

American Journal of Physical Anthropology

VOLUME II

OCTOBER-DECEMBER, 1919

NUMBER 4

ERUPTION AND DECAY OF PERMANENT TEETH IN WHITES AND NEGROES, WITH COMPARATIVE REMARKS ON OTHER RACES

DR. V. SUK

*Assistant Anthropological Institute, and Lecturer on Anthropology, Čech University,
Prague, Bohemia*

I

The following paper is based on records made partly among the Zulu of Natal and Zululand in South Africa, and partly among Whites in Central Europe. The observations on teeth in Africa were undertaken by the writer on the initiative and under the direction of Dr. Aleš Hrdlička, of the Smithsonian Institution, and were carried out during a larger part of 1913-1914, as a part of the plan of comparative studies of the child among primitive peoples.¹ The local opportunities for these studies were most favorable owing to the numerous schools of the American Zulu Missions; and the Missionaries facilitated the work with a helpfulness that has left a deep impression and placed the writer under many obligations.

The present paper comprises the results or observations on 1,008 sub-adult Zulu from all parts of Natal and Zululand. Of these, 492 were males and 516 females, of different ages. The condition and number of teeth of every individual examined were carefully recorded. The age distribution was as follows:

The ages of the children here given may be regarded as quite reliable. Many of the Christianized children knew the exact day of their birth, while in other instances this could be obtained through

¹ See Hrdlička (A.), "Some Recent Anthropological Explorations," *Proc. Nat. Ac. Sci.*, 1915, I, 235-8; and Brief Notes on recent anthropological explorations under the auspices of the Smithsonian Institution, *Ibid.*, 407-410.

the teacher; and among the natives of northern and western Zululand and in some parts of Natal, distant from the towns and missionary stations, it was found that they clearly remembered various historical events of known date, such as for instance the great Zulu war, the first Boer war, the great South African war, and the last Zulu rebellion in 1907. These and other data rendered it possible to ascertain the age of practically all of the subjects examined with a fair degree of accuracy.

TABLE 1. AGES OF SUBJECTS

Years	Male	Female	Years	Male	Female
0-4	2	4	13	47	41
5	8	13	14	32	48
6	29	13	15	34	26
7	16	22	16	17	32
8	34	35	17	19	31
9	31	32	18	9	30
10	47	43	19	12	11
11	31	40	20	55	44
12	69	51	Total	492	516

As to the observations in Europe, they were made on children of several Normal schools, on students of colleges, and on apprentices in different trades in Prague, Bohemia. They were carried out by Prof. J. Matiegka,¹ Director of the Anthropological Institute of the Čech University, and by the writer. For many years Prof. Matiegka has been making extensive investigations of the anthropological conditions and state of health of the children of the schools in Prague,² and the data on the conditions of the teeth of the children is part of this work. The subjects embraced in the work are of Čech extraction and represent fairly well the urban and rural inhabitants of central Bohemia, a population of Slavic origin with some Alpine and Germanic admixture.

Records of detailed observations on the condition and eruption of teeth in colored races are as yet few in number. The writer was able to find but two: Bean's study of the Philippinos, and Hrdlička's investigations on the Indians.³ These standard studies, based on extensive material, together with the above mentioned

¹ Writer is much indebted to Prof. Matiegka for ceding these data for publication and furthering his investigations.

² Partly published in "Vzrůst, vývin, etc., mládežek k. m. Prahy." *Rozpr. Č. Akad.*, VI, No. 17, 1-78 (předl. 1896).

³ See bibliography.

records from Bohemia, furnish a good opportunity for comparison of conditions with those found among the Zulus. Bean studied children from all parts of the Philippine Archipelago, the majority being mestizos, mixed Spanish, Chinese, and Philipinos attending the Manila Normal and Trade Schools and representing the littoral population of the Archipelago. Hrdlička's material consists of full-blooded Indian children from the southwestern part of the United States and northern Mexico.

The present paper deals with permanent teeth only. Little information could be gathered on the temporary set, as the number of sufficiently young Zulu children available for examination was very small.

II

TIME AND ORDER OF ERUPTION OF THE PERMANENT TEETH IN THE ZULU NEGROES

It was found impracticable to make the age groups smaller than one year. In recording permanent teeth, distinction was made between teeth fully erupted and those just erupting through the gums, *i.e.*, those which did not reach the masticatory plane. These erupting teeth are shown in all tables in italics. The following tables give the conditions found in percentages. These percentages have been calculated from the number of permanent teeth erupted or erupting at each age, and for each type of tooth, for the right and left side, and for the upper and lower jaw, separately. Hence, for instance, the figure 86.2 in Table 6 on the right side in column "M," second line, indicates that at the age of six years, out of the 29 boys examined, 86.2 per cent had the "upper right first molar" fully erupted.

In these six tables we can follow the eruption of the permanent teeth in the Zulu. From the figures in italics, indicating the erupting teeth, we see that the period of greatest intensity of eruption of the different types of teeth is between the eighth and the thirteenth year. There is some sex difference in this respect, the girls being somewhat more precocious than the boys, for the period of greatest intensity ends in boys at the thirteenth year and in girls at the twelfth year. As to race differences, the material will be considered in a later chapter. Calculations have been made for upper and lower teeth, and for males and females separately, from the total number of permanent teeth erupted or erupting at each age. The total number of a full set of teeth, that is 16 teeth for each jaw, has been made to equal 100.

TABLE 2. PERCENTAGE OF EACH PERMANENT TOOTH ERUPTED OR ERUPTING AT EACH AGE, IN ZULUS
(The figures in *italics* indicate the erupting teeth)

Age	Number of Cases	Males											
		Upper Jaw						Males					
		Right						Left					
		M	M	M	P	P	C	I	I	C	P	P	M
5	8	—	—	87.5	—	—	—	25.0	37.5	—	—	—	75.0
6	29	—	—	86.2	—	—	—	24.1	12.5	—	—	—	12.5
7	16	—	—	100	—	—	—	68.7	58.6	—	—	—	86.2
8	34	—	—	91.2	—	—	—	62.2	3.4	—	—	—	100
9	31	—	—	100	—	—	—	62.2	93.7	—	—	—	100
10	47	—	—	100	—	—	—	62.2	93.7	—	—	—	100
11	31	—	—	100	—	—	—	62.2	93.7	—	—	—	100
12	69	—	—	100	—	—	—	62.2	93.7	—	—	—	100
13	47	—	—	100	—	—	—	62.2	93.7	—	—	—	100
14	32	—	—	100	—	—	—	62.2	93.7	—	—	—	100
15	33	—	—	100	—	—	—	62.2	93.7	—	—	—	100
16	17	—	—	100	—	—	—	62.2	93.7	—	—	—	100
17	19	—	—	100	—	—	—	62.2	93.7	—	—	—	100
18	9	—	—	100	—	—	—	62.2	93.7	—	—	—	100
19	12	—	—	100	—	—	—	62.2	93.7	—	—	—	100
20	55	—	—	100	—	—	—	62.2	93.7	—	—	—	100

TABLE 3. PERCENTAGE OF EACH PERMANENT TOOTH ERUPTED OR ERUPTING AT EACH AGE, IN ZULUS
(The figures in *italics* indicate the erupting teeth)

(The figures in *italics* indicate the erupting teeth)

LOWER JAW										Males									
Age	Number of Cases	Right						Left											
		M	M	M	P	P	C	I	I	C	P	P	M	M	M				
5	8	—	—	87.5	—	—	—	25.0	50.0	12.5	—	—	—	—	87.5				
6	29	—	—	89.7	—	—	—	25.0	25.0	37.5	—	—	—	86.2	—				
7	16	—	—	3.4	—	—	—	62.1	86.2	55.2	—	—	—	6.9	—				
8	34	—	—	100	—	—	—	93.7	100	100	100	—	—	—	—				
9	31	—	—	97.1	—	—	—	11.8	94.1	97.1	100	—	—	94.1	—				
10	47	—	—	100	—	—	—	11.8	8.8	8.8	—	—	—	5.9	—				
11	31	—	—	100	16.1	5.9	22.6	35.5	100	100	100	100	19.3	16.1	100				
12	69	—	—	100	44.7	3.2	61.7	63.8	100	100	100	100	38.7	3.2	—				
13	47	2.1	—	100	100	100	100	100	100	100	100	100	63.8	27.7	—				
14	32	3.1	—	100	100	100	100	100	100	100	100	100	8.5	12.8	—				
15	33	12.1	—	100	100	100	100	100	100	100	100	100	6.4	6.4	—				
16	17	29.4	—	100	100	100	100	100	100	100	100	100	3.2	3.2	—				
17	19	36.8	—	100	100	100	100	100	100	100	100	100	95.6	92.7	100				
18	9	28.9	—	100	100	100	100	100	100	100	100	100	97.9	97.9	100				
19	12	100	—	100	100	100	100	100	100	100	100	100	97.9	93.6	2.1				
20	55	94.5	—	100	100	100	100	100	100	100	100	100	2.1	2.1	4.3				
													100	100	96.9				
													100	100	3.1				
													100	100	9.1				
													100	100	3.0				
													100	100	29.4				
													100	100	5.9				
													100	100	47.4				
													100	100	31.6				
													100	100	77.8				
													100	100	11.1				
													100	100	100				
													100	100	96.4				

TABLE 4. PERCENTAGE OF EACH PERMANENT TOOTH ERUPTED OR ERUPTING AT EACH AGE, IN ZULUS
(The figures in *italics* indicate the erupting teeth)

Age	Number of Cases	Females													
		UPPER JAW													
		Right							Left						
		M	M	M	P	P	C	I	I	I	C	P	P	M	M
5	12	—	—	16.7	—	—	—	25.0	25.0	—	—	—	—	25.0	—
6	13	—	—	16.7	—	—	—	8.3	61.5	8.3	—	—	—	8.3	—
7	22	—	—	92.3	—	—	—	15.4	7.7	23.1	—	—	—	92.3	—
8	35	—	—	—	—	—	—	15.4	81.8	54.5	—	—	—	95.4	—
9	32	—	—	—	—	—	—	9.1	4.5	71.4	8.6	11.4	5.7	100	—
10	43	—	—	—	—	—	—	8.6	100	8.6	50.0	2.9	46.9	100	—
11	40	—	—	—	—	—	—	100	100	100	65.1	65.1	55.8	100	—
12	51	—	—	—	—	—	—	100	100	100	11.6	2.3	82.5	62.5	—
13	41	—	—	—	—	—	—	100	100	100	87.5	87.5	5.0	2.5	—
14	48	—	—	—	—	—	—	100	100	100	10.0	2.5	94.1	84.3	—
15	26	—	—	—	—	—	—	100	100	100	96.1	98.0	5.9	100	—
16	32	—	—	—	—	—	—	100	100	100	2.0	100	100	100	—
17	31	—	—	—	—	—	—	100	100	100	100	100	100	100	—
18	30	—	—	—	—	—	—	100	100	100	100	100	100	100	—
19	11	—	—	—	—	—	—	100	100	100	100	100	100	100	—
20	44	—	—	—	—	—	—	100	100	100	100	100	100	100	—

TABLE 5. PERCENTAGE OF EACH PERMANENT TOOTH ERUPTED OR ERUPTING AT EACH AGE, IN ZULUS
(The figures in *italics* indicate the erupting teeth)

TABLE 6. TOTAL PERCENTAGE OF PERMANENT TEETH AT EACH AGE, IN ZULUS
(The total number of 16 teeth in each jaw being equal to 100)

Age	UPPER TEETH				LOWER TEETH			
	Males		Females		Males		Females	
	Erupted, Per Cent.	Erupting, Per Cent.	Erupted, Per Cent.	Erupting, Per Cent.	Erupted, Per Cent.	Erupting, Per Cent.	Erupted, Per Cent.	Erupting, Per Cent.
5	17.9	2.3	5.7	2.6	19.5	6.2	11.9	3.6
6	21.3	1.2	21.6	2.88	28.8	0.6	26.4	3.3
7	32.0	0.7	28.9	2.2	37.1	—	34.6	0.8
8	34.7	3.2	36.4	3.2	39.1	4.6	40.1	1.4
9	44.9	2.8	59.9	1.7	46.7	1.8	60.3	2.9
10	59.9	3.0	66.0	2.1	62.1	3.6	62.3	5.7
11	71.3	2.8	77.8	2.5	71.2	1.6	80.1	1.7
12	82.2	0.6	84.3	0.8	83.5	0.7	85.0	0.5
13	86.1	0.6	87.1	—	86.4	1.0	86.2	0.3
14	87.5	—	87.1	0.2	87.5	0.3	88.1	2.4
15	88.2	0.1	89.4	0.9	88.8	0.3	89.9	1.4
16	87.5	1.1	88.2	2.7	91.1	0.7	91.2	2.1
17	88.8	0.3	90.9	0.8	92.7	3.6	93.9	1.0
18	98.6	0.6	94.1	1.0	97.9	0.6	93.7	1.6
19	100	—	92.6	2.8	100	—	94.8	1.1
20	99.8	—	98.7	0.4	99.4	—	99.4	0.1

The figures in heavy-faced type show the sexual discrepancies, the precocity of girls being well pronounced at the age of nine years.

TABLE 7. BEGINNING AND END OF ERUPTION OF THE PERMANENT TEETH
IN ZULUS*Males*

Teeth	Upper				Lower			
	Order of Eruption	Begin	The Majority is Erupting at	End	Order of Eruption	Begin	The Majority is Erupting at	End
Med. Incisors.....	II	before 5?	5- 6	8	II	before 5?	5- 6	6
Lat. Incisors.....	III	5	7- 8	8	III	5	6- 7	8
Canines.....	V	8	10-11	13	IV	8	10-11	13
Ant. Premolars.....	IV	8	10-11	12	V	8	10-11	13
Post. Premolars.....	VI	8	10-11	12	VI	8	10-11	12
First Molars.....	I	before 5?	5- 6	8	I	before 5?	5- 6	8
Second Molars.....	VII	10	11-12	13	VII	9	11-12	14
Third Molar.....	VIII	13	18-20	?	VIII	13	17-19	?

Females

Med. Incisors.....	II	before 5?	6- 7	7	II	before 5?	5- 6	7
Lat. Incisors.....	III	5	7- 8	8	III	5	6- 7	8
Canines.....	V	8	9-11	13	IV	6	9-10	13
Ant. Premolars.....	IV	8	9-10	12	V	8	9-10	12
Post. Premolars.....	VI	8	9-11	12	VI	8	9-11	13
First Molar.....	I	before 5?	6- 7	—	I	before 5?	5- 6	—
Second Molar.....	VII	9	11-12	—	VII	9	11-12	13
Third Molar.....	VIII	12	18-20	?	VIII	12	17-19	?

Thus for instance, figure 32.0 in Table 6, second column, third line, indicates that at the age of seven in boys there were 32 per cent of erupted permanent teeth in the upper jaw, whereas the figure 100 in the same column, last line but one, indicates that males at the age of nineteen had already a full set of teeth, *i.e.*, 16 permanent teeth in the upper jaw.

Table 7 gives the beginning and the end of eruption, the time at which the majority of teeth are erupting, and the order of eruption. The time at which the majority of teeth are erupting is "the time of eruption" in the proper sense, the beginning and the end of eruption being more or less extremes only. This time of eruption is therefore about the same as the "median" of Bean, being the time half way between the beginning of eruption and the end of eruption (Bean, p. 128).

All of these tables can now be considered together, and it may perhaps be best to take each type of tooth separately.

UPPER TEETH

Median Upper Incisors.—Most probably they begin to erupt earlier than the fifth year in some cases, but in boys the main time of eruption is the fifth and sixth years and in girls the seventh year. Girls are somewhat more backward in this particular than boys, but the period of eruption of this tooth appears to be shorter in girls than in boys. At the age of eight in girls all median incisors were through the gums, whereas the boys did not reach 100 per cent before the ninth year. There were hardly any discrepancies between the right and left side in this respect.

Lateral Incisors.—The lateral upper incisors begin to erupt a little later than the median, and the girls are again appreciably more backward than the boys. But the mean time of eruption is the same for both sexes, showing that in this case too dentition in girls once started progresses more rapidly than in boys. At the age of nine years both sexes have the full number. There is also in this case practically no difference between the two sides.

Canines.—The time of beginning of eruption of the upper canines appears to be about the same in both sexes. At the age of eight, however, the number of erupted teeth is greater in girls than in boys, and likewise at the age of eleven years the number of erupted canines is greater in girls than in boys. The limits of the period of eruption for both sexes are practically the same, but from the percentage of erupted

canines at intermediary ages we see that the girls are a little precocious. In both sexes the left canine seems to develop a little more rapidly than the right.

Anterior Upper Premolars.—In both sexes the extremes of the period of eruption are the same, beginning at the age of eight and ending at twelve years. But girls once more are earlier in point of time at which the majority of the teeth are erupted. The median time, as we call it in accordance with Bean, is for this tooth from nine to ten in girls and from ten to eleven in boys. There is practically no difference in the time of eruption of the anterior premolars on the right and left side.

Posterior Premolars.—In a very few individuals, males and females, the posterior upper premolars were seen to begin to erupt at the age of eight years; but the time of greatest intensity is from nine to eleven in girls and from ten to eleven in boys. The percentage of erupted posterior premolars at the age of eleven years is greater in girls than in boys, the former tending again to be a little precocious. In both groups the end is in the twelfth year.

First Molars.—The first upper molars in the Zulu begin to erupt before the age of five years, at least so in the boys, where 75 per cent in the left and 87.5 per cent in the right side were already erupted at the age of five years. The greatest intensity is from the fifth to the sixth year in boys and from the sixth to the seventh year in girls. At the end of seven the eruption was found to be fully terminated in the girls but in some of the boys it was prolonged until the eighth year. Hence, the end is a year earlier in girls than in boys. There is no difference in the time of eruption on the two sides.

Second Molars.—The second upper molars begin to erupt at the age of ten years in boys and a year earlier in girls. The median period, when the majority of these teeth are erupting, lasts two years, from eleven to twelve, in both sexes. At the age of thirteen the eruption of this tooth is terminated in the girls, whereas in boys of that age we still find some individuals without the second upper molar, consequently the boys are one year more backward than the girls. No differences could be noticed as to right and left.

Third Molars.—The upper wisdom teeth begin to appear very early, at the age of twelve years in girls and of thirteen in boys, but they are present in only a few individuals before the fourteenth or fifteenth year. Most of the third molars erupt in both sexes between the eighteenth and twentieth years. As to the end, nearly the full 100

per cent in boys and about 92 per cent of erupted or erupting teeth in girls are present at the age of twenty. It seems that the teeth of the right side erupt somewhat more promptly than those of the left.

LOWER TEETH

Median Incisors.—The lower median incisors, like the upper, begin to erupt in some cases before the age of five years. The maximum intensity of eruption is between the fifth and sixth years in both sexes. At five the percentage of erupted lower incisors is greater than that of the upper, therefore, in general they may be regarded as slightly earlier. The end of eruption is reached soon, the full 100 per cent being already present in boys of seven years, while in girls but few were lacking at that age. All the girls had the median lower incisors at the age of eight.

Lateral Lower Incisors.—These begin to erupt during the fifth year. The percentage of erupted teeth at that age is again greater than in the upper jaw. The girls here also are a little more backward than the boys but the median time is the same for both sexes, and at the age of eight there are but few individuals of either sex without both the lateral lower incisors.

Canines.—The lower canines also erupt earlier than the canines of the upper jaw, as seen from the percentages of erupted teeth at the age of eight years. The girls are somewhat earlier than the boys. At thirteen the eruption is terminated; and at fourteen all individuals of both sexes were found to have the full number of lower canines.

Anterior Premolars.—The anterior lower premolars erupt slightly later than the upper, the percentage of erupted teeth at the age of eight being higher in the upper jaw than in the lower jaw. The median time is from nine to ten in girls and from ten to eleven in boys, the time of greatest intensity in eruption beginning earlier in girls than in boys. The termination of eruption is also earlier in girls than in boys, occurring at twelve and thirteen years respectively.

Posterior Premolars.—There were few instances of erupting posterior lower premolars at eight years; but the majority of teeth were observed to erupt between the ninth and eleventh year in girls and between the tenth and eleventh in boys. This time the end came sooner in boys than in girls; at the age of thirteen the boys had 100 per cent of these teeth, while in the girls there were still some lacking.

First Lower Molars.—At the age of five years, 87.5 per cent of the first lower molars were already erupted, hence it is evident that these

teeth occasionally erupted before that age. They were observed to be slightly more precocious than the upper first molars. Their period of maximum eruption was from the fifth to the sixth year, and proceeded more quickly in girls than in boys. It also ended earlier in girls, for a few instances were found where boys still lacked the first lower molars at the age of eight. On the whole, among the Zulu the first molars in both sexes were the first permanent teeth to erupt.

Second Molars.—In both sexes the second lower molars erupted earlier than the upper. The beginning was at the age of nine years, and the period of greatest intensity of eruption was seen to be between the eleventh and twelfth years. The girls showed a little more precocity than the boys. The end came at the thirteenth year in girls and at the fourteenth in boys.

Third Molars.—The third lower molars were slightly earlier than the upper. The time of the greatest intensity of eruption in both sexes was between the seventeenth and nineteenth years, and the girls were a little ahead of the boys. About 96 per cent of these teeth in both sexes were erupted or erupting at the age of twenty.

We have now considered dentition among the Zulu tooth by tooth. From table 7 it can be seen that the order of eruption is the same for both sexes in each jaw; that the beginning of eruption of permanent teeth is very early; and that girls in general are slightly more precocious in this respect than boys.

The sex discrepancies are even more evident in Table 6. This table gives the total percentage of all permanent teeth erupted or erupting at each age. We have noticed already that with regard to several of the teeth the girls are somewhat precocious; also that the same is true when we regard dentition as a whole. We see that girls at the age of nine have erupted 59.9 per cent of all permanent upper teeth, while boys reach this percentage one year later; and the case is similar with the lower teeth at the same age. From this period of nine years the girls are ahead; but both sexes will have about the same percentage of permanent teeth after puberty, when dentition is complete except for the third molar.

Besides this an interesting feature is seen between the ages of eight and nine years. There is a sudden leap from 36.4 per cent in the eighth to 59.9 per cent in the ninth year in the upper teeth of the girls, and the same in the lower teeth, where the ratio is 40.1 per cent to 60.3 per cent. Without doubt this jump is connected in some way with the development of the body in general.

As to *side*, it was possible to observe 119 groups of discrepancies. Of these groups, in 65 the right side was the more advanced, *i.e.*, 54.6 per cent; in 54 the left side was the more advanced, *i.e.*, 45.4 per cent. Hence, in 9.2 per cent more of the cases the right side was further advanced than the left.

Remarks. Anomalies.—In general the Zulu have a fine set of teeth. The individual teeth are well developed, well differentiated, very seldom discolored, and the cusps are well formed. Additional cusps on the molars (the cusp of Carabelli) are not rare. Crowding of teeth and displacements were met with in a few cases only. Decay of teeth will be considered in a special chapter.

Fairly frequent is the tremma (central diastema) in the upper jaw; the writer saw it several times in talking to the people, and found it six times recorded in his notes. The natives know it very well, have a special name for it—*ityako*,—and admire it both in men and in women.

As we have seen, the teeth begin to erupt very early and dentition is completed in a relatively short time; at the age of eighteen several of the individuals examined had all four of the third molars erupted; one boy, 148.9 cm. tall, about thirteen or fourteen years old, already had 32 teeth, though still no hair in the armpit and in the pubic region.

As to *Anomalies*, the following were recorded:

1. *Supernumeraries.*—There was a supernumerary conical tooth behind the upper right permanent median incisor found in three cases: boy, thirteen years old, 129.9 cm. tall; girl, eleven years old, 129.5 cm. tall; and a girl, eleven years old, 139.2 cm. tall.

2. *Congenital Deficiencies.*—The upper left permanent median incisor lacking: girl, eighteen years, 153.9 cm. tall; the upper right permanent lateral incisor lacking: boy, twelve years, 137.0 cm. tall; the upper left permanent lateral incisor small and conical [a supernumerary with impaction of incisor?—Ed.]: girl, sixteen years, 156.9 cm. tall; the lower left permanent lateral incisor lacking: girl, twelve years, 139.9 cm. tall; the upper canines lacking, no space for them, the arch quite symmetrical and the row full, three cases: boy, thirteen years, 141 cm. tall; boy, twelve years, 130.2 cm. tall; girl, thirteen years, 144.9 cm. tall; the lower canine lacking: girl, seventeen years, 161.6 cm. tall; the lower right and left canines with three cusps: boy, nine years, 129 cm. tall; the upper right and left permanent anterior premolar and the lower right and left permanent posterior premolar lacking at full row: girl, nineteen years, 157.7 cm. tall.

3. *Coexistence of Permanent with Temporary Teeth.*—The lower left permanent median incisor and the temporary incisor both present together: two cases: boy, nine years, 123.5 cm. tall, boy, ten years, 130.8 cm. tall; the upper right and left permanent canines and the deciduous canines present together: boy, eleven years, 139.2 cm. tall; the lower left permanent canine and the temporary canine present together: boy, ten years, 130.8 cm. tall; the upper right and left permanent posterior premolars and the temporary posterior molars present together: girl, eleven years, 144.4 cm. tall; the upper right permanent posterior premolar and the temporary molar present together: girl, thirteen years, 149 cm. tall.

It will be seen that the anomalies attending the first and second dentition among the Zulu negroes are not many. Supernumerary teeth behind the upper median incisors have been met with also in a Zulu boy near the Umseneni River in northern Zululand. He had two such teeth behind the upper median incisors in the palate. They troubled him somewhat, for he asked to have them pulled. A plaster cast of the abnormality was made, and both teeth could be drawn easily. However, most of the abnormalities met with were defects of individual teeth which in some cases at least may have been due to impaction, and delayed shedding of individual temporaries.

III

TIME AND ORDER OF ERUPTION OF THE PERMANENT TEETH IN WHITES

As already mentioned, the condition of teeth in Whites in this connection has been studied in children and adolescents at Prague.¹ The investigations were carried out in quite the same manner as in South Africa, hence the data gathered form a good basis of comparison. The subjects were boys between the ages of six and nineteen years from three different schools: Normal school, College, and School for Apprentices in different trades. The age was taken from the school records and quoted only in full years. The age groups of eighteen and nineteen years are small, but this is of no importance, the eruption of permanent teeth at that time being finished except for the third molar. To gather reliable statistics for the wisdom teeth in Whites would require the examination of a large number of individuals at ages ranging from twenty to thirty years, for in our race the time of eruption of the third molar differs much in individuals and covers a

¹ This part of the investigations has been published with some more details by the writer in the *Čech Medical Review*, 1916. (Lékařské Rozhledy, Praha.)

period of nearly twenty years. The boys were examined at the Paedologic Institute of the City of Prague¹ by Prof. Matiegka, or the writer.

TEETH OF WHITE BOYS (BOHEMIA).

Subjects:

Age	Normal School	School for Apprentices	College	
6	21	.	.	21
7	25	.	.	25
8	24	.	.	24
9	30	.	.	30
10	28	.	.	28
11	29	.	24	53
12	44	.	22	66
13	51	.	33	84
14	12	32	21	65
15	1	92	20	113
16	.	90	14	104
17	.	49	9	58
18	.	9	4	13
19	.	1	9	10
Total number of subjects.....				694

The following tables, 8 and 9, contain the number of cases at each age, and the per cent of erupted and erupting teeth for each type of tooth, for each jaw, and for right and left side separately, in the same manner as in Tables 2, 3, 4, and 5.

With these tables at hand we are able to consider the whole dentition for each tooth and each jaw separately. The time at which the majority of teeth are erupting is again "the time of eruption" in the proper sense, whereas the entire time covered by the eruption of each type of tooth is given in Table 10.

UPPER TEETH

Median Upper Incisors.—It is almost certain that these teeth begin to erupt at the fifth year, for among our cases we found at the age of six years 14.3 per cent of fully erupted and 9.5 per cent of erupting median incisors on the left side, and 4.8 per cent of erupted and 4.8 per cent of erupting teeth on the right side. The main period of eruption for these teeth is the *seventh* year. At the age of eight the eruption is nearing its end, and in the ninth year we always found the full number. The observation that the left side developed more rapidly than the right corresponds with Bean's results (p. 129). It

¹ Thanks are due in this connection, to M. J. Dolenský, Curator at the Institute, or facilitating the work.

TABLE 8. PERCENTAGE OF EACH PERMANENT TOOTH ERUPTED OR ERUPTING AT EACH AGE, IN WHITE BOYS AT PRAGUE
(The figures in *italics* indicate the erupting teeth)

Age	Number of Cases	Males											
		UPPER JAW						Left					
		Right			Left			Right			Left		
		M	M	M	P	P	C	I	I	C	P	P	M
6	21	—	—	38.1	—	—	—	4.8	14.3	—	—	—	42.9
7	25	—	—	14.3	—	—	—	4.8	9.5	—	—	—	19.0
8	24	—	—	68.0	—	—	—	60.0	52.0	—	—	—	56.0
9	30	—	—	20.0	—	—	—	4.0	16.0	—	—	—	28.0
10	28	—	—	100	—	—	—	37.5	87.5	—	—	—	95.8
11	53	—	—	100	—	—	—	33.3	12.5	—	—	—	4.2
12	66	—	—	100	—	—	—	60.0	100	—	—	—	100
13	84	—	—	100	—	—	—	20.0	20.0	—	—	—	100
14	65	—	—	100	—	—	—	89.3	89.3	—	—	—	100
15	113	—	—	100	—	—	—	100	100	—	—	—	100
16	104	—	—	100	—	—	—	100	100	—	—	—	100
17	58	—	—	100	—	—	—	100	100	—	—	—	100
18	13	—	—	100	—	—	—	100	100	—	—	—	100
19	10	—	—	100	—	—	—	100	100	—	—	—	100

TABLE 9. PERCENTAGE OF EACH PERMANENT TOOTH ERUPTED OR ERUPTING AT EACH AGE, IN WHITE BOYS AT PRAGUE
(The figures in *italics* indicate the erupting teeth)

was well marked in the children of Prague, the left side having three times as many teeth at a certain period as the right side.

Lateral Upper Incisors.—The beginning of eruption is in the seventh year. The left side is again ahead, agreeing once more with Bean's results. The main time of eruption is from the eighth to the ninth year, in some cases extending to the tenth or even eleventh year, the latter being the extreme limit.

Canines.—The upper canines begin to erupt at the ninth year. At ten about one-fourth have already erupted. The main period of eruption is between the tenth and the eleventh year. In individual cases eruption is not completed until the sixteenth year; but on the whole it ends at the fifteenth year, which again agrees with Bean's observation.

Anterior Upper Premolars.—While in a few cases these teeth were observed at seven years of age, the general beginning of their eruption is from the tenth to the eleventh year. The end of eruption comes at the age of fourteen. The left side is just a little ahead of the right. The entire period of eruption covers eight years, as in the case of the upper canines; in the case of the median incisor and the first molar the entire period does not cover more than four years.

Posterior Upper Premolars.—The beginning of eruption was observed at the eighth year. The main period of eruption extends from the tenth to the twelfth years. The entire period of eruption covers eight years, the end coming at the age of fifteen. The left side is again slightly ahead of the right.

First Upper Molar.—In Prague children the first molars begin to erupt at the age of five years, and were found in 30 per cent of the cases at the age of six. Possibly in some instances eruption begins even before the fifth year. The main time of eruption is from the sixth to the seventh year, the end comes during the eighth. There were no discrepancies between the two sides. The entire time of eruption of these teeth is rather short, only four years.

Second Upper Molars.—These teeth were found in a few children during their tenth year, but in general they begin to erupt at the eleventh year, the main period of eruption being between the twelfth and the fourteenth years. The end comes during the seventeenth year, the entire period of eruption covering eight years, or double that of the first molars.

Third Upper Molars.—As already stated, the number of cases in the higher ages is insufficient to permit definite conclusions as to the

eruption of these teeth. However, none were observed to begin to erupt before the seventeenth year. In the main the beginning of eruption was about the nineteenth year, which agrees with the results obtained by other investigators among White adolescents (as for instance those of Magitot, Zuckerkandl, Quain, etc., according to Herpin's review). Bean states that in American and in German-American boys the third upper molar never appears before the eighteenth year (p. 132); while Daffner gives the average time at which these teeth begin to erupt in German children of his observation as twenty-one and a half years. In a few instances our school boys are more precocious than American boys, and in general more precocious in this respect than Daffner's Germans.

LOWER TEETH

Median Incisors.—At the age of six years 50 per cent of the lower median incisors were already through the gums, there is no doubt, therefore, that eruption begins in the fifth and in some instances possibly even before the fifth year. The main period of eruption lasts only two years, from the sixth to the seventh year; at the beginning of the eighth year the full 100 per cent were already found present. Hence the lower median incisor is by a year more precocious than the upper one, and the right lower tooth is somewhat more precocious than the left, a result which quite agrees with Bean's statements. The whole period of eruption lasts three years, a year less than for the median incisors of the upper jaw.

Lateral Lower Incisors.—Begin to erupt in the sixth year, in some cases probably even earlier. The main time of eruption is from the seventh to the eighth year, and proceeds until the tenth year. We have always found the full number at the beginning of the eleventh year. Like the median incisors, these teeth also erupt a year sooner than the corresponding ones. The entire period of eruption lasts five years, a year less than in the upper jaw.

Canines.—The lower canines, too, were found to be more precocious than the upper. They begin to erupt at the eighth year, and the main time of eruption extends from the tenth to the eleventh year. The entire period lasts seven years, or to the end of the fourteenth year. Bean also places the beginning of eruption of the lower canines a year earlier than that of the upper.

Anterior Lower Premolars.—These teeth, contrary to the incisors and canines, are a year later in their eruption than those of the upper

jaw. The main period of eruption extends from the tenth to the twelfth year, but in some individuals the process lasts until the fifteenth year, the whole period covering approximately eight years. The two sides showed no discrepancies. All this agrees with Bean's observations on American Whites.

Posterior Lower Premolars.—On the whole, conditions found in connection with these teeth were similar to those in the upper jaw, the teeth of the latter being a little more precocious. The same was noticed by Bean. The entire period of eruption in both jaws lasts eight years, but the main time is between the eleventh and twelfth year. There is no appreciable difference between the two sides.

First Lower Molars.—These are the earliest teeth of the permanent dentition. No doubt their eruption frequently begins in or even before the fifth year, for we find 70 per cent of these teeth present in the sixth year. The entire period is very short, covering only three years, the end being at seven. The whole time lasts a year less than in the upper jaw, ending a year earlier. No particular difference was noted between the right and left sides.

Second Lower Molars.—The beginning of eruption is just a little earlier than in the corresponding teeth of the upper jaw. Eruption proceeds very slowly, so that it is difficult to define the time of greatest intensity. The main period lasts from the eleventh to the fourteenth year. After fourteen eruption proceeds very slowly and ends at seventeen. The entire period lasts, therefore, as in the upper jaw, about eight years. The right side is a little more precocious than the left.

Third Lower Molars.—These teeth begin to erupt two years earlier than the upper ones, and the right side is more precocious than the left. They begin to erupt during the fifteenth year, the main period of eruption probably being the eighteenth year. According to Bean, the lower third molars develop sooner than the upper, but the difference in his subjects was slight.

GENERAL REMARKS ON DENTITION IN WHITES

The preceding statements are summarized in the following table (10).

The figures show plainly that in the boys of Prague the beginning of eruption in the lower jaw is more precocious than in the upper, the main period of eruption is shorter, and the end of eruption comes earlier. On the whole it may be said that *the earlier the eruption of a tooth begins the shorter will be the main period of its eruption.*

TABLE 10. BEGINNING AND END OF ERUPTION OF PERMANENT TEETH IN WHITE BOYS OF PRAGUE

Males

Teeth	Upper				Lower			
	Order of Eruption	Begin	The Majority is Erupting	End	Order of Eruption	Begin	The Majority is Erupting	End
Med. Incisors.....	II	5	7- 8	8	II	5	6- 7	7
Lat. Incisors.....	III	7	8- 9	11	III	before 6?	8	10
Canines.....	VI	9	11-12	15	IV	8	10-11	14
Ant. Premolars.....	IV	7	10-11	14	V	8	10-12	15
Post. Premolars.....	V	8	10-12	15	VI	8	11-12	15
First Molars.....	I	5	6- 7	8	I	before 5?	5- 6	7
Second Molars.....	VII	10	12-14	17	VII	10	11-13	17
Third Molars.....	VIII	17	19-?	?	VIII	15	18-?	?

To get a correct idea of how dentition is proceeding at a given age we may consider table 11, which gives the total percentages.

TABLE 11. TOTAL PERCENTAGE OF PERMANENT TEETH AT EACH AGE, IN THE WHITE BOYS OF PRAGUE

(The total number of 16 teeth in each jaw being equal to 100)

Males

Age	Number of Cases	Upper Jaw		Lower Jaw	
		Erupted	Erupting	Erupted	Erupting
6	21	6.2	2.9	16.6	2.9
7	25	15.2	5.2	25.0	2.0
8	24	29.4	7.5	32.8	5.4
9	30	36.2	4.5	40.2	3.5
10	28	49.7	5.3	50.4	6.4
11	53	57.4	6.6	61.1	6.9
12	66	72.5	5.5	78.2	3.1
13	84	79.3	2.9	80.6	2.2
14	65	83.4	1.4	83.2	1.5
15	113	86.1	0.5	85.9	0.2
16	104	86.5	--	86.4	0.5
17	58	86.7	0.4	86.6	0.7
18	13	88.4	1.4	90.8	1.4
19	10	86.2	1.8	88.7	1.2

The number of permanent teeth in each jaw is here presented in percentages of the full number, 16 teeth equaling 100 per cent. According to this an individual with all 16 teeth in one jaw has 100 per cent of the permanent dentition in the respective jaw, while for instance, a person without the third molars in a jaw has in this jaw only 14 teeth, or 87.5 per cent of the full dentition. One tooth in each jaw is equal to 6.25 per cent of the full dentition in that jaw.

Table 11 shows plainly that in the youth of Prague the lower jaw is ahead of the upper one; further, that the progress of dentition is not symmetrical, the greatest difference in the increase being between the eleventh and twelfth years, *i. e.*, at the time when the beginnings of puberty in our country are just becoming noticeable. The percentage of erupting teeth (Table 1, columns 4 and 6) are high in these years, a sign that dentition at this time is proceeding with great speed. With the seventeenth and eighteenth years dentition is completed, except for the third molar, whose appearance is quite irregular.

A few precocious cases of eruption may be mentioned in this place. A college boy, twelve years one month old, had already 28 teeth, although the two second upper molars had not yet fully erupted. Another boy, twelve years five months old, had 28 fully erupted teeth, and both lower third molars in the process of eruption. In his textbook on Dentistry, Nesel records a case of 28 teeth in a boy of twelve, and a full set of 32 teeth in a boy of seventeen.

In Negroes we noticed some differences in eruption on the right and left sides (p. 363); we find similar discrepancies in our Whites. We had 86 groups of discrepancies. In 45 (52.3 per cent) the right side was the more advanced, and in 41 (47.7 per cent) the left side was the more precocious. Thus the right side was more advanced in 4.6 per cent more cases than the left.

Taken as a whole dentition in the boys of Prague shows no marked peculiarities in comparison with other Whites.

III

RACIAL COMPARISONS

The literature furnishes numerous data on dentition among Whites, but it would be impracticable to draw on all these in the limits of the present paper. So far as Whites are concerned, the most convenient to use for comparison will be Bean's investigations on American and German-American children from Ann Arbor, Michigan; Roesse's work on eruption of permanent teeth of boys from different countries in Europe (Sweden, The Netherlands, Switzerland, Belgium, Germany and Denmark); and our own study of Čech boys from Prague. For the yellow, brown and black races we have Hrdlička's observations on North American Indians, Bean's publication on Philippino children from schools in Manila, and our own records of Zulu boys and girls from South Africa.

For a better survey of the beginning and end of eruption of teeth

in different races Table 12 is placed here. From it we see at once that white children from the different countries show no great differences in these respects—still it is apparent that with the Čech boys the eruption of permanent teeth is a little more precocious than in the American children. The American and German-American girls are ahead of the boys, as is the case among all groups. In the colored

TABLE 12. BEGINNING AND END OF ERUPTION IN DIFFERENT RACES

Teeth	Ameri- can Boys, Bean	Ameri- can Girls, Bean	German- Ameri- can Boys, Bean	German- Ameri- can Girls, Bean	Čech Boys Prague, Matieška & Suk 6	Diff. Europ. Boys, Roese	Philippino Boys, Bean	Philippino Girls, Bean	Zulu Boys, Suk	Zulu Girls, Suk
1	2	3	4	5	6	7	8	9	10	11
<i>Upper:</i>										
Median incisor . . .	7- 9	6- 9	6-11	7-10	5- 8	5½-11½	b. 15- 9	b. 5- 9	b. 5- 8	b. 5-7
Lat. incisor	7-11	7-12	7-11	7-11	7-11	6-?	b. 5-11	b. 5- 9	5- 8	5- 8
Canine	10-14	9-15	10-14	8-15	9-16	7½-15	b. 5-11	5-13	8-13	8-13
Anter. premolar . . .	8-16	8-13	8-14	8-13	7-14	6½-14½	5-14	10-13	8-12	8-12
Poster premolar . . .	9-16	8-14	9-14	8-14	8-15	6½-15	5-15	10-13	8-12	8-12
First molar	6- 9	6- 8	6- 9	5- 7	5- 8	5- 9½	b. 5-10	b. 5- 9	b. 5- 8	b. 5- 7
Second molar	12-16	10-15	11-16	11-16	10-17	9-15	5-14	10-15	10-13	9-12
Third molar		16- ?			17- ?		13- ?	12- ?	13- ?	12- ?
<i>Lower:</i>										
Med. incisor	6- 8	5- 8	6-11	5- 9	5- 7	5-10	5- 9	b. 5- 9	b. 5- 6	b. 5- 7
Lat. incisor	7-10	6- 9	7-10	7-10	6-10	6-12	5-10	b. 5- 9	5- 8	5- 8
Canine	9-13	8-13	10-14	8-12	8-14	7-15	5-11	b. 5- 9	8-13	6-13
Anter. premolar . . .	9-14	9-14	10-14	8-14	8-15	7-14½	5-14	5-13	8-13	8-12
Poster premolar . . .	8-16	9-15	10-14	9-15	8-15	7-15	5-15	10-13	8-12	8-13
First molar	6- 8	5- 8	6- 7	5- 8	5- 7	5-10	b. 5-12	b. 5- 9	b. 5- 8	b. 5- 6
Second molar	11-17	10-16	10-16	10-14	10-17	9-15	5-14	5-13	9-14	9-13
Third molar		16- ?		14- ?	15- ?		13- ?	14- ?	13- ?	12- ?

races, the Filipinos and Zulus, we note that eruption begins earlier and is completed sooner. Most of the boys and girls at the ages of fourteen and fifteen years in these races have 28 fully erupted teeth, while in white children we do not find this number (*i.e.*, the full set apart from the third molars) until the seventeenth and eighteenth years. In Negroes we find the period of greatest intensity of eruption to fall between the ages of nine and ten in boys, and between the ages of eight and nine in girls (Table 6). We find the same period and with similar sex difference in our children two years later (Table 10, 11). There is no doubt that these conditions are closely connected with the general development of the body, and in particular with the earlier reaching of puberty in the Negroes.

Table 13 which follows affords the best basis for comparison, giving us the time of eruption in the proper sense, *i.e.*, the time when the majority of teeth are erupting. Some writers have attached too much

importance to finding an exact date for eruption, *i.e.*, getting a proper mean number for each tooth. Roese did this with his material. By means of a very complicated calculation he determined the average time of eruption for each tooth. He says, for instance, that the upper

TABLE 13. "THE TIME OF ERUPTION," OR THE PERIOD OF THE MOST RAPID ERUPTION OF THE PERMANENT TEETH IN DIFFERENT RACES

Teeth	American Boys, Bean	German- American Boys, Bean	American Girls, Bean	German- American Girls, Bean	Čech Boys, Prague, Matiegka & Suk	Phil- ippino Boys, Bean	Zulu Boys, Suk	Zulu Girls, Suk
<i>Upper:</i>								
Med. incisor....	7- 8	7- 8	7- 8	7- 8	7- 8	.	5- 6	6- 7
Lat. incisor....	8-10	8- 9	8- 9	7- 9	8- 9	.	7- 8	7- 8
Canine.....	11-12	11-12	10-11	10-12	11-12	5- 9	10-11	9-11
Ant. premolar..	10-11	10-12	9-11	9-11	10-11	5-10	10-11	9-10
Post. premolar..	10-12	10-12	10-11	10-11	10-12	7-11	10-11	9-11
First molar.....	6- 7	6- 7	5- 6	6- 7	6- 7	.	5- 6	6- 7
Second molar...	12-14	11-14	12-13	12-13	12-14	10-11	11-12	11-12
Third molar....	.	.	.	.	19-?	17-20	18-20	18-20
<i>Lower:</i>								
Med. incisor....	6- 7	6- 7	5- 6	6- 7	6- 7	.	5- 6	5- 6
Lat. incisor....	7- 9	7- 9	7- 8	7- 8	7- 8	.	6- 7	6- 7
Canine.....	11-12	11-12	9-11	10-11	10-11	5- 9	10-11	9-10
Ant. premolar..	10-12	11-12	9-11	10-11	10-12	10-11	10-11	9-10
Post. premolar..	11-12	10-13	10-11	11-12	11-12	10-11	10-11	9-11
First molar.....	6- 7	6- 7	5- 6	6- 7	5- 6	.	5- 6	5- 6
Second molar...	11-14	11-14	10-12	11-12	11-14	10-11	11-12	11-12
Third molar....	.	.	.	.	18-?	17-18	17-19	17-19

posterior premolar has an average time of eruption of eleven years and four months (his Table 14, p. 564), while in our table we find that the "time of eruption" for this tooth is between the ages of ten and twelve (our Table 13), and Bean has it the same. The writer does not doubt that Roese's figure of eleven years and four months may be mathematically correct, but it is of very little use. The eruption of a tooth is a comparatively slow physiological process always covering a long period, hence it is of little use to express the time by a "point"; it is much better expressed by a "line," like a Gaussian statistical curve. Thus if we say that the upper posterior premolar erupts between the tenth and twelfth years we shall be correct in about 85 per cent of the cases (Table 8). The eruption would give us a very flat Gaussian curve and not a sharp-pointed one.

From Table 13 we see that the colored races, Philipinos and Zulus, are much more precocious than the white children. The native white Americans are a little more precocious than the German-Americans, and the eruption of permanent teeth in the Prague boys

advances somewhat more rapidly than in either of the groups just mentioned. In Americans, German-Americans, and Čechs we find the third molar still lacking in most cases at the age of eighteen, whereas in Philipinos and Zulus the eruption of this tooth begins at the age of thirteen, and most of the boys and girls already have their full set of 32 teeth at the age of twenty.

Chérot (quoted after Bean), who published new data on dentition in French children, shows that the beginning and end of tooth eruption is somewhat more precocious in French than in American children.

Hrdlička's data on full blood Indians (Pima and Apache) need a separate consideration. His work was among Indians in whom the keeping of age records was of very recent date. In consequence, out

TABLE 14. ERUPTION OF TEETH IN INDIANS (PIMA AND APACHE, HRDLIČKA)
(In 124 children of known age)

	Earliest Age at which One or Both were Seen Erupting or Erupted			Oldest Child in Whom One or Both were Still Lacking		
	Year	Monthly	Day	Year	Monthly	Day
<i>Upper:</i>						
Median incisor.....	—	7	17	1	—	18
Lateral incisor.....	—	7	20	1	—	15
Canines.....	1	5	14	1	11	—
Anterior premolar..	1	4	25	1	5	14
Posterior premolar..	2	2	9	2	2	9
<i>Lower:</i>						
Median incisor.....	—	2	15	—	6	—
Lateral incisor.....	—	8	16	1	6	2
Canine.....	1	5	14	2	—	—
Anterior premolar..	1	4	25	1	6	2
Posterior premolar..	1	10	—	2	2	—

PERMANENT TEETH

<i>Upper:</i>						
Median incisor.....	7	4	7	7	9	13
Lateral incisor.....	8	0	0	10	6	11
Canine.....	10	8	0	—	—	—
Anterior premolar..	10	6	11	—	—	—
Posterior premolar..	10	6	11	—	—	—
First molar.....	4	9	7	5	10	0
Second molar.....	10	8	—	—	—	—
<i>Lower:</i>						
Median incisor.....	6	9	20	8	2	0
Lateral incisor.....	7	9	15	10	6	11
Canine.....	10	6	11	—	—	—
Anterior premolar..	10	6	11	—	—	—
Posterior premolar..	12	1	8	—	—	—
First molar.....	4	9	7	5	10	0
Second molar.....	10	8	—	—	—	—

of the large number of children and adolescents he examined, the exact age could be ascertained in only 124 subjects, ranging from three to thirteen years of age. The data obtained on these children, which give us for the first time information as to the temporary teeth in a colored race, are summarized in the foregoing table.

Notwithstanding the difficulties of proper comparison, the preceding table is quite instructive. With one or two exceptions there appear to be no great discrepancies between the whites and the Indians. The eruption of the first permanent molars seems to occur a little earlier in the whites, but it must be remembered that the number of the Indian children available for comparison was small. The first molars, incisors and bicuspid appear at nearly the same statures in both races. The canines erupt possibly a little earlier in the Indians, and the second molars are decidedly earlier in both of the tribes than in white children.

The conclusions drawn by Hrdlička from his total Indian series (826 children and adolescents) were the following:

"Temporary teeth: All the teeth of the first dentition appear in the same order in the Indian child as in the white.

"All the incisors erupt on the average at about the same age in the two races.

"The appearance of the anterior premolars and the canines seems to be somewhat belated in the Indian.

"The eruption of the posterior premolars and the completion of the first dentition are accomplished earlier in the Indian than in the Caucasian.

"Permanent teeth: The incisors appear in the Indians at about the same age as in whites, and the same statement is probably true with regard to the permanent first molars and both bicuspid.

"The canines seem to appear somewhat earlier in the Indians than in the whites.

"The second molars erupt decidedly earlier in the Indians than in white children."

The third molars appear also to erupt a little earlier in the Indians, so that the whole dentition is on the average completed sooner than in civilized whites.

Retardation and non-appearance of the last molars occur also among the Indians, but are decidedly less frequent than among the American whites.

As to sex, there appears to be a little advantage as to promptness with the females.

In order to further facilitate comparison with Hrdlička's data, Bean as well as the writer calculated additionally the ratio dentition-stature in dentition-age. The results, which of course have no claim to as great accuracy as would those based on ages accurately determined, follow:

DENTITION OF PERMANENT TEETH IN FULL-BLOOD NORTH AMERICAN INDIANS
(APACHE AND PIMA—HRDLIČKA)

Teeth	Beginning and End of Dentition (Stated in Years and Tenths of a Year)
Median incisors.....	6.2— 8.5
Lateral incisors.....	7.7—10.00
Canines.....	9.0—12.2
Anterior premolars.....	7.9—13.0
Posterior premolars.....	8.7—14.0
First molars.....	4.9— 7.0
Second molars.....	10.0—13.0
Third molars.....	17.0—?

It is evident that there are no great differences in eruption of teeth between the North American Indians of the tribes examined (both of Arizona) and the Whites. Nevertheless the eruption of the first molar seems somewhat more precocious in these Indians than in white boys. Incisors and premolars appear about the same time, and the canines too do not show any considerable difference though earlier in the Indians. The second molar, however, appears decidedly sooner in the Indians, and the eruption of the third molar also appears to be somewhat earlier. Dentition in Indian girls develops also perceptibly sooner than in Indian boys.

On the whole, the available racial comparisons indicate that, so far as the permanent teeth are concerned, their eruption in the Whites is in general slower than it is in the more primitive colored races; and the differences between the Negroes and the Whites, and also those between the Philippino and White children are more marked than those between the Whites and Indian, so far as the latter have been studied in this respect. These interesting results naturally raise the question as to whether the developmental stage as a whole is not already longer among the civilized Whites than it is among primitive peoples.

DECAY OF PERMANENT TEETH IN WHITES AND NEGROES

Decay of permanent teeth in Whites has been studied by various observers, but not so with the colored races. Only one larger investigation along this line—Bean's studies on Philipinos—is known to the writer; but Bean published only his conclusions. They are as follows:

"The temporary teeth of the Americans are worse than those of the Filipinos, which are worse than those of the Germans. The permanent teeth of the Americans are worse than those of the Germans, which are worse than those of the Filipinos. The girls have worse teeth than the boys in all the groups."¹

"The average number of bad permanent teeth at 16 years is as follows, and this is a fair relative ratio of the extent of decay in the groups at all ages:²

American girls, 7.00 %	American boys, 5.00 %
German girls, 4.27 %	German boys, 3.67 %
Filipino girls, 2.74 %	Filipino boys, 2.16 %

Hrdlička's observations on decay of the teeth among the Indians show that decay is much less frequent than in the Whites, although its frequency varies somewhat according to tribes. The least decay of perhaps all the existing races, according to this observer (personal information), is to be found among the Eskimo.

A detailed comparison of tooth decay must be limited to Whites and Zulus. In this case again the Whites are for the most part school and high school pupils of Prague.

Teeth classed as decayed were those which showed any signs of decay, whether active, corrected, or removed. The data therefore include all filled and extracted teeth; Hutchinson's teeth, and teeth with notches caused by rachitis have not been counted as decayed. The investigation was made with care, but it is possible that a few teeth with a very small area of decay on the contact side have been overlooked, hence the percentage of caries might be slightly greater but not less.

Tables 15 and 16 show us how many teeth of each type were decayed at the different ages, and how decay increased with age. We notice in these tables, as well as in the following ones, the enormous difference

¹ "Eruption and Decay of the Permanent Teeth," *Anat. Rec.*, 1914, VIII, No. 5, 299-302.

² "The Permanent Teeth, with Special Reference to American Children," *Proc. XIX Inter. Cong. Am.*, Wash., 1917, 711-615.

TABLE 15. PERCENTAGE OF DECAYED PERMANENT TEETH IN PRAGUE BOYS
UPPER JAW

Age	Med. Incisor	Lat. Incisor	Canine	Anter. Premolar	Poster. Premolar	1st Molar	2d Molar
6	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—
8	—	—	—	—	—	10.4	—
9	—	—	—	—	—	18.3	—
10	—	—	—	—	—	23.2	—
11	—	1.9	3.3	1.2	3.2	31.1	—
12	1.5	6.1	0.9	1.6	0.9	32.6	1.3
13	3.0	4.7	1.3	5.5	3.2	41.1	0.8
14	2.3	4.6	0.8	6.2	3.2	45.4	6.0
15	3.1	6.1	1.7	4.8	9.9	49.5	1.8
16	5.3	7.2	0.5	10.6	12.0	43.3	6.2
17	10.3	6.0	0.9	9.5	10.3	56.9	4.5
18	—	—	—	11.5	3.8	15.4	7.7
19	20.0	20.0	10.0	30.0	25.0	55.0	15.0

LOWER JAW

6	—	—	—	—	—	—	—
7	—	—	—	—	—	4.3	—
8	—	—	—	—	—	16.7	—
9	—	—	—	—	—	33.3	—
10	—	—	—	—	—	46.4	—
11	—	—	—	—	1.7	48.1	—
12	—	—	—	1.6	3.7	62.1	0.9
13	—	—	—	2.5	6.3	66.1	3.4
14	1	1.5	—	0.8	5.1	61.5	10.3
15	—	0.9	—	1.7	6.7	62.7	12.7
16	—	—	0.9	1.9	6.7	61.5	7.8
17	1.7	1.7	0.8	2.4	8.6	64.7	20.
18	—	—	—	—	3.8	76.9	26.9
19	—	—	—	—	5.0	60.0	38.9

in this respect between Whites and Zulus, and that both as to number of decayed teeth and the number of individuals with decayed teeth.

In the Prague children decay of the permanent teeth begins at the age of about seven, the first lower molar generally decaying first, and in many cases being the only decayed tooth in the whole set. The first upper molar follows next. In Zulu children, decay also begins approximately at the age of seven years, but the first tooth to decay is the first upper molar. Zulu girls are more precocious in this respect than Zulu boys, where decay was not observed before the tenth year.

Teeth usually appear in couples, *i.e.*, the two corresponding teeth in each jaw erupt almost synchronously; but we have noticed that dentition developed sooner in the right side in about 9 per cent of the Negroes and 4.5 per cent of the Whites. The teeth decay in a similar

TABLE 16. PERCENTAGE OF DECAYED PERMANENT TEETH IN THE ZULUS

UPPER JAW					<i>Males</i>			
Age	Med. Incisor	Lat. Incisor	Canine	Anter. Premolar	Poster. Premolar	1st Molar	2d Molar	3d Molar
10	—	—	—	1.6	—	—	—	—
12	—	—	—	0.7	—	0.7	—	—
13	—	—	—	—	—	1.1	—	—
14	1.6	1.6	—	—	—	—	—	—
16	—	2.9	—	—	—	—	—	—
20	—	—	—	—	—	7.2	7.2	4.6

UPPER JAW					<i>Females</i>			
7	—	—	—	—	—	2.3	—	—
9	—	—	—	—	—	1.6	—	—
10	—	—	—	—	—	1.2	—	—
11	—	1.2	—	—	—	—	—	—
14	—	—	—	—	—	1.0	—	—
16	1.6	4.7	3.1	—	1.6	1.6	1.6	—
17	3.2	4.8	—	1.6	3.2	8.1	—	—
18	—	—	—	1.7	1.7	1.7	6.7	2.7
19	—	4.5	—	4.5	4.5	4.5	4.5	7.1
20	2.3	1.1	—	—	1.1	10.2	5.7	2.4

LOWER JAW					<i>Males</i>			
10	—	—	—	—	7.0	—	—	—
12	—	—	—	—	0.8	2.2	—	—
13	—	—	—	—	—	1.1	—	—
14	—	—	—	1.6	1.6	6.2	3.1	—
16	—	—	—	—	—	—	2.9	—
17	—	—	—	—	—	2.6	—	—
18	—	—	—	—	5.6	5.6	—	—
20	—	—	—	—	—	7.2	10.9	10.5

LOWER JAW					<i>Females</i>			
11	—	—	—	—	1.4	3.7	—	—
12	—	—	—	—	—	2.9	—	—
13	—	—	—	—	—	4.9	—	—
14	—	—	—	—	1.0	5.2	2.1	—
15	—	—	—	—	—	3.8	—	—
16	—	—	—	1.6	3.1	17.2	6.2	3.3
17	—	—	—	—	1.6	4.8	8.1	—
18	—	—	—	—	3.3	11.7	6.7	—
19	—	—	—	—	4.5	9.1	22.7	—
20	—	—	—	1.1	—	9.1	6.8	5.9

manner, the permanent teeth decay mostly in couples. Expressed in figures, this feature is very striking. In the Prague children the total number of decayed teeth was 1,764. Out of this number 546 in 152 individuals were single decayed teeth (not in couples), while 1,218 decayed teeth in couples were found in 364 individuals. Table 17 makes this plain.

TABLE 17. SHOWING THE BILATERAL DECAYING OF PERMANENT TEETH
Number of individuals with unilateral and bilateral decay (Prague boys)

Age	Number of Couples of Decayed Teeth								
	0	1	2	3	4	5	6	7	8
Years:					individuals:				
19	3	1	3	.	.	.	.	.	2
18	1	6	4						
17	14	24	9	6	2	1			
16	31	30	18	7	1	2	1		
15	33	31	27	6	2	.	1		
14	19	19	11	5	2				
13	14	36	16	4	.	1			
12	14	18	13	3	1				
11	8	21	5	2					
10	9	8	2						
9	3	4	5						
8	3	1	2						
7	.	1	.						

The first column of the above table gives the age of the children examined, the second column "O" gives the number of individuals with single decayed teeth, and to other columns give the number of individuals with one, two, or more bilateral couples of decayed teeth (as for instance the right and left first lower molar, etc.). The correlation is plain: the number of decayed couples is gradually increasing and the number of individuals with decayed couples is augmenting.

Out of the entire number of 1,764 decayed teeth in the Prague children there were:

Singles:		
Single decayed teeth on the right side.....	256	
Single decayed teeth on the left side.....	290	
Couples:		
200 individuals with one couple showing decay	400	
115 " " two couples "	460	
33 " " three " " "	198	
8 " " four " " "	64	
4 " " five " " "	40	
2 " " six " " "	24	
2 " " eight " " "	32	

The number of decayed teeth in each individual in Whites and Zulus is shown in the abstracts on next page.

This table is plain; the figures show us once more the great difference in respect to decay between the Whites and the Negroes. Among the Negroes we have but few individuals with four or more decayed

TABLE 18. DECAY OF PERMANENT TEETH IN WHITES AND ZULUS
Upper and Lower Jaw Whites (Prague)—Males

Age	Number of Cases	Individuals with															Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	16		
		Decayed Teeth															
6	21																1
7	25		1														6
8	24	3	1		2												12
9	30	2	5	1	4												19
10	28	6	8	3	2												36
11	53	9	14	4	5	1	3										49
12	66	11	11	6	16	1	2	1	1								71
13	84	8	24	13	13	7	2	2	1				1				56
14	65	13	15	3	11	4	4	1	4		1						100
15	113	18	22	11	20	11	10	1	3	2	1	1		1	2	1	90
16	104	12	26	14	14	10	3	3	2	1	1						56
17	58	7	9	14	7	5	4	2	4	2	2						11
18	13		5	2	1		3										9
19	10	2		1	3		1									2	
Totals	694	91	141	72	98	39	32	10	15	5	4	2	1	3	3		516

Zulu

Males

5	8																
6	29																
7	16																
8	34																
9	31																
10	47		2														2
11	31																
12	69	1	1	1													3
13	47	2															2
14	32	3	1			1											5
15	33																
16	17	2															2
17	9	1															1
18	9	2															2
19	12																
20	55	3	5		2	1			1	2							14
Totals	489	14	9	1	2	2			1	2							31

Zulu

Females

5	12																
6	13																
7	22	1															1
8	35																
9	32	1															1
10	43	1															1
11	40	3	1														4
12	51	3															3
13	41	2	1														3
14	48	4	1	1													6
15	26	2															2
16	32	2	2	2				1		1							8
17	31	9	2	1			1				1						13
18	30	4	3	2		1											10
19	11	2	1	2		1											6
20	44	8	3	2	3				1								17
Totals	511	42	14	10	4	1	1	1	1	1							75

teeth, but among the Whites we find more than 200 individuals with four or more, some having as many as sixteen decayed teeth. Besides this a decided sex difference is indicated: decay is more frequently met with in Zulu girls than in the boys, a fact which is also well known in Whites.

The frequency of decay in the different types of teeth is as follows:

TABLE 19. PERMANENT TEETH ACCORDING TO THEIR INVOLVEMENT BY DECAY AMONG CHILDREN OF PRAGUE AND THE ZULU

Tooth	Jaw	School Chil- dren Prague; Males	Zulu Males	Zulu Females	Tooth	Jaw	School Chil- dren Prague; Males	Zulu Males	Zulu Females
		Age: 6-19	Age: 5-20 and More				Age: 6-19	Age: 5-20 and More	
		Per Cent.	Per Cent.	Per Cent.			Per Cent.	Per Cent.	Per Cent.
First molar	lower	42.9	22.8	31.8	Second molar	upper	1.9	10.1	7.3
First molar	upper	29.2	12.7	13.9	Anter. premolar	lower	1.0	1.3	1.3
Second molar	lower	5.3	19.0	17.2	Canine	upper	0.8	—	1.3
Post. premolar	upper	4.3	—	4.0	Lateral incisor	lower	0.3	—	—
Anter. premolar	upper	4.1	2.5	2.0	Canine	lower	0.1	—	—
Lateral incisor	upper	3.6	2.5	5.9	Median incisor	lower	0.1	—	—
Poster. premolar	lower	3.4	7.6	5.2	Third molar	upper	—	6.3	2.6
Median incisor	upper	2.5	1.3	3.3	Third molar	lower	—	13.9	4.0

The figures given in this table are percentages. They show that the first lower molar is the most frequently decaying tooth and the first upper molar follows. In the Prague school children the first lower molar is found decayed twice as frequently as in the other Whites compared; the upper first molar is also more frequently found decayed in the children of Prague, while on the other hand the lower second molar in Prague children is not found as frequently decayed as in the Whites of other regions. In Zulus the second molars decay very frequently.

The remaining teeth do not show any important racial peculiarities in these respects. In the four groups under consideration we see that the lower incisors and the upper and lower canines are the best preserved teeth in the whole set.

On the whole it may be said that decay of teeth with regard to race shows no very important differences as to the types of teeth decaying, but does show great discrepancies with regard to frequency of decay, and to the number of decayed teeth in individuals. The Whites show the worst conditions.

The following tables give the total number of decayed permanent teeth at each age in Whites and Negroes, the number of individuals

TABLE 20. TOTAL NUMBER OF PERMANENT TEETH AND OF DECAYED PERMANENT TEETH AT EACH AGE

(WHITE BOYS PRAGUE)

Age	Number of Cases	Upper Jaw			Lower Jaw		
		Number of Permanent Teeth	Number of Decayed Permanent Teeth	Per Cents of Decayed Teeth	Number of Permanent Teeth	Number of Decayed Permanent Teeth	Per Cents of Decayed Teeth
6	21	31	—	—	66	—	—
7	25	82	—	—	109	2	1.8
8	24	142	5	3.5	147	8	4.5
9	30	196	11	5.6	210	20	9.5
10	28	247	13	5.2	255	26	10.2
11	53	543	40	7.3	577	52	9.0
12	66	825	58	7.0	859	89	10.3
13	84	1,106	99	8.9	1,113	129	11.6
14	65	883	88	9.9	881	101	11.4
15	113	1,566	174	11.1	1,559	189	12.1
16	104	1,441	176	12.2	1,446	163	11.2
17	58	809	114	14.1	811	114	14.0
18	13	187	10	5.3	191	28	14.6
19	10	141	35	24.8	144	20	13.9
Totals	694	8,199	823	10.0	8,368	941	11.2

ZULUS

Age	Upper Jaw							
	Males				Females			
	Number of Cases	Number of Permanent Teeth	Number of Decayed Permanent Teeth	Per Cents of Decayed Teeth	Number of Cases	Number of Permanent Teeth	Number of Decayed Permanent Teeth	Per Cents of Decayed Teeth
5	8	26	—	—	12	17	—	—
6	29	105	—	—	13	51	—	—
7	16	84	—	—	22	110	1	0.9
8	34	206	—	—	35	222	—	—
9	31	237	—	—	32	316	1	0.31
10	47	494	1	0.2	43	448	1	0.22
11	31	378	—	—	40	514	1	0.19
12	69	915	2	0.2	51	695	—	—
13	47	653	1	0.15	41	572	—	—
14	32	448	2	0.44	48	674	1	0.14
15	33	467	—	—	26	376	—	—
16	17	241	1	0.41	32	466	9	1.9
17	19	271	—	—	31	455	13	2.8
18	9	143	—	—	30	457	8	1.7
19	12	192	—	—	11	168	6	3.5
20	55	879	21	2.4	44	698	20	2.8
Totals	489	5,739	28	0.48	511	6,239	61	0.98

Age	Lower Jaw							
	Males				Females			
	Number of Cases	Number of Permanent Teeth	Number of Decayed Permanent Teeth	Per Cents of Decayed Teeth	Number of Cases	Number of Permanent Teeth	Number of Decayed Permanent Teeth	Per Cents of Decayed Teeth
5	8	33	—	—	12	30	—	—
6	29	137	—	—	13	64	—	—
7	16	95	—	—	22	125	—	—
8	34	237	—	—	35	233	—	—
9	31	241	—	—	32	324	—	—
10	47	494	3	0.6	43	462	—	—
11	31	380	—	—	40	524	4	0.76
12	69	930	4	0.43	51	698	3	0.43
13	47	658	1	0.15	41	568	4	0.7
14	32	450	8	1.7	48	696	8	1.15
15	33	471	—	—	26	380	2	0.52
16	17	250	1	0.4	32	478	19	3.97
17	19	293	1	0.34	31	471	9	1.91
18	9	142	2	1.4	30	458	13	2.83
19	12	192	—	—	11	169	8	4.73
20	55	875	31	3.5	44	801	20	2.49
Totals.....	489	5,878	51	0.86	511	6,481	90	1.39

with decayed permanent teeth in the two groups compared, and finally a comparative summary of the total number of permanent teeth and

TABLE 21. NUMBER OF INDIVIDUALS WITH DECAYED PERMANENT TEETH

Age	NATIVES OF NATAL AND ZULULAND						SCHOOLCHILDREN PRAGUE		
	Males			Females			Males		
	Number of Cases	Number of Individuals	Per Cents of Individuals	Number of Cases	Number of Individuals	Per Cents of Individuals	Number of Cases	Number of Individuals	Per Cents of Individuals
		With Decayed Teeth			With Decayed Teeth			With Decayed Teeth	
5	8	—	—	12	—	—	—	—	—
6	29	—	—	13	—	—	21	—	—
7	16	—	—	22	1	4.5	25	1	4.0
8	34	—	—	35	—	—	24	6	25.0
9	31	—	—	32	1	3.1	30	12	40.0
10	47	2	4.3	43	1	2.3	28	19	67.9
11	31	—	—	40	4	10.0	53	36	67.9
12	69	3	4.3	51	3	5.9	66	49	74.2
13	47	2	4.3	41	3	7.3	84	71	84.5
14	32	5	15.6	48	6	12.5	65	56	86.1
15	33	—	—	26	2	7.7	113	100	88.5
16	17	2	11.8	32	8	25.0	104	90	86.5
17	19	1	5.3	31	13	41.9	58	56	96.5
18	9	2	22.2	30	10	33.3	13	11	84.6
19	12	—	—	11	6	54.5	10	9	90.0
20	55	14	25.4	44	17	38.6	—	—	—
Total: .	489	31	6.3	511	75	14.6	694	516	74.3

the ratio of decayed permanent teeth. The facts are plain and require but little explanation.

It is seen that at the age of 18 years our school children have more than 10 per cent of their permanent teeth decayed, whereas the Zulus have ten times less, or only from .5 per cent to 1.4 per cent. At the

TABLE 22. DECAY OF PERMANENT TEETH

Group	Sex	Age	Number of Cases	Upper Jaw			Lower Jaw			Total		
				Number of Permanent Teeth	Number	Per Cent.	Number of Permanent Teeth	Number	Per Cent.	Number of Permanent Teeth	Number	Per Cent.
					Decayed Permanent Teeth			Decayed Permanent Teeth			Decayed Permanent Teeth	
Boys of Prague . . .	♂	6-19	694	8,199	823	10.03	8,368	941	11.47	16,567	1,764	10.64
Zulus	♂	5-20	489	5,739	28	0.48	5,878	51	0.86	11,617	79	0.68
Zulus	♀	5-20	511	6,329	61	0.97	6,481	90	1.38	12,720	151	1.18

age of eighteen only 10 to 15 per cent of the Whites have a set of teeth showing no decay, while among Zulus we find that 85 to 94 per cent of the individuals at the age of eighteen still have faultless teeth. The teeth in Zulu girls are twice as frequently found decayed as in Zulu boys. The total ratio of decayed teeth shown in the last part of Table 22 is very significant. Part of the natives examined in South Africa were uncivilized, some were Christianized children of civilized parents, and some were children of Christianized parents. So far as food was concerned, all of them were living under the same conditions as the uncivilized natives.

The teeth of primitive peoples who for many years have lived under civilized or partly civilized conditions through the influence of Whites, such as the Australian natives, are known to show poorer condition than those of the free members of the tribe. In his interesting study on natives of New South Wales Poech states that decay of teeth in the natives is now very frequent while decayed teeth in skulls from former days are rarely found. According to Poech this condition is brought about through changed food and different mode of living, together with the vices of civilization. The writer remembers that he has several times been somewhat surprised to note that the so-called "civilized" Negroes living in towns, especially those living for a long time among Whites, for instance, old colored Mission preachers, teachers, and servants, had worse teeth than the uncivilized natives of the same age.

In his study on the adolescents of the Bulgarian colleges, Wiazemski states that decay of teeth among them is frequent. From his figures the writer calculated an average of 66.7 per cent of decayed teeth in the boys and 54.9 per cent in the girls. Unfortunately, Wiazemski's data are not fully reliable, having been secured not by himself but through inquiries among the students by means of lists. The smaller percentage of decayed teeth in girls is contrary to general observation, for girls usually have more decayed teeth than boys. Magitot (quoted from Baštýř) says that the usual ratio of decayed teeth in boys and girls is 2: 3. The pupils of the Bulgarian colleges answered the inquiries themselves, and the smaller percentage reported by the girls may perhaps be attributed to a certain amount of vanity in the girls, regardless of the fact that in most cases it is impossible for an individual to ascertain accurately how many decayed teeth he has.

V

CONCLUSIONS

1. The main period of eruption of each permanent tooth, or the time during which the majority of a given tooth are erupting (Bean's "physiological standard"), generally covers about two years; but the total period of eruption differs widely with the different dental elements three to eight years). There are no essential differences in this respect among the Whites, except perhaps for a slight precocity in the children of Prague. In general girls are more precocious than boys, and colored races more precocious than Whites. The Filipinos and Zulus have a full set of teeth at eighteen to twenty years of age, and the American Indians but a little later.

2. The beginning and end of eruption in the lower jaw is somewhat earlier and the main period of eruption is a little shorter than in the upper jaw.

3. In general the earlier a type of tooth makes its appearance, the shorter will be its main period of eruption.

4. On the whole eruption proceeds in the right side a little in advance of the left.

5. Teething proceeds gradually but not regularly. There is a sudden leap of acceleration between the eleventh and twelfth years in Whites, and between the ninth and tenth in Zulu boys (eighth and ninth in Zulu girls).

6. Regarding decay of teeth, there is little difference among the groups of Whites compared, and with regard to the types of teeth af-

fectured there are but small differences between Whites and Negroes. But there are considerable discrepancies as to the number of decayed teeth between these groups, the white children having more than ten times as many decayed teeth as the Negroes.

7. Decay of teeth is most frequently bilateral, which indicates internal as well as external causes.

8. At the age of eighteen years there are only 10 to 15 per cent of individuals among Whites in large cities with a faultless set of teeth, while among Zulus 85 to 94 per cent of such individuals were found.

BIBLIOGRAPHY

Baštýr (M.)—Zubní Lékařství, Praha, 1866.

Bean (R. B.)—The eruption and decay of the permanent teeth. *Anat. Rec.*, 1914, VIII, 299–302.

—The Stature and the eruption of the permanent teeth of American, German-American and Philippine children. *Am. J. Anat.*, 1914, XVII, 113–160.

—The permanent teeth, with special reference to American children. *Proc. XIX Int. Cony. Amer., Wash.*, 1917, 611–615.

Daffner (F.)—Das Wachstum des Menschen. 8°, 2 ed., Leipzig, 1902.

Hrdlička (A.)—Physiological and medical observations among the Indians of southwestern United States and northern Mexico. *Bull. 34, Bur. Amer. Ethnol.*, Wash., 1908.

Herpin (A.)—Les dents a la naissance. *Bull. Soc. d'Anthr.*, 1912.

Nessel (E.)—Zubní Lékařství. Praha, 1895.

Pösch (R.)—Studien an Eingeborenen von New South Wales. *Mitt. Anthr. Ges.*, Wien, 1915.

Rösse (C.)—Ueber die Mittlere Durchbruchzeit der bleibenden Zähne des Menschen *D. Monatschr. f. Zahnheilk.*, Berl., 1909, XXVII, 553–570.

—Beziehungen zwischen Rasse und Zahnverderbniss, *Arch. f. Rassenbiol.*, 1906, III, 42.

Scheff (J.)—Handbuch d. Zahnheilkde., Wien, 1892.

Viazemski (N. V.)—Essai d'anthropologie pédagogique, Paris, 1907; also Moscow, 1907, in Russian.