AN ANALYSIS

OF THE REICH SITE OLD COPPER HUMAN REMAINS

BY

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INTRODUCTION

The skeletal material analyzed in this study was collected in excavations directed by Dr. Baerreis of The University of Wisconsin during his archaeological expedition to the Reigh site, Winebago County, Wisconsin, in 1953.

The Reigh site is located in Algoma Township, on the south shore of Lake Butte des Morts. It consists of a cemetary and a later village site placed upon a high gravel ridge overlooking the lake. According to Baerreis et al (1954), excavations at the Reigh site disclosed that the burials were primarily concentrated in an area 32 by 36 feet in maximum dimensions with a few additional burials located 40 feet northwest of the main sector. A total of 43 or 44 individuals were removed, a figure which does not include the burials disturbed prior to the archaeological field work. In part, the numbering of the burials was determined by convenience in the field situation, for not all individuals included under a single number were necessarily interred at the same time. Many of the burials at the northern margin of the area had suffered some disturbance, either due to action of a power shovel used to remove sand and gravel for commercial purposes or to subsequent probing or excavation prior to the archaeological field work. Burials at shallow depths also appeared to have been disturbed by deep plowing.

The site consists primarily of a cemetary and a later village site. Based on associated cultural artifacts and a C14 dating from related sites (Quimby, 1962), the cemetary is considered to be an example of the Wisconsin Old Copper culture of Late Archaic or Early Woodland time. The Reigh site was probably occupied around 1000 B.C. (Baerreis et al, 1954).

This report is based on a series of 39 individuals excavated from 23 burials at the Reigh site. The skeletal collection is housed at the Department of Anthropology, University of Wisconsin, except for one cranium with a head ornament which is presently at The State Historical Society, Madison, Wisconsin.

The study in this report explores five fields of interest. First, we will investigate the demographic dimensions of the collection. A mortality profile for the skeletons in the Reigh site will be designed, and will than be compared to those constructed for an Archaic skeletal series (Indian Knoll), Albany Hopewell (Illinois), and H1 Undeformed and H2 Hopewell (Ohio). The size of the population which contributed the skeletal materials at the Reigh site will be estimated. Second, the metric data on the Reigh site crania and their postcranial skeletons will be presented. A statistical analysis will be reported for thirty-seven cranial measurements, 10 mandibular measurements, four indices of the crania, 23 postcranial measurements on both sexes and seven postcranial indices on males. Third, there are two sources of data to be compared with the Reigh site material. The first of these is from areas adjacent to the Reigh site, i.e., the Oconto site, Oceola site, and the Riverside site of the Old Copper culture, and the Millville site of the Hopewell culture. They are all located in Wisconsin and Michigan. Unfortunately the data on these sites is quite scanty and can only be mentioned in a short note. The second source of comparative data is from Indian Knoll (Kentucky), Albany Mound (Illinois), and Undeformed H1 and H2 Hopewell (Ohio). This second group presents a sufficient sample of skeletal materials for comparison and therefore I shall draw my comparisons from

this source. Penrose's (1954) statistics will be used in these comparisons. Fourth, non-metrical features of the crania and the postcranial skeletons will be examined, finally, the pathology of the skeletons will be discussed. However, it should be remembered that the dry bone material can yield only limited information about the general health of a population. This is particularly true of the Reigh site of the small sample size and lack of certain bones, such as the vertebral column. However, a few pathological specimens do exist, although it is unclear what percentage of the population they represent.

DEMOGRAPHY

Age and Sex

Accuracy in ageing and sexing should certainly be one of the goals in skeletal studies so that the generalizations draw from these studies are valid. However, it is not the objective of this report to justify the traditional means of ageing criteria employed. Yet it should be mentioned that, whenever possible, multiple criteria were applied in conjunction with one another to obtain the maximum accuracy possible.

Symphyseal faces of the pubic bones, the best indicators of adult age, were not available for age estimation. Deciduous and permanent eruptions of dentition as well as the degree of dental attrition determined with the general patterning in the same population and the related populations, were often used concomitantly with the linear length of the long bones to assess the ages of infants and children. Epiphyseal union, endocranial suture closure, age-influenced pathological conditions and general texture were often utilized together to determine the physiologic ages of adolecents and mature adults.

In general, individuals were placed in one of the following catagories:

Infants - X to 3 years

Children - 4 to 12 years

Juveniles - 13 to 17 years

Sub-adults - 18 to 20 years

Young adults - 21 to 34 years

Middle and old adults - 35 years and above

Adults of unknown age

Because the Reigh site series collection is from a wide variety of burial practice (Baerreis et al, 1954), which includes fifteen individuals from eight secondary burials and eight individuals from four partial cremation, nearly half of the collection presents special difficulties in obtaining sufficient data. Thus it is difficult to determine the number of individuals represented by the collection, and the sex and age of these individuals. It is impossible to derive cranial and postcranial measurements from the cremated material. It is important that at least some of these difficulties be overcome so that data derived from cremated remains can be applied to important anthropological problems. Thus studies of cremated, secondary, and/or disturbed remains are divided into two general problem catagories:

The first of these catagories is biological distance. Here, I will compare one cremated series, or one inhumed skeletal series with another inhumed series, in order to study the results of microevolution. Since the Oconto site, the Oceola site, and the Riverside site all display the same practice of cremation seen at the Reigh site, I will estimate the degree of similarity between these populations. In addition, there appears in each population discrete traits of mylohyoid arch, inter-

parietal or Inca bone (Plate 1), sagittal keeling (Plate 1), shovel-shaped incisor (Plate 11), gonial eversion, chin eminence (among American Indians), septal aperture (Plate 11), deltoid tuberosity, spina bifida oculda (Plate 111), and osteoarthritis (Plate IV). From these non-metrical variants, we can gain further information about the characteristics of a population (Berry, 1968). However, non-metrical or discrete trait have anthropological significance in comparison with skeletal measurements, since it is most likely to be used as a tool for the investigation of populations where only skeletal material available.

The second general program catagory is that of population study. Occasionally the burial practices of a group allow the archaeologists to recover all or nearly all members of that group who died during a particular time interval. Such a skeletal series may be studied in terms of population profiles (age and sex) and total population patterning (growth, pathology, etc.). Although it is impossible to assume total recovery for the material at hand, I have been able to explore age and sex percentage, and partial aspects of population patterning. Thus while pathologies may be studied, growth can not be studied in this report.

In ageing of the Reigh site series, about 22 crania (or fragments of crania) are testified mainly by endocranial suture closure and the long bones. This was used whenever available. Eight individuals were aged by the mandible and the structure of its dental attrition. One juvenile was aged by pelvic elements only. An old adult female was aged through a diagnosis of a humerus head severely damaged by osteoarthritis. In

general, because there are more samples available in cranium and calvaria than the rest of the skeleton, ageing criteria are more or less based on endocranial suture closure. Generally speaking, age assessment becomes less accurate as the age of the subject increases because of the maturation rate decreases as the individual ages. Also, as Stewart (1962) and others have said, every observer who judges age from sutures is apt to have an interpretational bias. This should be kept in mind in the study of this series.

It is impossible to divide the Reigh site collection into age catagories for each burial, because there are too many disturbed or unlabled skeletons, in the collection. This may be due to carelessness by the excavators and/or to the poor condition of skeletal preservation.

Table 1 indicates the age distribution of the total collection. The mortality profile is compared to profiles constructed for other skeletal series. One of the comparative series is Snow's (1948) Indian Knoll skeleton. Indian Knoll is an Archaic site in Kentucky that yield 1244 skeletons (Snow, 1948), or 1132 individuals, which Howells (1960) removed from Snow's table the adults who were not aged and sexed. It was probably occupied sometime between 4000-3000 B.C.. Jamison (1969) constructed a mortality profile for the skeletons found in Albany Mound, Illinois. This is a Middle Woodland or Hopewell site, probably occupied between 200 B.C. - A.D. 400. It contained 221 individuals. Table two shows these three mortality profiles.

In view of the small sample size in the Reigh site series, it is doubtful whether broad generalizations should be drawn among these profiles, but Table 2 does represent deaths at archaeological sites

from three cultural traditions at three different time periods as well as three different geographical locations. These three may therefore be compared. The other set of comparative data from the same Archaic time level of the Oconto, Oceola, and Riverside sites, and the Millville site of later Hopewell culture, is all limited in sample size. Obviously, it is not adequate for detailed comparison with other American Indians (Meir, 1969).

As can be seen in these profiles, both Reigh and Albany Mound sites contain only a small number of Infants (X - 3 years), Children (4 - 12 years), Adolescents (13 - 17 years) in constrast to Indian Knoll. This is due both to the better preservation of adult bone as opposed to the delicate, fragile bone of infants, and to the nature of the site and to the condition of preservation and burial practice (secondary and cremation).

The other fact which can be seen from these mortality profiles is the increase in older adult death through time, i.e., from left to right in Table 2. The Reigh site is somewhat unclear because of the large number of adults which could not be placed within an age catagory. I divided those adults who could not be specifically aged into young adults and middle and old age adults in 2 : 1 ratio. Thus there are 25 (59%) young adults and 11 (25%) middle and old adults in this series. As in Albany Mound (Jamison, 1969), these percentages are too high, because of lack of very young individuals, but they do indicate that there were more older adults buried in the Reigh site burials as in the Albany Mound than there were at Indian Knoll.

In general, the mortality profiles of these sites indicate that the

Table 1

Age Distribution of the Total
Reigh Site Collection

Age in Years	Number	Percentage
X-3	1	2.6
4-12	0	0
13-17	1	2.6
18-20	1	2.6
21-34	20	51.3
35 +	5	12.8
Adults*	11	28.2
Totals	39	100.0

*These skeletons were either too fragmentary or too incomplete to age more precisely.

most fatal pressures of life were exerted from birth through the first few postnatal years. Slightly more children (4 - 12 years old) died at Indian Knoll and Albany Mound than at Reigh site. But the death of juveniles (13 - 17 years) and sub-adults (18 - 20 years) were relatively fewer in all three sites. Finally, the profiles show a progressively increasing number of deaths at higher ages through time. One can infer from this that there was gradual improvement in nutritional conditions and age of death stretching in time from Indian Knoll through Reigh site and down to Albany Mound. However, the results of comparison may be due to sample error, because of the very small sample size at Reigh site.

The sexual dimorphism of crania and postcrania in the Reigh site series was determined by non-metrical observation of the total collection in the range of variation in terms of this particular they belong to at first. The collection was then re-examined and a sexual determination, derived from as many parts of the skeleton as available, was made for each individual.

The following general list of features was used in the sexing of these skeletons:

Cranium

Overall size and rugosity (muscle markings)

Size of supraorbital ridges and prominence of glabella

Size and conformation of zygomatic bones

Shape of the chin

Shape of the superior orbital margins

Digastric fossa

Size of mastoid processes

Table 2

Mortality Profiles Based on Age at Death in Three Skeletal Series

Age in Years	Indian Knoll* 4000-3000 B.C. N	%	Reigh Site Burial 1000 B.C. N	%	Albany Mound** 200 B.C.-A.D.400 N	%
X-3	335	29.6	1	2.6	19	8.6
4-12	187	16.5	0	0	24	10.9
13-17	87	7.7	1	2.6	12	5.4
18-20	38	3.4	1	2.6	8	3.6
21-34	425	37.5	20	51.3	64	28.9
35 +	60	5.3	5	12.8	29	13.1
Adults	--	--	11	28.2	65	29.5
Totals	1,132	100.0	39	100.0	221	100.0

*From Howells (1960:169).

**From Jamison's M.A. thesis (1969:9).

Conformation of supra-meatal and supra-mastoid crests

Forehead profile

Prominence of occiput and nuchal lines

Pelvis

Overall size and rugosity (muscle markings)

Width and depth of greater sciatic notch

Capacity of the pelvic basin

Orientation and shape of pubic elements

The sacrum. Note the relative proportions of body of sacrum to the alae.

Presence or absence of pre-auricular sulcus

Long bones

Overall size and rugosity (muscle markings)

Such use of features can be seen in Krogman (1962), Stewart (1954), Anderson (1962), and others. Other studies have used a metrical method of sexing which entailed taking a number of measurements on the cranium, mandible, femur, and pelvis and subjecting them to the discriminant function analysis and indices figures of Giles and Elliot (1963), Giles (1964), Pons (1955), and Washburn (1948). This latter method has not been applied to this series because of the sample size and the condition of collection. Even the first morphological criterian of sex is barely applicable to the sub-adults (18-20 years) and adults (21-34 years) and middle and old adults (above 35 years) catagories.

Sexual dimorphism in the Reigh site crania appears to be primarily indicated by the mandible. The male crania shows evidence of a more powerfull masticatory apparatus, as indicated by the greater measure-

ments for the breadth and height dimensions of the mandible (Table 9).

The female crania may be regarded as being more juvenile than the male because of the higher cranial index and the lower fronto-occipital chord-arc indices (DeVillier, 1968). This series only shows cranial index and the occipital chord-arc index and left the frontal chord-arc index in a slightly reverse manner.

The features mentioned above commonly present themselves in typically male and female skeletal materials but it should be remembered that in the Reigh site burial, as in other racial groups, there are male skeletal materials which are less masculine than the average and tend more towards the female type, and there are females which approach the masculine type. Nevertheless, the afore-mentioned criteria should provide a useful guide to the indentification of sex in Reigh site burial.

Table 3 gives the sex of the sub-adults and adults in the total Reigh site collection by age catagories, in number and percentages. From this table it can be seen that males outnumber the females; there are 70.2% males, while the percentage of females is 18.9% among the sub-adults and adults at the Reigh site. This suggests that the Reigh site form of burial may relate to specific culture practices associated with young and middle age adulthood. The greater representation of males than females indicates that this culture practice may have been warfare, although a number of other explanations may be equally plausible. The sex ratio of Oconto site and Millville site suggests a quite different interpretation. The former has four relatively complete adult crania of which are females and the latter's yield of 3 adult crania was also female. Comparing these two series to the Reigh site series may cause

some sample errors, although there is a striking difference in sex proportion.

As far as the skeletal anomalies are concerned, the Millville series has two crania with bifrontal flattening and occipital deformation (Meir, 1969), while, interestingly enough, there is no cranial deformation present at Reigh site, and probably not at the Oconto, Oceola, and Riverside sites. Further judging from the numerous pathological conditions observed in the dentition of the skeletal material from the above sites (Oconto, Oceola, Riverside, and Millville sites), it can be inferred that most of the adults have same type of marked tooth wear, and some of them shared a poor state of dental health (Plate 4) in common. Since most of these sites have been assigned to the same Archaic time level, and only one belong to the Hopewell culture- Millville site. This observation suggests a similarity in ecological background among these isolated "populations" as well as a difference in cultural practices in terms of sex differentiated burial and immediately head deformation.

Population Size and Microevolution in the Reigh site

The present data come from a single small area and over a span of fifty to one hundred years (personal communication with Baerreis, 1970). But they are imperfect. The samples of each burial are too small and too selected by cultural practices- cremated bones and secondary burial, for example- and other accidents of preservation to be completely acceptable. Skeletal materials are influences by only some of the genes determing morphological distinctions between groups in recent man and would be an insufficient basis for conclusions as to variability and

Table 3

Age and Sex Distribution of the Sub-adults and Adults Reigh Site Skeletons

Age in Years	Males		Females		Unknown	
	#	%	#	%	#	%
18-20	1	2.7	0	0	0	0
21-34	15	40.5	4	10.8	1	2.7
35 +	4	10.8	1	2.7	0	0
Adult*	6	16.2	2	5.4	3	8.1
Totals	26	70.2	7	18.9	4	10.8

*These skeletons were too fragmentary to age more precisely.

intergroup relationships if unsupported by archaeological and historical evidence.

The Reigh site is a small and ecologically isolated area in which change in population size combined with such selective and complex factors as disease, migration, warfare, and regional factors allow small evolutionary change. The metrical and morphological observations analyzed in this report and the cultural practice with a homogeneous artifacts (personal communication with Baerreis, 1970), seem to indicate that any evolutionary change was due to environmental adaptation through selection and/or to the effect of a small breeding population (i.e., genetic drift, etc.).

The use of such a small sample makes it difficult to calculate the effective breeding unit, recticulum of populations, or the death rate. But in spite of this limitation we can use broad associations between interacting demographic factors as designed by previous anthropologists's studies to calculate population size (Hooton, 1920; Howells, 1960).

Hooton, in his analysis of the skeletal material from a protohistoric cemetary near Madisonville, Ohio, used an annual death rate of three per hundred in reconstructing the population size. Howells (1960) also calculated a death rate based on Snow's (1948) Indian Knoll material. He arrived at the figure of five deaths per year per one hundred individuals.

The following equation can be used to determine the size of the Reigh site population (Jamison, 1969):

$$\text{Number of Skeletons} = \text{Population Size} \times \text{Death Rate} \times \text{Occupation Time}$$

Table 4

Number of Skeletons by Burial in the Reigh Site Collection and in the Excavators' Records

Burial Number	Number in Collection	Number in Records
25	2	2
6*	7	8
17	1	2
20	1	1
10	2	5
18	1	1
24	0	1
22*	0	1
26	2	2
19	0	1
4	0	1
8	1	1
21	0	1
15	0	1
9	1	1
23	1	1
16	1	1
12	1	2
7	2	2
5	1	1
11	3	4
13	2	3
14	2	1
UN and D**	8	0
Totals	39	44

*This number also noted with disturbed-bone.

** These are the excavators' marks put on the disturbed and/or the unknown skeletons.

Table 5

Mortality Profiles in Percentages Based on Age at Death of Sub-adults and Adults in Three Skeletal Series

Age in Years	Indian Knoll* 4000 B.C.- 3000 B.C.		Reigh Site 1000 B.C.		Albany Mound** 200 B.C.-A.D. 400	
	M	F	M	F	M	F
18-20	2.9	3.5	2.7	0	3.5	2.1
21-34	42.6	39.3	40.5	10.8	32.6	31.9
35 +	11.1	0.6	10.8	2.7	17.8	12.1
Totals	56.6	43.3	78.8	21.2	53.9	46.1
	100.0		100.0		100.0	

*From Howells (1960:169).

**From Jamison (1969:17).

Indian Knoll may have been occupied for around 500 years and estimates of the size of the population living there at any one time range from 25 individuals to 50-80 individuals depending upon whether the death rate approximated 5% or 3% (from Jamison: cited Snow's 1948 and Howells's 1960, 1969). Based on this general formula, the Reigh site had a very small population of only 8-12 individuals. Certainly this quantification of population numbers is more or less of a speculation derived from factual data. We began by recognizing that the fragile infant skeletons might have disappeared and that adults might not have been returned to the home cemetary.

Comparing the four Old Copper sites, the populations from Oconto, Oceola, Riverside, and Reigh sites may be dated from approximately 4000 B.C. to 1000 B.C., and the Millville site of Hopewell culture to A.D. 200 respectively. After 4000 B.C., evolutionary changes were mainly microevolutionary and intragroup, although the intrasite and intersite materials are perhaps too scanty to make a further inference. It seems the Reigh site skeletons were better preserved than the other comparable Old Copper sites. These data, although imperfect, tends to indicate that the population living at Reigh site differed from the populations which occupied Oconto site and/or other adjacent sites*. The larger number of skeletal remains at Reigh site suggests a larger village population size than at the other sites.

*The writer made a trip to The Milwaukee Public Museum and only made a brief morphological observation on the collection of the Oconto, Oceola, and Riverside sites' skeletons.

METRICAL AND MORPHOLOGICAL OBSERVATIONS OF THE CRANIA AND POSTCRANIA

Although the total Reigh site skeletal series numbers thirty-nine individuals, a number of elements of the collection are either missing or damaged and therefore, only severely reduced metrical data can be reported. As far as damage is concerned, most of the crania and postcrania were crushed and broken with major parts missing, and the base and the face of the crania, as well as the head and end of the long bones, were seldom intact. On only two crania and twenty-two long bones could a complete set of measurements be taken. Fragmentary skeletons (crania and postcrania) were repaired whenever possible, if they were suitable for measurement.

The other aspect responsible for reduced measurement data was the absence of information due to cremated and disturbed skeletons. Yet, although unable to measure these bones as one would intact skeletons, one can derive fairly resonable amounts of data for the identification of age and sex. Methods of measurement were borrowed from the following sources: Martin (1957), Krogman (1962), Comas (1960), Keen (1950), and Giles (1964). The data were analyzed at The University of Wisconsin Computer Center on the 1108 computer using the "DSTAT2" program from the computer program laboratory. Table 4-7 presents the descriptive statistics calculated by this program for the Reigh site data. These tables contain sample size means, standard deviations, and coefficient of variation*for 37 cranial measurements, 10 mandibular measurements, 24 postcranial measurements, and four cranial indices for both males and females, and in addition, postcranial indices on males.

*The writer used hand calculation for coefficient of variation for 24 postcranial measurements of males.

The metrical observations of the indices found in Table 6 to Table 8 can be used to characterize the Reigh site population. The cranial indices indicate that the Reigh site males are dolichocranic (long head) and the females are mesocranic (medium head). The height-length indices of both males and females are orthocranic (straight head). On the basis of their length-breadth indices, the Reigh site males are acrocranic and the females are metriocranic. Further, the nasal indices indicate that the males are borderline messorrhine and the females are leptorrhine or narrowed nosed.

The postcranial measurements and indices of the males series are listed in Table 10, and Table 11. The femur, platymeric index is platymeric. The platycnemic index of the tibia is on the borderline of mesocnemic. The other postcranial indices are shown on Table 11.

In general, the male series has a large-medium size and a rugged shaft humerus with a strong deltoid tuberosity. There were insufficient data for study of the female series, and aside from being small in size and having a slight flatness, the humerus is not remarkable. Septal aperture occurs on either side in 57% of 14 males and 100% of the four observable females; this concurs with Morse's (1969) findings.

As mentioned in the metrical observation, leg bones are remarkable for platymeria, mesocnemia, relatively thick shafts and marked muscle attachments in the male series. Wagner ('26, pp. 115 in Angel's 1946) found similar associations of increased femoral torsion with increased rugosity and area of gluteus maximum (deep portion) insertion on the femur. In addition he found associations of torsion with increased platymeria (lateral rotator and abductor stresses?) and of tibia head

Table 6
Cranial Measurements of Reigh Site Males

Measurements (mm)	N	$\bar{X}$	S.D.	C.V.
1. Maximum Length	15	189	7.8	4.1
2. Maximum Breadth	15	136	5.5	4.1
3. Auricular Height	11	117	4.0	3.4
4. Minimum Frontal Diam.	12	95	4.9	5.2
5. Bizygomatic Breadth	3	124	2.1	17.2
6. Total Facial Height	2	114	4.2	3.7
7. Upper facial Height	5	70	4.1	5.8
8. Nasal Height	7	55	3.3	6.0
9. Nasal Breadth	7	26	2.4	8.9
10. Biorbital Breadth	11	99	5.5	5.5
11. Mastoid Length	15	31	2.6	8.5
12. Basion-Bregma Height	11	136	5.3	3.9
13. Basion-Nasion Length	11	112	1.8	16.2
14. Basion-Prosthion Lg.	4	110	1.0	9.3
15. Frontal Chord	14	109	9.8	9.0
16. Nasion-Lambda Chord	14	173	2.2	12.6
17. Nasion-Opisthion Chd.	12	141	1.1	7.9
18. Parietal Chord	14	113	2.1	18.4
19. Bregma-Opisthion Chd.	12	150	5.7	3.8
20. Occipital Chord	11	100	5.4	5.3
21. Frontal Subtense	14	23	2.9	12.6
22. Frontal Subt. Dist.	14	55	6.2	11.2
23. Parietal Subtense	15	21	3.1	14.2
24. Parietal Subt. Dist.	15	51	5.3	10.3
25. Occipital Subtence	11	32	5.1	15.6
26. Occipital Subt. Dist.	11	48	7.9	16.5
27. Frontal Arc	13	133	2.5	19.4
28. Nasion-Lambda Arc	13	246	1.1	4.5
29. Nasion-Opisthion Arc	11	367	1.4	3.7
30. Parietal Arc	14	122	6.7	5.5
31. Bregma-Opisthion Arc	11	234	3.8	16.1
32. Occipital Arc	11	124	8.1	6.5
33. Horizontal Circum.	14	518	1.2	2.3
34. Transverse Arc	12	311	1.3	4.3
35. Internal Alveolar Br.	6	37	2.8	7.6
36. External Alveolar Br.	6	59	6.7	11.3
37. Alveolar Length	6	50	7.1	13.9

Table 7

Cranial Measurements of Reigh Site Females

Measurements (mm)	N	$\bar{X}$	S.D.	C.V.
1. Maximum Length	6	177	1.2	6.6
2. Maximum Breadth	4	134	1.5	11.3
3. Auricular Height	2	108	4.2	3.9
4. Minimum Frontal Diam.	5	90	2.9	3.2
5. Bizygomatic Breadth	2	132	8.5	6.4
6. Total Facial Height	1	112	0.0	0.0
7. Upper Facial Height	3	64	3.1	4.8
8. Nasal Height	3	51	1.2	2.2
9. Nasal Breadth	3	23	5.8	2.4
10. Biorbital Breadth	4	95	2.2	2.3
11. Mastoid Length	3	30	2.0	6.7
12. Basion-Breagma Height	2	123	4.9	4.0
13. Basion-Nasion Length	3	96	6.7	6.9
14. Basion-Prosthion Lg.	3	87	1.1	12.9
15. Frontal Chord	5	106	6.6	6.2
16. Nasion-Lambda Chord	3	169	1.3	7.8
17. Nasion-Opisthion Chd.	4	135	9.1	6.7
18. Parietal Chord	5	103	6.1	5.9
19. Bregma-Opisthion Chd.	4	137	1.3	9.3
20. Occipital Chord	4	104	2.2	21.4
21. Frontal Subtense	5	23	7.1	3.1
22. Frontal Subt. Dist.	5	56	2.7	4.9
23. Parietal Subtense	4	20	3.1	15.8
24. Parietal Subt. Dist.	4	46	1.0	21.7
25. Occipital Subtense	3	30	3.0	10.0
26. Occipital Subt. Dist.	3	44	5.1	11.6
27. Frontal Arc	4	123	1.8	1.5
28. Nasion-Lambda Arc	4	233	6.2	2.7
29. Nasion-Opisthion Arc	3	345	1.2	3.6
30. Parietal Arc	3	148	6.1	41.1
31. Bregma-Opisthion Arc	2	217	5.7	2.6
32. Occipital Arc	2	108	4.2	3.9
33. Horizontal Circum.	5	497	1.2	2.5
34. Transverse Arc	2	284	1.4	0.5
35. Internal Alveolar Br.	2	39	2.1	5.4
36. External Alveolar Br.	2	60	5.6	9.4
37. Alveolar Length	2	48	3.5	7.3

Table 8

Indices Constructed from the Reigh Site Cranial Data

Index	Males				Females			
	N	$\bar{X}$	S.D.	C.V.	N	$\bar{X}$	S.D.	C.V.
1. Cranial Indes	15	72.1	4.7	6.5	4	77.8	1.4	18.6
2. Height-Length Index	11	72.1	2.1	2.9	2	71.5	1.2	1.7
3. Height-Breadth Index	11	100.2	6.6	6.6	2	95.2	7.9	8.3
4. Nasal Index	7	49.0	5.7	11.7	3	45.8	1.1	2.4

Table 9

Mandibular Measurements of the Reigh Site Series

Mandibular Measurements (mm)	Males N	$\bar{X}$	S.D.	C. V.	Females N	$\bar{X}$	S.D.	C. V.
1. Symphysis Height	10	33	1.1	31.3	3	32	1.0	3.1
2. Bigonial Diameter	7	105	7.9	7.5	2	93	7.1	7.6
3. Ramus Height	8	64	3.7	5.7	1	60	0.0	0.0
4. Ramus Maximum Breadth	11	44	2.9	6.5	2	40	0.0	0.0
5. Ramus Minimum Breadth	11	37	2.8	7.5	2	36	7.1	1.9
6. Body Thickness	12	15	1.1	7.5	3	16	2.0	12.5
7. Body Height	8	30	9.8	32.1	1	30	0.0	0.0
8. Condylo-Symphyseal Lg.	7	118	7.5	63.4	1	97	0.0	0.0
9. Body Length	8	106	1.5	13.8	1	83	0.0	0.0
10. Bicondylar Width	3	121	3.8	3.1	1	109	0.0	0.0

Table 10

Posteranial Measurements of Reigh Site Males

Measurements (mm)	N	$\bar{X}$	S.D.	C.V.
1. Humerus: Max. Length	8	329.6	14.3	4.3
2. " : Max. Head Dia.	8	45.5	2.6	5.6
3. " : Min. Head Dia.	8	40.5	2.2	5.4
4. " : Max. Md. Dia.	8	22.5	1.6	7.1
5. Radius: Max. Length	2	227.5	31.8	13.9
6. " : Max. Md. Dia.	2	14.5	0.7	4.9
7. Ulna: Max. Length	2	228.5	89.8	3.9
8. " : Max. Md. Dia.	2	14.5	0.7	4.9
9. Clavicle: Max. Length	4	165.5	8.4	5.1
10. " : Max. Md. Dia.	4	13.0	2.8	21.8
11. Atlas: A-P Dia.	3	44.7	3.2	7.2
12. " : Trans. Dia.	3	69.7	8.9	12.9
13. Axix: Od. Ht.	3	29.7	11.1	37.3
14. Femur: Max. Length	5	463.6	23.3	5.0
15. " : Bicon. Length	4	459.3	27.9	6.1
16. " : Max. Head Dia.	5	44.8	0.8	1.9
17. " : Subtro. A-P Dia.	5	28.6	4.4	15.4
18. " : Subtro. M-L Dia.	5	32.4	3.3	10.1
19. " : Md. A-P Dia.	5	28.4	1.1	4.0
20. " : Md. M-L Dia.	5	26.8	0.4	1.7
21. Tibia: Max. Length	4	379.3	20.0	5.3
22. " : Nutr. A-P Dia.	4	34.0	2.4	7.2
23. " : Nutr. M-L Dia.	4	19.8	4.9	25.3
24. Stature (calculated)	8	1746.1	4.5	2.6

Table 11

Indices Constructed from the Reigh Site Postcranial Data
Males

Index	N	$\bar{X}$	S.D.	C.V.
1. Platymeric Index	5	78.4	3.9	4.9
2. Pilasteric Index	5	105.9	4.2	4.0
3. Platycnemic Index	4	63.4	7.5	11.8
4. Humero-radial Index	2	72.8	6.9	9.4
5. Humero-femoral Index	4	70.4	2.9	4.2
6. Femoro-tibial Index	2	82.1	7.2	8.7
7. Tibio-radial Index	2	61.9	8.9	14.5

retroversion with increased platycnemia (Angel: '46 cited Wagner,: '26, pp. 116, 129). The tibia with a index of 63.4 is on the borderline of platycnemic, which goes along with the sabre-like type shaft, plus the bent proximal end. This may indicate that this specific posture of kneeling or squatting was practiced by this individual. This suggests an interesting study, but the available skeletons at Reigh site are too few for certain conclusions.

Finally, the estimate of stature in males is 174-175 cm (using Stevenson's formula) and 150-151 cm (using Person's formula) in females. The sample size on which these characterizations, and one must estimate the postcranial measurements and stature with caution. However, it can be said that men in general appear to be tall and strong.

CRANIAL AND POSTCRANIAL COMPARISONS WITH OTHER STUDIES

Two series of data may be compared with the Reigh site material. The first series invloves the adjacent sites of Oconto, Oceola and Millville of Wisconsin and, the Riverside site in Michigan. The other series of comparative data, on a somewhat broader scope, includes Indian Knoll (Kentucky), Albany Hopewell (Illinois), Undeformed H1 and H2 Hopewell (Ohio), and Adena Hopewell (Kentucky).

The first series is limited in sample size. For example, there are only three or four calvaria and some minor fragmentary skeletons from Oceola site and Riverside site. In addition there are only two or three crania and a few long bones from the Millville site. Apparently this kind of data is inadequate for detailed comparison with other American Indian skeletal collection. The second series of comparative data, on the other hand, may be utilized in an attempt to place the Reigh site material within the context of previous reports and similar manifestations in adjacent areas by using Penrose's(1954) statistics.

Comparative Data:

Wisconsin and Michigan

There is no adequate material from these areas for a detailed comparative skeletal study. Nevertheless, a few individual specimens spread around the Oconto, Oceola, Riverside sites yielded the same chorenological level--4000 B.C. to 1000 B.C. and the Millville site, a level at A.D. 200. This again must be qualified by the shortage of sample size. The Oconto site had only four adult female calvaria with reasonable completeness and some other fragmentary skeletons. The Oceola site and Riverside site had more fragmentary pieces of bones, but neither could be studied through measurement. Meir (1969) reported that

the Millville site had two or three complete adult female crania and post crania measurements.

Illinois

This skeletal series of 221 individuals came from Albany Mound, Illinois. The skeletal collection is located in the Davenport public museum, Davenport, Iowa. According to Jamison(1969) study, Albany Mound is considered to be an example of Illinois Hopewell, and the site was probably occupied sometime between 200 B.C. and A.D. 400 (Griffin, 1967).

Ohio

The Ohio sample came from the Hopewell, Harness, Seip, Esch, and Marietta mounds (Webb and Snow, 1945). Its occupation dates from approximately the same as other Hopewell populations. One of these group--Hopewell H1 Undeformed represented long-headed individuals, and the other group, H2 Hopewell, represented broaded-headed individuals. The sample size in the latter group is smaller to the former, but both are presented as representatives of the later period of Hopewell.

Kentucky

The first comparative samples from Kentucky came from the Indian Knoll site in Ohio County (Snow, 1948). This is an Archaic site which was probably occupied between 4000 and 4000 B.C. (Johnston and Snow, 1961). The total measurable Indian Knoll skeletons yielded 996 individuals (Snow, 1948). The second series came from the Dover Mound, Mason County. It was occupied around 400 B.C. according to C14 dating.(Webb and Baby, 1957). The other series is Adena Hopewell, Kentucky, which was occupied at about A.D. 400.

Statistics Used in Comparison:

Due to the small sample size and incomplete data record for individual skeletons in the Reigh site series, it was impossible to apply the widely used method of multivariate analysis in this skeletal study.

The statistics the writer chose to use are Penrose's Size (C_Q^2) and Shape (C_Z^2) distance. Penrose's contribution in 1954 was to partition the mean square distance (C_H^2) into components of "Size" and "Shape" distance.

The equation for the mean square distance (C_H^2) is:

$$C_H^2 = (d_1^2 + d_2^2 + d_3^2 + \ldots\ldots\ldots + d_m^2) / m \ldots\ldots\ldots (i)$$

where "d" refers to the difference between the mean values of a variable (express in terms of standard deviation units) in any two groups, and "m" refers to the number of variables used in the comparison. To determine the d-values, an estimate of the standard deviation about the mean for each variable is required to use as a common standard deviation for that variable across all the groups being compared.

This mean square distance (C_H^2) can be broken down into a "Size" component. The "Size" portion can be obtained by summing the deviations between standardized means (d-values) for all the variables. The actual "Size" distance (C_Q^2) between two groups will be the square of the mean of all the d-values, the equation for this is:

$$C_Q^2 = \left[(d_1 + d_2 + d_3 + \ldots\ldots\ldots + d_m) / m\right]^2$$

$$= \left[\sum_{i=1}^{m} (di)\right]^2 / m^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Differences in "Shape" between the two groups will depend upon the extent to which the d-values differ among themselves, and this can be

measured by their variance. An estimate of this "Shape" distance can be determined by substracting the "Size" distance (C_Q^2) from the mean square distance (C_H^2).

$$C_Z^2 \times \frac{m-1}{m} = {}_i\Sigma_1^m (d_i^2)/m - \left[{}_i\Sigma_1^m (d_i) \right]^2 / m^2$$

$$= C_H^2 - C_Q^2$$

Discussion of Penrose's "size" and "shape" statistics consider shape more important than size in studying affinity (phenetic similarity) or taxonomy (personal communication with Friedlaender and Jamison, 1969).

Variables Used in Comparisons

The variables chosen for this analysis were selected on the basis of three criteria: 1) the requirements of the comparative statistics; 2) the Reigh site data suitable for comparisons; and 3) the available comparative data. As above mentioned, the calculation of Penrose's statistics requires an estimate of the standard deviation for each variable to be used in standardizing the group means for that variable. Indian Knoll provided by far the largest sample used in the comparisons in this study, and therefore provided more accurate estimates of the standard deviations on all samples.

In order to exercise Penrose's statistics for comparative study from the Indian Knoll data, the writer chose twelve cranial measurements that were represented by the relatively larger sizes in the Reigh site data, and frequently reported data from the comparative samples in the literature. These are:

Cranial measurements

1. Maximum length
2. Maximum breadth
3. Minimum frontal breadth
4. Auricular height
5. Basion-bregma height
6. Upper facial height
7. Nasal height
8. Nasal breadth
9. Biorbital breadth
10. Horizontal circumference
11. Nasion-opisthion arc
12. Transverse arc

Mandibular measurements

13. Symphysis height
14. Bigonial breadth
15. Minimum ramus breadth

Table 12 gives the sample sizes and standard deviations about the means for the measurements determined from the Indian Knoll data.

Result of The Comparisons

Table 13 and Table 14 present the sample sizes and the measurement means for the comparative series (male and female, respectively) used in this study. Table 15 gives the size distance and the shape distance between the Reigh site material and each of the comparative series.

Table 12

Sample Sizes and Standard Deviations about the Means of Fifteen Measurements on Undeformed Indian Knoll Crania

	Males		Females	
	N	S.D.	N	S.D.
1. Maximum Length	253	5.4	209	4.6
2. Maximum Breadth	258	4.6	211	4.1
3. Minimum Frontal Br.	264	4.0	188	3.8
4. Auricular Height	239	4.2	166	3.7
5. Basion-Bregma Height	227	4.5	176	4.0
6. Upper Fac. Height	233	3.4	171	3.8
7. Nasal Height	246	2.6	184	2.6
8. Nasal Breadth	248	1.7	185	1.7
9. Biorbital Breadth	232	3.1	160	2.8
10. Horizontal Circum.	241	12.1	171	11.0
11. Nasion-Opis. Arc	232	12.4	161	10.2
12. Transverse Arc	245	9.4	174	9.0
13. Symphysis Height	223	2.4	138	2.5
14. Bigonial Breadth	252	6.0	172	4.9
15. Minimum Ramus Br.	256	2.2	178	2.4

Table 13

Sample Size and Measurement Means for the Male Comparative Series

Comparative Series	Max. Length		Maximum Breadth		Min. Fr. Br.		Aur. Height		Ba.-Breg. Height	
	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$
Indain Knoll (Ky.)	253	178	258	135	264	91	239	119	227	139
Hopewell H1 Undeformed (Ohio)	30	184	32	136	25	93	10	122	11	143
Hopewell H2 (Ohio)	6	177	9	148	6	94	5	122	3	146
Hopewell Albany (Illinois)	14	188	10	140	14	94	7	119	1	132
Adena Undeformed (KY.)	10	172	11	140	11	88	7	125	5	140

Table 13

Sample Size and Measurement Means for the Male Comparative Series (continued)

Comparative Series	Upp. Fac. Ht.		Nasal Ht.		Nasal Br.		Biorbital Br.		Hori. Circum.	
	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$
Indian Knoll (Ky.)	233	70	246	51	248	24	232	96	241	502
Hopewell H1 Undeformed (Ohio)	17	77	17	54	21	26	11	99	23	513
Hopewell H2 (Ohio)	5	75	5	52	5	25	5	100	6	512
Hopewell Albany (Illinois)	1	83	2	58	2	25	2	101	9	519
Adena Undeformed (Ky.)	7	70	7	51	8	25	7	97	10	499

Table 13

Sample Size and Measurement Means for Male Comparative Series (continued)

Comparative Series	Na.-Op. Arc		Trans. Arc		Symphysis Ht.		Bigonial Br.		Min. Ramus Br.	
	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$
Indian Knoll (Ky.)	232	368	245	306	223	34	252	104	256	34
Hopewell H1 Undeformed (Ohio)	15	374	13	309	21	37	20	103	19	36
Hopewell H2 (Ohio)	4	367	6	318	5	37	5	111	5	36
Hopewell Albany (Illinois)	9	372	6	324	17	37	12	105	18	34
Adena Undeformed (Ky.)	8	365	11	321	9	34	7	97	10	35

Table 14

Sample Size and Measurement Means for Female Comparative Series

Comparative Series	Max. Length		Max. Breadth		Min. Fr. Br.		Auricular Ht.		Ba.-Br. Ht.	
	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$
Indian Knoll (Ky.)	209	172	211	131	188	88	166	115	176	132
Hopewell H1 Undeformed (Ohio)	24	178	33	135	23	89	10	120	8	139
Hopewell H2 (Ohio)	4	170	4	143	4	92	1	120	1	143
Hopewell Albany (Illinois)	21	179	11	135	17	90	10	116	8	136
Adena Undeformed (Ky.)	6	166	7	139	3	88	1	119	5	143

Table 14

Sample Size and Measurement Means for the Female Comparative Series (continued)

Comparative Series	Upp. Fac. Ht.		Nasal Ht.		Nasal Br.		Biorbital Br.		Hori. Circum.	
	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$
Indian Knoll (Ky.)	171	65	184	47	185	23	160	93	171	485
Hopewell H1 Undeformed (Ohio)	17	73	17	51	17	25	11	97	19	499
Hopewell H2 (Ohio)	1	70	1	50	1	24	1	94	2	491
Hopewell Albany (Illinois)	5	70	5	51	5	26	4	94	12	487
Adena Undeformed (Ky.)	3	70	4	50	3	25	1	88	3	483

Table 14

Sample Size and Measurement Means for the Female Comparative Series (continued)

Comparative Series	Na.-Op. Arc		Trans. Arc		Symphysis Ht.		Bigonial Br.		Min. Ramus Br.	
	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$	N	$\bar{X}$
Indian Knoll (Ky.)	161	357	174	295	138	31	172	96	178	32
Hopewell H1 Undeformed (Ohio)	12	361	12	317	14	33	10	94	10	35
Hopewell H2 (Ohio)	3	327	2	308	2	32	1	92	2	37
Hopewell Albany (Illinois)	9	353	9	307	10	36	9	101	14	32
Adena Undeformed (Ky.)	3	357	5	308	2	32	2	92	2	35

Table 15 shows Hopewell H1 Undeformed, as well as the Indian Knoll samples, to be quite similar in "size" and "shape" to the Reigh site males. However, Hopewell H2 and Hopewell Albany are more similar to the Reigh site male series in "size" than in "shape". Comparison of the female series reveals the greatest similarity between the Indian Knoll and Reigh site material, while the other Hopewell series illustrates an inconsistant value, either very similar in "size", or not too similar in "shape" or "size" with the Reigh site material. Only the Adena Undeformed Hopewell series had more dissimilar values in "size" and in "shape" in comparison with the Reigh site males and females.

The above statistical analysis of "size", and "shape" distances reveals only a slight difference among all comparative series, with the exception of Adena Undeformed series. This indicates in terms of the available factual data, that all Archaic and Middle Woodland American Indians studies here were more or less similar to one another. However, this must be qualified by the manner and subject of the study of these data. Among these, the Adena series had been misclassified and most of the Hopewell series present certain problems for study, such as unsystematic research by different students employing different methods.

Although the study was mainly based upon males, female results would have only partially affected the male results.

Table 15 gives us only limited information concerning the comparative samples, with the exception that it shows the homogeneity of all American Indian series. The problem lies in the far too small sample size used in this study. However, such a study is justified by the writer because it affords an opportunity to exercise statistical analysis and comparisons the Old Copper skeletal remains from Wisconsin.

Table 15

Size (C_Q^2) and Shape (C_Z^2) Distance Comparisons

Reigh Site	Males		Females	
Compared With:	C_Q^2	C_Z^2	C_Q^2	C_Z^2
Indian Knoll (Ky.)	0.2704	0.9174	0.0400	1.5007
Hopewell H1 Undeformed (Ohio)	0.2152	0.4179	1.3301	2.1963
Hopewell H2 (Ohio)	0.1547	1.7207	0.5776	3.3982
Hopewell Albany (Illinois)	0.2178	1.7585	0.7627	1.8407
Adena Undeformed (Ky.)	0.2600	2.1221	0.2989	4.1025

PATHOLOGY

Obviously dry bone material can yield only limited information about the general health of a population. This is particularly true here because of the small sample size and the lack of certain diagnostic bones. However the few pathological skeletal materials found within the sample will be accepted as pathologically representative of the population:

Adult Lumbar Vertebra, Male. This individual has a wedged lumbar vertebra (from trauma) and a small round defect is noted on the cranial surface of this vertebral body which apparently results from herniation of nucleus pulposis of the disc into the vertebral body..... known in medical literature as a Schmorl's node. These usually develop in presence of osteoporosis because of the consequent weakening of vertebral body structure(Plate V).

Two Adult Thoracic Vertebrae, Male. Also has a wedge fracture of each vertebra of this individual(Plate V).

Adult Humerus, Female. This humerus manifests old healed fracture of the neck and post-traumatic arthritis of the humeral head (Plate VI).

Adult Femur, Male. Condensed bone lipping around the head of femur, probably due to osteoarthritis (Plate IV).

Two Adult Cervical Vertebrae, Female. This shows congenital fusion of two cervical vertebrae (Plate VII).

Dentition. Dental pathology is numerous in this series. Effects of wear are seen on mandible (Plate VIII), as in other series of American Indians, included extreme attrition, caries, absess pockets and periodontal diseases.

Of incidental interest, radiographs of the long bones show a paucity of growth-arrest lines (PLATE IX).

DISCUSSION AND CONCLUSION

The first part of this report was an examination of the demographic parameters of the Reigh site skeletal collection. The results of this can be stated in reference to the Indian Knoll series from Kentucky and the Albany Mound from Illinois.

1. The Reigh site and the Albany collections contained fewer infant skeletons than would have been expected in comparisons with other series.

2. Considered as an indepedent unit, the Reigh site collection contained slightly more than the other two series in the proportion of young adults (21-34 years old) and middle and old adults (above 35 years old) present.

3. The estimated population living at the Reigh site was much smaller than that of the Indian Knoll and that of Albany Mound.

The explaination for the first result, the small percentage of infant skeletons, cannot be stated conclusively. This might have been due to: 1) the delicate and fragile condition of the infant bones, 2) the technique of the excavators and the curators, or 3) cultural practices such as cremation and secondary burial. The second result indicates that in the progression through time of the Indian Knoll series, the Reigh site series, and the Albany Mound series, progressively more deaths occured in the old adult age catagory than in the young adult age catagory. Regarded historically, the increasing age of death at these sites seems to indicate an improvement in nutrition and health. A third result of this report, based upon limited evidence which suggests that because the population from the Reigh site was small it could only be compared with the other Old Copper site populations, is the suggestion that population expansion at the Reigh site may have been the consequence of an increase in individual

population.

Within the limitations of both the sample size studied here and the statistical technique, the following general results can be enumerated from the comparative study:

1. The comparisons of the Reigh site data with those from the earlier Archaic site of Indian Knoll, Kentucky as well as from the later sites of Early and Middle Woodland (Hopewell) sites in Illinois and Ohio indicate a high level of similarity. The results of the "size" and "shape" analysis seen in Table 15 suggests that these series may have belonged to a population that exhibited considerable genetic continuity through time and space, and that they shared a common higher frequency of Mongoloids (or proto-Mongoloids) stock traits.

2. The comparisons of the Reigh site Old Copper skeletons with those from other contemporary adjacent Old Copper sites in Wisconsin and Michgan are also indicative a level of similarity through a primarily morphological observation on a few discrete traits, i.e., shovel-shaped incisor, interparietal bone, and sagittal keeling; and they are of interest in the study of sex ratio, age catagory, and the general cultural practices within the field of social biology.The analysis indicates that these regional isolates have significance in their evolutionary history. The pieces of the Old Copper Indians' mosaic evolution may have been fashioned separately in regions apart from each other. They may have been assembled in different combinations at different places and times, until finally a particularly successful combination lifted their evolutionary line up to a new level of adaptation.

3. The comparisons of the Reigh site material with the series from Hopewell H2, Ohio, and from Adena Undeformed, Kentucky, indicate some degree of dissimilarity in "shape" distance.

The first comparative result is not remarkable in its similarity to other findings on the basis of physical and archaeological evidence (Neumann, 1937, Prufer, 1964, and Steuver, 1965). This suggests that most of the Hopewell population as well as the Indian Knoll population possessed genes in common with the Reigh site "population", although the Reigh site Indians can not necessarily be regarded as the ancestor of the Hopewell Indians nor be accepted as descent of Indian Knoll population. Rather, they should be regarded as belong to same recticulum, branching net, of population.

Based upon biological, ethnographical, and archaeological data, these comparisons evidently reflect varying forms of cultural systems as well as the genetic mechanisms at different levels of complexity.

According to the archaeological growth of the site, we can ascribe to the belief that a rather small group of people, perhaps not more than fifteen individuals, lived and died at Reigh site, passing along in a highly homogeneous manner their physical traits.

The few cases of skeletal pathology in this series offer some important information concerning our general knowledge of bone pathology, palaeodemography, and/or epidemiology.

It was quite surprising to find such a high incidence of bone pathology--10-15% of the total'population' in a series of this size, especially considering the large amount of incomplete skeleton. Various burials in the series also exhibited some form of dental pathology, ranging from

marked dental attrition, possibly reflecting subsistence pattern and diet, to periodontal disease or premortem loss of teeth. These may account for the high incidence of pathology present. A rugged, difficult mode of subsistence is probably also a contributing factor as these people were hunters and gathers and their way of life was certainly physically demanding.

The conclusions reached in this study may be summarized as follow:

1. The estimate of stature is 174-175 cm in males and 150-151 cm in females. However, it can be said that male in general appear to be tall and strong, at least taller than the available comparative data of Indian Knoll series.

2. The conclusion based on the study of the mean characters of the skeletons was confirmed by Penrose's statistics: the size and shape distances between each pair of groups (Indian Knoll, H1 Undeformed Hopewell, H2 Hopewell, Albany Hopewell, and Adena Hopewell) were small and the percentage overlap was high.

3. In spite of the small sample size--8-12 individuals, Reigh site seems to present a group of biologically and culturally homogenous traits in common with the other Old Copper sites in the adjacent areas.

4. The intersite study of the American Indian skeleton seems to indicate that the same common traits appeared generally in the subdivision of microevolutionary, and/or regional fragmentary unit of level, of complexity.

5. The study of the bone pathology in this series may help us acquire information about the culture of the Reigh site on a level of socio-biological study and palaeodemographic analysis.

Due to the small size of the sample, meaningful conclusions on the race, sex and age incidence are difficult to assess. A comparative study with other such populations would be advisable in this respect, and this survey can serve as a basis for such future studies.

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APPENDIX

The following is an example of the calculation of Penrose's size (C^2_Q), shape (C^2_Z) distances using the Reigh site and Indian Knoll data.

Step 1. The means for the measurements used in the comparisons must be standardized by dividing them by a common standard deviation. This common standard deviation was determined from the Indian Knoll series.

Reigh site males:

Max. Lg.	189 /5.4 = 35.0
Max. Br.	136 / 4.6= 29.6
Min. Fr.	95 / 4.0= 23.8
Aur. Ht.	117 / 4.2= 27.9
Ba.-Br. Ht.	136 / 4.5= 30.2
Up. Fac. Ht.	70 / 3.4= 20.6
Na. Ht.	55 / 2.6= 21.2
Na. Br.	26 / 1.7= 15.3
Biorb. Br.	99 / 3.1= 31.9
Hori. Cir.	518 /12.1= 42.8
Na.-Op. Arc	367 /12.4= 29.6
Trans. Arc	311 / 9.4= 33.1
Sym. Ht.	33 / 2.4= 13.8
Bigo. Br.	105 / 6.0= 17.5
Min. Ra. Br.	37 / 2.2= 16.8

Indian Knoll Series:

Max. Lg.	178 / 5.4= 32.9
Max. Br.	135 / 4.6= 29.3
Min. Fr.	91 / 4.0= 22.8

Aur. Ht.	119 / 4.2 = 28.3
Ba.-Br. Ht.	139 / 4.5 = 32.0
Up. Fac. Ht.	70 / 3.4 = 20.6
Na. Ht.	51 / 2.6 = 19.6
Na. Br.	24 / 1.7 = 14.1
Biorb. Br.	96 / 3.1 = 30.9
Hori. Cir.	502 / 12.1= 41.5
Na.-Op. Arc	368 / 12.4= 29.7
Trans. Arc	306 / 9.4 = 32.6
Sym. Ht.	34 / 2.4 = 14.2
Bigo. Br.	104 / 6.0 = 17.3
Min. Ra. Br.	34 / 2.2 = 15.5

Step 2. The standardized means are subtracted to obtain d-values for each measurement between the two groups compared . These d-values are summed and their squares are also summed.

Max. Lg.	35.0-32.9 = 2.1
Max. Br.	29.6 - 29.3 = .3
Min. Fr.	23.8 - 22.8 =1.0
Aur. Ht.	27.9 - 28.3 = -.4
Ba.-Br. Ht.	30.2 - 32.0 = -1.8
Up. Fac. Ht.	20.6 - 20.6 = 0
Na. Ht.	21.2 - 19.6 = 1.6
Na. Br.	15.3 - 14.1 = 1.2
Biorb. Br.	31.9 - 30.9 = 1.0
Hori. Cir.	42.8 - 41.5 = 1.3
Na.-Op. Arc	29.6 - 29.7 = -.1

Trans. Arc	33.1 - 32.6 = .5
Sym. Ht.	13.8 - 14.2 = -.4
Bigo. Br.	17.5 - 17.3 = .2
Min. Ra. Br.	16.8 - 15.5 = 1.3

Step 3. C_Q^2 or the "size" distance between Reigh site males and Indian Knoll males is equal to the square of the sum of the d-values divided by the square of the number of measurements.

$$C_Q^2 = \left[(d_1 + d_2 + d_3 + \ldots\ldots\ldots + d_m) / m \right]^2$$
$$= \left[.53 \right]^2$$
$$= .2704$$

Step 4. C_H^2 of the mean square distance must be determined next. This is equal to the sum of the squared d-values divided by the number of measurements.

$$C_H^2 = (d_1^2 + d_2^2 + d_3^2 + \ldots\ldots\ldots + d_m^2) / m$$
$$= 16.9 / 15$$
$$= 1.1269$$

Step 5. A quantity proportional to C_Z^2, the "shape" distance between Reigh site males and Indian Knoll males, is equal to C_H^2 minus C_Q^2.

$$C_Z^2 \times \frac{m - 1}{m} = C_H^2 - C_Q^2$$

$$C_Z^2 \times \frac{14}{15} = .8563$$

$$C_Z^2 = .9174$$

PLATES

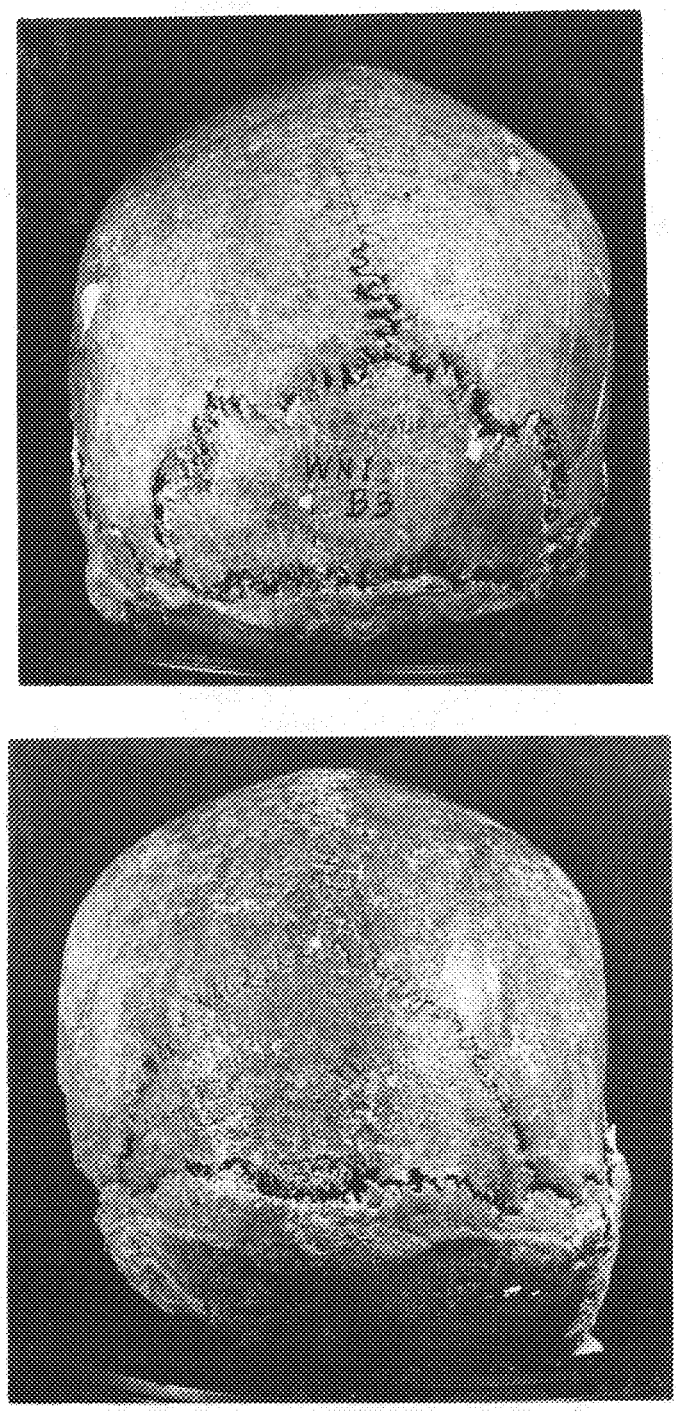


PLATE I Burial 3 and Burial 23, Adult Males. Each shows a complete Interparietal bone and a sagittal keeling.

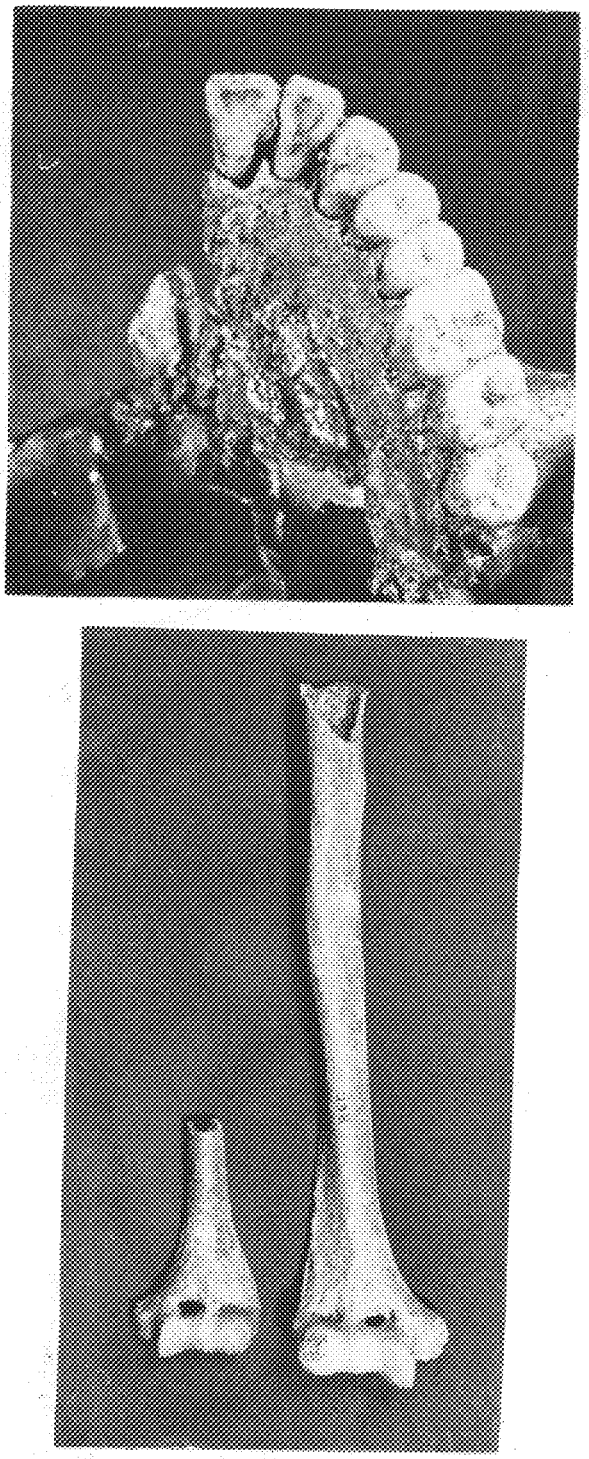
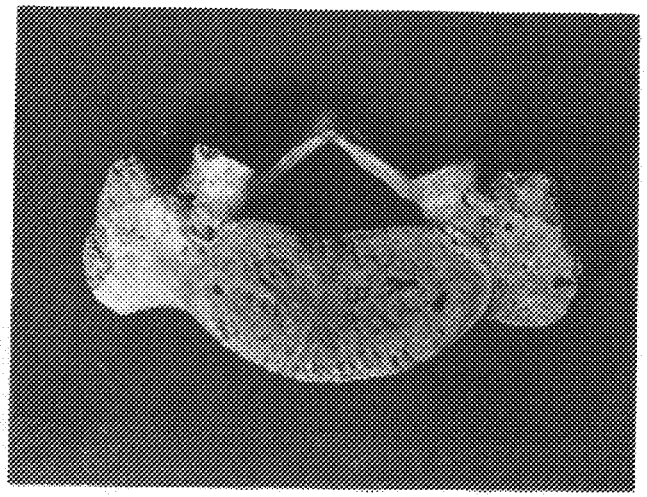


PLATE II Burial 6F, Male, and Burial 19, Female, show a marked shovel-shaped incisors and septal aperture on a pair of humerus.



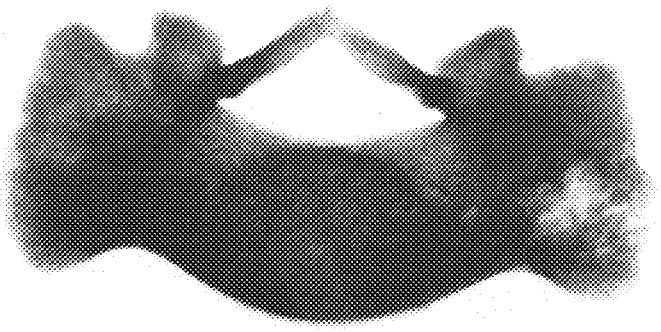


PLATE III Burial 6, Young Adult, Sex Unknown, shows spina bifida occulda on first segment of sacrum.

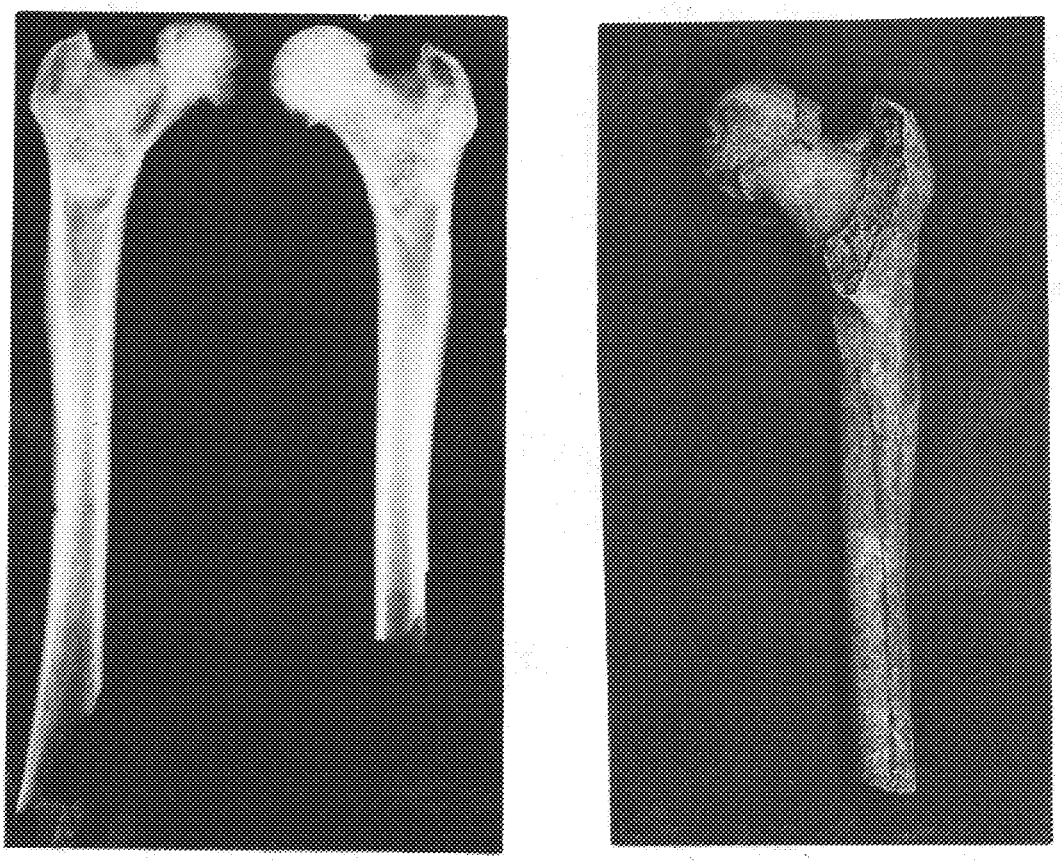
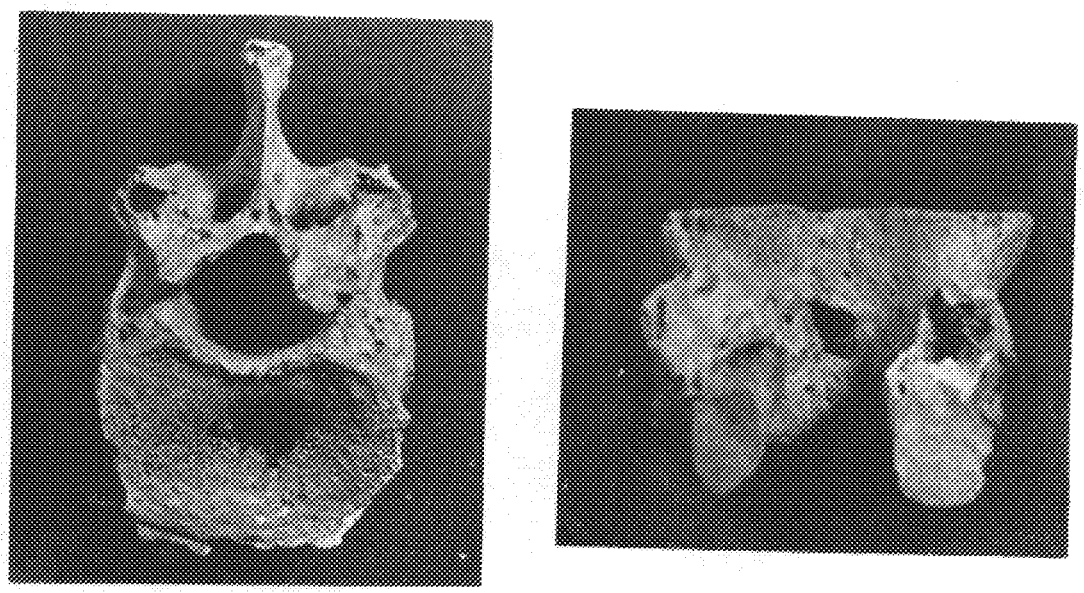


PLATE IV Burial 11A, Adult, Male, shows arthritis bone lipping on the head of femur.



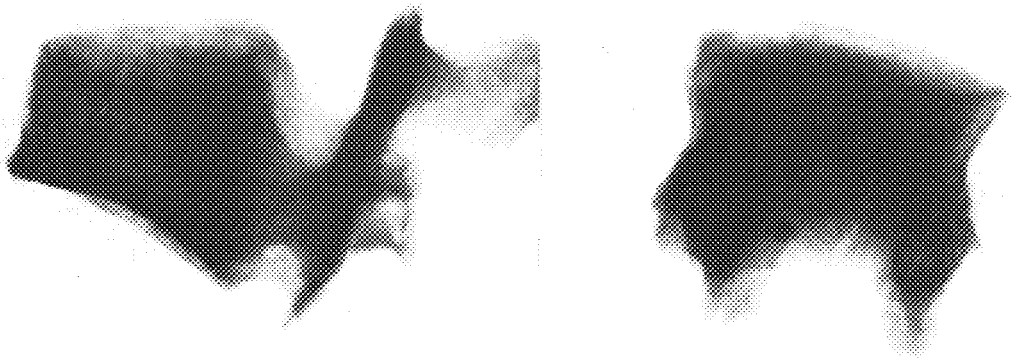


PLATE V Burial 25A and Burial 11A, Adult Males, show a wedge lumbar vertebra and a wedge fracture of thoracic vertebra . The one has a round defect is noted on the cranial surface of this vertebral body which usually develop in presence of osteoporosis.

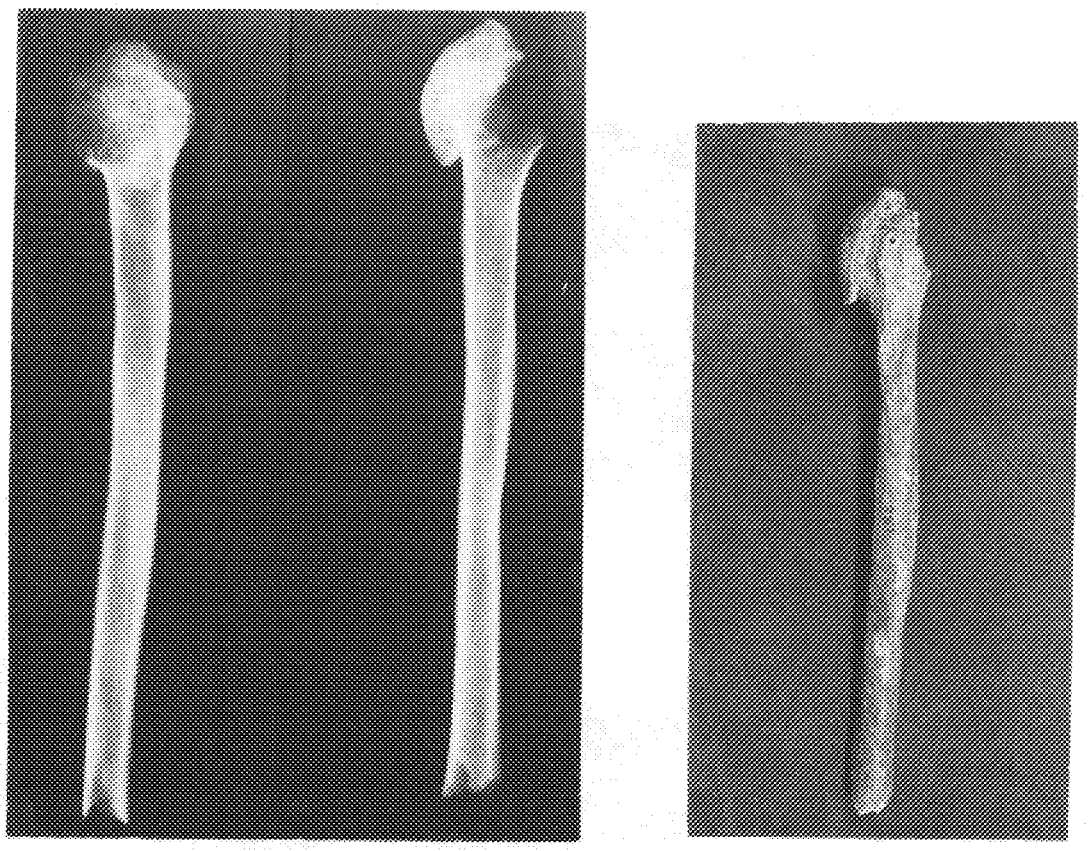
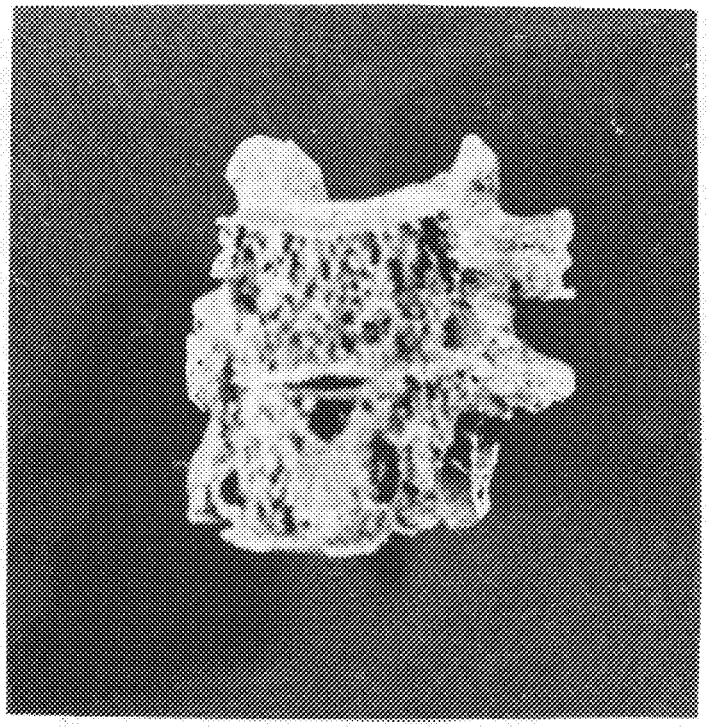


PLATE VI Burial 13C, Adult Left Humerus, Female. This humerus manifests old healed fracture of the neck and post-traumatic arthritis of the humeral head.



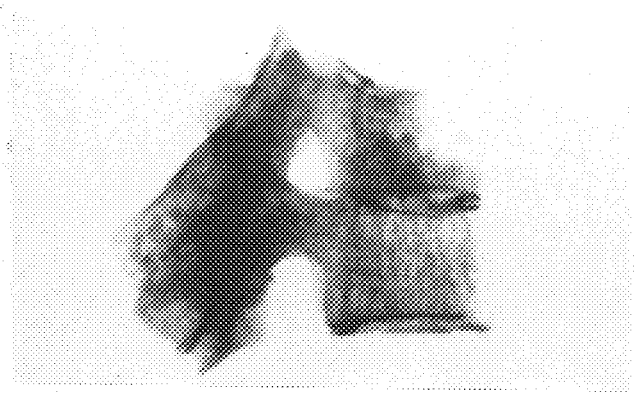


PLATE VII Burial 13B, Two Adult Cervical Vertebrae, Female. This shows a congenital fusion of two lower cervical vertebrae.

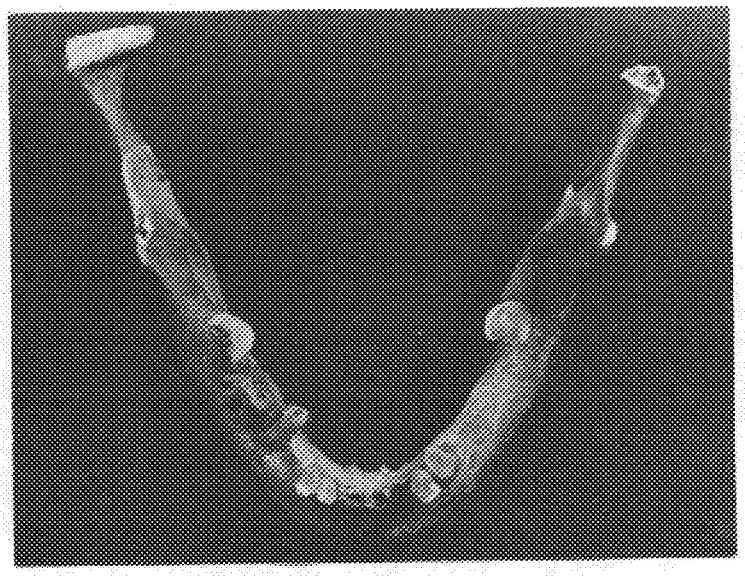


PLATE VIII Burial 13C, Mandibula, Old Adult, Female. This mandible shows severe attrition, caries, abcess pocket and periodontal diseases.

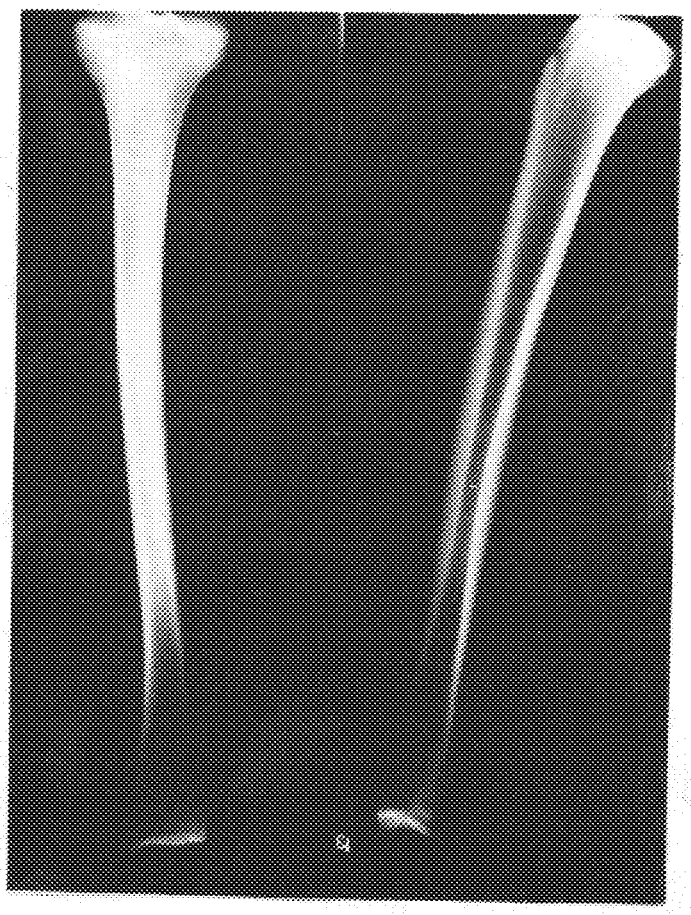


PLATE IX Burial 5, Adult Male, Right Tibia. This radiograph shows a paucity of growth-arrest lines.

APPROVED

Professor R. H. Osborne

DATE 4-11-70