

## Analysis of Race-Mixture in Bengal.

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### *Introduction.*

The problem which I have selected for a preliminary discussion in this paper is the "Analysis of Race-Mixture in Bengal." Dr. Annandale had taken very careful measurements of nearly 300 Anglo-Indians (new style) in Calcutta. He selected a sample of 200 individuals which, he believed, represented true Indo-European mixture and turned over the measurements to me for statistical analysis. I am publishing elsewhere a detailed analysis of these measurements.<sup>1</sup> During the course of my work a very interesting question arose: How are these 200 Anglo-Indians of Calcutta related to the different caste groups of Bengal? Are they more closely allied with the Hindus? or with the Mahomedans? Do they show a greater affinity with the higher castes of Bengal or with the lower castes? Is there any appreciable admixture with the aboriginal tribes in and on the borderland of Bengal? any appreciable resemblance with castes outside Bengal? In other words, can we obtain any idea about the possible composition of the given sample of Anglo-Indians in terms of the broader social and geographical divisions of the inhabitants of Bengal and its neighbourhood?

In order to answer the above questions we must adopt the usual scientific method of proceeding from the known to the unknown. We shall therefore first of all study the geographical and social resemblances shown by typical Bengal castes whose antecedents and present status are fairly well-known. We shall then be in a position to use these results for investigat-

*Note added on the 26th August, 1927.* The present paper contains the substance of the Presidential Address delivered before the Anthropological section of the Indian Science Congress in 1925. It was submitted to the Asiatic Society of Bengal in 1925, but the printing was delayed owing to the absence of the author out of India during the greater part of 1926 and 1927.

I have omitted certain personal explanations and also an obituary reference to Dr. Annandale, and have altered the form of the address at a few places, but have otherwise left the contents practically untouched. I have corrected a few arithmetical slips, added a new reference in a footnote, and a short note on the mean values used in this paper (in Appendix II).

<sup>1</sup> Records of the Indian Museum, Vol. 23, 1922.

ing the social and geographical connexions of the Anglo-Indians.

In this preliminary survey I have used for comparison 30 typical castes of North India for which anthropometric data were published by Risley in his 2 volumes on "Indian Castes and Tribes" (1891). Fortunately practically all the individuals measured by Risley were over 25 years old (i.e. had attained full maturity) so that in a preliminary analysis age-corrections would not be needed. The above 30 castes were selected partly because of their representative character and partly because of the comparatively large size of the samples (usually consisting of about 100 individuals).

The selected castes represent about 6 geographical divisions and 4 or 5 cultural strata. I show below both the geographical as well as the cultural classification.

#### (A) GEOGRAPHICAL CLASSIFICATION.

- (1) *Bengal (8)*. Brahman, Kayastha, Sadgop, Kaibarta, Rajbansi, Pod, Bagdi and Mahomedan.
- (2) *Chota Nagpur Tribes (7)*. Kurmi, Oraon, Santal, Munda, Bhuiya, Mal Pahari<sup>1</sup> and Malè<sup>1</sup>.
- (3) *Bihar (4)*. Brahman, Goala, Maghya Dom and Dosadh.
- (4) *North-Western Provinces and Oudh (5)*. Brahman, Kayastha, Goala, Dom and Chamar.
- (5) *Punjab (3)*. Khatri, Pathan, Chuhra.
- (6) *Eastern Districts (5)*. Lepcha, Chakma and Magh.

#### (B) CULTURAL CLASSIFICATION.

Cultural classification is a much more complicated affair. The Hindu community does not present in actual fact a regular hierarchy of social order in which every caste can be placed in a definite intermediate position between any two other castes. Social status is again, contrary to orthodox socio-religious theories, not a fixed thing. It is changing, and although changes are on the whole slow it is sometimes found that the relative social position of two castes is interchanged within a fairly short time.

The difficulty becomes much greater when we have to compare and fix the relative position of castes belonging to different provinces. In the absence of direct social contact between two castes belonging to different geographical divisions we are thrown back on a comparison through one or

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<sup>1</sup> Malès and Mal Paharis were originally included by Risley under Bengal. Risley's divisions were given in accordance with the administrative arrangements of his own time. Santal Pergana, the district from which the Mal Pahari and Malès were collected really belongs (both geographically as well as culturally) to Chotia Nagpur which is now included in the province of Bihar and Orissa.

more intermediary castes and a certain amount of indefiniteness is inevitable. Using broad categories such difficulties will however be minimised to a great extent.

In the classification adopted below weight has been given to orthodox theories as expounded in books like Nagendranath Bose's "*Banger Jatiya Itihas*" or Lalmohan Vidyandhi's "*Sambandha-Nirnaya*" as well as to the actual facts of present day society.

- (1) *High Castes* (6). Bengal Brahman; Bihar Brahman; N.W.P. Brahman; Bengal Kayastha; N.W.P. Kayastha; Punjab Khatri.
- (2) *Middle Castes* (6). Bengal Sadgop, Bengal Kaibarta, Bihar Goala, N.W.P. Goala, Bengal Pod, Bengal Rajbansi.
- (3) *Low Castes* (6). Bengal Bagdi, Bihar Dosadh, Punjab Chuhra, N.W.P. Chamar, Bihar Dom, N.W.P. Dom.
- (4) *Chota Nagpur Aboriginal Tribes* (7). C.N. Kurmi, C.N. Bhuiya, C.N. Santal, C.N. Oraon, C.N. Munda, Bengal Mal Pahari and Bengal Malè.
- (5) *Eastern Tribes* (3). Darjeeling Lepcha, Chittagong Chakma and Chittagong Magh.
- (6) *Mahomedans* (2). Bengal Mahomedan and Punjab Pathan.

For later comparisons I have included (1) High Castes (2) and Middle Castes together under one head as a distinct group of "upper castes," while in certain portions of the work Bengal Mahomedans have been included under "lower castes."

Out of the above 30 castes of north India I have selected the following 7 Bengal castes for detailed analysis: (1) *Brahmans* who represent the highest caste in Bengal. (2) *Kayasthas* who socially and culturally come next to the Brahmans (3) *Sadgops*, traditionally cowherds, who are recognised as *Jal-acharaniya*.<sup>1</sup> (4) *Kaibartas*, originally fishermen, now mainly agriculturists and petty farmers, some of whom are recognised as *Jal-acharaniya*. (5) *Bagdis*, a very low caste almost at the bottom of the social scale, believed to be of aboriginal descent: originally fishermen they are now mostly agricultural labourers or *palki-bearers*. Some of them eat beef and pork although others abstain from prohibited flesh. (6) *Mal Paharis*, a Hinduised section of the Asal Pahari or Malè tribe of Santhal Parganas. They speak a form of corrupt Bengali but their Hinduisation is not yet complete and they are ranked as the lowest of the low. (7) *Mahomedans* from East Bengal.

Brief descriptions of the above castes will be found in Appendix I.

<sup>1</sup> Literally "those whose water can be used," i.e., castes from whose hands water will be taken by Brahmans and other high castes.

*Caste Distances.*

My first task now will be to measure the degree of resemblance (and hence presumably the degree of intermixture or convergence) which each of the 7 selected Bengal castes show with each of the other castes belonging to different geographical or different cultural divisions. I have used from 12 to 15 characters (10 absolute measurements and 5 indices) for this purpose.<sup>1</sup> Two castes which differ very largely in physical appearance may be said to be anthropometrically farther apart than two other castes which resemble each other closely. We may in this special sense speak of caste-distances. Two castes which resemble each other closely will have a very small caste distance; on the other hand, castes which are widely different in character will have large caste-distances. The coefficient D (the statistical definition of which is explained in Appendix III) is one such measure of caste-distance. It takes into consideration the average values of the characters concerned but ignores the number of individuals on which such averages are based.

If we wish to give greater weight to samples which comprise a larger number of individuals we may use the "Coefficient of Racial Likeness" used by G. M. Morant and others.<sup>2</sup> I shall call this coefficient C.

The actual values of caste-distances measured by the two coefficients D and C are given in Tables 1-7 for each of the 7 selected Bengal groups.

Each table is arranged according to the magnitude of D. For example, in Table 1 (Bengal Brahmans) castes appearing high up in the table have smaller caste-distances, i.e. resemble the Bengal Brahmans more closely, than castes which appear lower down in the table.

*Caste Resemblances.*

Let us consider Table 1 (Bengal Brahmans) given on p. 310 for a moment. I shall not trouble you with individual figures but even a cursory glance at Table 1 will show you the very high position of almost all the Bengal castes. The implication is of course that the Bengal Brahmans resemble the other Bengal castes far more closely than they (the Brahmans) resemble castes from outside Bengal.

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<sup>1</sup> A list of the characters used will be found in Appendix 11.

<sup>2</sup> *Biometrika* XIV (1922-23) p. 194. "This is a measure of whether any two races can be considered samples of the same population." It ignores the correlation between mean values of the characters concerned, and assuming equal variabilities for all samples, uses values of average variabilities. The statistical definition of the Coefficient of Racial Likeness has been fully discussed by Prof. Karl Pearson in the *Biometrika* Vol. XVIII, 1926, pp. 105-117.

We can use a simple positional index (explained in detail in Appendix IV) to give a rough measure of such provincial or geographical resemblance. A positive value of this index indicates a greater resemblance than the average, maximum resemblance being given by an index of +100; a negative value on the other hand shows less than average resemblance, the minimum being an index of -100. The index thus varies between +100 and -100, the value zero showing just average resemblance.

For Brahmans the positional index for Bengal is found to be +78·3, showing the great influence of geographical proximity. We may call such resemblance associated with geographical proximity as "geographical resemblance" for convenience of reference.

Such "geographical resemblance" is however not confined to the province of Bengal alone. It is shown by the other provinces also. For example, the positional index for Bengal Brahmans is, for Bengal +78·3, for Bihar +38·5 and for N.W.P. and Punjab taken together -6·0, showing an effect which clearly decreases with distance.

This is not the only kind of resemblance which we can detect. The effect of cultural affinity is also prominent. For example, the positional index for Brahmans is for the "high castes" of Bengal, Bihar and Punjab +87·2, for "middle castes" +80·0, for "low castes" +18·0, and for "aboriginal tribes" of Chota Nagpur -74·0. There can scarcely be any doubt about the existence of a close association between resemblance in physical appearance and cultural affinity.

#### *Geographical and Cultural Factors.*

Summary Table 8, (p. 306) (which gives the positional indices based on serial position) shows at a glance the relative magnitude of the provincial and cultural factors.<sup>1</sup>

Bengal (line 1, Table 8) naturally enough contributes a preponderating share to every caste other than Mal Paharis and Mahomedans. Kayasthas (+95·0), Sadgops (+97·6) and Kaibartas (+96·1) have the highest and an almost equal share, and are thus seen to be typical indigenous castes of Bengal.

Bihar (Table 8, line 2) gives an appreciable share to Brah-

<sup>1</sup> Supplementary Tables (8·1)—(8·4) included in Appendix V, give similar figures based not on the average position of the different castes but on the average values of D and C, and are in substantial agreement with Table 8. In this preliminary survey I have considered it sufficient to restrict my analysis to Table 8, i.e., to serial positions irrespective of the actual magnitude of these coefficients. Speaking generally the same results flow from the other Tables (8·1)—(8·4) given in Appendix V (pp. 331-332).

TABLE 8.

Positional Indices based on serial position.

Serial No.		Brahman.	Kayastha.	Sudgop.	Kaibarta.	Bagdi.	Malpahari.	Mahomedan.	Anglo-Indian.
<i>(1) Provinces.</i>									
1	Bengal (7 or 8) .. ..	+ 78·3	+ 95·0	+ 97·4	+ 96·1	+ 63·6	+ 9·5	+ 48·2	+ 86·4
2	Bihar (4) .. ..	+ 38·5	+ 48·0	+ 42·0	+ 44·0	+ 20·0	- 10·0	+ 82·0	+ 25·4
3	North-West Provinces (5) ..	- 40·2	- 51·6	- 45·0	- 51·5	- 50·0	- 18·3	- 51·6	- 47·2
4	Punjab (3) .. ..	+ 50·1	- 20·0	- 30·1	- 38·5	- 79·2	- 100·0	- 12·3	+ 48·2
5	Chota Nagpur (7 or 6) .. ..	- 74·0	- 50·0	- 37·6	- 19·4	+ 49·3	+ 82·6	- 14·1	- 85·2
6	Eastern Districts (3) .. ..	- 48·7	- 47·3	- 71·5	- 77·0	- 92·3	- 25·0	- 79·2	- 25·9
<i>(2) All Castes (non-aboriginal).</i>									
7	Upper (13) .. ..	+ 73·8	+ 64·7	+ 60·6	+ 44·9	+ 31·4	- 9·1	+ 37·2	+ 75·3
8	Lower (7) .. ..	+ 0	+ 5·2	+ 11·7	+ 16·9	- 29·0	+ 1·5	+ 20·3	- 5·2
9	Total (20) .. ..	+ 80·0	+ 62·0	+ 60·0	+ 47·4	- 2·0	- 52·2	+ 44·0	+ 80·0
<i>(3) Bengal, Bihar and Punjab.</i>									
10	High Castes (4) .. ..	+ 87·2	+ 53·4	+ 52·0	+ 42·0	- 12·0	- 72·0	+ 40·0	+ 79·2
11	Middle „ (6) .. ..	+ 80·0	+ 91·6	+ 92·0	+ 88·0	+ 91·6	+ 50·0	+ 56·6	+ 76·6
12	Upper „ (9 or 10) .. ..	+ 97·6	+ 90·5	+ 85·7	+ 77·4	+ 53·9	+ 7·1	+ 60·0	+ 96·0
13	Lower „ (5 or 4) .. ..	+ 26·6	+ 38·3	+ 37·5	+ 44·2	- 14·0	- 6·0	+ 58·0	+ 20·0
14	Total „ (15) .. ..	+ 96·1	+ 84·8	+ 80·0	+ 86·6	+ 26·6	- 34·4	+ 60·9	+ 90·7
<i>(4) Bihar and Punjab.</i>									
15	Upper Castes (4) .. ..	+ 62·0	+ 18·0	+ 8·0	+ 2·0	- 20·0	- 48·0	+ 44·0	+ 57·7
16	Lower „ (3) .. ..	+ 20·7	+ 18·4	+ 13·1	+ 15·7	- 28·0	- 51·2	+ 61·5	+ 5·9
17	Total „ (7) .. ..	+ 50·6	+ 20·8	+ 11·8	+ 9·0	- 27·2	- 57·1	+ 45·9	+ 42·6
<i>(5) Bihar, N. W. P. and Punjab.</i>									
18	Upper Castes (7) .. ..	+ 28·2	- 3·9	- 10·3	- 24·5	- 35·1	- 50·5	- 5·2	+ 21·7
19	Lower „ (5) .. ..	- 13·7	- 20·0	- 16·6	- 16·6	- 40·3	- 26·7	+ 15·0	- 22·8
20	Total „ (12) .. ..	+ 13·7	- 14·7	- 14·7	- 28·2	- 50·0	- 54·1	+ 5·1	+ 3·3

mans (+38·5), Bagdis (+20·0), a considerable share to Kayasthas (+48·0), Sadgops (+42·0) and Kaibartas (+44·0), and makes the biggest and predominating contribution to Mahomedans (+82·0).

Castes from N.W.P. (Table 8, line 3) show a very marked and steady dissimilarity with all the castes analysed here. This result is surprising and difficult to explain. If real (i.e. not due to differences in the technique of measurement) it deserves careful investigation.

Punjab (Table 8, line 4) contributes largely to the Brahmans (+50·1) but not to any other caste. The degree of dissimilarity however steadily increases as we pass from Kayasthas (-20·0), Sadgops (-30·1), Kaibartas (-38·5), Bagdis (-79·2) and Mal Paharis (-100). Social status in Bengal thus appears to vary inversely as the amount of dissimilarity with the Punjab castes.

The aboriginal tribes of Chota Nagpur (Table 8, line 5) on the other hand exhibit an opposite but equally steady and systematic gradation. The Brahmans show the greatest dissimilarity (-74·0), then come Kayasthas (-50·0), Sadgops (-37·6), and Kaibartas (-19·4), Bagdis actually show a great deal of resemblance (+49·3), while Mal Paharis (+82·6) are seen to belong to the Chota Nagpur aboriginal group itself. The gradation described above is so regular in its character that it would be hardly an exaggeration to assert that the lower the social standing of a caste in Bengal the greater is its resemblance with the aboriginal tribes of Chota Nagpur, or *vice versa*.

The aboriginal castes from the eastern districts show consistent dissimilarity with every Bengal caste analysed here. This dissimilarity however does not decrease as we go down the social scale, on the contrary actually increases with decreasing social status. We conclude therefore that there is no tendency on the part of the lower castes of Bengal to mix freely with the eastern aboriginal tribes, and that whatever little admixture with them may now exist must have occurred through the higher rather than through the lower castes of Bengal.<sup>1</sup>

We may now consider the influence of cultural divisions. I worked at first with a tri-partite classification: "high castes," "middle castes" and "low castes" but as the total number of castes used here is rather small I am giving the final figures for the "high" and "middle" castes combined under one head: "upper castes."

Taking into consideration all non-aboriginal castes, the positional indices for "upper" and "lower" castes are shown

<sup>1</sup> I should point out however that this result is only tentative: further analysis, particularly of the lower castes of Eastern Bengal, is necessary before a result of such wide implication can be accepted.

separately in the above Table A, all the figures being taken from Table 8. Figures for Chota Nagpur are included for comparison. The systematic and perfectly regular character of the changes in the value of P as we pass from Brahmans to Mal Paharis is quite remarkable. Resemblance with

TABLE A. POSITIONAL INDICES.

	Brahman.	Kayastha.	Sadgop.	Kaibarta.	Mahomedan.	Bagdi.	Mal Pahari.
All Non-aboriginal Castes.							
“ Upper castes ” (13)	+ 73·8	+ 64·7	+ 60·6	+ 44·9	+ 37·2	+ 31·4	- 9·1
“ Lower castes ” (7) ..	0	+ 5·2	+ 11·7	+ 16·9	+ 20·3	- 29·0	+ 1·5
<b>Chota Nagpur Tribes (7)</b>	- 74·0	- 50·0	- 37·6	- 19·4	- 14·1	+ 49·3	+ 82·6

“ upper castes ” decreases *pari passu* with the increase in resemblance with “ lower castes.” So that the actual degree of resemblance with either the “ upper castes ” or with the “ lower castes ” furnishes a reliable index of social status.<sup>1</sup> Judged by this test (East) Bengal Mahomedans would appear to occupy a position a little below the Kaibartas.

If we take Bihar and the Punjab (Table 8, line 15) together (omitting N.W.P. as it does not contribute anything appreciable), we can gain some idea about the extra-provincial contribution from the north-west. The “ upper castes ” (now including Pathans) contribute a very large share to Brahmans (+ 62·0), a moderate share to Mahomedans (+ 44·0), and only a small and decreasing share to Kayasthas (+ 18·0), Sadgops (+ 8·0) and Kaibartas (+ 2·0), and actually show moderate dissimilarity with Bagdis (- 20·0) and great dissimilarity with Mal Paharis (- 44·0). The lower castes contribute very largely to Mahomedans (+ 61·5), and only slightly to Brahmans (+ 20·7), Kayasthas (+ 18·4), Sadgops (+ 13·1) and

<sup>1</sup> The chief reason of a marked dissimilarity between Bagdis and “ lower castes ” is probably this. My list includes only one low caste from Bengal e.g. Bagdis; in comparing with Bagdis this of course goes out, so that for Bagdis the “ low castes ” group contains castes from outside Bengal only, and the dissimilarity noticed here is probably largely due to the effect of geographical distance.



Kaibartas (+15·7); Bagdis (-28·0) and Mal Paharis (-51·2) again show moderate and great dissimilarity respectively.

The total contribution of Bihar and the Punjab (Table 8, line 17) shows interesting contrasts with the contribution of Chota Nagpur (Table 8, line 5). Brahmans show the greatest resemblance with Bihar and the Punjab (+50·6) and the greatest dissimilarity with Chota Nagpur (-74·0). Kayasthas, Sadgops and Kaibartas exhibit decreasing resemblance with Bihar and the Punjab (+20·8, +11·8, +9·0, respectively), and at the same time decreasing dissimilarity with Chota Nagpur (-50·0, -37·6, and -19·4 respectively). Bagdis show moderate dissimilarity (-27·2) with the northern provinces and a moderate similarity (+49·3) with Chota Nagpur, while the Mal Paharis show the greatest dissimilarity with the northern provinces (-51·2), and the greatest similarity with Chota Nagpur (+82·6). The case of the Mahomedans is the only exception; they show large resemblances with Bihar and the Punjab (+44·0), and only slight dissimilarity with Chota Nagpur (-14·1). It should be noted, however, that the Mahomedans show greater resemblance with the "lower castes," and in this respect offer a marked contrast to the Brahmans who derive by far the greater part of their contribution from the upper castes.

We may then say generally that the greater the similarity with the castes (particularly with the upper castes) of Bihar and the Punjab the greater is the dissimilarity with the aboriginal tribes of Chota Nagpur and *vice versa*. The variation of resemblance with Chota Nagpur is however more strongly marked than that with Bihar and the Punjab, and this greater intensity may probably be ascribed to the greater geographical proximity.

The results for Bengal, Bihar and the Punjab (as also for Bihar, N.W.P. and the Punjab) given in Table 8, lines 14-20 taken together corroborate the same thing. The total for all castes (excluding aboriginal tribes) given in Table 8, line 9 shows at a glance the proportions of caste admixture in the different castes; there is again a perfectly regular gradation from Brahmans (+80·0) to Mal Paharis (-52·2).

#### *Analysis of Bengal Castes.*

We may now rapidly review the results for each caste separately.

*Brahmans* (Table 1). The Bengal Brahmans stand out prominently as the only caste in Bengal which shows definite evidence of resemblance with the Punjab and also a substantial amount of resemblance with "upper castes" outside Bengal.<sup>1</sup>

<sup>1</sup> The position of the three Punjab castes is surprisingly high (4th, 9th, 12th). The resemblance between the Bengal Brahmans and Punjab

The Brahmans also show marked dissimilarity with the aboriginal tribes of Chota Nagpur and considerable dissimilarity with the eastern tribes.<sup>1</sup> At the same time it is evident that considerable intermixture with the other castes (particularly the upper castes) of Bengal has occurred so that the Brahmans may now be looked upon as a true Bengal caste.

One very striking thing in Table I is the close association between resemblance with the Brahmans and social status in Bengal. The proposition: "the higher the social status the

TABLE I.  
*Bengal Brahman (100).*

Serial Order.	Province and Caste.	Social Status.	n	D	C
1	Bengal Kayastha ..	High	100	0.236	10.8
2	" Sadgop ..	Middle	48	0.319	9.3
3	" Kaibarta ..	"	10	0.351	16.5
4	Punjab Khatri ..	High	60	0.413	14.5
5	Bengal Pod ..	Middle	100	0.451	21.5
6	Bihar Brahman ..	High	67	0.496	18.9
7	" Goala ..	Middle	100	0.585	28.2
8	Bengal Mahomedan	Lower	185	0.595	37.2
9	Punjab Chuhra ..	"	80	0.641	27.5
10	Bengal Rajbansi ..	Middle	100	0.693	33.6
11	N.W.P. Brahman ..	High	100	0.801	39.0
12	Punjab Pathan ..	Upper	80	0.804	34.7
13	Bihar Dom ..	Lower	100	0.841	41.0
14	Bengal Bagdi ..	"	99	0.857	41.1
15	Bihar Dosadh ..	"	100	1.155	56.7
16	Darjeeling Lepcha ..	Abor.	57	1.124	39.8
17	C.N. Kurmi ..	"	100	1.284	63.2
18	N.W.P. Dom ..	Lower	100	1.397	68.8
19	C.N. Oraon ..	Abor.	100	1.411	69.5
20	N.W.P. Kayastha ..	High	100	1.454	71.7
21	C.N. Santal ..	Abor.	100	1.781	88.1
22	Chittagong Magh ..	"	100	1.792	88.6
23	N.W.P. Goala ..	Middle	100	1.875	92.8
24	C.N. Bhuiya ..	Abor.	100	1.998	98.8
25	" Munda ..	"	100	2.035	100.8
26	Chittagong Chakma	"	100	2.540	126.0
27	(C.N.) Mal Pahari ..	"	100	2.549	126.4
28	N.W.P. Chamar ..	Lower	100	2.687	133.4
29	(C.N.) Malè ..	Abor.	100	2.983	148.2

*N.B.—The Probable Error of C (C.R.L.) is  $\pm 0.23$ .*

Pathans (D=0.804, C=34.7) is much greater than that between the Pathans and the Bengal Mahomedans (D=1.828, C=101.0), and is actually only a little less than that between the Bengal Brahmans and the Bengal Mahomedans (D=0.595, C=37.2).

<sup>1</sup> The Brahmans offer (Table 8) a complete contrast to the aboriginal tribes of Chota Nagpur (—74.0) and also to the tribes of the east (—48.0).

greater is the resemblance with the Bengal Brahmans" is almost literally true for every province. For example, the order of resemblance in the Punjab is Khatri (4th), Chuhra (9th), both Hindu castes, and then Pathan (12th). In Bihar the order is : Brahman (6th), Goala (7th), Dom (13th) and Dosadh (15th).

In Bengal itself the upper castes Kayasthas (1st), Sadgop (2nd), Kaibartas (3rd) and Pod (5th) occupy the first few places in the strict order of their social precedence. Then come the Mahomedans (8th) and after the Mahomedans, Rajbansi (10th) and Bagdi (14th). The inference that intermixture with Bengal Brahmans has varied directly as the cultural proximity of the caste concerned can scarcely be resisted.

Among the aboriginal tribes of Chota Nagpur, Kurmis show the greatest resemblance with Bengal Brahmans. This is not surprising as we know that the Kurmis are culturally nearest to the Hindus. Then come Oraon, Santal, Bhuiya, Munda and finally Mal Pahari and Malè.<sup>1</sup> The eastern tribes come in the order : Darjeeling Lepcha, Chittagong Magh and Chittagong Chakma.<sup>2</sup>

The present analysis seems to show that the Brahmans in Bengal can justifiably claim their descent partly from the Punjab and the upper provinces of Northern India. Considerable intermixture in Bengal (or convergence under climatic selection) must also have occurred, particularly with the upper castes who are culturally nearer to the Brahmans. The Brahmans do not appear to have intermixed appreciably with the eastern tribes, and are practically free from racial contact with the aboriginal tribes of Chota Nagpur.

*Other high castes of Bengal.* The Kayasthas, the Sadgops, and the Kaibartas all appear to be castes originally indigenous to Bengal. They show the same amount of moderate resemblance with Bihar but do not show any resemblance with the Punjab.

On the whole resemblance with the aboriginal tribes of Chota Nagpur is not appreciable, but the regular and systematic character of the variation indicates that intermixture with the Chota Nagpur tribes has taken place with increased frequency as we go down the social scale.

*Kayasthas* (Table 2). They show great resemblance with all the Bengal castes, particularly with the "middle castes" of Bengal, indicating either close intermixture, or surreptitious absorption through the unauthorised adoption of Kayastha

<sup>1</sup> The chief differences with the Chota Nagpur tribes occur in nose form and size, stature and the fronto-zygomatic index.

<sup>2</sup> The greatest differences occur in the bizygomatic breadth, fronto-zygomatic index and stature, and for the two Chittagong tribes also in nasal breadth and nasal index.

TABLE 2.  
*Bengal Kayastha (100).*

Serial Order.	Province and Caste.	Social Status.	n	D	C
1	Bengal Sadgop ..	Middle	48	0·079	1·6
2	„ Kaibarta ..	„	100	0·155	6·7
3	„ Pod ..	„	100	0·174	7·7
4	„ Brahman ..	High	100	0·234	10·7
5	„ Mahomedan	Lower	185	0·304	18·5
6	Bihar Goala ..	Middle	100	0·389	18·4
7	„ Brahman ..	High	67	0·416	15·7
8	Bengal Rajbansi ..	Middle	100	0·426	20·3
9	„ Bagdi ..	Lower	99	0·495	23·3
10	C.N. Kurmi ..	Abor.	100	0·833	40·6
11	Bihar Dosadh ..	Lower	100	0·849	41·4
12	„ Dom ..	„	100	0·889	43·4
13	Punjab Khatri ..	High	60	0·909	33·1
14	Darjeeling Lepcha ..	Abor.	57	0·976	34·4
15	Punjab Chuhra ..	Lower	80	1·006	43·7
16	C.N. Oraon ..	Abor.	100	1·040	49·2
17	N.W.P. Brahman ..	High	100	1·091	53·5
18	„ Kayastha ..	„	100	1·295	63·7
19	C.N. Santal ..	Abor.	100	1·406	69·3
20	N.W.P. Dom ..	Lower	100	1·417	69·8
21	C.N. Bhuiya ..	Abor.	100	1·438	70·9
22	N.W.P. Goala ..	Middle	100	1·486	73·3
23	Chittagong Mugh ..	Abor.	100	1·501	74·0
24	C.N. Munda ..	„	100	1·629	80·4
25	Punjab Pathan ..	Upper	80	1·716	75·2
26	(C.N.) Mal Pahari ..	Abor.	100	2·045	101·2
27	Chittagong Chakma	„	100	2·290	113·5
28	(C.N.) Malé ..	„	100	2·396	118·8
29	N.W.P. Chamar ..	Lower	100	2·437	120·8

*N.B.—The Probable Error of C (C.R.L.) is  $\pm 0\cdot28$ .*

names and habits by persons belonging to lower castes, or convergence under climatic selection. In fact they appear to be more closely connected with the Sadgops (1st), Kaibartas (2nd) and Pods (3rd) than with the Brahmans (4th). Resemblance with Mahomedans (5th) is also fairly close.

Omitting the Brahmans the rule about association between social status and order of resemblance is strictly preserved in Bengal (Sadgop, Kaibarta, Pod, Mahomedan, Rajbansi and Bagdi). In Bihar, Goala takes precedence over the Brahmans, otherwise the rule is again obeyed. In N.W.P. and the Punjab also the order of social status is faithfully reproduced in the table for caste resemblance with the only exception of N.W.P. Goala. The Kayasthas show less dissimilarity with the aboriginal tribes ( $-50\cdot0$ ) than the Brahmans ( $-74\cdot0$ ), but the resemblance is negligible (Table 8, line 5).

The Bengal Kayasthas thus appear to be an indigenous caste showing close resemblance with other Bengal castes, fairly close connections with Bihar but not with N.W.P. or the Punjab. They are more closely connected with the "middle" castes than with the Brahmans,<sup>1</sup> but are practically free from intermixture with the aboriginal tribes.

*Sadgops* (Table 3). There is very little difference between the *Sadgops* and the Kayasthas on the whole. The *Sadgops*

TABLE 3.  
*Bengal Sadgop (48).*

Serial Order.	Province and Caste.	Social Status.	n	D	C
1	Bengal Pod ..	Middle	100	0.033	0.1
2	"   Kaibarta ..	"   "	100	0.064	1.1
3	"   Kayastha ..	High	100	0.079	1.6
4	"   Mahomedan ..	Lower	185	0.195	6.4
5	"   Rajbansi ..	Middle	100	0.239	6.7
6	Bihar Goala ..	"   "	100	0.273	7.8
7	Bengal Bagdi ..	Lower	99	0.302	8.6
8	"   Brahman ..	High	100	0.319	9.3
9	Bihar Brahman ..	"   "	67	0.349	8.7
10	C.N. Kurmi ..	Abor.	100	0.588	18.0
11	Bihar Dom ..	Lower	100	0.602	18.5
12	C.N. Oraon ..	Abor.	100	0.649	20.0
13	Bihar Dosadh ..	Lower	100	0.672	20.8
14	Punjab Khatri ..	High	60	0.807	20.5
15	N.W.P. Brahman ..	"   "	100	0.831	25.9
16	Punjab Chuhra ..	Lower	80	0.862	24.8
17	N.W.P. Dom ..	"   "	100	0.945	29.6
18	C.N. Santal ..	Abor.	100	0.956	30.0
19	N.W.P. Kayastha ..	High	100	0.986	30.9
20	Darjeeling Lepcha ..	Abor.	57	1.019	25.5
21	C.N. Bhuiya ..	"   "	100	1.022	32.1
22	"   Munda ..	"   "	100	1.131	35.6
23	N.W.P. Goala ..	Middle	100	1.175	37.1
24	Chittagong Magh ..	Abor.	100	1.200	37.9
25	(C.N.) Mal Pahari ..	"   "	100	1.527	48.5
26	"   Malè ..	"   "	100	1.797	57.2
27	Punjab Pathan ..	Middle	80	1.828	53.8
28	N.W.P. Chamar ..	Lower	100	1.896	60.4
29	Chittagong Chakma	Abor.	100	2.005	64.0

*N.B.—The Probable Error of C (C.R.L.) is  $\pm 0.28$ .*

show slightly greater contact with the "lower castes," and also with the aboriginal tribes of Chota Nagpur. Resemblance

<sup>1</sup> In fact on the data here analysed Bengal Kayasthas would seem to be more closely allied to the "middle" rather than the "higher" castes of North India. This result is a little surprising and deserves further study.

with eastern tribes is however less pronounced than in the case of both Brahmans and Kayasthas.

The order of resemblance shows very interesting reversals in the order of social precedence in Bengal. We have already seen that the Kayasthas show the greatest resemblance with Sadgops but the latter show greater resemblance with both Pods and Kaibartas than with Kayasthas. Contact with Mahomedans is also very close but the position of Bengal Brahmans (4th in the list for Kayasthas) is much lower (8th for Sadgops).

*Kaibartas* (Table 4.) The Kaibartas show as much intermixture within Bengal and as close a contact with Bihar as Kayasthas and Sadgops. There is however greater dissi-

TABLE 4.  
*Bengal Kaibarta (100).*

Serial Order.	Province and Caste.	Social Status.	n	D	C
1	Bengal Pod ..	Middle	100	0.061	2.0
2	„ Sadgop ..	„	48	0.065	1.1
3	„ Bagdi ..	Lower	99	0.122	5.0
4	„ Mahomedan ..	„	185	0.142	8.1
5	„ Kayastha ..	High	100	0.155	6.7
6	Bihar Goala ..	Middle	100	0.192	8.6
7	Bengal Rajbansi ..	„	100	0.207	9.3
8	Bihar Brahman ..	High	67	0.356	13.3
9	Bengal Brahman ..	„	100	0.365	17.2
10	C.N. Kurmi ..	Abor.	100	0.375	17.7
11	Bihar Dosadh ..	Lower	100	0.429	20.4
12	C.N. Oraon ..	Abor.	100	0.430	20.5
13	Bihar Dom ..	Lower	100	0.472	22.6
14	C.N. Santal ..	Abor.	100	0.703	34.1
15	Punjab Chuhra ..	Lower	80	0.727	31.3
16	C.N. Bhuiya ..	Abor.	100	0.728	35.4
17	Punjab Khatri ..	High	60	0.733	26.5
18	C.N. Munda ..	Abor.	100	0.811	39.5
19	N.W.P. Dom ..	Lower	100	0.827	40.3
20	„ Brahman ..	High	100	0.833	40.6
21	Darjeeling Lepcha ..	Abor.	57	0.846	29.7
22	N.W.P. Kayastha ..	High	100	0.934	45.7
23	„ Goala ..	Middle	100	1.004	49.2
24	(C.N.) Mal Pahari ..	Abor.	100	1.163	57.1
25	Chittagong Magh ..	„	100	1.239	60.9
26	(C.N.) Malè ..	„	100	1.414	69.7
27	N.W.P. Chamar ..	Lower	100	1.646	81.3
28	Punjab Pathan ..	Middle	80	1.819	79.8
29	Chittagong Chakma	Abor.	100	1.965	97.2

*N.B.—The Probable Error of C (C.R.L. is  $\pm 0.28$ ).*

milarity with N.W.P. and the Punjab. They show (Table 8) less affinity with upper “castes” (+44.9) than both Kayasthas

(+ 64·7) and Sadgops (+ 60·6) and also greater resemblance with "lower castes," much less dissimilarity with the aboriginal tribes of Chota Nagpur (- 19·4), but less contact<sup>1</sup> with the eastern tribes (- 77·0).

The order of resemblance again shows interesting reversals. Bengal Pods show the greatest resemblance with the Kaibartas, next come Sadgops, Bagdis and Mahomedans, indicating that considerable intermixture must have occurred with low castes like Bagdis as well as with Mahomedans. Naturally enough Brahman comes last. In Bihar, the Goala gets precedence over the Brahman, and the Dosadh over the Dom. In Chota Nagpur the order Kurmi, Oraon, Santal, Bhuiya, Mal Pahari and Malè, and in eastern districts the order Lepcha, Magh, Chakma are still preserved. N.W.P. Dom is now above N.W.P. Brahmans, otherwise the order remains the same. Punjab Chuhra (a low caste) is also now higher than the Khatri (a higher caste). All these of course merely point to a close affinity with the lower castes of all the provinces.

*Bagdis* (Table 5). While Brahmans, Kayasthas, Sadgops and Kaibartas show a natural gradation and may be classed as true Bengal castes, Bagdis exhibit a number of peculiarities. First of all although considerable intermixture within Bengal is indicated, positional index for Bengal (Table 8) being (+ 63·6), it is much less than what we found to be the case for the other four castes (+ 78·3, + 95·0, + 97·4 and + 96·1 for Brahmans, Kayasthas, Sadgops and Kaibartas respectively). Evidently Bagdis contain considerable admixture from outside. Contribution of Bihar is comparatively small ( $P = + 20·0$ ) while N.W.P. (- 50·0) and Punjab (- 79·2) show great dissimilarity.<sup>2</sup> We find however that the contribution of Chota Nagpur is very large ( $P = + 49·1$ ).

In Bengal, Kaibartas (1st) show the greatest resemblance with the Bagdis, and then Rajbansi (3rd) and Sadgops (4th). Kayasthas (10th) and still more so Brahmans (20th) occupy low positions indicating comparatively little intermixture. Resemblance with Mahomedans (11th) is also slight.

The Santals occupy the 2nd position showing a very close resemblance indeed. Next come Mundas (6th), Kurmi (8th), Oraon (9th) and Bhuiya (12th)—the order being now quite different from the one we found for the higher Hindu castes.

<sup>1</sup> Chief differences with Bihar occur in bi-zygomatic breadth, with Chota Nagpur in nose size and form, with N.W.P. and with the Punjab in cephalic index, cephalic breadth and fronto-zygomatic index. The eastern tribes differ considerably in bi-zygomatic breadth and cephalic breadth and less in nasal and cephalic index.

<sup>2</sup> The greatest difference occurs in height from vertex to chin and vertico-cephalic index.

TABLE 5.  
*Bengal Bagdi (99).*

Serial Order.	Province and Caste.	Social Status.	n	D	C
1	Bengal Kaibarta* ..	Middle	100	0.123	5.2
2	C.N. Santal ..	Abor.	100	0.262	12.1
3	Bengal Rajbansi ..	Middle	100	0.266	12.3
4	„ Sadgop* ..	„	48	0.303	8.8
5	Bihar Goala* ..	„	100	0.305	14.3
6	C.N. Munda ..	Abor.	100	0.329	15.5
7	Bengal Pod ..	Middle	100	0.421	20.1
8	C.N. Kurmi ..	Abor.	100	0.455	21.8
9	„ Oraon ..	„	100	0.456	21.9
10	Bengal Kayastha* ..	High	100	0.495	23.8
11	„ Mahomedan	Lower	185	0.539	28.3
12	C.N. Bhuiya ..	Abor.	100	0.540	26.1
13	Bihar Brahman* ..	High	67	0.652	27.3
14	C.N. Mal Pahari ..	Abor.	100	0.687	33.5
15	Bihar Dom ..	Lower	100	0.703	35.4
16	C.N. Malé ..	Abor.	100	0.771	37.7
17	Bihar Dosadh ..	Lower	100	0.802	39.2
18	N.W.P. Dom* ..	„	100	0.829	40.6
19	„ Goala* ..	Middle	100	0.902	44.3
20	Bengal Brahman* ..	High	100	0.910	44.7
21	N.W.P. Kayastha ..	„	100	0.952	46.8
22	„ Brahman* ..	„	100	0.985	48.4
23	Punjab Khatri ..	„	60	1.072	39.0
24	„ Chuhra ..	Lower	80	1.155	50.0
25	N.W.P. Chamar* ..	„	100	1.437	71.1
26	Darjeeling Lapcha ..	Abor.	57	1.446	51.3
27	Chittagong Magh ..	„	100	1.455	72.0
28	„ Chakma ..	„	100	2.201	109.4
29	Punjab Pathan ..	High	80	2.975	130.5

*N.B.*—The Probable Error of C (C.R.L.) is  $\pm 0.25$ ; for castes marked with an asterisk it is  $\pm 0.28$ .

The Bagdis thus present a very mixed character. Even if the original stock was indigenous to Bengal very considerable admixture with the aboriginal tribes of Chota Nagpur (particularly with the Santals) must have taken place subsequently. They also show moderate amount of resemblance with the lower castes of Bihar but no connexions with the eastern tribes.<sup>1</sup>

*Mal Paharis* (Table 6). The Mal Paharis do not belong to Bengal at all although a considerable amount of intermixture with the Bagdis (5th), Rajbansis (6th), Pods (7th) and Kaibartas (9th) is indicated by the comparatively high position occupied by these castes. The resemblance with Chota Nagpur

<sup>1</sup> The dissimilarity is greatest in cephalic breadth, bi-zygomatic breadth, height from vertex to chin, and in cephalic, nasomalar and fronto-zygomatic indices.



tribes is strikingly close ( $P = +82.6$ , Table 8) and leaves little doubt that Mal Paharis form one of the typical aboriginal tribes of Chota Nagpur.

TABLE 6.  
(C.N.) Mal Pahari (100).

Serial Order.	Province and Caste.	Social Status.	n	D	C
1	(C.N.) Malé* ..	Abor.	100	0.035	0.7
2	C.N. Bhuiya* ..	"	100	0.065	2.2
3	" Munda ..	"	100	0.191	8.5
4	" Santal ..	"	100	0.240	11.0
5	Bengal Bagdi ..	Lower	99	0.687	32.8
6	" Rajbansi ..	Middle	100	0.864	42.2
7	" Pod ..	"	100	0.991	48.5
8	Bihar Goala* ..	"	100	1.097	53.8
9	Bengal Kaibarta* ..	"	100	1.164	57.2
10	C.N. Oraon ..	Abor.	100	1.186	58.3
11	N.W.P. Dom* ..	Lower	100	1.223	60.2
12	Chittagong Magh ..	Abor.	100	1.264	62.2
13	C.N. Kurmi ..	"	100	1.312	64.6
14	N.W.P. Goala* ..	Middle	100	1.370	67.5
15	" Chamar* ..	Lower	100	1.481	73.0
16	Bengal Sadgop* ..	Middle	48	1.532	48.6
17	Bihar Dom ..	Lower	100	1.646	81.3
18	Chittagong Chakma ..	"	100	1.668	82.4
19	Bihar Brahman* ..	High	67	1.829	72.3
20	Bengal Mahomedan ..	Lower	185	1.867	119.0
21	Bihar Dosadh ..	"	100	1.885	93.2
22	N.W.P. Kayastha* ..	High	100	1.932	95.6
23	Bengal Kayastha* ..	"	100	2.045	101.2
24	N.W.P. Brahman* ..	"	100	2.177	107.8
25	Darjeeling Lapcha ..	Abor.	57	2.283	81.9
26	Bengal Brahman* ..	High	100	2.633	130.6
27	Punjab Chuhra ..	Lower	80	2.814	123.9
28	" Khatri ..	High	60	2.866	106.5
29	" Pathan ..	Middle	80	3.774	166.6

*N.B.—The Probable Error of C (C.R.L.) is  $\pm 0.25$ ; for castes marked with an asterisk it is  $\pm 0.28$ .*

The resemblance between Mal Paharis and Malés is very close, so much so that it is practically impossible to distinguish between the two. They show very little resemblance with the Bengal Brahmans; the biggest differences occur in nasal index, nasal breadth, fronto-zygomatic index, nasal height, stature, frontal breadth, and height from vertex to chin. It is significant that the Malé and the Mal Pahari resemble each other closely in the very characters in which they both differ most from the Brahmans, i.e., in nose form and size, stature and frontal breadth.

There is practically no connexion with Bihar. There is great dissimilarity with both N.W.P.<sup>1</sup> and the Punjab<sup>2</sup> as well as with the two Chittagong tribes Chakma and Magh<sup>3</sup> and with Darjeeling Lepchas.<sup>4</sup>

We therefore conclude that the Mal Paharis represent a true aboriginal tribe from Chota Nagpur, which shows slight admixture with some of the lower castes of Bengal. They have no resemblance with the castes of Bihar, N.W.P., the Punjab nor with the eastern tribes.

*Mahomedans* (Table 7). The Bengal (or rather East Bengal) Mahomedans do not appear to be a purely indigenous group. Although they show signs of considerable intermixture (Table 8) within Bengal ( $P = +48.2$ ), a large number were probably originally derived from Bihar ( $P = +82.0$ ). Dissimilarity with Chota Nagpur is less pronounced ( $-14.1$ ) than in the case of the upper castes of Bengal, but dissimilarity with N.W.P. is just as clearly marked. Although the Mahomedans in the present sample all come from East Bengal they do not show any resemblance with the eastern tribes ( $P = -79.2$ ). The Punjab also does not show any resemblance ( $P = -12.3$ ).

It is rather significant that the order of resemblance within a province has now no connexion with the order of social precedence. For example, in Bengal the order is: Kaibarta, Sadgop, Kayastha, Bagdi, Brahman and Rajbansi. In Bihar: Goala, Dom, Dosadh and Brahman. In N.W.P.: Dom, Brahman, Kayastha, Goala, and in the Punjab: Chuhra, Khatri, Pathan.

On the whole Mahomedans show pronounced resemblance with "lower castes." In fact from the relative amount of resemblance with "upper" and "lower" castes they would seem to occupy culturally a position which is a little lower than the Kaibartas.

The East Bengal Mahomedans appear to have been derived to a large extent from Bihar particularly from the lower castes. They have intermixed extensively with the "middle" and "lower" castes of Bengal and also to a smaller extent with one or two aboriginal tribes of Chota Nagpur, but do not show any connexions with N.W.P. nor with the Punjab Pathans. In spite of geographical proximity they do not appear to have had any relations with the eastern tribes.

<sup>1</sup> Chiefly in nasal width, height from vertex to chin, nasal index and vertico-cephalic index.

<sup>2</sup> In all characters other than head length, head breadth and cephalic index.

<sup>3</sup> Chiefly in cephalic breadth, height from vertex to chin, cephalic index and to a smaller extent in nasal length and nasal index.

<sup>4</sup> Very considerably in nose length, nose width and nasal index and to a smaller extent in head breadth and cephalic index.

TABLE 7.  
Bengal Mahomedan (185).

Serial No.	Province and Caste.	Social Status.	n	D	C
1	Bihar Goala* ..	Middle	100	0.107	5.9
2	Bengal Kaibarta* ..	"	100	0.108	6.0
3	Bihar Dom ..	Lower	100	0.173	10.2
4	C.N. Kurmi ..	Abor.	100	0.183	10.8
5	Bengal Sadgop* ..	Middle	48	0.199	6.6
6	Bihar Dosadh ..	Lower	100	0.232	14.0
7	Bengal Kayastha* ..	High	100	0.303	18.6
8	C.N. Oraon ..	Abor.	100	0.310	19.1
9	Bihar Brahman* ..	High	67	0.374	17.4
10	Bengal Bagdi ..	Lower	99	0.533	33.3
11	" Brahman* ..	High	100	0.588	37.1
12	Punjab Chuhra ..	Lower	80	0.743	40.4
13	" Khatri ..	High	60	0.757	33.3
14	Bengal Rajbansi ..	Middle	100	0.809	51.5
15	C.N. Santal ..	Abor.	100	0.888	56.6
16	" Munda ..	"	100	0.977	62.4
17	N.W.P. Dom* ..	Lower	100	1.033	66.0
18	" Brahman* ..	High	100	1.196	76.6
19	Bengal Pod ..	Middle	100	1.223	78.4
20	Darjeeling Lepcha ..	Abor.	57	1.351	57.9
21	N.W.P. Kayastha ..	High	100	1.457	93.5
22	" Goala* ..	Middle	100	1.460	93.8
23	C.N. Malé ..	Abor.	100	1.542	99.3
24	" Bhuiya ..	"	100	1.815	116.8
25	Punjab Pathan ..	Middle	50	1.828	101.0
26	(C.N.) Mal Pahari ..	Abor.	100	1.868	120.2
27	Chittagong Magh ..	"	100	1.878	120.9
28	N.W.P. Chamar* ..	Lower	100	2.117	136.3
29	Chittagong Chakma	Abor.	100	2.671	172.3

N.B.—The Probable Error of C (C.R.L.) is  $\pm 0.25$ ; for castes marked with an asterisk it is  $\pm 0.28$ .

#### Summary of Analysis for Bengal Castes.

Summing up we find that intermixture within Bengal, i.e., intra-provincial intermixture has varied with the degree of cultural proximity, so that for Brahmans the amount of intermixture with other castes has been in proportion to the social standing of the caste concerned. Influence from outside Bengal, i.e., inter-provincial intermixture has followed two well-defined and clearly distinguished streams, one from the castes of northern India (chiefly from Bihar and the Punjab), and the other from the aboriginal tribes of Chota Nagpur. The influence of the northern Indian castes decreases and that of the aboriginal tribes of Chota Nagpur increases as we go down the social scale. In fact these two streams exhibit a marked opposition: the greater the resemblance with northern

India the greater being the dissimilarity with the aboriginal tribes and *vice versa*.

None of the castes analysed here show much resemblance with any of the aboriginal tribes of the east. In fact so far as the present analysis goes the Bengal groups appear to show a definite repugnance (which is still more strongly marked for the lower castes and the Mahomedans) against intermixing with the eastern aboriginal tribes.

Influence of North-Western Provinces is also surprisingly small and requires further investigation.

Brahmans, Kayasthas, Sadgops and Kaibartas come out as true Bengal Hindu castes. The Brahman alone can justifiably claim definite connexions with upper India, particularly with the Punjab. The Kayastha, the Sadgop and the Kaibarta all show comparatively little resemblance with upper India, and exhibit a systematic gradation of decreasing influence from North India and increasing intermixture with the Chota Nagpur aboriginal tribes. Bagdis appear to be a highly mixed group of which the basic stock was probably indigenous to Bengal but which subsequently very considerably intermixed with the aboriginal tribes of Chota Nagpur (particularly with the Santals) and also partly with the lower castes of Bihar. Mahomedans also show a highly mixed character. They appear to be originally largely derived from Bihar but have intermixed extensively in Bengal; they do not show any resemblance with the Punjab Pathans.

The above results are not at all startling, and with the exception of the N.W.P., are just what one would expect from the known social history of the castes concerned. The results of our analysis are thus in general agreement with the actual facts of the ethnic situation. This is re-assuring and gives us confidence in using the present method for the analysis of the Anglo-Indian sample.

#### *Analysis of the Anglo-Indian sample.*

We may now go back to our original problem, and in the light of the results described above attempt a provisional analysis of the Anglo-Indian sample. Using 7 characters, *e.g.*, head length, head breadth, nasal length, nasal breadth, cephalic index, nasal index and stature,<sup>1</sup> I find the caste-distances shown in the following Table 9 and positional indices shown in Col. 8 of Table 8.

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<sup>1</sup> I regret I have not been able to use other characters in the present analysis owing to uncertainty about the comparability of the measurements: work is however proceeding and I hope to publish a more detailed analysis in the near future. Results based on only 7 characters are of course only tentative.

TABLE 9.  
Anglo-Indians (200).

Serial Order.	Province and Caste.	Social Status.	n	D <sup>2</sup>	C <sup>2</sup>
1	Bengal Brahman ..	High	100	·022	0·5
2	„ Kyastha ..	„	100	·034	1·3
3	„ Sadgop ..	Middle	48	·082	2·2
4	Bengal Pod ..	Middle	100	·204	12·6
5	Punjab Pathan ..	Upper	80	·208	10·9
6	Bengal Kaibarta ..	„	100	·222	13·8
7	Bengal Mahomedan ..	„	185	·298	27·6
8	Bihar Brahman ..	High	67	·303	14·2
9	Bihar Goala ..	„	100	·319	20·3
10	Punjab Khatri ..	High	60	·470	20·7
11	Bengal Rajbansi ..	Middle	100	·512	33·1
12	Punjab Chuhra ..	Lower	80	·678	37·7
13	Darjeeling Lepcha ..	Abor.	57	·758	32·6
14	Bengal Bagdi ..	„	99	·776	50·4
15	Bihar Dosadh ..	„	100	·857	56·1
16	N.W.P. Brahman ..	High	100	·871	57·1
17	Bihar Dom ..	„	100	·932	61·1
18	C.N. Kurmi ..	Abor.	100	1·029	67·6
19	Chittagong Magh ..	Abor.	100	1·160	76·3
20	N.W.P. Dom ..	Lower	100	1·239	81·6
21	„ Kayastha ..	„	100	1·331	87·7
22	N.W.P. Goala ..	Middle	100	1·479	97·6
23	C.N. Oraon ..	„	100	1·533	101·2
24	C.N. Santal ..	Abor.	100	1·968	130·2
25	Chittagong Chakma ..	„	100	2·052	135·8
26	C.N. Bhuiya ..	„	100	2·201	145·7
27	„ Munda ..	„	100	2·524	167·3
28	N.W.P. Chamar ..	Lower	100	2·832	187·8
29	(C.N.) Mal Pahari ..	„	100	3·094	205·3
30	C.N. Malé ..	„	100	3·633	241·2

N.B.—The Probable Error of C (C.R.L.) is  $\pm 0\cdot54$ .

It will be noticed that the positional indices for the Anglo-Indians (Table 8) are very similar to those for the Bengal Brahmans. The chief differences are the slightly greater resemblance with Bihar, and the markedly less dissimilarity with the eastern tribes shown by the Anglo-Indians.

Intermixture within Bengal is very great: resemblance with both Brahmans<sup>1</sup> and Kayasthas being strikingly close. The order of resemblance within Bengal (Brahman, Kayastha, Sadgop, Pod, Kaibarta, Mahomedan, Rajbansi and Bagdi) very accurately reproduces the order of social precedence.

<sup>1</sup> In fact the Bengal Brahmans and the Anglo-Indians can scarcely be distinguished from each other so far as the 7 characters considered here are concerned.

There is considerable admixture with Bihar, the position of Goalas (9th) and Brahmans (8th) being fairly high.

N.W.P. does not show any resemblance. The Punjab castes however occupy high places and indicate either a certain amount of direct contact or else an indirect similarity arising out of the resemblance subsisting between Anglo-Indians and the Bengal Brahmans. A comparison based on characters in which Brahmans differ considerably from the Punjab castes is likely to throw light on this point.

There is practically no resemblance with the aboriginal tribes of Chota Nagpur; in fact they show a greater dissimilarity with the Anglo-Indians (– 85·2) than with the Brahmans (– 73·6). But the eastern tribes show much less dissimilarity, the coefficient for Anglo-Indians being – 25·9 against – 48·7 for Brahmans, – 47·3 for Kayasthas, – 71·5 for Sadgops, – 77·0 for Kaibartas and – 92·3 for Bagdis. Darjeeling Lepchas occupy the 13th place which indicates a certain amount of intermixture with the Anglo-Indians.

We thus find that the Anglo-Indians included in the present sample are derived (on the Indian side) mainly from the Bengal castes. They show a certain amount of admixture with Bihar and also possibly with the Punjab, but not with N.W.P. They are singularly free from contact with the Chota Nagpur tribes, but appear to have intermixed to some extent with the Lepchas of Darjeeling.

So far as the present analysis goes we also see that intermixture between Europeans and Indians in Bengal appears to have occurred more frequently among the higher castes than among the lower. Evidently cultural status played a considerable part in determining Indo-European union. The comparatively high resemblance with Lepchas is also not surprising; their fair colour (as also possibly their freedom from caste restrictions) may have helped intermixture.

#### *General Summary of the Analysis.*

If we assume that physical resemblance is the result of actual intermixture, and that also more or less in quantitative proportion,<sup>1</sup> then we may give a coherent interpretation to our results and thus obtain a broad view of the *general tendency* of social history in Bengal.

We find that movements of caste-synthesis are proceeding on every side under our very eyes. Social barriers and caste restrictions have not been able to suppress it completely. The peo-

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<sup>1</sup> I would add that physical resemblance may also arise through unauthorised adoption of names of higher castes by person of lower castes (but such surreptitious absorption would in subsequent generations lead to actual intermixture); and also through climatic selection.

ples from the north-west have fused with the indigenous stock in Bengal and the aboriginal tribes of Chota Nagpur have intermingled with them. Intermixture within the province has gone on slowly and steadily even if imperceptibly and a larger Hindu Samaġ has evolved which is not only not identical with the traditional society of Vedic or classic times but is in many respects even antagonistic. Sectarian obstacles have not proved insurmountable; the Mahomedans who came originally as immigrants have contributed their share and have received back their own contribution from the other castes. The process has not stopped here; it has gone on even after the advent of the Westerners with their totally different culture, history and tradition.

Yet equally striking is the fact that intermingling has not been altogether chaotic. It presents a gradual and well-ordered character in which cultural affinity and cultural selection has played an important part. Horizontal fusion (between low and low or between high and high caste) is more pronounced than vertical intermixture, a fact which serves to conserve the stability of the social system. The Hindu community of Bengal does not on one hand conform to the orthodox scheme of a logically perfect system of rigidly exclusive castes between which no intercourse is ever possible; on the other hand neither does it present an amorphous or chaotic character. It shows a definite structure which has its foundation in clearly marked cultural as well as physical differences, but through these differences the process of synthesis is steadily going on under the influence of cultural and geographical proximity.

#### *Conclusion.*

I have given above a piece of straightforward statistical analysis; I have also described some of the anthropological conclusions which may be derived from them. Here I wish to make a distinction. The reliability of the statistical results depends only on the accuracy of the measurements used, the validity of the formulæ employed, and the accuracy of the computation. The statistical results may therefore be called positive in the sense that they are amenable to objective checks. The anthropological results on the other hand partake of a definitely historical character, and their significance and weight depends on the legitimacy of the interpretation of historical and sociological factors of varying importance.

Strictly speaking my own business ends with finding the statistical results; and as I do not profess to claim any expert knowledge in anthropology, I must leave the anthropological deductions for consideration and acceptance or rejection by professed anthropologists.

Whatever may be the value of the particular deductions

given here I believe it would be readily admitted however that a comparison of caste-distances is likely to give us valuable information about caste affinities and connexions, and hence about caste-origins. It would therefore be desirable to make an exhaustive comparison of caste-distances for all castes for which reliable data are available.

The object of the proposed survey will be to arrange all Indian castes (for which reliable data are available) in a systematic way in accordance with their anthropometric measurements. If this systematic classification is once carried out it will be an easy matter to compare and study the connexions between any group of castes with any other.

This programme is not new. It was formulated in 1911 by Dr. (now Sir) Brajendra Nath Seal, in his address on "Race-origins" delivered before the first Universal Races Congress in London. He had stated: <sup>1</sup> "If the groups requiring to be arranged vary in "n" characters, and if biometric measurements are complete, the composite mean of the groups may be taken as the point of origin, and the mean of the single characters for each group may be imagined as marked off on "n" co-ordinates, and the position in n-dimensional space of each group could be easily assigned." The n-dimensional distance between any two castes in this space will then immediately give their anthropometric distance.

As a preliminary to the proposed survey it will be necessary to collect and examine all available anthropometrical data for India, and after a careful examination accept for final use only those which may be considered reliable and comparable. Neither the proposed survey nor even the preliminary examination of the data can properly be undertaken by a single individual. It is essentially a task for a group of workers. It would therefore be extremely useful to have a standing committee for Anthropology (in connection with the Indian Science Congress) for this purpose.

The first task of this committee will be to prepare a Bibliography of Indian Anthropometry. It will then examine the data and publish an authoritative note on their reliability and their comparability. It should also draw up a standard list of characters with standard definitions for future guidance of field workers in India, and should also indicate areas or castes for which surveys are urgently required. Such a Committee will also prove useful in preventing overlapping of field work and may act as a central clearing house for the co-ordination of anthropometric researches in India.

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<sup>1</sup> *Race Origins*, 1911, pp. 7-8.



## APPENDIX I.

I give below short notes on the castes selected for the present analysis.

### Bengal.

(1) *Brahmans*, 100. 75 from West Bengal and 25 from East Bengal (24-Perganas 13, Calcutta 12, Nadia 10, Burdwan 9, Dacca 7, Barisal 5, Faridpur 5, Khulna 4, Bankura 4, Jessore 4 and a few other places). The great majority belong to the *Rarhi* group with a sprinkling of *Varendras*.

(2) *Kayasthas*, 100. Traditionally Sudras (the fourth caste) and servants of the Brahmans, now culturally in the same class as the Brahmans. (Jessore 13, Dacca 13, 24-Perganas 8, Faridpore 8, Nadia 8, Hugli 7, Bakarganj 7 and a few other places).

(3) *Sadgops*, 48 (mainly from 24-Perganas 23, Midnapore 7, Hugli 5, Burdwan 4, and Birbhum 4).

Originally cowherds they have now taken to some of the minor professions and trades and enjoy a fairly good social status. Water and sweets are taken from their hands by higher castes.

(4) *Kaibartas*, 100. A cultivating caste, the *chási* or cultivating section of which is *Jal-acharaniya*. 92 belonged to West Bengal. (24-Perganas 22, Midnapore 19, Hugli 17, Nadia 8, Howrah 7, Murshidabad 6, Calcutta 4, and a few other places.)

(5) *Rajbansi*, 100, all from North Bengal (Rangpur 53, Jelpaiguri 24, Dinajore 18). Believed to be the remnants of an aboriginal race, the Koches of North Bengal, they have become Hinduised and have adopted the Bengali language. According to one view they are a Mongoloid race that entered Bengal from the east by way of the Bahmaputra valley; others consider them to be descended from a Dravidian stock.

(6) *Pod*, 100 (of whom 99 were residents of 24-Perganas). Originally a fishing caste, a large number have now become agriculturists or petty shopkeepers. They are not *Jal-acharaniya* and their touch defiles. They may be served by washermen but as a rule not by barbers. They generally abstain from beef, pork or fowls. Socially they rank very low.

(7) *Bagdis* 100 (of whom 99 came from West Bengal: 24-Perganas 30, Hugli 24, Burdwan 11, Bankura 10, Howrah 5, Birbhum 5, Murshidabad 4). Believed to be of aboriginal descent. Originally fishermen many of them are now agricultural labourers or *palki*-bearers. Some of them eat beef and pork, but there are others e.g., like the sub-caste *Tentuliyas* who abstain from prohibited flesh. Their social rank is very low and although admitted within the pale of Hinduism they are almost on the border-land.

(8) *Mal Pahari*, 100 (of whom 98 belonged to Santal Perganas and 2 to Birbhum). A Hinduised section of the Pahari or hill tribe of Santal Perganas. They speak a form of corrupt Bengali but their Hinduisation is not yet complete, and they are ranked among the lowest of the low.

(9) *Malè*, 100 (98 from Santal Perganas and 2 from Birbhum). An aboriginal tribe allied to the Chota Nagpur group.

(10) *Mahomedans*, 185, all from East Bengal, (Mymensingh 58, Dacca 38, Faridpore 34, Chittagong 27, Tippera 13, Pabna 8, Noakhali 5, and Barisal 2).

(11) *Lepcha*, 57. (Darjeeling 48, Sikkim 8, and Nepal 1.) They are the aboriginal inhabitants of the hill districts of Darjeeling and Sikkim; about 250 years ago they were driven out into the lower valleys and gorges by the Tibetans. They are a timid and peaceful people, very fond of their native woods. They have intermarried to some extent with the Limbus and Sikkim Bhotias who both rank higher in the social scale.

(12) *Magh*, 100. (Rangamati 82, and Chittagong 18.) It is a name which is commonly applied to the native inhabitants of Arakan, particularly those bordering on Bengal or residing near the sea.

(13) *Chakma*, 100 (all from Rangamati and Chittagong). An aboriginal tribe.

*Chota Nagpur.*

(14) *Bhuiya*, 100 individuals chiefly from Lohardaga 86, Hazaribagh 10, and Santal Pergana 4.

They are believed to be of Dravidian (?) origin and are a respectable class of cultivators, some of whom are small landholders. They are partially Hinduised and have adopted many Hindu rites and customs.

(15) *Kurmi*, 100 individuals from Manbhum 92, Lohardaga 6, and Hazaribagh 2.

They are petty agriculturists with a very humble social position and are not *Jal-acharaniya*. Risley believed them to be a Hinduised branch of the Santals but they may even be of non-aboriginal descent. It appears fairly certain however that they are entirely distinct from the Kurmis (of Bihar and U. P.) whose social position is considerably higher.

(16) *Munda*, 100 individuals from Lohardaga 96, Singbhum 3, and Hazaribagh 1.

They are an aboriginal tribe having universally admitted precedence over other tribes.

(17) *Oraon*, 100 individuals from Lohardaga.

They are believed to have come originally from Southern India.

(18) *Santal*, 100 individuals mainly from Santal Perganas 87, Manbhum 4, Birbhum 3, Midnapore 3, and adjoining districts.

An aboriginal caste who have penetrated more than others into Bengal and are getting partially Hinduised but have not yet been admitted within the pale of Hinduism.

*Bihar.*

(19) *Brahman*, 100 individuals collected from all over the province (Shahabad 9, Saran, 6, Monghyr 8, Darbhanga 5, Gaya 5, Bhagalpore 4, Champaran 4, Mozaffarpur 4, Allahabad 3, and other places).

(20) *Goala*, 100 individuals from Shahabad 25, Saran 20, Champaran 11, Patna 11, Bhagalpore 8, Gaya 8, Darbhanga 6, Mozaffarpore 5, and a few other districts.

Traditionally cowherds they have now taken to agriculture and occupy a respectable position in Hindu society.

(21) *Dosadh*, 100 individuals from Gaya 36, Monghyr 13, Bhagalpore 11, Darbhanga 8, Patna 8, and other districts.

They are mostly labourers, menials, swineherds, and are despised by Hindus generally and rank a little higher than Chamars.

(22) *Dom*, 100 individuals mainly from Champaran 28, Saran 26, Gaya 22, Patna 12, and a few other districts.

They breed pigs, supply fuel for burning dead bodies, eat prohibited food and occupy a place at the very bottom of the social scale.

*North-Western Provinces (United Provinces of Agra and Oudh).*

(23) *Brahman*, 100 (Gonda 42, Sultanpore 17, Fyzabad 10, Partabgarh 10, Rae Bareilly 6, and a few other districts).

(24) *Kayastha*, 100 individuals from all over the province. (Lucknow 9, Bareilly 8, Shabajpore 6, Benares 6, Agra 6, Jaunpore 5, Sultanpore 4, Hardoi 4, Aligarh 4, Allahabad 6, and many other districts.)

They are better educated than any other caste in this province and own a considerable amount of landed property. They rank next to the Brahmans in social position.

(25) *Goalas*, 100 individuals from all over the province (Hardoi 12, Bahraich 11, Fyzabad 10, Lucknow 8, Bareilly 6, Partabgarh 6, Gonda 6, Sitapur 5, and other places).

They are graziers by tradition but have now taken to cultivation. They enjoy a fairly high position in Hindu society but come after the Kayasthas.

(26) *Chamars*, 100 individuals widely distributed in the province, (Fyzabad 13, Bareilly 11, Agra 9, Hardoi 8, Partabgarh 7, Shabajpore 6, Bahraich 5, and other places).

They are leather-workers by tradition but many of them work as agricultural labourers; some of them own small pieces of land. Their social position is very low.

(27) *Dom*, 100 individuals from Gorakhpur 32, Azamgarh 15, Benares 14, Ghazipur 12, and other districts.

They are believed to be of aboriginal descent and in some districts are considered to be a criminal tribe. They come at the very bottom of the social scale almost on the borderland of Hindu society.

#### *Punjab.*

(28) *Khetri*, 60 individuals from Lahore 25, Guzrat 6, Amritsar 4, Gujranwala 3, Gurdaspore 3, Multan 3, Peshawar 3, Jullunder 3, and other places. Recognised to be of good social status.

(29) *Pathans*, 80 individuals from Peshawar 48, Bannu 15, Kohat 11, and a few other places.

Although a rather heterogenous collection they probably represent true north-western characteristics.

(30) *Chuhra*, 80 individuals from Lahore 56, Amritsar 6, Sialkot 5, and other places.

They are a class of agricultural labourers, village menials and scavengers and occupy a low position in society.

### APPENDIX II.

Out of the measurements given by Risely I have selected 15 (10 absolute measurements and 5 indices) for which I possessed fairly reliable values of variability. The following Table gives the mean standard deviations for 15 characters.

TABLE OF VARIABILITIES.

No.	Character.	S.D.
1	Nasal Index .. ..	6.86
2	Naso-malar Index .. ..	2.92
3	Cephalic Index .. ..	3.36
4	Fronto-zygomatic Index .. ..	2.74
5	Vertico-cephalic Index .. ..	3.60
6	Stature .. ..	5.38
7	Nasal height .. ..	2.88
8	Nasal breadth .. ..	2.51
9	Bimalar breadth .. ..	4.52
10	Nasomalar breadth .. ..	6.40
11	Cephalic length .. ..	6.30
12	Cephalic breadth .. ..	5.00
13	Frontal breadth .. ..	3.71
14	Bi-zygomatic breadth .. ..	4.50
15	Height: vertex-chin .. ..	10.00

In constructing the above table I used from 30 to 40 samples of Indian castes, each consisting of about 100 individuals. Standard deviations were obtained by direct computation in every case and may be considered fairly reliable.

*Mean Values.* The mean values were directly calculated in every case and where in agreement with (i.e. not differing by more than 0.1 from) mean values given by Risley, the latter were accepted for use. In cases of discrepancy individual measurements were carefully scrutinised and checked through indices, and were suitably corrected, and new mean values were worked out on the basis of such corrected measurements. A list of such reconstructed mean values (differing by 0.2 mm. or more from Risley's values) used in this paper is given below :—

- (1) *Bengal.*  
 Brahman : Fronto-zygomatic index (81.6).  
 Sadgop : Bizygomatic breadth (127.9).  
 Rajbansi : Nasal index (76.8). Nasal length (49.1).
- (2) *Darjeeling Hills.*  
 Lepcha : Cephalic Index (80.9). Cephalic breadth (148.7).  
 Nasal length (52.0). Nasal breadth (36.5). Nasal index (70.4).
- (3) *Punjab.*  
 Khatri : Height vertex to chin (217.3).
- (4) *Bihar.*  
 Brahman : Nasal index (73.0).
- (5) *Chittagong hills.*  
 Chakma : Height vertex to chin (219.8).  
 Magh : Nasal breadth (39.1).
- (6) *North-West Provinces.*  
 Kayastha : Nasal length (44.7).  
 Dom : Nasal index (83.2). Head length (182.9). Head breadth (136.4).

*Mean values for Anglo-Indian.*—Stature 165.7 cm.; Head Length 182.3 mm.; Head Breadth 142.6 mm.; Cephalic Index 78.4; Nasal Height 50.1 mm; Nasal Breadth 35.6 mm.; Nasal Index 71.9.

### APPENDIX III.

#### STATISTICAL DEFINITION OF CASTE-DISTANCE (D).

If  $M_1$  is the mean value of any character (say, nasal index) for one caste and  $M'_1$  the corresponding mean value of the same character for a second caste, then  $M_1 - M'_1$  gives the difference between the two castes for nasal index i.e. for the particular character considered. We are however not concerned with single characters; we wish to find the difference between the two castes as a whole, based on a number of characters, that is, we wish to take into consideration not only  $M_1 - M'_1$  (say, nasal index) or  $M_2 - M'_2$  (say, cephalic index) or  $M_3 - M'_3$  (say, nasomalar index) etc. taken singly, but all of them taken together. It is obvious however that a difference of, say, one centimetre in head length is a far more serious matter than the same difference in stature, that is the relative importance of  $(M_1 - M'_1)$  or  $(M_2 - M'_2)$  is not the same for all characters. It will be therefore necessary to reduce them to some common unit. The standard deviation ( $s_1, s_2$ ) of the characters concerned may be selected to furnish this unit; so that dividing  $(M_1 - M'_1)$  by the corresponding standard deviation  $s_1$  and  $(M_2 - M'_2)$  by  $s_2$  etc. we reduce the differences to the same statistical basis. These reduced

differences can then be compared *inter se* or added together. As some of the differences will be positive and others negative it will be desirable to get rid of the algebraic sign; we therefore take the squares of the reduced differences and adding together for all the different characters we get the expression

$$\left(\frac{M_1 - M'_1}{s_1}\right)^2 + \left(\frac{M_2 - M'_2}{s_2}\right)^2 + \dots + \left(\frac{M_p - M'_p}{s_p}\right)^2$$

Taking the mean value for "p" characters we have

$$D = \frac{1}{p} S \left( \frac{M_1 - M'_1}{s_1} \right)^2$$

as a first (provisional) measure of caste-distance.

It should be observed here that  $s_1, s_2, s_3, \dots$  should clearly be given the average value of the standard deviations obtained from a large number of different castes. The Table in Appendix II gives provisional values based on my own analysis of from 30 to 40 Indian castes and tribes.

The *Coefficient of Racial Likeness* of Prof. Pearson is defined as

$$C = \frac{1}{p} S \left( \frac{nn'}{n+n'} \right) \cdot \left( \frac{M_1 - M'_1}{s_1} \right)^2 - 1 \\ = \left( \frac{nn'}{n+n'} \cdot D \right) - 1$$

when the number of individual measurements is the same for all characters in the same sample.

When the size of the sample is constant for all samples, the two coefficient  $D$  and  $C$  are very nearly proportional to each other.

The Probable Error of  $C$  (Pearson's C.R.L.) has been calculated in every case from the corrected expression (given by Pearson in *Biometrika*

XVIII, Vol. I and II, p. 104.)  $\pm 0.6745 \sqrt{\frac{2}{p}}$ , where  $p$  is the total number of characters used for the comparison.

*Note added 26th August, 1927.*—I may note here that the coefficient  $D$  used in the present paper is essentially of the same type as the "Differential Index" proposed by H. E. Soper, and used by T. A. Joyce in his "Notes on the Physical Anthropology of Chinese Turkestan and the Pamirs" (*Jour. Roy. Anthropological Inst. XLII, 1912, p. 450*). Soper's coefficient is defined as the sum of (the difference in Means divided by the S.D.), and therefore differs from my  $D$  in certain respects. They are both in agreement however about not taking the size of the sample in consideration.

Since writing the present paper I have worked out a coefficient which I believe is theoretically preferable to the one used here. In the present notation it may be written as:

$$D' = \left[ \frac{1}{p} S \frac{(M_1 - M'_1)^2}{s_1^2} \right] - \frac{n+n'}{n \cdot n'} \\ = [D] - \frac{n+n'}{n \cdot n'}$$

with variance given by

$$\Sigma_D^2 = \frac{4}{p} \left( \frac{n+n'}{n \cdot n'} \right) [\bar{D}] + \frac{2}{p} \frac{n+n'}{n \cdot n'}$$

where  $\bar{D}$  is the mean value of  $D'$ . It can be shown that this mean value  $\bar{D}=0$  for two random samples taken from the same population.

It will be noticed that the new coefficient ( $D'$ ) differs from the present one ( $D$ ) by a small correcting term  $(n+n')/nn'$ , but is connected with Pearson's C.R.L. [ $C$ ] by the simple relation:—

$$D' = \left( \frac{n+n'}{n \cdot n'} \right) \cdot [C]$$

Although I consider the new coefficient  $D'$  to be preferable to  $D$ , I have not altered the figures in this paper for two reasons. The correcting terms are quite small (usually about  $-0.02$ , the maximum value being about  $-0.03$ ), so that the conclusions will not be appreciably affected. And secondly, the paper was given as an address on a particular occasion; I have therefore thought it proper to leave the contents practically unchanged.

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#### APPENDIX IV.

##### POSITIONAL INDEX.

We can compare the relative position of any sub-group, say, the Bengal castes, with the help of a simple positional index described below.

Each of the Tables I, (1)–(7) consists of 29 castes; the average position of a caste is therefore  $\frac{1}{2}(29+1)$ , that is, 15. Out of these 29 castes, 8 castes belong to Bengal. If all these 8 Bengal castes occupy the first 8 places then the average position of the Bengal castes would be  $\frac{1}{2}(8+1)$ , i.e. 4.5. On the other hand if the 8 Bengal castes occupy the last 8 places their average position would be 25.5. The total range of variation of average position is thus  $(25.5-4.5)=21$ .

Out of this amount  $(15-4.5)=10.5$  is the range above the average position of all castes and  $(15-25.5)=10.5$  is the range below the average position of all castes. Now in actual fact the average position of Bengal castes will be somewhere between 4.5 and 25.5. Let the average position of Bengal castes be " $a$ ." Then  $(15-a)/10.5$  will give a quantitative measure of the relative position of the Bengal castes in the whole list.

The general formula is very simple. Let " $n$ " be the total number in the whole list and " $m$ " the number in any sub-group and " $a$ " the observed average position of the sub-group (obtained by adding together the serial position of each of the castes belonging to the sub-group and dividing by the total number of castes in the sub-group).

The mean position of the whole group is then  $\frac{1}{2}(n+1)$ . If the  $m$  castes in the given sub-group occupy the first  $m$  positions in the list, their average position i.e. " $a$ " will be  $\frac{1}{2}(m+1)$ . If they occupy the last  $m$  positions " $a$ " will be  $n-\frac{1}{2}(m-1)$ . In actual practice " $a$ " will be somewhere between these two limits i.e. the range of variation of " $a$ " will be  $(n-m)$ . The positional index may then be defined as

$$P = \frac{n+1-2a}{n-m} \times 100.$$

When the " $m$ " castes occupy the first " $m$ " places, the value of " $a$ " will be  $(m+1)/2$  and  $p$  will become  $+100$ , and when they occupy the last " $m$ " places, " $a$ " is  $n-(m+1)/2$  and  $P$  will be  $-100$ .

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## APPENDIX V.

In supplementary tables (8.1)–(8.4) I give the average values of  $C$  and  $D$  and certain indices based on such average values. For example in Table (8.1) for the Bengal Brahmans the average value of  $D$  for seven Bengal castes (line 1) is .500, while the average for all castes (line 7) is 1.246. In Table (8.2) a corresponding index is shown for facility of comparison. If " $A$ " is the general average for all castes, and " $a$ " is the average for any subgroup, then the index used here is defined as  $\frac{(A-a)}{A} \times 100$ . In the present example,  $A=1.246$ ,  $a=.500$ , and therefore the index

$$= \left( \frac{1.246 - .500}{1.246} \right) \times 100 = +59.8.$$

Tables (8.3) and (8.4) give similar figures for  $C$  (Pearson's C.R.L.). It will be noticed that the three tables (8.0), (8.2) and (8.4) give very similar results.

Table 8 (1).—Average values of D.

		Brahman.	Kayastha.	Sadgop.	Kaibarta.	Bagdi.	Malpahari.	Mahomedan.	Anglo-Indian.
1	Bengal (7 or 8) .. ..	·500	·267	·176	·159	·437	1·473	·537	·264
2	Bihar (4) .. ..	·769	·636	·474	·362	·615	1·612	·222	·603
3	North Western Provinces (5)	1·043	1·545	1·167	1·049	1·021	1·637	1·452	1·550
4	Punjab (3) .. ..	·619	1·210	1·166	1·093	1·734	3·151	1·109	·452
5	Chota Nagpur (7) .. ..	2·006	1·541	1·096	·803	·500	·505	1·083	2·281
6	Eastern Districts (3) ..	1·818	1·589	1·408	1·350	1·701	1·738	1·967	1·323
7	General average .. ..	1·246	1·080	·839	·716	·842	1·521	·990	1·121

Table 8 (2).—Indices based on average values of D.

		Brahman.	Kayastha.	Sadgop.	Kaibarta.	Bagdi.	Malpahari.	Mahomedan.	Anglo-Indian.
8	Bengal (7 or 8) .. ..	+59·8	+75·2	+79·0	+77·8	+48·1	+3·1	+45·8	+76·4
9	Bihar (4) .. ..	+38·3	+41·1	+43·5	+49·4	+27·0	—5·9	+77·6	+46·2
10	North Western Provinces (5)	—31·8	—43·1	—39·1	—46·5	—21·2	—8·2	—46·6	—38·2
11	Punjab (3) .. ..	+50·3	—12·0	—39·0	—52·6	—105·9	—107·7	—12·0	+59·7
12	Chota Nagpur (7) .. ..	—60·9	—42·7	—30·6	—12·1	+40·6	+66·7	—9·4	—103·4
13	Eastern Districts (3) ..	—46·0	—47·1	—67·8	—88·5	—102·0	—14·2	—99·8	—18·0



Table 8 (3).—Average values of *C* (Pearson's *C.R.L.*).

		Brahman.	Kayastha.	Sadgop.	Kaibarta.	Bagdi.	Malpahari.	Mahomedan.	Anglo-Indian.
1	Bengal (7 or 8) ..	24.3	12.7	4.8	7.1	20.5	72.5	33.1	17.7
2	Bihar (4) ..	36.2	29.7	13.9	16.2	29.0	75.1	11.9	37.9
3	North Western Provinces (5)	81.1	76.2	36.8	51.4	50.2	80.8	93.2	102.4
4	Punjab (3) ..	25.6	50.6	33.0	45.8	73.2	132.3	58.2	23.1
5	Chota Nagpur (7)	99.3	75.8	34.5	39.1	24.1	24.2	69.3	151.5
6	Eastern Districts (3)	84.8	74.3	42.5	62.6	77.6	75.5	116.7	81.6
7	General average ..	50.2	51.5	25.6	33.5	39.0	70.8	60.5	72.6

Table 8 (4).—Indices based on average values of *C*.

		Brahman.	Kayastha.	Sadgop.	Kaibarta.	Bagdi.	Malpahari.	Mahomedan.	Anglo-Indian.
8	Bengal (7 or 8) ..	+51.2	+75.9	+81.2	+78.8	+47.4	- 2.4	+45.3	+ 75.6
9	Bihar (4) ..	+27.8	+42.3	+45.6	+52.4	+25.6	- 6.1	+80.3	+ 47.8
10	North Western Provinces (5)	-61.1	-47.8	-43.7	-54.1	-28.7	-11.3	-54.0	- 41.1
11	Punjab (3) ..	+49.0	+ 1.7	-28.8	-36.7	-87.7	-86.8	+ 3.8	+ 68.2
12	Chutia Nagpur (7)	-97.8	-47.2	-34.7	-16.6	+38.2	+65.8	-14.5	-108.6
13	Eastern Districts (3)	-68.9	-44.3	-66.0	-86.8	-98.9	- 6.6	-92.8	- 12.4