacro-iliac joints. It is normal except for degenerative changes. Most of the hand and foot bones are present, and are free from erosive changes.
Probably an erosive arthropathy, possibly a sero-negative arthritis.
The distal 1/2 of the shaft of the L 2nd metacarpal is irregularly swollen and has a slightly pitted surface. There appears to be a fracture just proximal to the distal joint surface which is firmly united with some volar angulation of the distal end. X-ray shows a wall of new bone outside the original cortex, some of which appears to have been removed by remodelling. Probably osteomyelitis secondary to local trauma.
Left 1/2 of skeleton and foot bones only.

2307. Exostosis on dorsal margin of R capitate.
Skeleton received is less complete than the drawing on the plan suggests.

2313. There is an incomplete horizontal cleft in the R medial cuneiform - i.e. the posterior and anterior joint surfaces are cleft but the middle part of the bone is normal.
2316. A middle L rib shows 2 fractures. One is well healed, 1/3

of the way from the sternal end, the other is un-united and lies 1/3 of the way from the head. A fragment of a L rib shows another un-united fracture near the vertebral end, and a rib fragment of unknown side shows a firmly healed fracture. The faces of the un-united breaks are very pitted and irregular, suggesting pseudarthroses. So 2L ribs show 2 united and 1 un-united fracture and 1 unsided rib shows a united fracture.

2318. There is a fracture about 1/3 of the way from the distal end of the R radius. Healed with dorsal angulation of the distal end.
Robust skeleton.

2320. Rather light, osteoporotic bones.

2326. Slight alveolar resorbtion and some pitting of interdental septa around molar teeth. Periodontal disease.
Neck bones and base of skull very poorly preserved.

2327. There is a circumscribed area of pitted bone on the inferior surface of the palate, adjacent to sockets of the R PM1 and canine. Osteitis. There is no periapical abscess nearby - perhaps there was one at the PM1 or canine which drained via the palate and subsequently healed.
Pronounced bathrocephaly. Many ossicles in lambdoid suture.
The proximal joint surfaces of both proximal hallucial phalanges have a small pit in them. Non-pathological.

2331. V-shaped transverse palatine suture.
Preservation good, but bones rather fragmentary.

2332. A lumbar vertebra (L4 & 5) shows spondylolysis. Only neural arch fragments of this vertebra remain.
The L tibia shows a raised nodule on its posterior-medial angle, about 12-13cm from the distal end. The surface of the lesion is fairly smooth and slightly pitted. Probably an ossified haematoma. X-ray seems to support this interpretation. There are irregular exostoses around the groove for the fibula and the distal joint surface, suggestive of traumatic myositis ossificans.

2333. Ante-mortem chipping of the R mandibular PM1. THe lingual half of the crown has been removed exposing the pulp. The lesion looks suspiciously post-mortem (i.e. sharp edges) under low power binocular microscope, but the presence of a large periapical abscess cavity indicates an ante-mortem origin for the lesion.
The atlas has a thin bony bridge connecting the L transverse process with the posterior arch. Cannot inspect the R side for a similar bridge as it is damaged.
There are 3 cystic defects on the superior part of the L acetabulum, 2-3mm diameter and 9mm deep; probably related to the osteoarthritic changes at this joint.

2334. Some teeth show super-eruption.
Some interdental septa are porotic and somewhat irregular in profile - periodontal disease.

A few thoracic and lumbar vertebral bodies show small, smooth osteophytes, originating away from the disc margins.

2343. Slight-moderate alveolar resorbtion and porosis of interdental septa. Periodontal disease.
There is an irregular exostosis on the L tibia in the groove for the fibula. The fibula is normal. Probably traumatic myositis ossificans.

2348. There is a fracture through the distal joint surface of the L radius, extending through the facet for the ulna. Healed with fracture lines clearly visible. Most of the force of the fracture appears to be directed at the dorsal part of the joint surface. There is slight osteophyte formation around the joint margins and slightly pitted callus is present on the dorsal surface of the metaphysis. The L scaphoid, lunate and distal joint surface of the ulna are normal except for very slight osteoarthritis.
L5 shows spondylolysis. Although there is much post-mortem damage to the centra of L5 and S1, it does not appear that spondylolisthesis occurred.

2349. Bathrocephaly. Many ossicles in lambdoid suture.
L2 shows a thick, smooth osteophyte on the R inferior border of its body. A similar osteophyte on the superior part of the body of L3 touches, but is not fused to this one. Osteophytes originate at the disc margins. Cause unknown.

2373. There is fusion of the lateral thumb sesamoid to the distal joint surface of the R 1st metacarpal.
There is an exostosis projecting laterally near the posterior margin of the distal joint surface of the R tibia. All 3R cuneiforms show exostoses on their plantar aspects. The R 3rd metatarsal shows exostoses near the proximal end. All L foot bones normal. It seems likely that these lesions are caused by trauma of the R ankle joint.

2384. Infra-bony pockets and mandibular M3s, porosis and concavity of some interdental septa, and slight alveolar resorbtion. Periodontal disease.
Periostitis on the shaft of the L 5th metatarsal.

2386. Axis and C3 are fused at the L facet joint and the L part of the neural arch. Disc space and R facet joints normal. Congenital fusion.
Severe osteoarthritis of R talus and distal tibia with eburnation. Also severe osteoarthritis on the posterior facet on the calcaneus. The L ankle joint is free from osteoarthritic changes. These lesions are probably sequential to trauma of the L ankle as it is a fairly unusual site for osteoarthritis, it is severe and changes are unilateral.
The R 2nd, 3rd and 4th metacarpals show healed fractures of their shafts. Healing with fairly abundant callus and some volar displacement of distal ends. Marked osteoarthritis on the proximal joint surfaces of 4th and 5th R metacarpals and on the R

trapezium and hamate - probably related to trauma.
Colles' fracture of R radius, healed with slight dorsal displacement of distal end. There is a large cystic defect on the volar border of the distal joint surface of the R radius - probably related to trauma.

2389. Rib fragments and R arm and hand bones only.

2391. Robust skeleton.
Irregular new bone growth around distal joint surface of L radius, especially on dorsal and lateral sides and also near the tuberosity of the R radius. X-ray shows that these lesions consist of new bone laid down upon the normal cortex. Unknown cause.

2396. The bodies of T10 & 11 are fused by thick, flowing, smooth, R-sided osteophytes. Disc space normal. T9 may also have been fused to T10 but post-mortem damage makes it impossible to be sure. T4-6 and T7-9 have similar, smaller osteophytes, but none are fused together. Facet joints are all normal except for osteoarthritis. The L sacro-iliac joint was probably fused by a thick, smooth osteophyte at the anterior/superior border, although the joint surfaces have broken apart post-mortem. The faces of the joints are normal except for degenerative changes. The R sacro-iliac joint shows similar osteophytes but was probably not fused. There is some sub-periosteal new bone on the R sacral ala, near the sacro-iliac joint. There is slight spurring on the iliac crests, linea asperae and at the insertions of the Achilles tendons on the calcanei. There is ossification of the xiphoid, thyroid, costal and ?cricoid cartilages. Early DISH.
Incomplete foramen transversaria on atlas.

2397. Quite large post-cranial bones, but pelvic bones look probably female; the skull is indeterminate.
Manubrium fused to sternal body.
Small indentation with a pitted surface on the distal joint surface of the R humerus.

2400. Small bony exostosis on the medial condyle of L femur.

2405. Small exostosis at medial margin of the iliac face of the R sacro-iliac joint.
The L femoral head appears rather flattened. No evidence for displacement of femoral head, insertion of ligamentum teres is normal and there is no osteoarthritis. No evidence for pathological changes in the gross specimen or on X-ray.
A fragment of a L rib shows a cystic cavity 5-6mm diameter on its inferior border. Probably not pathological.

2407. Small, smooth walled cystic defects near the medial margins of the heads of both 1st metatarsals. There is a similar defect at the distal joint surface of the L proximal hallucial phalanx. Probably not pathological.
Two L ribs, 1R rib and fragments from 2 ribs of unknown side show healed fractures. On the L ribs they are located about 1/3

of the way from the vertebral ends and on the R rib in the midshaft area. The R rib shows less callus at its fracture than the others.
Lower parts of body better preserved than upper parts.

2411. L1 has T12-type facet joints.
A cavity lined with trabecular bone lies on the medial margin of the head of the R 1st metatarsal. There is lateral deviation of the proximal hallucial phalanx. The L 1st metatarsal is normal. Unilateral hallux valgus.
Irregular depressed area of sclerotic trabecular on the proximal joint surface of the L proximal hallucial phalanx. Osteochondritis dissecans.

2432. Maxillary LM3 has only 2 roots, 1 buccal, 1 lingual.
There are large infra-bony pockets at the mandibular LM3, RM2 and RPM1. Interdental septa are concave and porotic. Periodontal disease.
A lumbar vertebra (?L5) shows spondylolysis; only the detached neural arch is present.
Top half of skeleton only.

2436. R tibia and fibula are fused together just above the distal joint surfaces. X-ray suggests that there is a minor fracture of the tibia on the medial side where it is fused to the fibula; it appears to be disruption of the distal tibio-fibular syndesmosis with avulsion of a fragment of the tibia. The fibula shows no sign of fracture.

2439. Severe alveolar resorbtion and porosis and concavity of interdental septa. Infra-bony pockets at mandibular RM1, RM3 and LM3, and at maxillary RM1, RM2, RM3, LM2 and LM3. Molars rather loose in their sockets. Periodontal disease.
Both patellae bear depressed areas of sclerotic trabeculae (9x9mm on the R, 11x11mm on the L) on the ridge between distal and lateral parts of their joint surfaces. There is a small pit on the distal joint surface of the L femur in the depression between the condyles. R distal femur normal. Osteochondritis dissecans.
There is a groove on the R side of the frontal bone communicating with the R supra-orbital foramen.
Large but gracile bones. Pelvic bones very damaged, but suggests female sex, skull indeterminate.

2441. The superior surface of the body of L4 shows a shallow pitted erosion at its anterior margin. Appears to be anterior herniation of disc.
T12 shows a compression fracture of the superior/R side of its body. Firmly healed. The superior surface of the vertebral body also bears a Schmorl's node.

2443. L foot only received. Drawing on the site plan shows a whole skeleton.

2448A. There is a cleft in the proximal joint surface of the L lateral cuneiform, with a slight ridge in the corresponding

position on the L navicular. Non-pathological.
Smooth walled cystic cavity at the medial margin of the head of the R 1st metatarsal. Probably a bunion erosion - hallux valgus.

2448B. The axis and C3 are fused at their L facet joints, L parts of neural arches and L parts of centra. Congenital fusion.
Some thoracic vertebral centra have small, thick, smooth osteophytes on their centra.
R foot: large exostoses at the margins of the talo-navicular joint; both faces of the joint are rather bumpy and irregular. There are a few exostoses present at the superior margin of the calcaneal face of the calcaneo-cuboid joint, and on the navicular face of the lateral cuneio-navicular joint. Both faces of the talo-navicular joint show moderate osteoarthritis, as does the articulation between the cuboid and the lateral cuneiform. The rest of the tarsal bones are missing.
L foot: exostoses are present at the margins of both faces of the calcaneo-cuboid articulation, and on the anterior talar facets of the calcaneus. The articulation between the cuboid and the lateral cuneiform shows moderate osteoarthritis. Other tarsals missing.
These lesions are probably a result of trauma to the feet.
The L tibia shows a 18mm long by 5mm wide exostosis on the medial/posterior border. Probably traumatic myositis ossificans.

2449. R mandibular canine has 2 roots.

2451. The R maxillary canine has failed to erupt and the deciduous tooth is retained. The unerupted tooth is visible through the incisive fossa and appears to be directed medially. The L maxillary canine has erupted anterior and medial from its normal position; here too the deciduous tooth is retained. The deciduous mandibular R canine was retained, but has fallen from its socket and been lost post-mortem; the unerupted permanent tooth is visible in its crypt. The L mandibular canine has erupted normally.
There is partial sacralisation of L5 - its enlarged R transverse process articulates with a roughened area on the sacral ala - probably fibrous union existed between them at this site.

2452. A middle thoracic vertebra shows a healed compression fracture on the superior surface of its body. The edges of the fracture are fairly sharp; perhaps it only occurred a short time before death.
There is a bridge of bone connecting the R transverse process and the posterior arch of the atlas.
There is a small cystic cavity near the medial margin of the head of the L 1st metatarsal and near the distal joint surface of the R hallucial proximal phalanx. Probably non-pathological.

2457. Reduced maxillary M3s.
Pitting and concave profiles of interdental septa. Slight-moderate alveolar resorbtion. Periodontal disease.
Both 5th metatarsals show periostitis on their shafts, as do the lateral and posterior surfaces of the L tibia (most marked

near the distal end), the R tibia (medial surface, and the posterior and lateral surfaces near the distal end), both fibulae, L calcaneus and, to a very slight extent, the R 4th metatarsal.

Slight spurring on plantar surface of L calcaneus and on both patellae.

Bones rather fragile and fragmentary.

2458. Two fragments of the R parietal and frontal bones in the region of the coronal suture show fine pitting indicative of cribra cranii. This individual also shows cribra orbitalia of the porotic type.

There are large erosions near the anterior margins of the inferior surfaces of the bodies of T12 and L1. Than on L1 does not affect the outer rim but there is some erosion of the rim on T12. The surfaces of the lesions are rough and irregular. The margins of the lesions are shown to be sclerotic on X-ray. Probably Scheuermann's disease.

Partial lumbarisation of S1 - incomplete fusion of L transverse processes of S1 & 2 (R sides too damaged to permit observation).

There is a smooth-walled erosion at the medial margin of the head of the R 1st metatarsal with some lateral deviation of the proximal hallucial phalanx. Hallux valgus.

2459. Slight alveolar resorbtion around the L mandibular molars and pitting of interdental septa. Periodontal disease.

2461. Both patellae show raised, irregular, sclerotic areas on their articular surfaces; on the R this area lies on the ridge between the lateral and medial parts of the joint surface, that on the L lies on the medial part of the joint surface. Probably healed osteochondritis dissecans.

There is a healed depressed fracture on the L frontal and parietal bones lying across the coronal suture. The centre of the lesion is located about 1.5cm above the pterion. Healed fracture lines radiate from the focus of the lesion. There was some fragmentation of bone at the area of impact, where the bone is depressed about 1cm below the normal outer table. Although the edges of bone fragments at the focus of the lesion and the lines of radiating fractures are still fairly well defined and distinct, there is no woven bone indicative of early callus, suggesting prolonged survival after the trauma episode. The appearance of the injury suggests a fairly blunt impact over a fairly small area of bone, the trajectory of the blow being probably from the individual's left and slightly above and in front. No evidence for infection of the wound.

There is an area 16x7mm of roughened bone on the frontal bone 3cm to the R of the midline and 1.5cm from the coronal suture. Possibly fairly minor trauma to the outer table with subsequent healing.

2462. There is a bridge of bone connecting the R transverse process with the posterior arch of the atlas.

Slight pinkish tinge to some bones.

2466. Only 2 hand phalanges are present. Both are proximal phalanges and both show erosive changes. One shows complete destruction of its distal joint surface with a hook-like overhanging edge. The other shows erosions on the joint surface an at its margins, there is a small patch of eburnation on the joint surface. The internal surfaces of the erosions are of smooth trabecular bone. The proximal joint surfaces of both phalanges are normal. The only other hand bones present are the L 1st metacarpal and one L carpal; they are normal.

There is complete destruction of the L acromio-clavicular joint, the eroded surfaces being composed of sclerotic, irregular trabecular bone. The R clavicle is missing.

Only about 1/2 the skeleton is present and the rest of the bones, lacking foot bones but including about half the vertebral column and the iliac face of the L sacro-iliac joint, are free from erosive changes. The lack of involvement of the axial skeleton and the hook-shaped lesion on the proximal phalanx are suggestive of gout.

Slight bathrocephaly.

Large bones.

T9 and 10 are united at their centra by a large, thick, R-sided osteophyte. An osteophyte on the inferior part of the body of T10 clearly interlocked with one on T11 (which is missing). Facet joints and disc spaces normal. Early DISH.

2474. Two L hand phalanges show small smooth walled cystic defects near their joint margins. Probably not pathological.

L4 & 5 show spondylolysis. No evidence for spondylolisthesis.

Bones in the R shoulder region and some thoracic vertebrae show a pinkish tinge.

2476. T12 has lumbar-type facet joints.

There is a bony bridge between the L transverse process and the posterior arch of the atlas.

A proximal foot phalanx shows a healed fracture through its distal joint surface. This has caused a step in the joint surface and there is an eburnated patch on the projecting part.

The R 1st metatarsal has a large (7x5x4mm deep) pit lined with sclerotic trabeculae in its proximal joint surface. Osteochondritis dissecans. The distal joint surface of the R medial cuneiform shows a smooth projection at the point where it articulates with the pit on the 1st metatarsal. There is a smaller, similar pit on the proximal joint surface of the L proximal hallucial phalanx. Probably also osteochondritis dissecans.

Very slight periosteal reaction on the lateral and medial surfaces of both tibiae and on the shaft of the R fibula.

There is a large deposition of new bone in the L olecranon fossa, and near the lateral margins of the distal joint surface and lateral epicondyle, of the L humerus.

Muscle attachments attachments more rugose on the L than the R arm bones.

Black staining near the base of the skull - these parts very fragile.

Arm bones very robust.

2478. There is a bridge of bone over a gully on the R side of the occipital bone which appears to convey the structures which run through the R mastoid foramen.
Slight spurring on patellae, distal fibulae, L linea aspera and R soleal line. A lower thoracic vertebra shows a large osteophyte originating on the R anterior wall of the body of the vertebra, well away from the disc margin. A upper thoracic vertebra shows a similar, slightly larger osteophyte. Fragments of 2 thoracic centra are fused at their R sides by a large osteophyte which covers the whole height of the centra. Early DISH.

2480. Porosis and sclerosis of interdental septa. There is an infra-bony pocket between the L maxillary I2 and canine. Moderate alveolar resorbtion. Periodontal disease.
Fragments of 2 ribs show healed fractures, both near the sternal ends.

2482. Congenital absence of L maxillary I2.
The body of T12 shows a healed compression fracture.
The distal joint surface of the R 4th metacarpal is flattened with an irregular, porotic surface with some eburnated patches. Distal part of shaft is slightly and irregularly swollen. There seems to be a fracture through the distal joint surface with probable osteomyelitic infection of the distal parts of the bone.
Large, thick osteophytes on the anterior surfaces of the bodies of some lumbar vertebrae.

2484. Foot and lower leg bones only.
Very large, robust bones. Must be male.

2489. The superior surface of the body of T12 shows a depression near the anterior border with very sclerotic trabeculae. Scheuermann's disease.
The femora and tibiae show much post-mortem pitting.

2491. There is an iron fragment embedded in the L part of the frontal bone, 38mm from the upper rim of the L orbit and 20mm from the temporal line. The fragment is pointed and roughly rectangular in cross section and measures 6x5mm. There is a rectangular hole 1x3mm in the inner table but the iron fragment does not project through it. The bone around the object on the outer table is bevelled suggesting that the object became embedded while the individual was alive or at least when the bone was fairly fresh. X-ray suggests that the fragment is the tip of a projectile, implement or weapon which broke off in the wound; the tip just fails to pierce the inner table. The bevelled sides of the bone around the fragment suggest that the wound occurred during life (or at least fairly soon after death while the bone was still fresh). The injury is clearly insufficient on its own to be cause of death.

2492. Small pit in the proximal joint surface of the R hallucial proximal phalanx.
Posterior, middle and anterior R clinoid processes connected by a bridge of bone.

2494. A mid-thoracic vertebra has a large osteophyte above the inferior rib demi-facet; its inferior neighbour shows a similar osteophyte on its left inferior rib demi-facet. The first of these 2 vertebrae also bears a small, smooth osteophyte on the margin of its body.

2496. Three middle-upper thoracic vertebral centra are united by a large, thick, smooth R-sided osteophyte. Disc spaces appear normal. Fragments of 6 other thoracic centra are present and 4 show thick, smooth osteophytes, as does a lumbar vertebra. Ossification of costal cartilages. DISH.
Robust bones.

2499. Large cavity, lined with trabecular bone, on the medial margin of the head of the L 1st metatarsal. Proximal phalanx deviates laterally. Unilateral hallux valgus.
Partial lumbarisation of S1: the centra of S1 & 2 are incompletely fused and S1 has lumbar-type posterior facet joints. The R ala is normal, but the L shows a joint between S1 & 2.
The R ulna is stained green on the posterior surface of its shaft.
Lower half of skeleton only present.

2501. Most of skeleton cut away by later feature.

2504. Profile changes and porosis of interdental septa, particularly around the molar teeth, and severe alveolar resorbtion. Periodontal disease.
Small pit on the proximal joint surface of the R proximal hallucial phalanx.
Terminal and intermediate phalanges of a little toe are fused.

2506. Spondylolisthesis of L4. Grade 2 osteophytosis of L5, which shows some sub-periosteal new bone on its anterior wall, probably as a result of elevation of the periosteum as a result of forward slippage of the body of L4.
There are small, shallow erosions on the iliac faces of both sacro-iliac joints. Probably non-pathological. The rest of the joints in this fairly complete skeleton are free from pathology (other than degenerative joint disease).

2508. Super-eruption of teeth.
Two fragments of thoracic vertebral centra show thick, smooth osteophytes which originate away from the disc margins. All vertebrae are very fragmentary and poorly preserved, hence it is difficult to assess the extent of changes in the vertebral column, however many fragments of neural arches are present and in no case was there any pathology of the facet joints, except for osteoarthritis. There is extensive bony spurring on patellae, at the roots of the bifurcated ligaments and Achilles tendons on both calcanei, on the lesser tuberosities and deltoid ridges on both humeri, at the inferior margin of the R glenoid, at the medial end of the R clavicle, around both acetabula, on both iliac crests, on the linea asperae, on the R soleal line and on both radial tuberosities.

These changes seem to be "bone former" or early DISH-type changes.

L5 shows spondylolysis, no evidence for spondylolisthesis.

The L scapula has a hole in the part of the wing lying immediately inferior to the spine. It is irregular in outline, with its long axis parallel to the scapular spine. There is a small (2mm) hole in the corresponding area of the R scapula.

2511. Preservation very poor; shown as partial shadow burial on the plan.

2514. Faint traces of a sutura mendosa at both asterions.

Arm bones, scapulae and base of skull in poor condition, rest of skeleton well preserved.

Iron Nail head adhering to posterior surface of the R humerus, near the lateral epicondyle.

2527. Many interdental septa have concave profiles and are porotic. Slight alveolar resorbtion. Periodontal disease.

Femora have very pronounced anterior curvature and buttress-type linea asperae.

Two iron coffin nails bagged with bones, one with wood preserved in corrosion products.

2533. In addition to the M3s there is also congenital absence of both mandibular, and the R maxillary, M2s. The maxillary M1s have only 2 roots, 1 buccal, 1 lingual. All teeth are rather small, particularly the molars.

Pitting of interdental septa and slight alveolar resorbtion. Periodontal disease.

2535. The R mandibular M3 is impacted against the M2.

Porosis and flattening of interdental septa and slight alveolar resorbtion. Periodontal disease.

The R talus has an incompletely separated os trigonium.

2537. All bones light and rarefied. Osteoporosis. It is notable that where post-mortem breaks rendered their trabecular structure visible the transverse trabeculae of the vertebral bodies appear to be more affected by rarefication than the vertically orientated ones.

Fragments of lumbar vertebrae bear thin, smooth osteophytes covering the whole height of the R sides of their bodies. The thoracic vertebrae and sacro-iliac joints are normal.

Two lumbar vertebrae, L1 & L5, show compression fractures of their bodies.

There is a large cystic cavity on the medial margin of the head of the L 1st metatarsal, with some irregularity of the adjacent portion of the joint surface, which also bears a patch of eburnation. The joint surface has shifted markedly to the lateral side. The R 1st metatarsal is missing. Hallux valgus.

There are shallow, bifurcated grooves on the L and R sides of the frontal bone, each communication with the supra-orbital foramen.

2542. Hole, 4mm diameter, near the posterior part of the L calcaneus. Probably excavation damage.

There is a cavity lined with rough, irregular bone near the superior part of the L acetabulum. It communicates with both the joint surface and the lateral (outer) aspect of the ilium. On X-ray its size was revealed to be about 1x2cm. The entire bone is much damaged post-mortem, but there are traces of a similar, smaller cavity anterior to that already described. There is also some recession and thinning, by resorbtion of bone from the surface of the ilium, of the posterior part of the acetabular rim. X-ray revealed several small cavities around the rim of the R acetabulum. There is slight new bone formation on the ilia, near the superior margins of the acetabula and the superior parts of the joint surfaces are rather bumpy and irregular, especially the R. Of the sacro-iliac joints only part of the iliac face of the R remains; this shows destruction of its joint surface with irregular, slightly sclerotic bone in its place.

The joint surface of the R femoral head is bumpy and irregular and the site for attachment of the ligamentum teres is infilled with new bone. X-ray revealed several cavities within the R femoral head.

No sacral or lumbar vertebral bodies are present; 4 thoracic vertebrae are present and are normal. The rest of the skeleton was X-rayed and no further pathologies were found.

The pathological changes in 2542 are suggestive of infectious lesions, although a more specific diagnosis is difficult. Tuberculosis is one possibility.

Two middle thoracic vertebrae are fused at their R facet joints. All other vertebrae normal. Cause unclear.

2546. L2 shows a compression fracture of the inferior part of its centrum. The fracture edges are still sharp and there is cancellous, porous callus in the fracture cavity, suggesting that healing was still active when death intervened. There is a deep Schmorl's node at the site of the break, indicating that disc meterial was forced into the vertebral body. Two middle thoracic vertebral bodies show probable compression fractures; like that on the L2 they seem to be in the fairly early stages of healing.

A lower thoracic vertebra shows a large osteophyte on the R side of its body. Spurring on tibial tuberosities and on soleal lines.

The distal and intermediate phalanges of both little toes are fused.

2548. Skull and pelvic bones are both borderline male; post cranial bones rather gracile.

Bones all quite light and rarefied - osteoporosis.

Porotic interdental septa, initial stages of infra-bony pocket formation around the distal roots of the R mandibular M1 and slight alveolar resorbtion. Periodontal disease.

Fracture about 1/2 way down the sternal body. Healed with the inferior part displaced slightly posteriorly. Cancellous bone bridges the fracture and the broken edges are clearly visible; hence fracture probably occurred not long before death.

A midshaft fragment of a R rib shows a healed fracture; another R rib shows a healed fracture between the head and the

tuberosity. Both are firmly united with little callus - they look like old fractures; they probably pre-date the sternal fracture.

2556. As well as both mandibular and one maxillary M3 there is also congenital absence of the L maxillary I2. The L canine thus lies adjacent to the I1. Between the canine and the PM1 there is a small socket which probably held a retained deciduous canine which has fallen out post-mortem. The R maxillary I2 is reduced in size and the L maxillary canine is rotated about 70 degrees from its normal orientation.

There is a fairly smooth round area of raised bone on the L parietal, 12mm diameter, situated 5-5.5cm from the sagittal and 4.5cm away from the coronal suture. Probably a button osteoma.

There are 6 sacral segments, the 6th being an extra vertebra rather than sacralisation of L5.

There is severe osteoarthritis with spurring, and eburnation of the superior parts, of the lateral condyle of the L femur; there are similar changes on the inferior/lateral parts of the joint surface of the L patella. There is some infilling of the distal joint surface between the condyles with new bone.
There are similar, less marked lesions of the R distal femur and patella. As these osteoarthritic lesions are very much more marked than those found at any other joints in this young adult it seems possible that they may be sequential to trauma to the legs. In support of a thesis of trauma to the legs there is a flange-like exostosis about 2/3 of the way down the L femur, lateral to the linea aspera: probably traumatic myositis ossificans.

There is an area of periostitis on the medial surface of the L tibia 1/2 to 3/4 of the way down the bone. There is a similar area slightly lower down the R tibia. The shaft of the L fibula and the L and R 3rd, 4th and 5th metatarsals also show periostitis: the deposition of new bone on the 5th metatarsals is particularly marked in the area immediately distal to the articular surfaces for the neighbouring 4th metatarsals.

2575. Large longbones for dental age.
Skull intact but distorted by soil pressure.

2576. Congenital absence of L maxillary I2, with reduction of R maxillary I2
Both transverse foramina on atlas incomplete.

2577. All teeth quite small, particularly premolars.
Manubrium fused to sternum.

L2-4 are fused at their facet joints. The bodies of 2 & 3 are almost completely destroyed with negligible bony regeneration. Only their posterior and some of their lateral walls remain. The superior part of the body of L4 is also destroyed leaving sclerotic, irregular trabecular bone. The anterior wall of the body of L1 bears a lytic lesion showing negligible bony regeneration. The collapse in this area of the spine has resulted in about 70 degree kyphosis. The rest of the (about 3/4 complete) skeleton was X-rayed but no further lesions were revealed. Tuberculosis.

2583. L foramen transversarium on atlas incomplete.

All carpal bones show smooth walled cystic cavities at the margins of their joint surfaces, as do most metacarpals, some phalanges, the distal radii, some tarsals, metatarsals and foot phalanges. These lesions are of unknown cause (Rogers 1989) and may well be non-pathological. Many hand and wrist bones show severe osteoarthritis, but the cystic defects do not appear to be connected with this - similar lesions occur in a few other skeletons which show no osteoarthritic changes.

Both 1st metatarsals show cystic cavities on the medial sides of their heads and the hallucial proximal phalanges deviate laterally. Bilateral hallux valgus.

Pitting of the greater and lesser tuberosities of the humeri - probably rotator cuff disease.

There is an irregular, sclerotic depressed area 13cm long and 2-3cm wide on the lateral side of the shaft of the L femur 1/3-2/3 of the way from the distal end. X-ray indicates that the changes here are restricted to the outer cortex; the endosteal surface and the medullary cavity appear normal. Hence these changes should be classed as periostitis. The lesion is suggestive of chronic infection of this part of the leg.

There is marked bony spurring on the soleal lines of the tibiae, slightly on linea asperae and at the insertions of the Achilles tendons on the calcanei.

There is depression 1.5-2.5cm diameter on the L parietal 3-3.5cm from the sagittal and coronal sutures. There is no corresponding convexity of the tabula interna. Possibly traumatic in origin, or perhaps a pressure erosion from an overlying sebaceous cyst.

A rib fragment shows a healed fracture.

2591. T6-11 are united at their bodies by a large, flowing R-sided, paravertebral osteophyte. T5 & 6 are fused in a similar fashion, as are T9 & 11, except in this case the osteophyte is L-sided. All facet joints are normal. The R 1st rib is fused to the manubrium by ossification of the costal cartilage and the L 5th rib may have been fused in a similar fashion to the sternal body but post-mortem damage makes it impossible to be sure. There is marked capsular ossification at the medial claviculae and at the vertebral ends of the ribs. Ossified thyroid and costal cartilages. The following sites show bony spurring: R olecranon process, R radial tuberosity, linea asperae, greater and lesser trochanters of femora, soleal lines, iliac crests, patellae and insertions of the Achilles tendons on the calcanei. Pronounced ridges on the palmar surfaces of the hand phalanges. DISH.

The lateral, anterior and posterior aspects of the distal part of the L femur exhibit swelling and have rather roughened surfaces. There is a post-mortem break at the junction between the normal and the pathological bone: this reveals that the pathological cortex has the appearance of cancellous bone, with sparse, sclerotic trabeculae. The post-mortem break also reveals that the cortex on the medial side of the distal part of the femur is normal. The demarcation between normal and pathological bone is sharp and distinct.

X-ray suggests that there is slight coarsening of trabeculae in the area of the iliac face of the L sacro-iliac articulation; the gross specimen shows slight swelling and pitting in this area.

These changes have a similar appearance to those in 0950 and have the appearance of Paget's disease but are rather too slight to permit a firm diagnosis.

Very robust skeleton.

2593. There is destruction of the anterior nasal spine to Moller-Christensen's (1961) II and most of the rest of the nasal spine is also destroyed. There is resorbtion of the maxillary alveolar process to Moller-Christensen's II . There is also rounding and erosion of the pyriform aperture. The superior surface of the hard palate and the internal surface of the R nasal process of the maxilla shows pitting, indicative of infection. There is markedly increased pitting on the inferior surface of the hard palate and the posterior part of the palate is perforated ante-mortem. The L orbit shows cribra orbitalia.

There is periostitis on the tibiae, mainly confined to the lower parts of the bones and most pronounced near the interosseous borders, and on the fibulae over the general surface of their shafts.

L foot: slight periostitis on the calcaneus and slight destruction of the proximal joint surface of the 1st metatarsal, near the dorsal border.

R foot: partial destruction of head of 2nd metatarsal and slight resorbtion of the head of the 5th metatarsal.

Hand bones normal. Leprosy.

Blue/black staining on skull base; this area is poorly preserved.

2596. Super-eruption of teeth.

The atlas bears a supernumary facet for the odontoid process of the axis of the medial surface of the R lateral mass.

The L 3rd and 4th and the R 4th metatarsals show deposits of sclerotic, smooth bone on their shafts, the 3rd metatarsal on its medial side, the 4th metatarsals on their lateral sides.

Exostosis on dorsal surface of L navicular.

The superior part of the L acetabulum shows an irregular exostosis on the joint surface. The R acetabulum has a cystic defect in the joint surface at the same point. Unknown cause.

Purple-black staining on base and back of skull and L talus and calcaneus. These bones are poorly preserved and fragile.

2612. The interdental septum between the L M2 & M3 is concave in profile and pitted. Periodontal disease.

Depressed, pitted area (4x5mm) of sclerotic trabeculae on proximal joint surface of L proximal hallucial phalanx. Probably osteochondritis dissecans.

Spurring on patellae, superior margins of sacro-iliac joints and at insertions of Achilles tendons on calcanei.

Shallow gullies lined with sclerotic bone run around the periphery of both glenoid cavities.

Smooth deposit of new bone upon the plantar surface of the shaft of the R 4th metatarsal.

Base of the skull, R side of face, proximal femora and acetabula stained black. These parts are very fragile and poorly

preserved.

2614. Exostoses on dorsal surfaces of L cuboid and lateral cuneiform.
There is an area of periostitis on the posterior/lateral surface of the L tibia, just above the inverted V-shaped depression for the fibula.
The L carpals have smooth walled cystic cavities at the margins of their joint surfaces. R carpals normal. Some thoracic vertebrae have R-sided osteophytes which originate away from the disc margins.
There is a small foramen on the wing of the R ilium.

2616. Porosis of interdental septa, slight alveolar resorbtion. Periodontal disease.
L3 has small osteophytes on its L side, originating away from the disc margins.
L5 has sub-periosteal new bone upon the L-anterior wall of its centrum and osteophytes on its inferior margins. Seems to be anterior disc herniation (lifting the periosteum, causing the new bone deposition). The inferior surface of the body of this vertebra bears 2 small Schmorl's nodes, perhaps produced by the same traumatic incident which caused the anterior disc herniation.
Small exostosis on the dorsal surface of the R triquetral.
There is a bridge of bone over what appears to be a vascular channel on the L humerus where the supra-condyloid process lies when it is present.
The foot and some lower leg bones are missing, although they are shown as present on the plan.
Dark staining on skull base; this area is very fragile.

2617. Congenital absence of L maxillary canine.
Some interdental septa have flattened profiles and show porosis. There is slight alveolar resorbtion. Periodontal disease.
Bones very eroded, skull distorted by soil pressure.

2620. Marked overbite and odd dental wear pattern.
Ante-mortem chipping on L mandibular M2.
Interdental septa are pitted and a few have concave profiles. Slight alveolar resorbtion. Periodontal disease.
C6 & 7 are united by osteophytes at the lateral parts of their centra. There are severe osteoarthritic changes at the diarthrodial articulations on these and neighbouring vertebrae, suggesting increased strain on these joints as a result of the ankylosis of this pair of vertebrae.
Bony spurring on patellae, near distal joint surfaces of fibulae, linea asperae of femora and at insertions of Achilles tendons on calcanei.
Lower parts of skeleton well preserved, the rest is rather poor. The skull base and lower parts of occipital bone are stained black and are very fragile. All vertebrae very fragmentary.

2622. Abscess at the socket of the R maxillary M1 (which has been lost ante-mortem) pierces the antrum of Highmore, within which there is much pitted, reactive, well remodelled new bone, indicative of infection.

The marked osteoarthritis on the foot bones seems to be associated with trauma. The L navicular bone seems displaced laterally on the talus with exostoses on the medial parts of both bones near and at the joint surface margins. There are also exostoses at the articulation between the L cuboid and the lateral cuneiform and on the medial surface of the medial cuneiform. There are similar but less severe changes on the R tarsals.

The joint between the L 2nd metacarpal and the proximal phalanx is ankylosed in an extended position. There are exostoses at the site of fusion. The outline of the base of the phalanx is faintly visible on X-ray, but most of that of the metacarpal head is not. It seems to be long-standing fusion, probably associated with trauma, although X-ray revealed no evidence for fracture. Marked osteoarthritis on hand bones might be interpreted as supporting a thesis of trauma.

Spondylolysis of L5. S1 and L5 show large marginal osteophytes and L5 shows a deposition of sub-periosteal new bone on the anterior wall of its body. When L5 and S1 are re-articulated the position of interlocking osteophytes indicates that forward slippage of the body of L5 occurred - spondylolisthesis. The forward slippage of the body of L5 has created a novel articular facet between the inferior surface of the L pedicle of L5 and the lateral part of the body of S1.

Spurring on patellae, iliac crests, ischial tuberosities, L olecranon process and at insertions of Achilles tendons on calcanei.

1st coccygeal segment fused to S5.

2624. Rotation and crowding of some maxillary anterior teeth and premolars.

There is a sinus draining an abscess at the L maxillary M2 through the buccal side of the maxillary bone.

There is slight wedging of the body of L1; no trace of a fracture, probably not pathological.

The R 1st metatarsal shows a small cystic cavity at the medial margin of its head with slight displacement of the joint surface laterally. Hallux valgus.

There appears to be hypoplasia of the scapula necks with greater growth deficiency on the posterior sides so that the glenoid cavities face posteriorly. The acromia are abnormally high (their superior surfaces are level with the coracoid processes) and broadened. The L glenoid cavity shows marginal lipping, an irregular sclerotic joint surface and there are cystic cavities in the joint surface. Changes to the joint surface of the R glenoid are of a similar nature but are rather less marked. The humerus heads are rather damaged post-mortem but their diameters can be estimated at 44mm for the left and 47mm from the right. Compared with other measurements on the bones these values seem rather low, especially that for the left; it is thus possible that there is slight hypoplasia of the humeral heads. The L clavicle appears normal but the right is

somewhat flattened superior-inferiorly.

Probably acongenital anomaly.

Both acetabula are rather shallow but there is no evidence for hip joint instability.

The anterior nasal spine show resorbtion to Moller-Christensen's (1961) II , the margins of the pyriform aperture are rounded and eroded. There is pitting and reactive new bone on the superior surface of the hard palate and on the internal surfaces of the nasal processes of the maxillae, and the posterior portion of the palate, although much damaged post-mortem, was certainly perforated ante-mortem. There is resorbtion of the maxillary alveolar process to Moller-Christensens II .

The lower leg bones show periostitis, the tibiae mainly on their lower parts, and deposition is thickest on the interosseous borders where it has a nodular appearance. There are several transverse "blood vessel impressions" on the posterior surfaces of both bones. The fibulae show much periosteal new bone on their diaphyses.

L foot: the tarsals show osteitic pitting. The navicular and the medial and intermediate cuneiforms are fused together. It seems probable that the 1st metatarsal was also fused to this block, but post-mortem damage makes it impossible to be certain. The distal joint surfaces of the cuboid and lateral cuneiform are destroyed as are, partially, both faces of the articulation between the lateral cuneiform and the cuboid. The 1st, 2nd and 3rd metatarsals are the only ones present; there is osteolysis so that the heads and distal ends of the 2nd and 3rd are missing, as is the distal 2/3 of the 1st. The 2nd and 3rd metatarsals taper from the sides giving "screw-driver" type ends. The 1st metatarsal has a "collar stud" appearance. One (proximal) phalanx is present and is normal.

R foot: slight osteitis of some tarsals.

A terminal phalanx from the L hand shows resorbtion of the volar surface of its unguicular process. The R hand bones are normal but no terminal phalanges are present for study.

Leprosy.

There are 6 sacral segments, the 6th being an extra vertebra, rather than sacralisation of L5.

The base of the skull is stained black; this area is also poorly preserved.

2626. Intermediate and distal phalanges of the little toes are fused together.

The L navicular bone bears an additional facet which articulates with the cuboid, and the inferior border of the bone has a porotic appearance, as does the area on the calcaneus which normally forms the anterior part of the anterior facet for the talus. The appearance of these 2 bones suggests that there was calcaneo-navicular union via a bridge of fibrous tissue. Peroneal spastic flatfoot (Leonard 1974). The relevant bones are missing from the R foot so it is uncertain whether the condition is bilateral.

2628. L4 shows spondylolisthesis. The superior surface of the body of L5 and the inferior surface of the body of L4 are very pitted and irregular. There seems to be slight forward slippage of the body of L4 - when the osteophytes on the vertebral bodies are articulated the body of L4 projects 3-5mm forward of L5. In addition there is sub-periosteal new bone formation upon the anterior wall of the body of L5, probably as a result of lifting of the periosteum due to the slight forward slippage of the body of L4.

C5 & 6 are fused by an osteophyte at the anterior parts of their centra. The facet joints and neural arches are normal, as is the disc space. The osteophyte covers the whole height of the vertebral bodies and is quite massive - it seems to be a DISH or "bone former" type osteophyte, but the cause must remain uncertain. The union was probably of long-standing; there is severe degenerative disc disease between these vertebrae and their immediate neighbours.

The L ulna shows an un-united transverse ("parry" type) fracture at the midshaft. The 2 broken ends bear massive osteophytes which interlock in a pseudarthrosis. The surfaces of the pseudarthrosis are pitted and sclerotic. There is also a small, slightly pitted pseudarthrosis between the area of the fracture and the interosseous border of the radius. There is very severe osteoarthritis with much remodelling at all components of the L elbow joint, presumably indicating that the limb was still functional after the injury, although there was some disruption of the joint.

The distal L radius lacks the facet for the head of the ulna. The distal joint surface of the ulna is eburnated. Thus there seems to be some disruption of the L distal radio-ulnar joint with displacement of the distal ulna distally away from its normal articulation with the radius.

X-ray of the forearm bones shows some rarefication of the radius and, more particularly, the ulna on the injured side. There is also slightly increased radiolucency and decreased cortical thickness of the L humerus. There was no evidence, however, for any difference in radiodensity of the L and R hand bones. The unilateral osteoarthritic changes at the R shoulder might be interpreted as reflecting increased use of the R arm over the L following the injury.

All bones in the skeleton are markedly light and rarefied - osteoporosis.

There is slight swelling of the distal 1/3 of the L tibia with a pitted and striated surface. There are also transverse "blood vessel impressions" on the lateral surface. X-ray reveals that the swelling is due to deposition of bone upon the external surface of the cortex - periostitis.

There is a small (7x6mm) benign osteoma on the L part of the frontal bone, just inferior to the upper temporal ridge.

2631. Pitting of interdental septa and slight alveolar resorbtion. Periodontal disease.

Cleft in R mandibular condyle, running diagonally across entire joint surface. Similar, smaller cleft in L condyle.

Incomplete fusion between bodies of S1 & 2. Only the 1st 3 sacral segments are present; it is not possible to discern

whether this represents incomplete lumbarisation of S1 or partial sacralisation of the last lumbar vertebra.
The preservation gets better the further down the skeleton one goes.

2632. Smooth paravertebral osteophyte on the R inferior border of a lumber vertebra (?L3).

2636. A few interdental septa have concave profiles and many show porotic changes. There is slight-moderate alveolar resorbtion, and an infra-bony pocket between the L mandibular M2 and M3. Periodontal disease.
Large, thick osteophyte on the superior border of the L acetabulum and some ossification near the lesser trochanters of femora. Slight spurring on the medial condyle of the R femur and iliac crests.

2638. There is a large thick exostosis around the distal joint surface of the R proximal thumb phalanx. The medial part of the joint surface is damaged post-mortem but the lateral part shows eburnation as does the corresponding portion of the joint surface of the distal phalanx. The exostoses are almost certainly myositis ossificans following trauma to the joint; the eburnated joint surface is also consistent with trauma.
Some parts of the skull are stained black, mainly the occipital region. Skull poorly preserved.

2640. Rotation of mandibular L canine and R I2. R maxillary I1 shows ante-mortem chipping.
Some bony spurring on patellae and R iliac crest.
Muscle markings on L humerus are more pronounced than on the R.

2642. A very large abscess cavity at the R anterior part of the maxilla has a sinus which discharges through the inferior surface of the hard palate; the palate shows increased pitting in this area indicative of infection.
Porosis and concavity of interdental septa and slight alveolar resorbtion around mandibular molars. Periodontal disease.
L5 shows spondylolysis, no evidence for spondylolisthesis.
The 2nd, 3rd, 4th and 5th metatarsals from both feet have smooth sclerotic deposits of new bone on their shafts, mainly confined to the dorsal, lateral and plantar surfaces.

2647. Large, robust bones.
T3-10 are united by a thick, smooth, flowing osteophyte on the R sides of their vertebral bodies. The disc spaces are normal. T2 and 11, and 2 lumbar vertebrae bear similar osteophytes. The cervical vertebrae show osteophytes on their centra, but they appear to be the type associated with degenerative disc disease, a condition which the porotic appearance of the surfaces of the bodies of these vertebrae show was definitely present in the cervical spine. All facet joints are normal except for osteoarthritis. There is spurring on the R patella, linea asperae and the tuberosity of the R radius. The glenoid cavities show some capsular ossification. DISH.
A fragment of an iron nail adheres to the body of T9.

T11 and 2 lumbar vertebrae show healed compression fractures of their centra. The lesions on T11 consist of a slight fracture and a large Schmorl's node on the superior surface of the body, this last suggests that disc material was forced into the vertebral body in the incident which caused the fracture. The body of the upper of the 2 pathological lumbar vertebrae shows compression fractures in both its inferior and superior surfaces; these (like the lesions on the other vertebrae) are confined to the central portion of the body, hence there is no kyphotic deformity of the spine. The other lumbar vertebra has a compression fracture on its inferior surface. All fractures show fairly sharp edges, and are thus probably in the fairly early stages of healing.

2650. L mandibular canine shows ante-mortem chipping.
Porosis and flattening of many interdental septa and severe alveolar resorbtion. Periodontal disease. There is also super-eruption of some teeth.
There is an oval depression 17x10mm on the L parietal bone 2-2.5cm from the lambdoid suture 4-4.5cm above the asterion. The surface of the depression is pitted. There is a corresponding bulge on the inner table. Probably a healed depressed fracture.
The tibiae show several transverse "blood vessel impressions" on their lateral and posterior surfaces.
Many ossicles in the lambdoid sutures; slight bathrocephaly.
The trunk and arm bones are poorly preserved, the rest of the skeleton is fairly well preserved.

2654. Porotic interdental septa, moderate alveolar resorbtion. Periodontal disease.
There are 13 thoracic vertebrae. There are 7 cervical vertebrae and fragments of 4 lumbar vertebrae, so the extra thoracic may be a thoracised lumbar vertebra or it may be an extra segment.
T1 has only a demi-facet below on its R side; the L side of the body is normal.
C5 & 6 have large, flowing, interlocking osteophytes on the anterior parts of their centra. They originate away from the disc margins. T3 & 4 bear similar osteophytes on the R side of their centra. The bodies of 11 thoracic vertebrae, T4-L1, are fused by a flowing osteophyte which covers the R sides of T4-10 and the anterior parts of T11-L1. There is some sclerotic bone in the disc spaces of some of these vertebrae. A lumbar vertebra bears a massive L-sided osteophyte and fragments of other lumbar vertebrae show similar, smaller osteophytes. All facet joints are normal except for those between T11 & 12 which are fused; the bases of the neural arches of these vertebrae are also fused. The sacro-iliac joints are normal and these is no evidence for erosive changes anywhere on the skeleton. The following sites show bony spurring: soleal lines, linea asperae and the insertions of the Achilles tendons on the calcanei. There is capsular ossification on a L rib and on the proximal ulnae. Heavily ossified thyroid and costal cartilages. DISH.
Both tibiae are bowed laterally near their proximal ends and show very prominent anterior edges. Probably normal variation - not pathological.

2656. Large, robust bones.

There is extensive marginal lipping and porosis of articular surfaces of the R forearm bones and the distal R humerus and heavy spurring on olecranon process and radial tuberosity.

Only 2 hand bones are present, the L 2nd metacarpal and the R 5th metacarpal. The proximal and distal joint surfaces of both bones show erosions which are lined with trabecular bone.

R foot: the 1st and 2nd metatarsals, and the medial and intermediate cuneiforms are fused together in a block. It is impossible to distinguish the location of the original joint surfaces on the gross specimen, although they are visible on X-ray. The cuneiforms and the navicular bone show florid marginal lipping and erosive changes at their joint surfaces. Most of the cuboid has been destroyed ante-mortem leaving only a small fragment with the joint surface which articulates with the 4th and 5th metatarsals, which is itself sclerotic and irregularly eroded. All the metatarsal joint surfaces for which observations can be made (distal 1st & 5th, proximal 2nd, 3rd, 4th and 5th) show erosive changes. Two (proximal) phalanges are present; one of them, the proximal phalanx of the 4th toe shows an erosive lesion on its distal joint surface. There is heavy spurring at the insertion of the Achilles tendon on the calcaneus and slight lipping at the margins of the joint surfaces of talus and calcaneus.

L foot: the lateral cuneiform, cuboid and navicular are fused in a block, as are the 2nd metatarsal and the medial and intermediate cuneiform. All tarsals have florid osteophytes near their joint margins. The exception to this is the articulation between the medial cuneiform and the 1st metatarsal which is normal. There is heavy spurring at the insertion of the Achilles tendon on the calcaneus; there is also slight lipping of the joint surfaces of the talus and calcaneus. All the metatarsal joint surfaces for which observations can be made (proximal 1st, 3rd, 4th & 5th and distal 1st & 5th) show marginal exostoses and erosive changes except the proximal joint surface of the 1st metatarsal. Three proximal phalanges are present: that of the 5th toe shows destruction of its base, that of the 4th destruction of its distal joint surface.

A proximal and distal foot phalanx are present; the latter shows destruction of its joint surface, and there are erosive changes on the distal articular surface of the latter.

Of the lower leg bones only the distal parts of the R fibula are present and there are erosions at the margins of the distal joint surface.

The surfaces of all erosions are of trabecular bone and show negligible sclerosis. None of the bones show the periosteal reactions which are a frequent feature of arthropathies which occur in association with psoriasis or some alimentary tract or venereal infections. Other than the bones already described the only other bone definitely from this skeleton was 1 L rib (which was normal).

Graves 2579 (skeleton 2583), 2592 (skeleton 2593) and 2655 (skeleton 2656) form an intercutting sequence. The R humerus, which is certainly part of skeleton 2656, was present as a stray bone in context 2593 and the L 2nd metacarpal, which is also

certainly part of this skeleton, was present as a stray bone in context 2583. In addition to these 2 bones which definitely belong to 2656 these are a further 3 vertebrae which may also form part of this body. Two middle thoracic vertebrae, present as stray bones in context 2593 are fused together by an osteophyte on the anterior parts of their centra. The osteophyte does not appear to be a large, paravertebral "DISH-type" but appears to be more characteristic of a sero-negative arthropathy. The 3rd is a T1 present as a stray bone in context 2583. It is normal except for severe eburnation, porosis and marginal lipping of its L facet joints. There are a few other very robust-looking bones present in context 2593 which may also belong to 2656; none are pathological.

This is a proliferative erosive arthropathy which affects the extremities in a bilateral fashion; sufficient foot bones were present to discern that the lesions affected the feet in a fairly symmetrical manner. A more precise diagnosis is hampered by the very incomplete nature of the remains.

2658. Small pit in the proximal joint surface of the L proximal hallucial phalanx.

Pitting of interdental septa, and infra-bony pocket formation at the distal root of the L mandibular M2. Periodontal disease.

There are 6 lumbar vertebrae. L6 bears facets on its large transverse processes from articulation with the sacral alae. The sacrum is damaged so it is not possible to ascertain whether L6 is an extra segment or lumbarisation of S1.

2663. R tibia shows a slight, well remodelled periosteal reaction, mainly on its medial surface. The lesion has a striated appearance. The fibula shaft shows similar changes.

The R femur has a smooth deposit of bone upon its medial border, about 2cm below the lesser trochanter. Probably an ossified haematoma.

2671. Large, robust bones.

Exostosis on dorsal margin of R capitate.

Bones rather friable.

3051. Fairly large bones.

Lower parts of body only.

A L 5th metatarsal, present as a stray bone in this context shows ante-mortem destruction of its distal end, the bone tapers from the sides to a rounded end. This has the appearance of the type of change characteristic of leprosy, but clearly no diagnosis can be sustained on the basis of a single bone. A R 5th metatarsal is also present as a stray bone; it is rather damaged post-mortem but appears normal. All bones from the main burial 3051 normal.

3054. Infra-bony pockets at: maxillary R I2, R I1, L I1, L & R canines, and R M2, and mandibular L canine. Many interdental septa have concave profiles. Slight alveolar resorbtion. Periodontal disease.

There are areas of periostitis on the lateral/posterior surface of the L maxilla and on the buccal surface near the L premolars.

Probably infection associated with dental abscesses.

The R maxillary molars and premolars are completely covered by calculus deposits. Their occlusal partners in the mandible are missing ante-mortem.

There is a thin bridge of bone connecting the posterior arch with the R transverse process of the atlas.

Both 1st metatarsals show cystic cavities at the medial margins of their heads, with slight lateral deviation of the 1st phalanges. Bilateral hallux valgus.

Slight spurring on olecranon processes.

Slight periostitis on R calcaneus. Joint surfaces normal. Probably local infection.

Fusion of axis and C3 at the L facet joint; probably a congenital anomaly.

3091. The distal diaphysis and metaphysis of the L radius are swollen and somewhat pitted. A midshaft fragment of the L ulna is present and is normal. Distal parts of the R ulna are present and show pitting and slight swelling. A fragment of the R radius is present and is normal. There is slight pitting on the diaphyses of the L 2nd and 3rd metacarpals, and the acromion and spine of the L scapula show pitting and slight swelling. These changes seem to be a result of periostitis or osteitis. The widespread distribution of lesions would seem to suggests a systemic disease as the cause. The skeleton is very incomplete and fragmentary, and the surfaces of the bones are very eroded; these last 2 factors mean that a radiographic study of the lesions was not possible, and the former means that it is impossible to gain an accurate impression of the distribution of lesions in the skeleton. Uncertain cause.

L maxillary I2 is reduced in size.

3095. The L 1st rib is rather reduced.

The transverse foramina of the atlas are incomplete.

S1 and 2 have articulating facet joints, although they are solidly fused together at their centra and transverse processes.

Both calcanei show a continuous joint surface from the posterior talus facet to the posterior 1 of the 2 anterior calcaneal facets. Similarly both tali show a corresponding continuous joint surface on their inferior surfaces. There is a porotic area on both tali and calcanei at the junction between the anterior and posterior joint surfaces, suggesting possible fibrous union between tali and calcanei at this point; perhaps this might explain the exostoses found on the lateral cuneiforms at the dorsal margins of the articulations for the cuboids - extra stress on these joints would have resulted if there was union between the tali and calcanei.

3101. Crowding of anterior mandibular dentition.

The R foramen transversarium of the atlas is incomplete.

Intermediate and distal phalanges of the R little toe are fused together.

Skeleton well preserved but very fragmentary.

3105. Mandibular canines have twin roots.
Small cystic defect near the distal end of the L hallucial proximal foot phalanx.
Medial part of distal joint surface of R hallucial proximal phalanx is bumpy and shows some sclerotic trabeculae. Distal parts of the bone missing. Possibly traumatic?
Small area of irregular sclerotic trabeculae on the medial/distal margin of the posterior joint surface of the L talus; probably the site of fibrous attachment for an os trigonium.
Bones rather friable.

3107. Abscess cavity at the L maxillary M3 (which has been lost post-mortem) penetrates the maxillary sinus.
Super-eruption of mandibular M3s.
Cystic cavities on the margins of the acetabula and on the margin of the radial facet on the R scaphoid. Probably not pathological.
The L radius shows a Colles' fracture. The distal end is deflected laterally.
Exostoses on the L 3rd metacarpal - on the dorsal margin of the head and near the articulation with the 4th metacarpal. The articulation for the 3rd metacarpal on the 4th shows similar changes. The R 3rd metacarpal shows similar changes to its counterpart from the L hand. A R proximal foot phalanx has an exostosis on the medial margin of its proximal joint surface.
There is a cleft in the proximal joint surface of the L proximal hallucial phalanx.
There is severe osteoarthritis at the R hallucial metatarso-phalangeal joint. The phalanx deviates markedly to the lateral side. Severe unilateral hallux valgus.
The L talus has an area of roughened, sclerotic trabeculae on the medial/posterior margin of the posterior joint surface. Probably the site for fibrous attachment of an os trigonium.
Navicular bones have very prominent tuberosities.
Six sacral segments; S1 is completely fused to S2 except at the R facet joints and parts of the centra. S6 is an extra spinal segment, not sacralisation of the last lumbar vertebra.
L5 shows spondylolysis; no sign of spondylolisthesis.
Two R middle ribs show healed fractures, about 1/3 of the way from the vertebral ends.
The superior R facet joint of a lumbar vertebra is not fused to the rest of the vertebra, but is present as a separate ossicle.
There is an iron coffin nail adhering to the posterior surface of the L humerus.
Slight purple staining on skull base.

3109. Slight bathrocephaly.
There is a considerable accumulation of calculus on the occlusal surface of the L mandibular M3, probably reflecting the absence of its occlusal partner.
Interdental septa are porous and have flattened profiles. There is slight alveolar resorbtion. Periodontal disease.
There is a healed fracture running anterior-posterior across the distal joint surface of the L tibia. The distal joint surface of the L fibula is missing but there is a healed fracture

in the region of the distal metaphysis.
The fractures are probably a result of a fall from a height onto the feet. The L talus shows exostoses on its neck and slight eburnation on its trochlear joint surface; the L intermediate and medial cuneiforms are united by a smooth osteophyte on their dorsal parts. These lesions are probably caused by the trauma episode which caused the fractures.
The L maxillary canine is unerupted.
The bones are rather fragile; the legs are poorly preserved.

3111. The middle and distal phalanges on a little toe are fused - i.e. the intermediate one is fused to the epiphysis of the distal one.
Lower parts of the body only present. Feet are quite well preserved.

3118. Spurring on olecranon processes, patellae, distal parts of fibulae and proximal ends of 5th metatarsals.
There is a supernumary facet between the R 2nd and 3rd metatarsals, just posterior to the distal joint surfaces.
There is an area of raised, pitted sclerotic bone on the medial joint surface of the R patella. Probably healed osteochondritis dissecans. There is a corresponding depression on the medial condyle of the R femur.

3126. Smooth walled cystic defect on the lateral/plantar margin of the head of the L 1st metatarsal. Probably non-pathological.
There is hypoplasia of the R scapula neck with the growth deficiency most marked in the posterior parts so that the glenoid cavity is angled about 60 degrees posteriorly. The appearance of this bone is very similar to the scapulae of 2624, although as the R acromion and the relevant areas of the L scapula are missing it is impossible to assess the extent of the anomalies in 3126. Probably a congenital malformation.
Most of the skeleton poorly preserved but feet good.

3133. Pitted new bone in the L maxillary sinus near molar tooth area. Probably infection following a (now healed) dental abscess. The socket of the L M2 is healed over, the tooth having been lost in life. Perhaps there was once an abscess here.