Geological Survey of Alabama

WALTER B. JONES, STATE GEOLOGIST (ON LEAVE)

MUSEUM PAPER 16

ALABAMA MUSEUM OF NATURAL HISTORY

CONDYLO-DIAPHYSIAL ANGLES OF INDIAN HUMERI FROM NORTH ALABAMA [1]

By

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[1]Read before the annual meeting of the American Association of Physical Anthropologists at the American Museum of Natural History, New York City, May 2-4, 1940.

UNIVERSITY, ALABAMA

1940

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LETTER OF TRANSMITTAL

University, Alabama

September 26, 1940

Honorable Frank M. Dixon,
Governor of Alabama,
Montgomery, Alabama.

Sir:

I have the honor to transmit herewith the manuscript of a report entitled "Condylo-Diaphysial Angles of Indian Humeri from North Alabama", by Charles E. Snow. It is requested that this be printed as Museum Paper 16 of the Geological Survey of Alabama.

Respectfully,

STEWART J. LLOYD,
Asst. State Geologist.

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CONDYLO-DIAPHYSIAL ANGLES OF INDIAN HUMERI FROM NORTH ALABAMA

I wish to acknowledge my indebtedness to those who made possible the preparation of this paper. I am obliged to the Work Projects Administration and to Mr. David L. DeJarnette, Sponsor's representative and Curator of the Alabama Museum of Natural History, for the opportunity, facilities and assistance which have made possible the study of the material. I am also grateful to Professor William S. Webb, Archaeological Consultant for the Tennessee Valley Authority for his encouragement. I am particularly indebted to Mr. John K. Bodel, Jr., of Harvard University for his excellent spirit of cooperation in providing detailed diagrams and photographs of his apparatus which was reconstructed with slight modifications to measure the angles of the humeri of the Alabama series.

Introduction

The Condylo-diaphysial angles of 1,026 adult humeri were determined and analysed. All available humeri from the well documented Indian burials excavated jointly by the Alabama Museum of Natural History and the Tennessee Valley Authority in cooperation with the Work Projects Administration from extensive aboriginal sites in the Tennessee Valley, were utilized. This material has been preserved, restored and measured at the W.P.A. Archaeological Laboratory in Birmingham.

There is no need to review the literature on the subject of condylo-diaphysial angles since Mr. John K. Bodel, Jr., has adequately referred to the past methods of study, as well as the results of research[2]. Bodel's apparatus is a device which expedites the determination of the long axis of the humeral shaft in the region of the lower extremity and permits measurements of the angle formed between this axis and the plane of the inferior surfaces of the condyles. The modified Bodel instrument is seen in Figure 1,

[2]John K. Bodel, Jr., "Determination of the Condylo-diaphysial Angle of the Humerus" *American Journal of Physical Anthropology,* Volume 25, Number 3, 1939, pp. 333-339.

and consists of a triangle mounted on legs, a sliding U-shaped runner, a simple caliper device, a protractor and a right angled measuring board.

The technique involved begins with the placement of each humerus, posterior surface up, upon the measurement board so that the condyles touch the vertical upright. The shaft of the bone thus will lie at an angle to the plane of the upright. Next the caliper device is applied tightly to the shaft three inches above the epicondyles. The U-shaped runner is slipped down the shaft until it rests firmly against the expanding sides of the epicondyles and at right angles to the axis of the shaft. The celluloid triangle is placed on the measuring board with the legs straddling the bone and the apex contacting the upright. The median line of the triangle is carefully placed along the axis of the shaft which is indicated by the centers of the caliper device and the U-shaped runner. The protractor is then placed with its straight edge against the upright and the angle at which the axis of the bone (indicated by the median line of the triangle) meets the upright is read to the nearest half degree. See Figure 2. The celluloid triangle with a median line bisecting the angle at the apex was used in place of Bodel's glass plate and was equipped with slightly longer supports made by fastening bolts through the celluloid plate. The technique described by Bodel was followed explicitly with the exception that in reading the angle formed between the plane of the upright against which the articular surfaces of the lower extremity of the humerus were placed and the axis of the shaft itself, the protractor was simply placed with its flat edge against the upright and the reading taken to the nearest half degree. Essentially, the original instrument has been followed and probably the difference due to technique is negligible.

Analysis

The total series consists of 1,026 condylo-diaphysial angles of the bones of both sexes and both sides. Several divisions were carried through separating the humeri by sexes into rights and lefts, into regional basins and racial types as well as by individual sites which go to make up the whole. Both paired and unpaired series were formed.

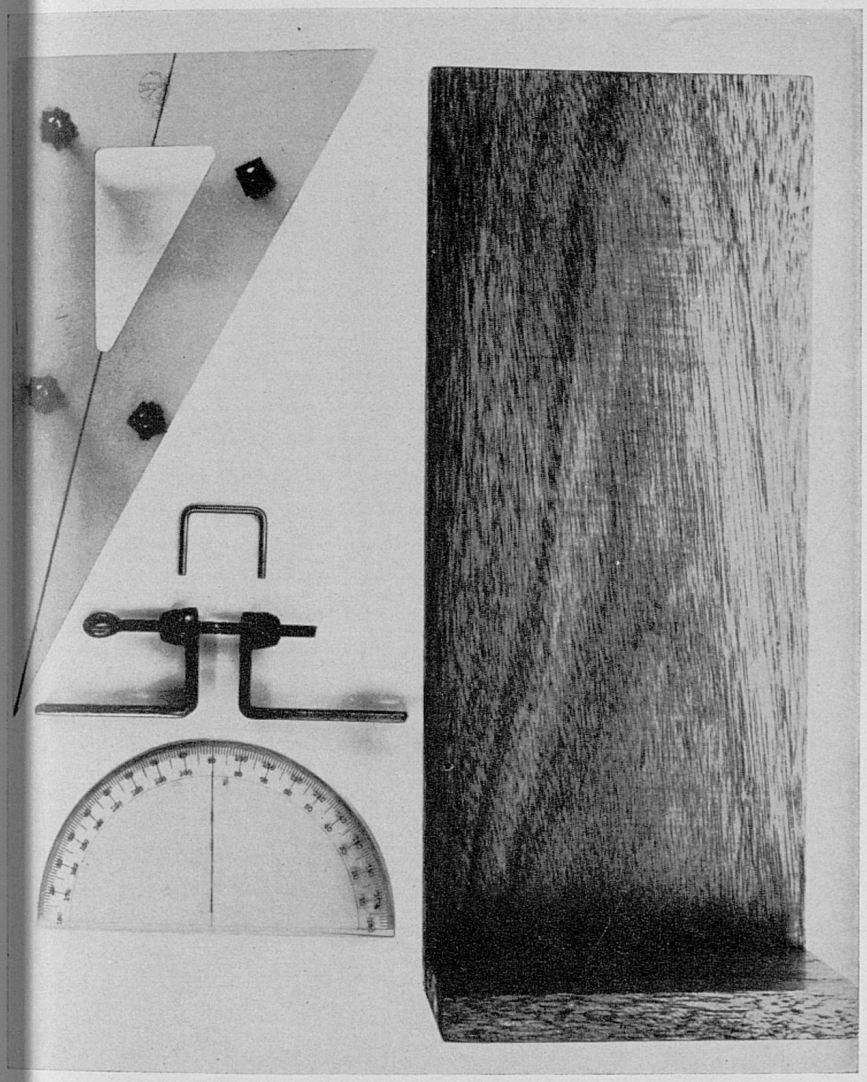

Fig. 1. Photograph of the various parts of the Bodel apparatus. The celluloid triangle on legs, the sliding U-shaped runner, the simple caliper device, a protractor and right angled measuring board.

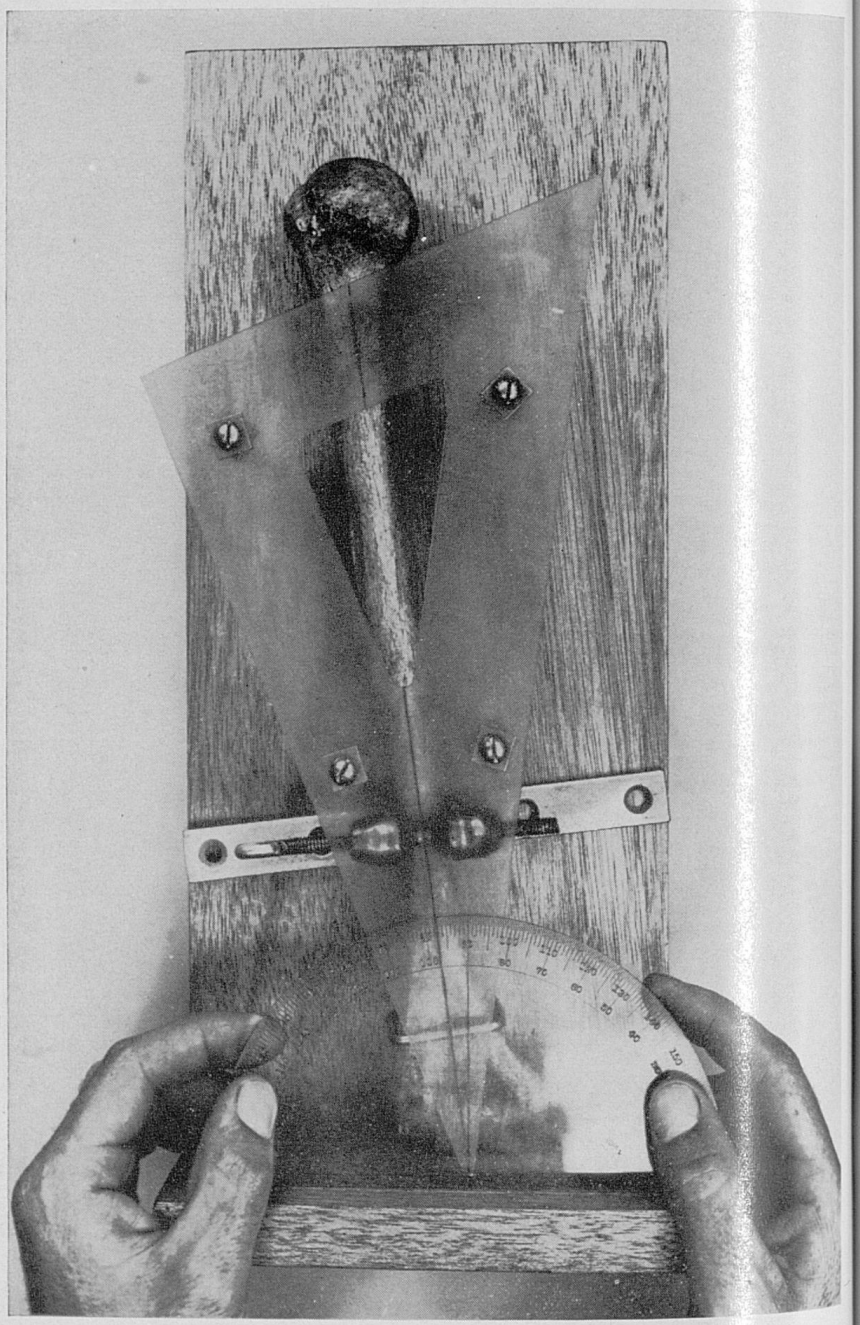

Fig. 2. Photograph showing an actual reading of the condylo-diaphysial angle of a left male humerus. The reading 82.5° approaches closely the mean of the entire series.

The mean angle of the total series, 1,026 humeri, is 82.1°. Bodel's mean for 468 Pecos humeri is 84.8°. According to Bodel the mean of 70 Tierra del Fuego humeri is 82.58°. In the Alabama series, the average angle of the female humerus exceeds the male by .92°. in the left and .93° in the right. There are 154 paired female and 202 paired male bones in these calculations. These averages are but slightly lower than those obtained by Bodel in the Pecos series. Using only paired bones again, the average difference between the left and right bones of both sexes (356 pairs) combined is 1.56° in favor of the left bone. In each series used to form this combination, statistically significant differences are found between the left and the right bones of both sexes. (See tables at end of paper) Bodel, however, did not find significant differences between the left and right angles of Pecos humeri.

It is important to note in this connection that these comparisons are of paired bones; that is, the left and right bones from the same individual were combined to form the series involved. In some instances only one bone was measurable, in which case it was included in the unpaired total series but excluded from the series of paired bones.

On the whole, the standard deviations, coefficients of variation and the probable errors of the means of the Alabama series are very similar in magnitude to Bodel's on the Pecos humeri[3]. It is to be noted that these measures of variability of the single physical type series are not appreciably lower than those of the combined series. The significance of this is not clear to us although it is conceivable that the factors of habitus, size of series, et cetera, are to be considered.

The Alabama series not only corroborates the results of Bodel's study of Pecos humeri in which the angles of the female bones are higher than those of the males, but there are consistent and significant indications in the Alabama series that the angles of the left humeri of both sexes are higher than those of the right.

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[3]It is interesting to note in this connection that von Bonin and Morant found their Pecos Pueblo cranial series more variable than any other Indian series they examined. G. von Bonin and G. M. Morant, *Biometrika,* "Indian Races in the United States". Volume 30, 1938, p. 125.

In addition, the angles of the total Alabama series are significantly lower than the Pecos series. When the paired humeri of both sexes coming from the earlier cultural levels are compared with those from later ones, the earlier are characterized by possibly significantly smaller angles. The physical types associated with early cultural levels are distinctly different from the types associated with later horizons[4]. Thus it can be assumed that the differences in the humeri are perhaps racially significant. It is possible that the higher angles of the left humeri in both sexes may indicate functional differences.

The accompanying tables compare the various series from the Pecos Pueblo, the Paltacalo and the Alabama series. The size of the Alabama series provides a very adequate and representative sample of the physical types present in North Alabama.

A word might be added concerning the utility of the Bodel apparatus and technique as well as a critical appraisal of its limitations. The utilization of the distal extremity of the humerus is most commendable for archaeological material since much of it is fragmentary and often the lower end with its intact articular surfaces is the only portion of the humerus preserved. It was observed that, on the whole, the axes of the entire shafts of the Alabama humeri were approximately determined by the two caliper devices applied to the lower end of the shafts. In the case of specimens with medium to pronounced bowing of the shaft or the occurrence of pronounced lateral flare just above the lateral epicondyle accompanied by torsion there might be some question concerning the correct determination of the mid-line or axis. However, it is the writer's opinion that the Bodel technique is very satisfactory and offers a practical method of determining the condylo-diaphysial angle of the humerus.

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[4]"Preliminary Report on the Skeletal Material from Pickwick Basin, Alabama", by Newman, M. T. and Snow, C. E., included as a section in *An Archaeological Survey of Pickwick Basin in the Adjacent Portions of the States of Alabama, Mississippi and Tennessee.* B.A.E. Bul. 129, by Webb, Wm. S. and DeJarnette, David L, in press.

Summary

The condylo-diaphysial angles of 1,026 humeri from well documented adult Indian burials were determined for the series from North Alabama. The results corroborate the studies of Bodel which demonstrate that the angles of females are higher than the males. Data based upon paired bones only, indicate that in the Alabama series there are consistent differences between the left and right sides of both sexes, the left having higher angles. There are suggestions that the humeri of the earlier aborigines along the Tennessee River in Alabama are characterized by slightly lower angles than those of the later peoples.

CONDYLO-DIAPHYSIAL ANGLES

Miscellaneous Groups

	UNPAIRED						PAIRED					
	MALES			FEMALES			MALES			FEMALES		
	No.	Range	Mean	No.	Range	Mean	No.	Range	Mean	No.	Range	Mean
Wheeler Basin (Combined)												
Right	24	75-84	79.6°	25	75-91	82.6°	19	75-84	79.3°	18	75-91	82.7°
Left	22	77-87	81.6°	27	73-88	83.8°	19	77-87	81.1°	18	73-88	84.0°
Wheeler Basin—(Koger's Island)[5]												
Right	9	76-83	80.0°	5	81-91	84.8°	7	76-83	79.4°	5	81-91	84.8°
Left	8	79-85	81.4°	8	82-88	85.2°	7	79-85	80.9°	5	85-88	86.8°
Wheeler Basin—(Shell Mound)[5]												
Right	13	75-83	79.0°	15	75-88	81.5°	11	75-81	78.7°	11	75-88	81.8°
Left	13	77-86	81.2°	15	73-88	83.0°	11	77-86	80.7°	11	73-87	82.7°
Pickwick & Wheeler Basin—(Total Koger's Island)												
Right	80	72-87	81.3°	52	73-95	82.5°	61	72-87	81.0°	46	73-95	82.8°
Left	79	75-94	83.1°	52	78-90	83.9°	61	75-94	83.1°	46	78-90	84.1°
Pickwick & Wheeler Basin—(Total Shell Mound)												
Right	138	72-89	80.4°	107	74-89	81.2°	102	72-89	81.5°	72	75-89	81.3°
Left	136	74-91	82.4°	104	83.89	83.2°	102	76-89	82.2°	72	73-88	82.9°
Total Series												
Right	294	71-90	80.7°	224	73-95	81.7°						
Left	284	74-94	82.7°	224	73-90	83.4°						
GRAND TOTAL												
	1026	71-95	82.1°									

[5] The term Koger's Island (K. I.) has been adopted to refer to the round headed physical type associated with shell-tempered pottery on the Koger's Island site in Pickwick Basin. The site is regarded as late prehistoric. The term Shell Mound (S. M.) identifies the undeformed long headed type which is found in the earliest levels of the shell middens along the Tennessee River in North Alabama.

CONDYLO-DIAPHYSIAL ANGLES

PICKWICK (Sites)

	UNPAIRED						PAIRED					
	MALE			FEMALE			MALE			FEMALE		
	No.	Range	Mean	No.	Range	Mean	No.	Range	Mean	No.	Range	Mean
Lu°5—(S.M.)												
Right	1	.....	78.5°	1	.....	83.0°	---	.....	.....	---	.....	.....
Left	1	.....	81.0°	1	.....	81.0°	---	.....	.....	---	.....	.....
Lu°5—(Combined No. K.I. one unknown)												
Right	1	.....	78.5°	1	.....	83.0°						
Left	1	.....	81.0°	2	79-81	80.0°						
Lu°21 (K.I.)												
Right	---	.....	.....	1	.....	80.0°	---	.....	.....	---	.....	.....
Left	---	.....	.....	---	.....	.....	---	.....	.....	---	.....	.....
Lu°61—(Combined)												
Right	6	75-84	80.8°	7	74-82	79.9°						
Left	9	81-87	82.9°	5	81-88	84.2°						
Lu°61—(S.M. others unknown)												
Right	4	80-84	82.0°	5	74-82	79.6°	4	80-84	82.0°	3	80-82	81.0°
Left	6	81-87	82.5°	5	81-88	84.2°	4	81.82	81.8°	3	81-88	83.3°
Lu°72—(Combined)												
Right	7	77-84	81.3°	4	80-84	81.8°						
Left	6	82-84	83.0°	4	81-85	82.3°						
Lu°72—(S.M.)												
Right	5	77-84	81.0°	2	80-81	80.5°	3	77-82	80.0°	2	80-81	80.5°
Left	3	83-84	83.3°	3	81-82	81.5°	3	83-84	83.3°	2	81-82	81.5°
Lu°72—(K.I.)												
Right	2	81-83	82.0°	---	.....	.....	2	81.83	82.0°	---	.....	.....
Left	2	83	83.0°	---	.....	.....	2	83	83.0°	---	.....	.....
Lu°25—(Combined)												
Right	82	72-84	80.9°	39	76-90	81.8°						
Left	84	74-94	82.8°	41	75-90	83.5°						
Lu°25—(S.M.)												
Right	48	74-87	80.8°	21	76-86	81.8°	39	74-86	80.7°	13	76-86	81.5°
Left	52	74-91	82.6°	26	75-89	83.0°	39	76-86	82.6°	13	78-85	82.5°
Lu°25—(K.I.)												
Right	29	72-86	80.6°	16	77-90	81.6°	21	72-86	80.4°	13	78-90	82.3°
Left	26	75-94	83.0°	14	81-90	84.5°	21	75-94	83.3°	13	81-90	84.5°

CONDYLO-DIAPHYSIAL ANGLES

PICKWICK (Sites)—Continued

	UNPAIRED						PAIRED					
	MALE			FEMALE			MALE			FEMALE		
	No.	Range	Mean	No.	Range	Mean	No.	Range	Mean	No.	Range	Mean
Luv92—(All K.I.)												
Right	26	74-86	81.4°	21	73-88	82.1°	20	74-86	80.8°	20	73-88	82.0°
Left	28	78-88	83.3°	20	78-88	83.4°	20	78-88	83.6°	20	78-88	83.4°
Lu°59 (Combined)												
Right	34	75-89	81.6°	25	75-95	82.0°						
Left	31	78-92	82.8°	23	80.88	84.0°						
Lu°59—(K.I.)												
Right	11	75-87	82.2°	4	80-95	87.8°	8	78-87	83.0°	4	80.95	87.8°
Left	10	80-92	83.7°	5	81-87	83.2°	8	80.84	83.4°	4	81-87	83.8°
Lu°59—(S.M.)												
Right	19	77-89	81.1°	17	76-85	80.8°	11	77-89	81.6°	13	76-85	81.5°
Left	16	78-88	82.5°	16	80-88	84.2°	11	78-88	82.7°	13	80-88	84.5°
Ct°8 (Combined)												
Right	17	72-86	80.2°	24	74-88	81.3°						
Left	16	78-87	82.4°	22	79-88	82.6°						
Ct°8—(K.I.)												
Right	3	81-86	83.7°	5	78-84	81.0°	3	81-86	83.7°	4	78-84	80.8°
Left	4	82-85	83.8°	5	80-85	82.8°	3	83-85	84.3°	4	82-85	83.5°
Ct°8—(S.M.)												
Right	11	72-85	79.0°	14	77-86	80.9°	8	72-85	79.4°	9	77-85	79.9°
Left	10	78-87	81.9°	12	79-87	82.1°	8	78-87	81.8°	9	79-87	82.2°
Ct°27—(S.M.)												
Right	22	77-88	81.4°	17	78-86	80.9°	15	77-88	81.7°	9	78-83	80.4°
Left	21	77-88	83.5°	14	79-89	82.6°	15	77-88	83.8°	9	79-84	81.4°
Ct.°27—(K.I. 1 L. Male No. R.)												
Right	...	.....	.....	...	.....	.....	...	.....	.....	...	.....	...
Left	1	.....	84°	...	.....	.....	...	.....	.....	...	.....	...
Lu°67—(S.M. No. K.I.)												
Right	15	75-83	79.1°	15	76-89	81.8°	11	75-83	79.2°	12	76-89	82.2°
Left	14	76-87	80.9°	13	81-88	83.8°	11	76-85	80.6°	12	81-88	83.8°
Total Pickwick												
Right	210	72-89	81.0°	154	73-95	81.6°						
Left	211	74-94	82.8°	144	75-90	83.3°						

CONDYLO-DIAPHYSIAL ANGLES

PICKWICK (Sites)—Continued

	UNPAIRED						PAIRED					
	MALE			FEMALE			MALE			FEMALE		
	No.	Range	Mean	No.	Range	Mean	No.	Range	Mean	No.	Range	Mean
Total Pickwick—(S.M.)												
Right	125	72-89	80.6°	92	74-89	81.2°	91	72-89	80.7°	61	76-89	81.2°
Left	123	74-91	82.5°	89	75-89	83.2°	91	76-89	82.5°	61	78-88	83.0°
Total Pickwick—(K.I.)												
Right	71	72-87	81.6°	47	73-95	82.3°	54	72-87	81.2°	41	73-95	82.5°
Left	71	75-94	83.3°	44	48-90	83.7°	54	75-94	83.4°	41	78-90	83.8°

GUNTERSVILLE (Sites)

Ms°80												
Right	9	77-82	80.0°	9	77-83	82.1°	5	77-82	80.2°	8	77-83	82.0°
Left	8	80-84	82.4°	14	78-87	83.6°	5	80-84	82.4°	8	78-86	83.4°
Ms°91—Unit I												
Right	6	79-84	81.7°	6	81-86	82.8°	4	80-84	82.2°	6	81-86	82.8°
Left	5	80-87	82.6°	8	80-90	85.9°	4	80-87	83.0°	6	80-90	86.0°
Ms°91—Unit II												
Right	7	75-84	80.3°	6	77-83	80.8°	7	75-84	80.3°	5	78-83	81.6°
Left	10	78-84	81.4°	9	79-86	82.4°	7	78-84	81.1°	5	81-86	83.6°
Jav155												
Right	15	78-90	81.5°	5	79-88	82.6°	12	78-90	80.9°	2	81-88	84.5°
Left	14	78-88	83.3°	6	80-90	84.3°	12	78-88	82.9°	2	83-89	86.0°
Jav155-A												
Right	—	———	———	1	———	82.0°	—	———	———	1	———	82.0°
Left	—	———	———	1	———	84.5°	—	———	———	1	———	84.5°
Jav28												
Right	9	71-84	79.2°	13	74-93	81.5°	3	78-82	80.0°	11	74-84	80.6°
Left	5	78-84	81.8°	12	77-86	81.8°	3	81-84	82.7°	11	77-86	81.4°
Ja°28-A												
Right	2	78-81	79.5°	3	81-84	82.0°	2	78-81	79.5°	2	81-84	82.5°
Left	2	81-82	81.5°	2	82-84	83.0°	2	81-82	81.5°	2	82-84	83.0°
Jav27												
Right	3	78-83	81.0°	—	———	———	1	———	82.0°	—	———	———
Left	1	———	86.0°	—	———	———	1	———	86.0°	—	———	———
Jav27-A												
Right	1	———	74.0°	—	———	———	—	———	———	—	———	———
Left	—	———	———	—	———	———	—	———	———	—	———	———

CONDYLO-DIAPHYSIAL ANGLES

GUNTERSVILLE (Sites)—Continued

	UNPAIRED						PAIRED					
	MALE			FEMALE			MALE			FEMALE		
	No.	Range	Mean	No.	Range	Mean	No.	Range	Mean	No.	Range	Mean
Jav102												
Right	8	76-86	79.6°	2	77-79	78.0°	5	76-86	79.2°	1	-----	79.0°
Left	6	81-88	83.2°	1	-----	83.0°	5	81-88	83.2°	1	-----	83.0°
Guntersville Sites Combined												
Right	60	71-90	80.3°	45	74-93	81.7°	39	75-90	80.5°	36	74-88	81.7°
Left	51	78-88	82.5°	53	77-90	83.4°	39	78-88	82.4°	36	77-90	83.4°

CONDYLO-DIAPHYSIAL ANGLES

TABLE OF MISCELLANEOUS GROUPS

GRAND TOTAL

	Number	Range	Mean	S. D.	V.
Left					
Right	1026	71-95	82.07±0.07	3.24±0.05	3.95±0.06

UNPAIRED MEASUREMENTS

TOTAL SERIES—MALES

Left	284	74-94	82.67±0.12	2.97±0.08	3.59±0.10
Right	294	71-90	80.72±0.12	3.14±0.09	3.89±0.11

TOTAL SERIES—FEMALES

Left	224	73-90	83.41±0.14	2.90±0.09	3.48±0.11
Right	224	73-95	81.74±0.15	3.32±0.11	4.06±0.13

TOTAL KOGER'S ISLAND—MALES (Paired)

Left	61	75-94	83.08±0.27	3.10±0.19	3.73±0.23
Right	61	72-87	80.98±0.27	3.09±0.19	3.82±0.24

TOTAL KOGER'S ISLAND—FEMALES (Paired)

Left	46	78-90	84.13±0.27	2.69±0.19	3.20±0.23
Right	46	73-95	82.78±0.43	4.30±0.30	5.19±0.36

TOTAL SHELL MOUND—MALES (Paired)

Left	102	76-89	82.25±0.20	3.04±0.14	3.70±0.17
Right	102	72-89	81.50±0.22	3.24±0.15	3.98±0.19

TOTAL SHELL MOUND—FEMALES (Paired)

Left	72	73-88	82.94±0.23	2.86±0.16	3.44±0.20
Right	72	75-89	81.29±0.22	2.78±0.15	3.42±0.19

PICKWICK KOGER'S ISLAND—MALES (Paired)

Left	54	75-94	83.37±0.28	3.08±0.20	3.69±0.24
Right	54	72-87	81.20±0.28	3.12±0.20	3.84±0.25

PICKWICK KOGER'S ISLAND—FEMALES (Paired)

Left	41	78-90	83.83±0.28	2.68±0.20	3.20±0.24
Right	41	73-95	82.54±0.45	4.32±0.32	5.23±0.39

CONDYLO-DIAPHYSIAL ANGLES

TABLE OF MISCELLANEOUS GROUPS—Continued

	Number	Range	Mean	S. D.	V.
			PICKWICK SHELL MOUND—MALES (Paired)		
Left	91	76-89	82.47±0.21	3.02±0.15	3.66±0.18
Right	91	72-89	80.71±0.23	3.28±0.16	4.06±0.20
			PICKWICK SHELL MOUND—FEMALES (Paired)		
Left	61	78-88	82.98±0.22	2.48±0.15	2.99±0.18
Right	61	76-89	81.20±0.23	2.58±0.15	3.18±0.20
			TOTAL GUNTERSVILLE—MALES (Paired)		
Left	39	78-88	82.36±0.26	2.46±0.19	2.99±0.23
Right	39	75-90	80.51±0.30	2.84±0.22	3.53±0.27
			TOTAL GUNTERSVILLE—FEMALES (Paired)		
Left	36	77-90	83.36±0.34	3.07±0.24	3.68±0.29
Right	36	74-88	81.72±0.30	2.70±0.22	3.30±0.26

COMPARATIVE TABLE

CONDYLO-DIAPHYSIAL ANGLES

BOTH SIDES COMBINED—UNPAIRED

MALES

	Number	Range	Mean
Total Alabama	578	71-94	81.70°
Total Paltacalo	32	78-89	83.97°
Total Pecos Pueblo	288	76-94	84.21°

FEMALES

Total Alabama	448	73-95	82.58°
Total Paltacalo	28	79-91	85.46°
Total Pecos Pueblo	180	80-96	85.74°

RIGHT AND LEFT SEPARATE—UNPAIRED

MALES

	Number	Range	Mean	S. D.	V.
Left					
Total Alabama	284	74-94	82.67±0.12	2.97±0.08	3.59±0.10
Total Paltacalo	17	----	84.1	----	----
Total Pecos Pueblo	144	76-94	84.57±0.17	2.96±0.12	3.50±0.14
Right					
Total Alabama	294	71-90	80.72±0.12	3.14±0.09	3.89±0.11
Total Paltacalo	15	----	84.8	----	----
Total Pecos Pueblo	144	76-94	83.85±0.18	3.14±0.12	3.74±0.15

FEMALES

Left					
Total Alabama	224	73-90	83.41±0.14	2.90±0.09	3.48±0.11
Total Paltacalo	19	----	85.5	----	----
Total Pecos Pueblo	87	80-96	85.70±0.21	2.84±0.15	3.31±0.17
Right					
Total Alabama	224	73-95	81.74±0.15	3.32±0.11	4.06±0.13
Total Paltacalo	9	----	84.8	----	----
Total Pecos Pueblo	93	80-94	85.77±0.20	2.86±0.14	3.33±0.16

CONDYLO-DIAPHYSIAL ANGLES

P.E.D. Between Means of Alabama and Pecos Pueblo[1]

Males

Left *Unpaired* *Right*

Pecos Pueblo Av.	= 84.57±0.17	Pecos Pueblo Av.	= 83.85±.018
Total Alabama Av.	= 82.67±0.12	Total Alabama Av.	= 80.72±0.12
diff	= 1.90	diff.	= 3.13
P.E.D.	= .2081	P.E.D.	= .2164

Females

Left *Unpaired* *Right*

Pecos Pueblo Av	= 85.70±0.21	Pecos Pueblo Av.	= 85.77±0.20
Total Alabama Av.	= 83.41±0.14	Total Alabama Av.	= 81.74±0.15
diff.	= 2.29	diff.	= 4.03
P.E.D.	= .2523	P.E.D.	= .2500

P.E.D. Between Right and Left

Unpaired

Total Series—Males *Total Series—Females*

Total Alabama Av. L.	= 82.67±0.12	Total Alabama Av. L.	= 83.41±0.14
Total Alabama Av. R.	= 80.72±0.12	Total Alabama Av. R.	= 81.74±0.15
diff.	= 1.95	diff	= 1.67
P.E.D.	= .1697	P.E.D.	= .2052

Paired

Total Guntersville—Males *Total Guntersville—Females*

Total Alabama Av. L.	= 82.36±0.26	Total Alabama Av. L.	= 83.36±0.34
Total Alabama Av. R.	= 80.51±0.30	Total Alabama Av. R.	= 81.72±0.30
diff.	= 1.85	diff.	= 1.64
P.E.D.	= .3970	P.E.D.	= .4534

[1] The Standard formula P.E.M. = .6745 $\sigma/\sqrt{n}$ has been used to determine whether or not differences between these series are significant. When the differences are more than 3x Probable Error of the Difference (3xP.E.D.) they are considered significant and are underlined above. Differences less than 3x Probable Error of the Difference (3x P.E.D.) but more than 2x Probable Error (2x P.E.D.) of the difference may possibly be significant and are indicated by broken underlines.

CONDYLO-DIAPHYSIAL ANGLES

P.E.D. Between Right & Left—Continued

Paired

Total Koger Island—Males

Total Alabama Av. L. = 83.08±0.27
Total Alabama Av. R. = 80.98±0.27

diff. = 2.10
P.E.D. = .3818

Total Koger Island—Females

Total Alabama Av. L. = 84.13±0.27
Total Alabama Av. R. = 82.78±0.43

diff. = 1.35
P.E.D. = .5077

Paired

Total Shell Mound—Males

Total Alabama Av. L. = 82.25±0.20
Total Alabama Av. R. = 81.50±0.22

diff. .75
P.E.D. .2973

Total Shell Mound—Females

Total Alabama Av. L. = 82.94±0.23
Total Alabama Av. R. = 81.29±0.22

diff. 1.65
P.E.D. .3183

Paired

Pickwick K.I.—Males

Total Alabama Av. L. = 83.37±0.28
Total Alabama Av. R. = 81.20±0.28

diff. = 2.17
P.E.D. = .3960

Pickwick K.I.—Females

Total Alabama Av. L. = 83.83±0.28
Total Alabama Av. R. = 82.54±0.45

diff. = 1.29
P.E.D. = .5300

Paired

Pickwick S.M.—Males

Total Alabama Av. L. = 82.47±0.21
Total Alabama Av. R. = 80.71±0.23

diff. = 1.76
P.E.D. = .3115

Pickwick S.M.—Females

Total Alabama Av. L. = 82.98±0.22
Total Alabama Av. R. = 81.20±0.23

diff. = 1.78
P.E.D. = .3183

P.E.D Between Males & Females

Unpaired

Total Serie—Males & Females—Right

Total Alabama Av. Fem. R.=81.74±0.15
Total Alabama Av. Male R.=80.72±0.12

diff. = 1.02
P.E.D. =.1922

Total Series—Males & Females—Left

Total Alabama Av. Fem. L.=83.41±0.14
Total Alabama Av. Male L.=82.67±0.12

diff. = .74
P.E.D. =.1843

CONDYLO-DIAPHYSIAL ANGLES

P.E.D. Between Males & Females—Continued

Paired

Total Guntersville—Males & Females R.

Total Alabama Av. Fem. R.=81.72±0.30
Total Alabama Av. Mal. R.=80.51±0.30

diff. = 1.21
P.E.D. = .4240

Total Guntersville—Males & Females L.

Total Alabama Av. Fem. L.=83.36±0.34
Total Alabama Av. Mal. L.=82.36±0.26

diff. = 1.00
P.E.D. = .4280

Paired

Total K.I.—Males & Females—Right

Total Alabama Av. Fem. R.=82.78±0.43
Total Alabama Av. Mal. R.=80.98±0.27

diff. = 1.80
P.E.D. = .5077

Total K.I.—Males & Females—Left

Total Alabama Av. Fem. L.=84.13±0.27
Total Alabama Av. Mal. L.=83.08±0.27

diff. = 1.05
P.E.D. = .3818

Paired

Total S.M. Males & Females—Right

Total Alabama Av. Mal. R.=81.50±0.22
Total Alabama Av. Fem. R.=81.29±0.22

diff. = .21
P.E.D. = .3112

Total S.M. Males & Females—Left

Total Alabama Av. Fem. L.=82.94±0.23
Total Alabama Av. Mal. L.=82.25±0.20

diff. = .69
P.E.D. = .3048

Paired

Pickwick K.I. Males & Females—Right

Total Alabama Av. Fem. R.=82.54±0.45
Total Alabama Av.Males R.=81.20±0.28

diff. = 1.34
P.E.D. = .5300

Pickwick K.I. Males & Females—Left

Total Alabama Av. Fem. L.=83.83±0.28
Total Alabama Av.Males L.=83.37±0.28

diff. = .46
P.E.D. = .3960

Paired

Pickwick S.M. Males & Females—Right

Total Alabama Av. Fem. R.=81.20±0.23
Total Alabama Av.Males R.=80.71±0.23

diff. = .49
P.E.D. = .3253

Pickwick S.M. Males & Females—Left

Total Alabama Av. Fem. L.=82.98±0.22
Total Alabama Av.Males L.=82.47±0.21

diff. = .51
P.E.D. = .3041

CONDYLO-DIAPHYSIAL ANGLES

P.E.D. Between Shell Mound & Koger's Island

Paired

Total S.M. & K.I. Males—Right

Total Alabama S.M. Av. R.=81.50±0.22
Total Alabama K.I. Av. R.=80.98±0.27

diff. = .52
P.E.D. =.3483

Total S.M. & K.I. Males—Left

Total Alabama K.I. Av. L.=83.08±0.27
Total Alabama S.M. Av. L.=82.25±0.20

diff. = .83
P.E.D. = .3360

Paired

Total K.I. & S.M. Males—Right

Total Alabama K.I. Av. R.=82.78±0.43
Total Alabama S.M. Av. R.=81.29±0.22

diff. = 1.49
P.E.D. = .4830

Total K.I. & S.M. Females—Left

Total Alabama K.I. Av. L.=84.13±0.27
Total Alabama S.M. Av. L.=82.94±0.23

diff. = 1.19
P.E.D. =.3547

Paired

Pickwick K.I. & S.M. Males—Right

Total Alabama K.I. Av. R.=81.20±0.28
Total Alabama S.M. Av. R.=80.71±0.23

diff = .49
P.E.D. =.3624

Pickwick K.I. & S.M. Males—Left

Total Alabama K.I. Av. L.=83.37±0.28
Total Alabama S.M. Av. L.=82.47±0.21

diff. = .90
P.E.D. = .3500

Paired

Pickwick K.I. & S.M. Females—right

Total Alabama K.I. Av. R.=82.54±0.45
Total Alabama S.M. Av. R.=81.20±0.23

diff. = 1.34
P.E.D. =.5054

Pickwick K.I. & S.M. Females—Left

Total Alabama K.I. Av. L.=83.83±0.28
Total Alabama S.M. Av. L.=82.98±0.22

diff. = .85
P.E.D. =.3561

CONDYLO-DIAPHYSIAL ANGLES

WHEELER BASIN

Ma°48

Males			Females		
No.	Right	Left	No.	Right	Left
142	----	85.5°	22	78.5°	----
103	80.5°	83.5	18	----	88°
34	81.5	86	10	82	----
168	81	79.5	7	80	83
93	83.5	----	66	76.5	78
96	81.5	79	87	82	----
24	82	----	75	----	88.5
21	----	86	151	83	85.5
58	81	80	2	75	73.5
113	77.5	80.5	3	85	86
110	82	----	129	84	87
127	78	----	132	91	88
97	75.5	80	73	88	87
164	77	83	68	----	79
45	77	77	67	81	87
130	78	79	124	----	82.5
95	----	82	125	87.5	----
145	80	81	102	----	84
41	83	85	163	----	85
14	78.5	81.5	99	----	82
121	80	84	35	83.5	84
165	81	79	36	86	87
74	80	----	59	81	78.5
137	84	87.5	94	82.5	----
53	80	82	40	83.5	86
43	76.5	79.5	61	----	81
26	76	77	119	84	----
			120	83.5	85
			86	80.5	----
			82	83.5	86
			148	80	83
			149	86.5	87
			128	81.5	82
			140	----	82

CONDYLO-DIAPHYSIAL ANGLES

PICKWICK BASIN

Ct°27

Males

No.	Right	Left	No.	Right	Left
135	82°	86°	9	79°	84°
26	(80)	84	52	----	82
105	(83)	----	11	----	82.5
97	82	----	114	----	84
55	79.5	----	45	81	----
84	80	81	56	77	77.5
117	79	84	40	84	----
83	79	82.5	99	----	88
78	87	88	75	83	82.5
88	86.5	88.5	116	88	88
72	82.5	----	28	----	78.5
86	81	----	27	82.5	84
4	82	84	98	----	82
22	82.5	83	92	82	86
80	77	----	25	78	80.5

Females

111	81	----	57	82.5	----
54	----	89	107	86	----
2	82	----	3	80	80.5
51	----	85	1	80	----
136	78	----	23	----	84
69	81	79	36	80	----
137	80	84.5	53	83	----
118	83	84.5	33	----	83
77	78	81	34	79	79
21	81	82	49	81	82.5
?	----	83	113	81	82

PICKWICK BASIN

Lu°67

Males

No.	Right	Left	No.	Right	Left
63	----	87°	88	79°	----
57	77°	79	89	77	77°
55	80	----	69	82.5	82
58	----	78	75	79	83

CONDYLO-DIAPHYSIAL ANGLES

PICKWICK BASIN

Lu°67—(Continued)

No.	Right	Left	No.	Right	Left
11	79°	----	76	81.5°	85°
18	75.5	76°	74	----	82.5
27	83	82	65	76	76.5
21	81	84	81	83.5	82.5
16	78	----	64	77.5	80
Females					
36	81	85	8	81	82.5
25	82.5	(80)	12	80	82
40	80	87	14	82.5	83.5
62	78.5	----	15	83	84
54	76.5	82	82	18	----
53	89	82	73	82.5	85
2	82	85.5	77	87	88
7	----	83	68	83.5	81.5

PICKWICK BASIN

Lu°25

	Males			Females	
No.	Right	Left	No.	Right	Left
355	83.5°	89°	403	85°	82.5°
460	----	85	354	84	----
463	76	79.5	454	----	83.5
359	80	----	365	(80)	----
377	----	83	376	86	----
416	82	84	453	79	80
455	(80)	79	401	87	87.5
469	81.5	83	470	84.5	----
388	83	(80)	360	----	84.5
458	79	79.5	465	82	85
505	80	84.5	95	----	86.5
16	83	86.5	179	----	86.5
480	----	74	326	81	87
394	80.5	----	24	86.5	84.5
372	----	83.5	216	----	81.5
361	----	80	226	80	82
415	75.5	77	247	----	84
413	82	75.5	162	83	85

CONDYLO-DIAPHYSIAL ANGLES

PICKWICK BASIN

Lu°25—(Continued)

Males			Females		
No.	Right	Left	No.	Right	Left
408	80°	----	180	84°	83°
392	86	85°	171	----	84
400	85	----	165	81	83
374	82.5	83	55	82.5	82.5
72	81.5	80	59	77	----
3	83	81.5	32	----	86
84	81	89	141	----	80.5
21	78.5	----	31	(86.5)	85
263	78	----	36	81	----
161	79.5	84	277	85	86
20	83	----	69	86	----
222	----	80	183	82	----
134	81	84.5	75	81	80
23	77	----	158	79	82.5
25	78	----	239	80.5	84
44	84.5	----	152	79	83
66	82	----	77	81	(82)
166	80.5	82.5	19	79	----
242	(85)	87	198	90	90
256	81	81	13	84	85
147	83	----	11	79	----
6	75.5	81	254	76	78
170	----	84	163	82.5	85
135	80	82	287	82	84
215	79	82	133	78	(80.5)
28	----	82	164	78	81
33	78	83	324	----	88
83	76.5	79	322	80.5	83
192	----	82.5	82	----	(82.5)
207	----	78	200	----	80
229	----	84.5	244	80	----
107	87.5	----			
114	80	84.5			
314	78	79			
304	80	81.5	103	84	83.5
110	83	(88)	27	80	81.5
112	83.5	82.5	126	----	89.5
174	79.5	84	300	(75.5)	----
220	85	86	342	82	84.5
259	----	83	270	----	75
115	83.5	84.5	100	83.5	84.5

CONDYLO-DIAPHYSIAL ANGLES

PICKWICK BASIN

Lu°25—(Continued)

Males			Females		
No.	Right	Left	No.	Right	Left
283	77.5°	79°			
57	83	87			
93	(83)	85.5			
320	----	91			
223	82.5	80.5			
206	79	84			
278	81	83			
178	81.5	94			
310	77	79			
327	82.5	----			
51A	----	80			
50	84.5	89.5			
305	74.5	76			
39	86	83			
335A	84.5	84.5			
335B	83	85			
48	84	----			
54	80.5	84.5			
131	79	78.5			
302	78	81			
343	79	82			
348	84.5	----			
38	78.5	----			
14	87	----			
25	81	82.5			
47	72	75			
169	80	86			
62	----	82.5			
130	84.5	84.5			
175	83.5	85			
52	80	85.5			
76	83.5	82.5			
315	77.5	80			
341	(84)	85			
340	79	84.5			
312	83	86			
347	82.5	87.5			
219	86	88			
86	----	84			
122	85.5	82.5			
296	85.5	86.5			

CONDYLO-DIAPHYSIAL ANGLES

PICKWICK BASIN

Lu°25—(Continued)

Males		
No.	Right	Left
127	----	84.5°
125	----	83
111	85°	85
92	78.5	82

Lu°72

Males			Females		
No.	Right	Left	No.	Right	Left
21	77.5°	83°	8	80°	81°
15	81.5	----	7	81	82
14	----	82.5	19	82	81
18	84	----	2	84	85
13	81.5	84.5			
9	82	83.5			
6	81	83			
3	83	83			

Lu°61

Males			Females		
No.	Right	Left	No.	Right	Left
20	80°	82.5°	27	81°	81°
3	82	82	57	82.5	81.5
4	----	87.5	58	74	----
5	84	81.5	60	(82)	88.5
2	82	82	----	----	----
30	----	85.5	8	----	83
39	75	82	7	82.5	----
29	82.5	84.5	16	80	88
55	----	81	51	79	----
			54	81	----

Lu°21

Males			Females		
No.	Right	Left	No.	Right	Left
----	----	----	13	80°	----

CONDYLO-DIAPHYSIAL ANGLES

PICKWICK BASIN

Lu°5

Males			Females		
No.	Right	Left	No.	Right	Left
4	78.5°	----	1	----	81°
7	----	81°	3	83°	----
----	----	----	5	----	79.5

Ct°8

Males			Females		
No.	Right	Left	No.	Right	Left
74	86°	85.5°	134	78.5°	82°
12	84	83	135	84	82.5
14	81	85	93	82	----
			136	80.5	85
9	----	85	35	81.5	85.5
			34	----	80
24	78	81	1	80.5	81
57	78	80	23	83	82
59	85.5	84.5	27	----	79.5
73	74	----	36	83	----
75	----	80	45	85	85
81	72	78.5	58	78	80.5
95	83.5	82	78	83	83.5
121	80.5	83	66	78	82
153	78	79	67	78	79.5
110	78.5	----	76	88	88.5
79	86.5	85	100	80	86.
137	----	82.5	112	----	86.5
6	82	87	123	----	84.5
117	82	----	128	81	----
157	80	----			
158	77	80	82	83	----
			150	85	87
			152	74	79
			71	----	80
			120	82	----
			133	82	----
			163	77	82
			131	80	81.5
			156	86	----

CONDYLO-DIAPHYSIAL ANGLES

PICKWICK BASIN

Luv92

Males			Females		
No.	Right	Left	No.	Right	Left
35	79.5°	83.5°	67	78.5°	78°
60	----	79	65	82	79.5
66	86.5	----	45	79.5	82.5
13	79.5	81	25	85	85
95	----	84	47	88	88.5
59	----	84.5	91	76	80
32	----	80.5	16	85	86.5
95	----	84	33	73	79
41	85	86	30	84	84.5
34	82	----	78	80	85.5
39	80	84	24	78	82
31	----	85	46	87	87.5
36	82	82	53	(79)	----
17	83	----	14	84	----
5	78	78	87	82.5	82
54	75.5	83.5	26	85.5	86.5
90	74.5	80	89	83	83
21	84.5	85	57	87.5	87.5
23	86	87	81	79	82
38	86	----	101	82	81
4	79	----	83	83.5	85
93	81.5	86.5	42	(80.5)	(87)
22	83	84	72	84	88
15	80.5	85			
70	81.5	82			
94	----	83.5			
11	80.5	79			
79	----	80			
74	81	88			
40	83	----			
6	80	82.5			
61	82	86			
20	86	88.5			
92	80	84			

CONDYLO-DIAPHYSIAL ANGLES

PICKWICK BASIN

Lu°59

Males			Females		
No.	Right	Left	No.	Right	Left
47	84°	83°	124	78.5°	81°
105	80	82	159	84	83
107	78.5	78.5	173	----	81.5
133	87	----	2	94.5	87
141	79	83	16	82	86
150	81	----	18	95.5	84.5
4	----	92	22	82.5	83.5
27	84.5	83	81	80	81
30	81.5	80.5	190	83	84.5
41	89	86.5	164	----	83.5
54	84	81.5	151	----	83
66	82	82	121	82	84
75	81	83.5	113	83	84
78	----	83.5	109	76	82.5
85	86.5	84	59	84	85
86	87	83	80	79	84
198	87	88.5	49	85.5	88
179	82	85	43	81.5	----
155	80	----	154	84	85
144	----	84	145	----	84.5
153	78.5	----	139	84.5	87
192	79.5	----	99	79	----
127	75	----	61	82	86
120	78.5	84.5	92	77.5	----
119	80	83	Misc.	82	----
77	----	81.5	Misc.	75.5	----
185	84	----	45	83.5	88
91	----	86	35	78	80
60	81	81	6	77	
69	77.5	84.5			
70	81.5	----			
15	89	88.5			
42	81	----			
51	----	81			
65	----	79.5			
Misc.	----	80			
Misc.	----	82.5			
Misc.	85.5	----			
28	78.5	----			

CONDYLO-DIAPHYSIAL ANGLES

PICKWICK BASIN

Lu°59—(Continued)

Males			Females		
No.	Right	Left	No.	Right	Left
23	77.5°	----			
208	----	83			
200	79	81			
195	81	----			
194	79	78.5			

GUNTERSVILLE BASIN

Jav155

Males			Females		
No.	Right	Left	No.	Right	Left
8	80°	82.5°	5	----	81°
6	----	86	12	----	83
7	79.5	85.5	15	----	90
14	84.5	88.5	19	----	80
17	79.5	80	28	82°	----
18	90	87	29	88	89
21	81	----	33	81	83
22	81	83	35	79	----
24	80	80.5	43	83	----
25	80.5	83			
26	80	84			
31	----	83			
34	79	84			
36	84.5	----			
42	78.5	78			
44	86.5	----			
46	81.5	83			

Jav28

Males			Females		
No.	Right	Left	No.	Right	Left
68	----	83°	37	84°	81°
62	80°	----	33	83	83

CONDYLO-DIAPHYSIAL ANGLES

GUNTERSVILLE BASIN

Jav28—(Continued)

Males			Females		
No.	Right	Left	No.	Right	Left
64	71.5°	----	40	81.5°	79°
11	81	----	39	82	80
16	78	81°	73	74.5	77
18	82	84	65	80	86
58	76	----	70	----	86.5
54	80.5	83.5	47	81.5	----
55	81.5	----	48	81	81
59	84	----	46	74	79
60	----	78.5	56	84.5	82.5
			7	82.5	84
			17	93	----
			19	81	83

Jav27

Males			Females		
No.	Right	Left	No.	Right	Left
6	82.5°	86.5°			
11	83				
12	78				

Ja°28-A

Males			Females		
No.	Right	Left	No.	Right	Left
3	78.5°	81.5°	9	84°	84°
14	81.5	82.5	11	81	----
----	----	----	13	81	82

Jav155A

			1	82	84.5

Ja°102

Males			Females		
No.	Right	Left	No.	Right	Left
2	79.5°	----	13	77°	----
5	76	82°	18	79	83°
6	84.5	----			
8	80.5	82			
11	----	83			
17	86	88.5			

CONDYLO-DIAPHYSIAL ANGLES

GUNTERSVILLE BASIN

Ja°102—(Continued)

Males		
No.	Right	Left
21	76°	81°
22	78.5	83
25	78	----

Jav27A

Males			Females		
No.	Right	Left	No.	Right	Left
2	74°	----			

Ms°91 Unit I

Males			Females		
No.	Right	Left	No.	Right	Left
11	83°	87.5°	7	81°	80.5°
20	82.5	----	8	82	83
33	80	81	9	81	85
34	82	80.5	24	86	90
38	79	----	27	83	90.5
42	----	81	44	84	88
52	84.5	84.5	48	----	85
			47	----	86

Ms°91 Unit 2

Males			Females		
No.	Right	Left	No.	Right	Left
12	80°	79.5°	3	78°	82°
13	80	81	7	77	----
24	----	83.5	14	82	83
31	83	81.5	17	82	81.5
51	75	78	18	----	83
75	83	84.5	74	83	86.5
76	----	82.5	107	----	82.5
97	----	81.5	114	----	79
115	77	81.5	138	----	80
52	84	84	154	83.5	86

CONDYLO-DIAPHYSIAL ANGLES

GUNTERSVILLE BASIN

Ms°80

Males			Females		
No.	Right	Left	No.	Right	Left
6	79.5°	—	38	82.5°	85.5°
9	80	83°	20?	—	87.5
11	82	82	11?	83	—
10	80	—	15	—	87.5
44	77.5	82	25	83.5	86
57	78	—	28	83.5	82
51	—	80	40	—	81
62	81	81	41	83.5	82.5
49	81	84	54	—	82
80	82.5	—	55	83	84
26	(80)	84.5	36	83.5	85
37	—	83	7	—	84.5
			23	77	78
			38	82.5	85.5
			58	—	83

Left
85.5°
87.5
—
87.5
86
82
81
82.5
82
84
85
84.5
78
85.5
83

SCALE MODEL OF THE BESSEMER SITE
Location of the mounds in relation to the surrounding terrain at time of excavation.