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A PRELIMINARY STUDY OF THE CHINESE HUMERUS

By T. L. WOO

1. *Introductory.* The humerus is one of the important parts of the human skeleton which has usually been considered to be a great aid for the purposes of discriminating or classifying the racial varieties of modern man. The available anthropometric data of this bone for different races are far more slender than those of the cranium. It is particularly so for the Oriental material. During the last few decades only a few decent studies of the Chinese skeleton by different authors have been published. In 1902, Haberer* in his study gave a short account of the northern Chinese humerus characters with a list of measurements but the sample taken is too small to arrive at any definite results. In 1923, Davidson Black** published a valuable memoir on Chinese skeletal remains. The nine principal bones including the humerus were investigated. The specimens he measured consist of the three Chinese series, two from the prehistoric sites—Sha Kuo T'un in Liaoning and Yang Shao Ts'un in Honan and one of modern date from the North China plain. However, his data required for investigation are still by no means extensive and they are all drawn from the restricted area of North China. Four years later (1929), Paul Huston Stevenson† took the maximum lengths of the right humerus of 43 northern Chinese as well as lengths of their other long bones. The main purpose of his study is to obtain the stature reconstruction formulae for the Chinese. Hence, all of these studies referred to dealt with the humerus generally in conjunction with other parts of the corresponding skeleton. The need for a more comprehensive study of this particular bone based on a larger sample drawn from other parts of China has long been felt.

The object of the present study is to throw some new light on the features of the Chinese humerus. The problems we endeavor to answer are threefold: (a) Are the characters of the Chinese humerus asymmetrical in type? If so, on what side are they predominant?, (b) Do the characters of the Chinese humerus show any marked sexual differentiation? (c) What differences are found when comparisons are made between the present material and available data of the same or different races?

2. *The Material Measured.* The material dealt with in this paper consists of the two series of the Chinese humeri preserved in the Museum of the Institute of History and Philology, Academia Sinica. The specimens were carefully sexed according to the characteristics of this bone as well as those of the corresponding crania and other skeletal parts. They all represent

* Haberer, K. A.: *Schädel und Skeletteile aus Peking*, I. Band, pp. 136-137 (1902).

** Black, Davidson: *The Human Skeletal Remains from the Sha Kuo T'un Cave Deposit in Comparison with Those from Yang Shao Ts'un and with Recent North China Skeletal Material*. *Palaeontologia Sinica*, Series D, Volume I, Fascicle 3, pp. 83-94 (1923).

† Stevenson, P. H.: *On Racial Differences in Stature Long Bone Regression Formulae, with Special Reference to Stature Reconstruction Formulae for the Chinese*. *Biometrika*, Vol. XXI, Parts I to IV, pp. 313-331 (1929).

the bones of the adult. No immature specimen was included. In the majority of cases, they were kept in good condition except for a few cases which were defective or broken at the proximal or distal epiphysis or at both ends. The source of these series is:

(a) Hsiao T'un series: The Chinese skeletons of the Sui-T'ang dynasties (581-899 A.D.) together with their corresponding skulls were excavated in 1929-1932 by the Archaeological Section of this Institute from several cemeteries at Hsiao T'un, Anyang. A detailed account of the discovery of the material is given in a report on "A Study of the Chinese crania of the Sui-T'ang dynasties excavated from Hsiao T'un, Anyang". This series consists of 22 right and 21 left humeri, 28 ♂'s and 15 ♀'s.

(b) Hsiu Chiu Shan series: The skeletons of the present series together with their crania were collected by the writer in the Summer of 1936 from unclaimed graves at Hsiu Chiu Shan, north of Hsia Kuan, Nanking. The specimens undoubtedly represent the poor class of the city and its vicinity. Most of them came from the eastern part of the country but a few from unknown localities. They are all of modern date. There are 146 right and 124 left humeri. Of these 168 are male and the remaining 102 female.

3. *Measurements Taken.* In the present study there are only 12 important measurements—11 linear and one angular—to be taken on each side of bones. The measurements which have been made and the technique followed in each case are as follows:

(1) Maximum length of the humerus; the distance from the highest point of the head (caput) to the lowest point of the trachea, measured with the osteometric board.

(2) Total length of the humerus; the distance from the highest point of the head to the lowest point of the capitulum. The axis of the humeral shaft should be parallel to the side wall of the osteometric board. It is also termed "total caput-capitulum length".

(3) Breadth of the proximal epiphysis; the greatest breadth taken from the most medial point of the articular surface of the head to the most lateral point of the greater tuberosity. The shaft of the specimen must be placed to be parallel to the side wall of the board.

(4) Breadth of the distal epiphysis; the greatest breadth taken between the medial and lateral epicondyles, measured with the osteometric board in the same plane as the preceding measurement.

(5) Maximum diameter of the shaft at middle; the greatest diameter taken with a small caliper in the horizontal plane at the middle of the shaft. The plane drawn should accord with the mid-section of the maximum length of the bone.

(6) Minimum diameter of the shaft at middle; the least diameter taken in the same plane at the middle of the shaft. It is not necessarily perpendicular to the preceding maximum diameter.

(7) Circumference of the shaft at middle; the circumference taken in the same plane at the middle of the shaft, measured with the steel tape.

(8) Minimum circumference of the shaft; the least circumference measured with the steel tape. This is usually found at about the second third, distal to the deltoid eminence.

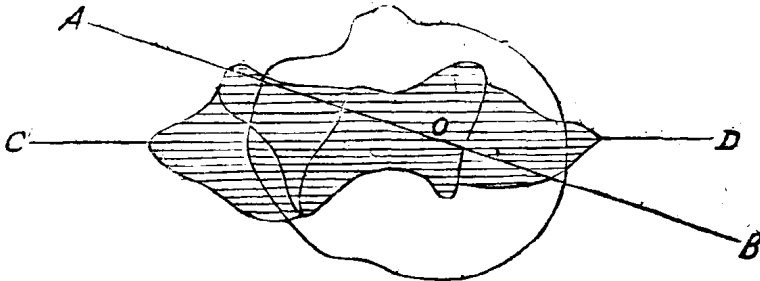
(9) Maximum sagittal diameter of the head; the greatest diameter from the highest point on the edge of the articular surface of the head to the lowest on the edge of the same surface, taken in a plane parallel to the long axis of the bone.

(10) Maximum transverse diameter of the head; the greatest diameter taken at right angles to the preceding measurement.

(11) Circumference of the head; the circumference measured around the margin of the articular surface of the head with a slip of paper.

(12) Angle of torsion; The humerus usually appears twisted, the articular surface of the proximal end looks mainly in a medial direction while the articular surfaces at the lower end look forwards and backwards. The magnitude of the twist can accurately be recorded by taking the angle formed by the major axes of these articular surfaces, i.e. angle of torsion. Fig. I shows how this angle is constructed. The line AB denotes the axis connecting the centre of the head and the greater tuberosity while the line CD the axis connecting the two condyles, the two axes intersecting each other at the point O. Then $\angle AOD$ or $\angle COB$ is the one* we require to find.

Fig. I



The above contours of the articular surfaces of the two ends of the humerus were superimposed upon each other showing the angle of torsion being formed. The plain contour indicates the surface of the head while the shaded one the surface of the two condyles.

In practice, two fine knitting needles were first laid across the median position of their respective articular surfaces. The directions of the two needles projecting upon the paper were then accurately delineated by means of the parallelograph, and the degree of the angle can be measured by a protractor.

Three humerus indices were deduced from pairs of the six absolute measurements given above.

(13) Shaft index at middle:

$$\frac{100 \times \text{Minimum diameter of the shaft at middle (6)}}{\text{Maximum diameter of the shaft at middle (5)}}$$

(14) Caliber index;

$$\frac{100 \times \text{Minimum circumference of the shaft (8)}}{\text{Maximum length the humerus (1)}}$$

(15) Index of head:

$$\frac{100 \times \text{Maximum transverse diameter of the head (10)}}{\text{Maximum sagittal diameter of the head (9)}}$$

It is clear that the first index refers to the shape of the shaft in the median horizontal section and the second indicates the shape of the whole. It is also termed the index of robustness. The thinner the bone the smaller

*The supplement of $\angle AOD$ or $\angle COB$ is also regarded as an angle of torsion by some authors.

will be the index and vice versa. The last indicates the shape of the articular surface of the head.

Readings of the characters measured with the osteometric board and tape were taken to the nearest 0.5 of a millimetre while those measured with the small caliper to the nearest one-tenth as the latter has a vernier scale attached.

In Table I are given the constants of the 15 characters for the two Chinese series examined. The values of constants were derived from all the available specimens of both sides and these will be discussed in the following sections. The constants of variabilities, both absolute and relative, were only calculated for the large sample of the Hsiu Chiu Shan series.

4) *Bilateral Comparisons.* For the sake of accuracy all the bilateral comparisons made below are based on the means of the two series derived from paired specimens. In Table II are given the mean constants of all the characters on both sides for the two series considered. In the first place we notice that differences between pairs of bilateral characters in both series are of almost similar orders. In columns 5, 9, 13 and 17 of the same table are provided the side ratios of each series (right mean/left mean). The values of these ratios vary from .95 to 1.05 which are not appreciably divergent from unity. Of the 12 absolute characters the means are all predominant on the right side except in the case of the minimum diameter of the shaft at middle for which the mean on the left side is slightly higher. This was found in the Hsiu Chiu Shan females. The asymmetrical nature of the humerus characters in favour of the right side, particularly in the case of the maximum length and breadths of epiphyses, has similarly been observed in some of the available data of other races. Of the three indices formed, the caliber index in both sexes is again in favour of the right side. For the remaining two indices—index of shaft at middle and index of head—the means on the left side are greater. This is possibly due to the fact that the numerators of indices—least diameter of the shaft and the transverse diameter of the head—are less different bilaterally than their respective denominators, viz., the maximum diameter of the shaft and the sagittal diameter of the head. The larger value of the left shaft index has previously been noticed by Hrdlicka and Black. It accords well with the result of the present study. However, we may conclude that the humerus characters are asymmetrical in type, mainly predominant on the right side.

5) *Sexual Comparisons.* From the characters considered the humerus exhibits a well-marked sexual differentiation. In Table III are given the sex ratios (male mean/female mean) of the 15 characters for the Hsiao T'un and Hsiu Chiu Shan series. It will be seen that the ratios shown in columns 2 and 3 for the corresponding characters of the two series are very similar although the sizes of the two samples from which means are derived are not the same. In both series the angle of torsion has the least sex-ratio (1.016-1.021) while the minimum diameter of the shaft at middle has the largest value (1.231-1.303). More than two-thirds of characters dealt with have the sex-ratios greater than 1.1. The average ratio of linear measurements for the two series is 1.147 and that of the angle and indices 1.053 as against 1.052 (59 cases) and .996 (35 cases) of cranial characters found for the Hsiao T'un series.* Both average ratios in the former case are appreciably higher. On the whole the male humeri are greater in length with broader epiphyses, stouter shaft

*The values are cited from the writer's paper "A Study of the Chinese Crania of the Sui-T'ang dynasties from Hsiao T'un, Anyang", loc. cit.

and larger head. Hence the characteristics of the humerus are evidently of great value in aiding the sexing of the skeletal materials.

6) *Racial Comparisons.* We are finally proceeding to examine the significance of racial differences or different characters between various series of specimens available. It is, perhaps, more convenient to discuss them singly or in a group in accordance with the order given in Table I.

(1) The length of the humerus. The maximum length of the humerus is one of the important characters which has commonly been measured by anthropologists. Table IV gives the male and female means of the maximum lengths and their group means for the Chinese series as well as for other races. Among the five Chinese series compared means of same sex are very similar except in the case of the male Yang Shao and female Sha kuo T'un means which are particularly high or low. The similarity of the Hsiao T'un and recent North China means and a slightly higher value of means of both series just referred to than that of the Hsiu Chiu Shan series may possibly be accounted for by the fact that the samples were drawn from different regions of the country, the first two from the North China plain and the last East China. From the figures of group means shown it is obvious that the Chinese humerus lengths are placed between the Europeans, Africans, and Indians on one hand and some of the other Asiatic races on the other. The total length of the humerus measured from the highest point of the head to the lowest one of the capitulum is of the same nature as that of the maximum length except that the former is taking into consideration the projecting height of the trochlea. As the comparative material of the second character is rather slender it is only possible to compare the means of the two Chinese series examined. It again shows that both the male and female means of the Hsiao T'un series are slightly higher than those of the Hsiu Chiu Shan series as has happened in the case of the maximum length. The two humerus lengths seem to be highly correlated with each other and the ratio of the maximum length to the total one for both series in either sex can be expressed approximately as 100:98.

(2) Breadths of the humerus epiphyses. Table V provides the means of breadths of both proximal and distal ends. The corresponding average breadths of other Chinese materials investigated by Black* are certainly incomparable with the present constants owing to different definitions followed. From the table we note that the means of the two breadths in the two Chinese series as well as some of related Oriental series are not appreciably different from one another. They lie again intermediately between the two extremes of the racial groups represented. The ratio of the distal breadth to the proximal one for the two Chinese series in both sexes is 100:31 and there is no indication of any serial or sexual differences in this respect. Yet the similar ratios for the other five races vary from 80 to 33 in males and from 79 to 33 in females. It clearly indicates that the ratio of this kind is not uniformly constant for different races compared.

(3) Measurements of the shaft and the head. Table VI provides the means of the 7 measurements taken on the humerus shaft and head for the series

*Definitions of breadths of the humerus epiphyses given by Black are: The maximum diameter of the proximal epiphysis is the greatest distance from the lowermost medial margin of the head of the humerus to the furthest point on the greater tubercle taken with the sliding compass, while the maximum diameter of the distal epiphysis is the greatest breadth between the epicondyles taken with the sliding compass. See his paper, p. 88, loc. cit.

dealt with. Some of the available means of the corresponding characters for Black's Chinese series are also given in the same table for comparative purposes. Of 7 characters, 4 are concerned with the size of the shaft and the remaining 3 with the size of the head. Considering the maximum and minimum diameters of the shaft first, both the Hsiu Chiu Shan and recent North China means are slightly less than the Hsiao T'un means and more so than the Yang Shao means. As to measurements of the two circumferences taken at middle and the least part the Hsiu Chiu Shan means in both sexes are again slightly lower than the corresponding means of the Hsiao T'un series as was anticipated. Measurements of the head** are considered next. The form of the head depends not only on the relative lengths of the two diameters but also on the magnitude of its circumference. From the figures of the three characters shown in the table, the means of the Hsiao T'un, recent North China and Hsiu Chiu Shan series are not sensibly different from one another but they are definitely lower than the Yang Shao means.

(4) Angle of torsion. It has generally been recognised that the angle of torsion is subject to a wide variation both sexually and racially. Some authors have considered it as a character of phylogenetic nature. In Table VII are given the mean angles for the present two series in both sexes. For comparative purposes, the averages of the angles and their ranges for some racial groups are given in the lower part of the table. The first thing we note is that the angles of the two series are not distinctively differentiated from each other although they are clearly different for the two sexes. Judging from the average values of the angle shown, the Europeans descending from the prehistoric to the modern have the largest angle, the American Indians stand next while the Mongolians lie between the American Indians and the dark-skinned races but no significance can be attached to the order given. The mean distributions in some of the groups are rather scattered and the range of the American Indians nearly covers the limits of groups in the two extremes. The character in question may be capable of differentiating some races or racial groups quite clearly but it is certainly incapable of arranging races in the order of "primitiveness". So the angle of torsion can hardly be regarded as a character of phylogenetic nature. Some authors suggested that the degree of the twisted angle is closely associated with the robustness of the humerus bone. Rivet basing his a few specimens of the California Indians has found that the stronger bone will have the smaller angle of torsion and the less frequencies of perforation of the olecranon foramen. In order to examine this point accurately, the correlation coefficients between the caliber index and the angle of torsion have been calculated for the male and female Hsiu Chiu Shan series. The coefficients are:

Male	Female
$-.52 \pm .07(159)$	$-.59 \pm .05(94)$

It will be seen that in both sexes a fairly high but negative correlation was found between the characters considered. Intra-racially, the stronger humeri tend to have a smaller angle formed by the axes of the two ends. The previous assumption, hence, has positively been confirmed by a quantitative method.

** The maximum diameter of the head defined by Black is the maximum distance taken with the sliding compass regardless of the plane in which the diameter falls. Since the maximum diameter of the humerus head in the great majority of cases lies practically in the vertical plane, his measurements are fairly comparable with the corresponding figures of the present material.

(5) Indices. We are proceeding to discuss the size of the humerus indices. The means of the three indices for the Chinese series together with available data of other races are provided in Table VIII. Considering the shaft index at middle first, the indices of all the Chinese series in each sex are practically in close agreement. Inter-racially, the male means of the Chinese series are placed intermediately between the Negroes and Whites on one hand and the American Indians on the other, but in the case of females there is no clear distinction between the Chinese and American Indian types. From Table VIII, b, the caliber indices* of the two Chinese series in either sex are again very similar although the Hsiao T'un means are longer and thicker in their absolute measurements. When compared with other races, the Chinese means lie still in an intermediate position between the two extremes of the series represented. The third index as we have mentioned is designed to indicate the shape of the head. As available metrical data of this index for other races are scanty, it is only possible to make a comparison on the series newly measured. In males the Hsiu Chiu Shan mean is slightly less than the Hsiao T'un one, yet in females the difference of means between the two series is too small to be significant.

The features of the humerus bone for different series may more accurately be compared in a generalized way. The value of α † which has usually been used to test differences of cranial and mandibular characters was worked out for the available humerus characters between pairs of the four** Chinese male series. The average values of these α 's give an estimate of the degree of relationships on the features between different series compared. Table IX provides the values thus calculated. It will be seen that the average values of α 's between pairs of the Hsiao T'un, Hsiu shan and recent North China series are not appreciably different from one another (values from .38 to 2.95). In the first two series there are only 2 α 's of 15 characters greater than 10. These appear in the cases of the maximum and minimum of the shaft at middle. For other comparisons none of these values exceeds this limit. It is of interest to note that the average values of α between the Yang Shao series and any of the other 3 series are sensibly high (values from 5.99 to 9.29). In each comparison there are two of 5 cases greater than 10. The significant differences are always found in the humerus length and maximum sagittal diameter of the head. Hence, the results arrived at by a generalized method all agree with those obtained by comparisons of individual characters.

7) *Morphological characters.* Two important morphological or non-metric characters—the perforation of the olecranal fossa and the supracondyloid notch—have carefully been observed in the present study. Their main results are given below:

* For Black's series the last two indices are not provided in the table as measurements of least circumference and the transverse diameter of the head were not taken by him.

† The formula for calculating the value of α is $(m_1 - m_2) \times \frac{\sigma_1 + \sigma_2}{n_1 + n_2}$, where m_1 and m_2 are the two means of the same character for any two series compared; n_1 and n_2 the sizes of the two samples; and σ_1 and σ_2 two standard deviations. If the σ_1 and σ_2 are assumed to be approximately equal, the formula becomes $\frac{n_1 \sigma_1 (m_1 - m_2)}{n_1 + n_2 \sigma_1^2}$. In the present case the second formula is used and the standard deviations of the Hsiu Chiu Shan series are employed throughout on the assumption that the variations for the 4 series are approximately equal.

** The unsexed means of the Sha Kuo T'un series are not used for comparison.

(1) Perforation of the olecranal fossa. Perforations of the olecranal fossa* are openings of various sizes found frequently in the humeri of man as well as of other mammals, in the bony septum that separates the coronoid from the olecranon fossa. The frequency percentage of this feature not only has a great racial differentiation, but also has a significant distinction between the two sexes or the two sides of the same sex. It has been asserted by previous authors that the occurrence of this anomaly will appear more frequently in the primitive races than in the advanced, in the prehistoric specimens than in the modern ones. Of the same race, this anomaly will be found more commonly in females than in males, on the left side than on the right. In Table X are provided frequencies of occurrence and the corresponding percentages of this anomaly for the present series according to their sides and sex-s. (see Table X, a). For comparative purposes, the mean percentages of the incidence of this anomaly for Black's Chinese series as well as for different racial groups are also given in parts b and c of the same table. In the Hsiao T'un and Hsiu Chiu Shan series, if the percentage of each sex or that of each side is considered separately, the female or left side humeri have a decidedly higher percentage. Yet in either case they are not so markedly differentiated as observed in other races. According to Hrdlicka's data,** the mean percentage of this anomaly for the 19 racial series in males is 17.58 while that in females is 34.68. The similar percentage based on the corresponding series of both sexes on the right side is 20.13 and that on the left 27.89. The difference between the male and female mean percentages is 17.12 while that between the mean percentages of the two sides is 7.48 as against 3.15 and 2.00 respectively for the two Chinese series. The reasons for the sexual and lateral divergence were given by some authors as the result of a phylogenetic or inherited nature, by others as a mechanical or functional factor. The point, however, can not be satisfactorily solved based on the meagre evidence available at present. The mean percentages of this anomaly for different Chinese series are not significantly divergent from one another except in the case of the Sha Kuo T'un series which shows a particularly lower value of the percentage. It is of interest to note the racial order arranged by the size of percentages given in the last part of the table. The mean percentage for different racial groups varies from 7.92 to 45.48. Judging from this particular feature only the Chinese type is much closer to the European than to any other racial groups. With regard to the relative frequencies of the unilateral and bilateral perforations appeared, it was found that unilateral openings occurred to bilateral in the proportion of 2.3 to 1 in the two series considered (of bilateral perforations, 3 pairs were found in the Hsiu Chiu Shan series, 2 pairs in males and one pair in females; and one pair was found in the Hsiao T'un female series). It has been shown by Hrdlicka that unilateral perforations are from 1.5 to 2.6 times as frequent as the bilateral. The figures of the present data, although they were deduced from a smaller number, do fall within the range found by Hrdlicka.

The size of perforation varies considerably from punctiform to a marked opening. Among the specimens perforated, the Hsiao T'un series has only a female specimen with double foramina on the right side. However, there

*Several other names such as 'intercondyloid foramen', 'intercondyloid perforation', 'supracondyloid foramen', 'epitrochlear foramen', 'supratrochlear foramen', 'and septal aperture', have been used by different authors.

**Hrdlicka's data were given in his paper on "The Humerus: Septal Apertures", *Anthropologie*, Prague, X, 1932.

is no trace of any double or multiple foramens found in the Hsiu Chiu Shan series.

(2) *Supracondylar process.* The supracondylar process, a small hook-like projection with its point directed downwards in front of the medial epicondylar ridge, is occasionally found in the bones of certain races. In examining all the specimens of both series considered there is no single case showing such a peculiar anomaly. The same is true for Black's Chinese materials. It seems to indicate that the Chinese humeri present no such special characteristic. This point would be worth further investigating when more extensive materials are available.

8) *Summary.* Two series of Chinese humeri belonging to different periods were dealt with in this paper. The material measured consists of 196 male and 117 female specimens. Of these 168 belong to the right side and the remaining 145 to the left. Twelve linear and one angular measurements were taken, whenever possible, on each specimen giving three indices which indicate the shapes of the whole bone, its shaft and head respectively. From the foregoing discussions some tentative results may be arrived at as follows;

(1) Judging from the evidence of the present material, the characters of the Chinese humeri seem to be asymmetrical in type. Most of the absolute measurements and the caliber index are predominant on the right side and the remaining two indices are predominant on the left.

(2) The humerus exhibits a well-marked sexual differentiation. The male bones are longer and stouter, with greater breadth of epiphyses and a larger head.

(3) In both male and female series, the characters of the Hsiao Tun and Hsiu Chiu Shan specimens are closely related to each other. Means of the two series, especially the Hsiu Chiu Shan one, are also close to those of the recent North China series, although only five characters were used for comparison. The Yang Shao means are more divergent from any of the three series mentioned.

(4) When compared with the available data of other races, the type of Chinese humeri in most cases lie in an intermediate position between the two extremes of the racial series represented.

(5) Judging from the incidence of the perforation of the olecranon fossa and the absence of the supracondylar process, the type of Chinese humeri tends to be decidedly closer to the European races than to any of other racial groups.

中國人肱骨之初步研究

吳 定 良

本研究根據材料有二：(一)隋唐時代肱骨標本，十餘年前由河南安陽小屯村掘得，(二)近代肱骨標本，五年前由南京郊外繡球山獲得。此兩組材料歸於男性者196根，女性者117根，右側168根，左側145根。研究方法採用測量十三種，指數三種，觀察二種，均為人類學者所常用。經各種分析與比較，得下列結果：(1)中國人肱骨左右側，似不對稱，各種測量與「粗大指數」右側數均較左側為大。(2)該骨之性區別甚為顯著。(3)小屯標本形態與步達生氏之史前仰韶組標本相近，而繡球山標本則與步氏之近代華北組相近。(4)與他族同一材料比較，中國人肱骨形態位置適中。(5)本文材料缺乏「顆上突」，但「顆間孔」之百分數甚低，似與歐族相近。

PRELIMINARY REPORT ON THE MEASUREMENTS AND OBSERVATIONS OF THE TA HWA MIAO¹

By Y. Yen

1. Introduction
2. Brief Notes Of History and Distribution
3. Brief Notes on Measurements and Indices
4. Brief Notes on the Statistic Analysis
5. Tables for the Measurements of Both Sexes
6. Table for the Observations of Both Sexes

1) *Introduction* - This paper presents the statistic analysis of the Ta Hwa Miao data which is contained in the *Schedule of Physical Anthropological Measurements and Observations on Ten Ethnic Groups of Szechwan Province, West China.*²

Doing anthropological works in West China is not easy, poor communication, bandit's life threatening, tribe's misunderstanding and many other obstacles are always ahead. In the summer vacation of 1934, the author had the privilege of accompanying the late Prof. W. R. Morse to make an expedition to the borderland of Szechwan, in the northwest part of Kweichow and the northwest of Yunnan. Several hundred measurements were made at this time.

The statistical treatment of the data includes the determinations of the means, standard deviations, coefficient variations, and measures of skewness and kurtosis of the respective frequency distributions.

Owing to some reasons the results of statistical analysis have not been reported up to the present. This report is preliminary and partial, just to serve as a suitable baseline for the comparison with other similarly adequate data from other ethnic groups of Szechwan province.

In the present instance the age of twenty-two years has been selected as the lower age limit of adulthood for both sexes and sixty-two as the highest. The total number of subjects treated is 133 males and 58 females.

2) *Brief Notes of History and Distribution*³ In the legends transmitted amongst the Ta Hwa Miao it is stated that their ancestors first lived near the regions of Yang-tze River, from where they removed to Hunan, then to Kweichow, first to the northeastern part and finally to the northwestern part. They have been in Kweichow province for more than one thousand years.

The present population of Ta Hwa Miao is approximately around 100,000, mainly distributed over the region of the northwestern part of Kweichow and the northeastern part of Yunnan, with the Wei-ning(威寧) district of Kweichow

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- (1) Since the author is contemplating a more detailed statistical study and would like to compare the results of this paper with those which will be published in the near future, he requests that the results of this work should not be used by others without his permission.
 - (2) By W. R. Morse, supplement to vol. viii of the *Journal of the West China Border Research Society*, 1937.
 - (3) This information is given by Mr. H. S. Yang (楊漢光) to whom I am much obliged.

as their center. A few of the tribes in the west even penetrate as far as Wu-ting (武定) district of Yunnan, while the eastern tribes cover the middle of Kweichow, in such districts as An-shun (安順) and Shui-ch'eng (水城), and a few extends to the south bank of the Chin-sha River.

3) *Brief Notes on Measurements and Indices* The measurements utilized in the present study are of two kinds: absolute and relative, the latter consisting of various indices.

The absolute measurements are direct measurements. The relative measurements used according to Prof. P. H. Steavenson⁴ are subdivided into three groups: 1. the segmental indices, 2. the intrasegmental indices, and 3. the intersegmental indices.

The segmental indices are the results of the relative proportion of all the body segments expressed in terms of percentage ratio of total body length. The intrasegmental indices are the results of the relative proportion of all the body segments expressed in terms of percentage ratio of linear measurements of the body division to which the respective belongs. The intersegmental indices are the results of the relative proportion of all the body segments expressed in terms of percentage ratio of homologous segments of other major body divisions.

The absolute measurements used are 42 in number, and the relative measurements used are 23 in subdivision 1, 25 in subdivision 2, and 2 in subdivision 3.

4) *Brief Notes on the Statistic Analysis* No measurement of a physical characteristic of a racial group is complete without measuring the average, and an accompanying measure of the average variation in the group. In order to unusually complete the above, the measuring of the degree of concentration or lack of concentration about the central tendency is needed that is, skewness, and the measuring of the degree of flat-toppedness, as compared with the normal curve is also needed, that is, kurtosis.

In the present study, there are seven constants to be used, mean, standard deviation, coefficient of variation, B_1 , B_2 , skewness, and kurtosis, the first three are often seen to be used in the usual quantitative expressions of the average size and of the normal variability and the relative variability character respectively, and the last four are used in a complete description of a human group or a biologic group.

Acknowledgement. The calculation work has received financial assistance from the Morse Fund and the Chinese Cultural Studies Research Institute. This I gratefully acknowledge. Miss K. Y. Ren and Miss C. Y. Fan have been of great help in assisting with the calculation work.

(4) Detailed Anthropometric Measurements of the Chinese of the North China Plain, *Anthropologia Sinica* No. 2, 1938

TRACHT UND ORNAMENTIK DER PA MIAO IM ANSHUN KREIS DER PROVINZ KWEICHOW*

Von Inez de Beauclair

Die Kreisstadt Anshun 安順 liegt 100 km westlich der Provinzialhauptstadt von Kweichow, Kweiyang 貴陽. Unter den in diesem Kreis vertretenen Miaogruppen, nehmen die Pa Miao 瑯苗 mit einer Zahl von ca 1570 Familien eine hervorragende Stelle ein. Wie saemtliche Miaogruppen bezeichnen sie sich selbst als Meng (auch Mong oder Mao) mit einem Beiwort, und zwar nennen sie sich Meng Bang, wobei bang Blume bedeutet. Von ihren naechsten Nachbarn im Norden werden sie Meng ali, von den Ch'ing Miao 清苗 Meng 'yang genannt. Sprachlich sind die Pa Miao einer Reihe von anderen Miaogruppen verwandt, so den Shui Hsi 水西 und Ta Hua Miao 大化苗. Mit denselben haben sie auch gemeinsame Tradition, jedoch voellig verschiedene Tracht. Ausser im Kreis Anshun finden sich heute noch kleinere Pa Miao Doerfer in den benachbarten P'uding 普定 und Chenning 鎮寧 Kreisen.

In ihren heutigen Siedelungen sitzen die Pa Miao schon seit einer Reihe von Generationen, teilweise sind sie in wohnplaetze von Keh Lao 佬佬 und Lung Chia 龍家 eingerueckt, was aus Ortsnamen und Bezeichnungen alter Begrabsnisstaetten zu schliessen ist.

Die Pa Miao treiben Ackerbau, hauptsaechlich Raps, Reis, Mais und Bohnen; sie halten Wasserbueffel, Rinder und Schweine, daneben Gefluegel. Die Frauen arbeiten auf dem Felde; im Winter und an Regentagen werden Strohsandalen, Matten und Regenmantel zum Verkauf hergestellt. Daneben verwenden vor allem die jungen Maedchen in den Wintermonaten viel Zeit auf die Anfertigung von Stickereien und Batik.

Gerade bei den Pa Miao findet sich der im allgemeinen den Miao inwohnende Zug von Froehlichkeit und Romantik besonders ausgepraegt. Die Markttagge bringen Abwechslung in das schwere Arbeitsleben; der Markt bildet den Treffpunkt fuer Burschen und Maedchen aus den verschiedenen Doerfern. Nur in sorgfaeltigster Kleidung machen sich die jungen Leute in kleinen Trupps auf den Weg; auf dem Marktplatz wird in Gruppen zusammengestanden, gescherzt und gelacht. Darin unterscheiden sich die Pa Miao von anderen Miaogruppen, welche in ihrer Arbeitskleidung auf den Markt kommen. Die Pa Miao gehoeren auch zu den wenigen Miaogruppen, bei denen sich eine Maennertrachte erhalten hat, die allerdings stark im Schwinden begriffen ist.

Im folgenden soll nun die Tracht der Pa Miao beschrieben, und ihre Ornamentik besprochen werden. Schon von ganz kleinen Maedchen, die kaum dem ersten Kindesalter entwachsen sind, wird Tracht getragen. Am reichsten und sorgfaeltigsten sind natuerlich die jungen Maedchen im heiratsfaehigen Alter gekleidet; an ihrem Prunkstueck, der Hochzeitsjacke wird Jahre hindurch gearbeitet.

Die Haartracht.

Das Haar wird in der Mitte gescheitelt, der Scheitel ueber den Hinterkopf

*Bemerkung Wegen der Schwierigkeiten und hohen Kosten, die mit dem Drucken von Abbildungen verbunden sind, ist es uns unmoeglich, hier alle Illustrationen von Stickereimustern und auetern Bildern beizufuegen. Wir koennen nur eine gezeichnete Hochzeitsjacke und einige photographischen Bilder drucken lassen. Wir bitten unsere Leser, dieses Ausfallen guetigst zu entschuldigen. Der Redakteur.

durchgezogen. Ueber den Ohren und der Schlaefengegend wird das Haar aufgerollt, straff aus der Stirn gezogen, und die Enden um einen halbmondfoermigen Holzkamm gewunden. (za¹) Der Kamm wird so eingesteckt, dass seine spitzen Enden nach vorn zeigen. Die Entfernung der Kammenden betraegt 22cm, und der aeussere Rand, sowie die Enden sind mit leuchtend roter Farbe bemalt. Auf der rechten Seite wird der Kamm etwas nach aufwaerts gedrueckt, und das Haar in einem kleinen Knoten um das Kammende gewickelt. Dies ist ein Wichtiges Schoenheitszeichen bei einer sorgfaeltig angefertigten Frisur (a¹ ban² za¹, a¹ bau² sa¹). Nun werden noch aus ausgekaemmten Haaren zusammengedrehte Schnuere in zahlreichen Windungen um den Kamm gelegt (hla¹ blau²). Um diese Schnuere wird eine Silberkette gewunden, die verschiedenen lang sein kann. (sau² njai¹) Zuletzt wird in der Mitte hinten noch ein Silberspatel eingesteckt, der haeufig mit der Kette verbunden ist. (a¹ tsai² dung¹) Der Spatel ist aus Silberblech, 1½cm breit, 13cm lang. Sein aeusserer Rand ist leicht nach unten umgebogen, und zuweilen mit einem kleinen Silberrhombus als Anhaenger versehen. Dieser Spater dient lediglich als Schmuckstueck, besitzt auch keine Zinken, so dass er nicht als Kopfkratzer bezeichnet werden kann. (Abb. 1.)

Die Jacke.

Die eigentliche Tracht besteht zunaechst aus einer Jacke, welche auf dem blossen Koerper getragen wird. Dieselbe ist aus schwarzem Baumwolltuch weit und lose, im Kimonoschnitt gearbeitet. (o² tsau¹) Sie besitzt keine Knoepfe oder sonstigen Verschluss; das linke Vordertheil der Jacke wird ueber das rechte geschlagen, und unter den Guertel geschoben. Hinten haengt die Jacke lose herab. Die Aermel sind weit und lang, koennen jedoch zur Arbeit aufgeschlagen werden. An den Seiten, unter den Armen, ist der untere Rand der Jacke ein wenig eingeschlitzt. Um den Rand der Jacke laeuft eine ca 4cm breite Einfassung aus helloder dunkelblauem Tuch. Ein etwas breiterer Streifen aus dem gleichen Material ist oft auch den Aermeln in Ellenbogenhoehe aufgesetzt (Abb. 1). Hinten sitzt auf der Jacke ein rechteckiges Tuchstueck in derselben Farbe wie die erwahnten Streifen auf, und bildet eine Art Kragen. Durch diese Verstaerkung steht die Jacke hinten stets ein wenig vom Halse ab (so² ue¹ tsau¹). Besondere Sorgfalt ist dem Aemelaufschlag zugewandt; derselbe ist haeufig aus Tuch mit Batikmuster, gemustertem Kattun, oder zum mindesten aus hellfarbigem, z.B. gelbem Tuch. Die jungen Maedchen ist der Jacke in der Mitte des Rueckentheils noch ein mit Kreuzstich in bunten Farben besticktes Dreieck (a¹ ba¹) aufgeheftet, dessen Basis mit Perlenfransen verziert ist. Die Spitze sitzt einem runden mit Kettenstich besticktem Tuchstueckchen auf. (Abb. 1. Stickermuster 1.).

Der Rock.

Die Pa Miao Frauen tragen einen Rock (o² dai¹) aus schwarzem Tuch, welcher nicht ganz bis zu den Fussgelenken reicht. Er ist ca 150cm weit, und wird um die Huesten, von links nach rechts geschlungen. An der rechten Seite ist der Rock in einige Falten gelegt, und ein 5cm breiter, bestickter Laengsstreifen bildet den Abschluss des linken uebergeschlagenen Theiles. Der Rockbund ist aus leichterem Material, und zeigt oft ein Batikmuster. Das mittlere vordere Teil des Rockes wird von einer weissen Schuerze (bang¹ sai²) aus Haantuch bedeckt. Diese Schuerze wird mit einer Kalkmischung eingerieben, und stets leuchtend weiss erhalten. Sie wird von den Frauen selbst gewebt, und ist ca 30cm breit, und 70cm lang. An ihrem unteren Ende sind dieser Schuerze 2-3 Streifen von ca 5cm Breite