

Anthropology. — *On sexual differences in the teeth of the Javanese.* By
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In studying the skeletal remains of comparatively recent prehistoric men found in Java by the Archeological Service and placed at our disposal by the courtesy of Dr. P. V. VAN STEIN CALLENFELS, it proved necessary to pay special attention to the teeth, these being the best preserved parts of the skeletons. As no data regarding the dimensions of the teeth in recent Javanese are available, in collaboration with Mrs. MIJSBERG I undertook the study of the teeth of those skulls collected in the Anatomical Museum at Batavia, which had belonged to native inhabitants of the isle of Java, died at Batavia. In this way we could gather the data necessary to the comparison of the prehistoric teeth with those of recent Javanese.

But apart from this purpose our investigation has yielded interesting results, especially with regard to the sexual differences in the dimensions of the teeth.

Since F. SCHAAFFHAUSEN 1883 made the statement, which soon should prove an erroneous one, that the upper middle incisors in the females should be broader than in the males, the question as to the presence of sexual differences in the dimensions of the teeth has been discussed. Much attention has been paid to the incisors and the canine teeth, as these teeth in the Anthropoids, especially in the Gorilla, show considerable sexual differences, all dimensions in the males being greater than in the females. According to DE JONGE COHEN ¹⁾ the facts brought forward tend to believe that in man the same sexual differences exist, only they are far less considerable and can only be detected by comparing the means of the measures taken from a great number of teeth. According to some authors a corresponding difference should exist in the breadth and the thickness of the molar teeth (cf. the investigations of HRDLIČKA ²⁾ on the 1st and 2nd lower molars).

JANZER ³⁾ from his study on the teeth of skulls from New Pommern, an isle in Melanesia, drew the conclusion that the average breadth and thickness of all male teeth are greater than in the females, with the only ex-

¹⁾ DE JONGE COHEN, TH. E., *Mühlreiters Anatomie des menschlichen Gebisses*, 5. Aufl. Leipzig, 1928.

²⁾ HRDLIČKA, A., *Variation in the dimensions of lower molars in Man and Anthropoid Apes*. Amer. Journ. of phys. Anthrop. Vol. 6, 1923.

³⁾ JANZER, O., *Die Zähne der Neu-Pommern*. Vierteljahrsschr. f. Zahnheilk. 1927.:

ception of the lower incisors, the breadth of which is the same in the two sexes.

All previous investigations suffer from the same deficiency. As is the case in most anatomical and anthropological work conclusions have been drawn from the study of a rather scanty material. Therefore it is not sufficient to calculate the arithmetic mean (M) only, but it is inevitable to calculate the standard deviation of the mean (m) as well. When in the males the mean breadth of a certain tooth may be represented by the formula $M_{\sigma} \pm m_{\sigma}$ and the mean breadth of the same tooth in the females by $M_{\varphi} \pm m_{\varphi}$, a real difference between these means is not to be accepted unless the quotient $\frac{M_{\sigma} - M_{\varphi}}{\sqrt{m_{\sigma}^2 + m_{\varphi}^2}}$ attains or exceeds the value 3. This should be kept in mind with all statistical work.

In the tables accompanying this paper the breadth and the thickness of upper and lower teeth have been tabulated separately. In each table the 1st and 2nd columns refer to the male teeth, the 3rd and 4th to the teeth of the females. In the 1st and 3rd columns the number of teeth measured is put down; the 2nd and 4th columns contain the means of these measures and their standard deviations for the males and the females respectively. In each 5th column the difference between the means in the two sexes is put down. Each 6th column contains the value of the quotient $\frac{M_{\sigma} - M_{\varphi}}{\sqrt{m_{\sigma}^2 + m_{\varphi}^2}}$

All measures are in millimeters. It should be added that m is calculated from the formula $m = \sqrt{\frac{\sum e^2}{n}}$, in which e represents the deviation of each separate measure from the mean, whereas n represents the number of the teeth measured.

It will appear from the tables that the number of the teeth measured is not always the same. We studied 69 complete male skulls, moreover 1 upper jaw and 2 lower jaws of men, 20 complete female skulls, moreover 2 upper jaws and 1 lower jaw of women. Although we only used those skulls of our collection, in which the dentition was almost complete and the teeth were not much worn by use, nevertheless some teeth were too much worn, others were affected by disease, still others were absent, being lost during life or after maceration of the skull. The small number of 3rd molars is due to the fact, that in some adult skulls these teeth had not completely erupted or even were not visible at all.

The nomenclature of tooth dimensions differs with different authors. We have called the *Breadth* of a tooth the distance between the most mesial and the most distal point of the tooth, measured along the axis of the row of teeth. Accordingly in the incisors the breadth is the greatest transverse dimension; in the molars this measure is taken in the antero-posterior direction. The *Thickness* of a tooth is the distance between the

most lingual and the most buccal point of the tooth measured at right angles to the preceding dimension.

TABLE 1.

Upper Jaw. Breadth of Teeth.						
	♂		♀		$M_{\text{♂}} - M_{\text{♀}}$	$\frac{M_{\text{♂}} - M_{\text{♀}}}{\sqrt{m_{\text{♂}}^2 + m_{\text{♀}}^2}}$
	<i>n</i>	$M_{\text{♂}} \pm m_{\text{♂}}$	<i>n</i>	$M_{\text{♀}} \pm m_{\text{♀}}$		
<i>I</i> ₁	129	8.6 ± 0.061	35	8.2 ± 0.117	0.4	3.0
<i>I</i> ₂	131	7.0 ± 0.060	38	6.7 ± 0.099	0.3	2.6
<i>C</i>	136	8.0 ± 0.049	42	7.7 ± 0.075	0.3	3.3
<i>P</i> ₁	133	7.5 ± 0.047	39	7.3 ± 0.074	0.2	2.3
<i>P</i> ₂	129	7.0 ± 0.045	40	6.9 ± 0.087	0.1	1.0
<i>M</i> ₁	129	10.8 ± 0.058	41	10.5 ± 0.091	0.3	2.8
<i>M</i> ₂	125	10.0 ± 0.061	39	9.6 ± 0.114	0.4	3.1
<i>M</i> ₃	96	9.2 ± 0.099	31	9.1 ± 0.136	0.1	0.6

TABLE 2.

Upper Jaw. Thickness of Teeth.						
	♂		♀		$M_{\text{♂}} - M_{\text{♀}}$	$\frac{M_{\text{♂}} - M_{\text{♀}}}{\sqrt{m_{\text{♂}}^2 + m_{\text{♀}}^2}}$
	<i>n</i>	$M_{\text{♂}} \pm m_{\text{♂}}$	<i>n</i>	$M_{\text{♀}} \pm m_{\text{♀}}$		
<i>I</i> ₁	131	7.4 ± 0.047	35	6.9 ± 0.095	0.5	4.7
<i>I</i> ₂	131	6.7 ± 0.042	38	6.3 ± 0.090	0.4	4.0
<i>C</i>	136	8.5 ± 0.050	43	7.8 ± 0.074	0.7	7.8
<i>P</i> ₁	132	9.8 ± 0.053	39	9.4 ± 0.089	0.4	3.9
<i>P</i> ₂	129	9.7 ± 0.055	40	9.2 ± 0.087	0.5	4.9
<i>M</i> ₁	130	11.8 ± 0.053	41	11.2 ± 0.077	0.6	6.4
<i>M</i> ₂	125	11.7 ± 0.062	39	10.9 ± 0.123	0.8	5.8
<i>M</i> ₃	96	11.2 ± 0.107	31	10.7 ± 0.122	0.5	3.1

TABLE 3

Lower Jaw. Breadth of Teeth.						
	♂		♀		$M_{\sigma} - M_{\text{♀}}$	$\frac{M_{\sigma} - M_{\text{♀}}}{\sqrt{m_{\sigma}^2 + m_{\text{♀}}^2}}$
	<i>n</i>	$M_{\sigma} \pm m_{\sigma}$	<i>n</i>	$M_{\text{♀}} \pm m_{\text{♀}}$		
<i>I</i> ₁	128	5.5 ± 0.043	37	5.4 ± 0.076	0.1	1.1
<i>I</i> ₂	133	6.2 ± 0.045	39	6.1 ± 0.090	0.1	1.0
<i>C</i>	139	7.2 ± 0.044	42	6.8 ± 0.080	0.4	4.4
<i>P</i> ₁	133	7.3 ± 0.045	42	7.1 ± 0.065	0.2	2.5
<i>P</i> ₂	131	7.3 ± 0.051	42	7.1 ± 0.083	0.2	2.0
<i>M</i> ₁	114	11.5 ± 0.060	36	11.2 ± 0.093	0.3	2.7
<i>M</i> ₂	132	10.9 ± 0.061	38	10.4 ± 0.123	0.5	3.6
<i>M</i> ₃	98	10.9 ± 0.075	28	10.7 ± 0.132	0.2	1.3

TABLE 4

Lower Jaw. Thickness of Teeth.						
	♂		♀		$M_{\sigma} - M_{\text{♀}}$	$\frac{M_{\sigma} - M_{\text{♀}}}{\sqrt{m_{\sigma}^2 + m_{\text{♀}}^2}}$
	<i>n</i>	$M_{\sigma} \pm m_{\sigma}$	<i>n</i>	$M_{\text{♀}} \pm m_{\text{♀}}$		
<i>I</i> ₁	130	5.9 ± 0.044	37	5.5 ± 0.080	0.4	4.4
<i>I</i> ₂	133	6.3 ± 0.043	39	6.0 ± 0.073	0.3	3.6
<i>C</i>	139	7.9 ± 0.043	42	7.2 ± 0.066	0.7	8.9
<i>P</i> ₁	132	8.2 ± 0.055	42	7.7 ± 0.061	0.5	6.1
<i>P</i> ₂	131	8.5 ± 0.049	42	8.2 ± 0.082	0.3	3.1
<i>M</i> ₁	117	11.0 ± 0.060	35	10.7 ± 0.096	0.3	2.7
<i>M</i> ₂	133	10.5 ± 0.057	38	10.2 ± 0.103	0.3	2.5
<i>M</i> ₃	99	10.4 ± 0.071	29	10.2 ± 0.111	0.2	1.5

From the data put down in the tables it appears that the mean dimensions of all the teeth in the males are greater than in the females. But the tables show clearly that the sexual differences not always are reliable, as the

value of the quotient $\frac{M_{\sigma} - M_{\text{♀}}}{\sqrt{m_{\sigma}^2 + m_{\text{♀}}^2}}$ sometimes is less than 3.

The sexual differences in the mean figures are most considerable in the

thickness of the teeth. In all teeth of the upper jaw the sexual difference in the mean thickness is reliable, and the same holds good for the teeth of the lower jaw with the only exception of the molars. It should however be noted that the value of the quotient in the 1st and 2nd lower molars is only little smaller than 3.

Reliable differences in the breadth of the teeth are present in the medial upper incisors, in both upper and lower canine teeth and in both upper and lower 2nd molars.

With regard to each tooth separately it appears from the tables that the greatest sexual differences in the mean figures of both dimensions are shown by the canine teeth, the value of the quotient in these teeth being greatest of all.

Next to the canine teeth come the medial incisors and the 2nd molars, reliable sexual differences lacking in one table only. In the case of the medial incisors this result corresponds to the statements, made by other authors who found sexual differences in the dimensions of these teeth, the breadth of the lower medial incisors excepted.

In the case of the 2nd molars a reliable sexual difference is lacking in the thickness of the lower molar teeth. But we have already pointed out that the quotient bearing on the statistical reliability of this difference nearly attains the value 3. Consequently with regard to sexual differences of the means the second molars even rank before the medial incisors. This result does not agree with the statements of those authors who confine sexual differences to the incisors and canine teeth.

In contradiction to the same authors we found no reliable sexual difference in the mean breadth of the upper lateral incisors.

With regard to the premolar teeth sexual differences are present in the mean thickness of lower and upper teeth only.

In the 1st molars a reliable difference is present in the mean thickness of the upper teeth; in the 3 other tables the quotient bearing on statistical reliability very nearly attains the value 3.

In the 3rd molars only the thickness of the upper teeth shows a reliable sexual difference.

Conclusions.

1. The mean breadth and thickness of the teeth are in the males greater than in the females.
 2. Sexual differences are most considerable in the mean thickness of the teeth, reliable differences lacking only in the 3 lower molars.
 3. With regard to the mean breadth of the teeth reliable sexual differences are present in the upper medial incisors, both upper and lower canine teeth and upper and lower 2nd molars.
 4. The canine teeth show the greatest sexual differences of all, in the breadth as well as in the thickness.
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