

SOME RACIAL PECULIARITIES OF THE NEGRO BRAIN.

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WITH 16 FIGURES, 12 CHARTS, AND 7 TABLES.

From time to time in the past hundred years attempts have been made to determine the distinctive points of difference between the Caucasian and the Negro brain. While differences in skull capacity, in brain weight and size—especially of the frontal lobes—or in the gyri have been demonstrated by Gratiolet, Tiedemann, Broca, Manouvrier, Peacock, Marshall, Parker, and others,—more recently by Waldeyer in Germany and by Elliott Smith in Egypt,—yet no exact measurements of the brain, such as we have of the skull, are to be found.¹

An effort will be made to show by measurement of outline drawings of brains in different positions, by composites of these outlines, and by actual drawings from individual brains that there is a difference in the size and shape of Caucasian and Negro brains, there being a depression of the anterior association center and a relative bulging of the posterior association center in the latter; that the genu of the corpus callosum is smaller in the Negro, both actually and in relation to the size of the splenium; and that the cross section area of the corpus callosum is greater in relation to brain weight in the Caucasian, while the brain weight of Negro brains is actually less. The amount of brain matter anterior and posterior to the fissure of Rolando is roughly estimated, but other points of possible difference, as in the gyri, the insula, the opercula, the "Affenspalte," the proportions of white and gray matter, and the cerebro-cerebellar ratio are necessarily omitted in this study.

In December, 1904, I reported to the Association of American Anatomists the results of the measurements of fifty-four brains, thirty-seven from American Negroes, and seventeen from American Caucasians. Since

¹The brains measured for this work are in the Wistar Institute under the same numbers given in Table I.

that time I have examined about one hundred additional brains, making in all one hundred and fifty-two, of which one hundred and three are from American Negroes and forty-nine are from American Caucasians.

The work was undertaken at the suggestion of Dr. Mall, as a result of information by Dr. Hrdlička, of the U. S. National Museum, that racial differences exist in the Negro brain. Dr. Hrdlička had observed particularly that the brain of the full-blood Negro has relatively small volume and straighter lines anteriorly to the central fissure, the sides of the Caucasian brain over the same area showing, even in dolichocephals, more mass and arching. I wish here to express my hearty appreciation for the interest Dr. Hrdlička has displayed in my work since its inception and for his generosity in allowing me to make this study. Most of the brains studied are from the collection at the Anatomical Laboratory of the Johns Hopkins University and were placed at my disposal by Dr. Mall who has also controlled the measurements taken. Some of the specimens were obtained through the courtesy of Dr. Page from the Baltimore City Alms House, and some from Dr. W. G. MacCallum, of the Pathological Department of the University

In order to make more exact measurements and comparisons of the brain it is necessary to determine the more fixed points, from which to measure the more variable, and at the suggestion of Dr. Mall the following arbitrary line was passed through the brain as an axis, and its midpoint naturally becomes the brain center. The details regarding these will be discussed later on (p. 404). At this point I wish to state that the axis passes between the hemispheres through the brain stem, passing just above the anterior commissure and just below the splenium (Fig. 2a). The axis usually measures the greatest length of the brain. The position of the brain center is in the middle of the axis and varies but slightly in different specimens. It is seen that the surface of the brain can be measured in great part by extending radii from the center to the surface which may also be marked in degrees,—“of latitude and longitude.” The outlines of the brain are generally given in sagittal section (0°), in transverse section (90° , right or left), and by rotating the brain on this axis to a point midway between these two (45° , right or left). “Anterior” has not been separated from “posterior,” but the numbers from 0° to 180° are used rather than an “equator” with 0° to 90° for the anterior half of the brain and 90° to 0° for the posterior half.

The first table (Table I) gives a list of the brains from which drawings and measurements were made. The brains are arranged in eight groups, owing to the different methods used in their preservation.

TABLE I.
RECORD OF MATERIAL USED.

Group.	Number of Cadaver.	Age of subject.	Race.	Sex.	Weight of brain in gm. (fresh).	Weight of brain in gm. (when measured.)	Area of corpus callosum in sq. mm.	Length of body in cm.	Weight of body in kilos.	Cause of death.	Color of body (Broca's standard).	Number of days between death and removal of the brain.
1	1189	50	Negro	Male	(1400)	1880	770	...	....	Hanging	..	0
1	1190	23	Negro	Male	(1420)	1400	668	...	....	Hanging	..	0
7	1216	59	Caucasian	Male	....	....	805	...	....	Asthenia	..	1
7	1246	44	Negro	Male	....	....	610	...	....	Asthenia	..	0
1	1405	47	Caucasian	Male	(1430)	1410	700	...	....	Asthenia	..	5
3	1449	20	Negro	Male	....	1157	...	188	Medium	Tuberculosis	..	0
1	1449	28	Negro	Female	(1170)	1150	643	188	37.2	Asthenia	..	1
1	1451	25	Negro	Male	(1390)	1370	710	152	41.2	Pneumonia	..	6
1	1452	45	Negro	Female	(1320)	1300	640	152	52.5	Alcohol	..	12
1	1453	50	Negro	Male	(1245)	1225	492	163	46.7	Frozen	..	18
1	1454	23	Negro	Male	(1135)	1115	605	160	55.8	Tuberculosis	..	1
1	1455	73	Caucasian	Male	(1358)	1330	653	168	47.2	Asthenia	..	1
1	1456	28	Negro	Male	(1150)	1130	706	165	43.1	Pneumonia	..	2
1	1457	79	Caucasian	Male	(1200)	1180	630	173	46.7	Nephritis	..	6
1	1458	43	Caucasian	Male	(1340)	1320	735	173	47.6	Pneumonia	..	1
1	1459	40	Negro	Female	(1080)	1060	602	147	89.0	Pneumonia	..	2
1	1463	60	Caucasian	Male	(1555)	1535	730	188	86.2	Pneumonia	..	13
1	1466	57	Mulatto	Male	(1440)	1420	722	183	70.3	Tuberculosis	..	1
7	1467	27	Negro	Male	....	....	642	...	....	Tuberculosis	34	1
1	1469	81	Caucasian	Male	(1185)	1165	453	178	77.1	Asthenia	..	0
1	1470	70	Negro	Male	(1100)	1080	522	157	61.2	Heart disease	..	0
1	1472	62	Negro	Male	(1060)	1040	438	157	61.2	Tuberculosis	..	0
1	1473	25	Negro	Male	(1135)	1115	525	165	72.6	Tuberculosis	..	1
1	1475	50	Negro	Male	(1355)	1335	...	168	81.6	Heart disease	..	2
1	1476	25	Negro	Male	(1240)	1215	533	163	63.5	Nephritis	..	5
1	1477	54	Negro	Female	(1145)	1125	475	154	47.6	Nephritis	..	2
1	1478	..	Negro	Male	(1200)	1180	668	178	72.6	Tuberculosis	..	7
1	1479	45	Negro	Female	(1130)	1110	603	154	47.6	.....	..	2
1	1480	60	Negro	Male	(1375)	1355	730	176	86.0	Hæmorrhage	..	2
1	1485	62	Caucasian	Female	(1010)	990	463	163	44.2	Asthenia	..	0
1	1486	57	Negro	Male	(1270)	1245	687	186	68.0	Shot	..	7
1	1487	50	Negro	Female	(1025)	1005	368	188	72.6	Heart disease	..	1
1	1489	58	Caucasian	Male	(1280)	1260	773	190	75.0	Pneumonia	..	1
1	1490	40	Caucasian	Male	(1500)	1480	910	193	67.1	Heart disease	..	3
1	1492	12	Negro	Male	(1185)	1165	458	127	27.2	Epilepsy	..	1
1	1493	31	Negro	Female	(1035)	1015	525	157	86.0	Heart disease	..	5
1	1494	44	Negro	Male	(1360)	1340	...	168	77.1	Suffocation	..	20
1	1495	35	Negro	Male	(1245)	1225	568	178	85.0	Heart disease	..	1
1	1496	60	Caucasian	Male	(1390)	1370	742	178	85.5	Pneumonia	..	3
1	1497	19	Negro	Male	(1270)	1245	645	168	48.0	Typhoid	..	4
1	1500	76	Negro	Female	(910)	893	427	176	40.8	Asthenia	..	1
1	1501	30	Negro	Female	(1060)	1040	620	154	46.3	Tuberculosis	..	2
1	1502	23	Negro	Female	(1225)	1205	557	163	72.6	Pneumonia	..	1
1	1506	34	Caucasian	Male	(1300)	1280	...	188	84.0	Pneumonia	..	6
1	1510	36	Caucasian	Female	(1190)	1170	568	171	59.0	Tuberculosis	..	2
1	1511	70	Negro	Male	(1130)	1110	614	157	75.8	Heart disease	..	2
1	1512	74	Caucasian	Male	(1330)	1310	666	163	80.8	Tuberculosis	..	9
1	1514	61	Caucasian	Male	(1430)	1460	722	160	64.0	Heart disease	..	0
1	1515	67	Negro	Female	(1045)	1025	487	163	62.0	Pneumonia	..	0
1	1519	8	Negro	Male	(1120)	1100	500	130	34.4	Pneumonia	..	3

TABLE I.—CONTINUED.

Group.	Number of Cadaver.	Age of subject.	Race.	Sex.	Weight of brain in gm. (fresh).	Weight of brain in gm. (when measured).	Area of corpus callosum in sq. mm.	Length of body in cm.	Weight of body in kilos.	Cause of death.	Color of body (Broca's standard).	Number of days between death and removal of the brain.
1	1520	40	Caucasian	Male	(1540)	1520	832	163	49.0	Tuberculosis	..	3
1	1521	32	Negro	Female	(1230)	1210	683	157	54.0	.....	..	1
1	1522	36	Caucasian	Female	(1065)	1045	617	154	59.2	Tuberculosis	..	1
1	1523	40	Negro	Male	(1145)	1125	..	163	46.4	.....	..	..
1	1524	35	Mulatto	Male	(1180)	1160	590	178	65.3	.....	..	..
3	1526	11	Negro	Male	....	1300	..	69	Light	Tuberculosis	..	0
1	1527	77	Caucasian	Female	(1140)	1120	707	157	44.0	Asthenia	..	0
1	1528	37	Negro	Male	(1410)	1390	913	176	81.6	Pneumonia	..	1
1	1529	42	Caucasian	Male	(1475)	1455	652	170	72.6	Asthenia	..	2
1	1530	70	Negro	Male	(1010)	990	666	163	71.0	Asthenia	..	0
1	1531	25	Mulatto	Female	(1100)	1080	..	157	45.7	Asthenia	..	1
1	1532	65	Mulatto	Male	(1420)	1400	..	178	65.0	Asthenia	..	2
1	1533	50	Negro	Male	(1170)	1150	558	190	81.6	Asthenia	..	1
1	1538	67	Caucasian	Male	(1310)	1290	698	185	77.1	Hemorrhage	..	0
1	1544	27	Negro	Female	(1160)	1140	658	168	45.0	Tuberculosis	..	1
1	1553	42	Mulatto	Female	(1140)	1120	680	157	65.8	Shock	..	2
7	1582	19	Negro	Male	....	....	555	..	....	Tuberculosis	36	..
1	1583	80	Caucasian	Female	(1275)	1255	733	168	63.5	Asthenia	..	1
1	1591	67	Caucasian	Male	(1235)	1235	672	165	63.5	Heart disease	..	0
1	1593	43	Mulatto	Female	(1000)	1000	..	178	46.3	Tuberculosis	..	1
7	1650	28	Mulatto	Male	....	....	755	..	....	Accident	..	..
7	1653	29	Negro	Female	....	....	655	..	....	Tuberculosis	41	..
2	1659	63	Negro	Female	1050	1050	512	165	59.0	Pneumonia	..	3
2	1660	82	Negro	Male	1560	1520	732	170	....	Nephritis	..	3
2	1661	73	Negro	Male	1040	1000	575	163	....	Pneumonia	22	1
2	1662	45	Negro	Female	1210	1210	713	..	....	.....	43	1
7	1667	31	Negro	Male	....	....	620	..	Heavy	.....	36	..
6	1678	42	Negro	Female	....	1020	600	..	....	.....	..	..
5	1680	62	Negro	Male	1080	1060	438	163	Medium	Nephritis	22	1
7	1681	45	Negro	Male	....	....	..	163	Heavy	.....	36	..
5	1682	35	Caucasian	Male	1330	1290	715	165	Heavy	Accident	..	13
5	1683	42	Caucasian	Male	1320	1265	640	173	Medium	Heart disease	..	4
5	1684	50	Negro	Female	1220	1170	600	163	Light	Tuberculosis	53	3
5	1685	65	Negro	Female	1230	1100	600	150	Heavy	Pneumonia	34	1
5	1686	35	Negro	Female	1090	1040	697	165	Medium	Nephritis	37	1
5	1687	64	Negro	Female	980	925	490	173	Medium	Nephritis	29	2
6	1690	40	Caucasian	Male	1450	1420	773	168	Light	.....	..	..
6	1691	62	Negro	Male	1200	1160	475	152	Light	Pneumonia	43	1
6	1692	24	Caucasian	Female	1250	1235	695	142	Light	Tuberculosis	..	1
6	1693	50	Caucasian	Male	1320	1250	573	173	Heavy	Poison	..	18
6	1695	66	Mulatto	Female	1140	1055	492	150	Heavy	Nephritis	25	2
6	1696	45	Caucasian	Male	1410	1340	757	178	Medium	Tuberculosis	..	1
6	1697	74	Caucasian	Female	980	955	540	157	Light	.....	..	..
6	1699	32	Negro	Male	1200	1205	635	163	59.0	.....	29	..
6	1700	28	Negro	Female	1225	1185	715	160	54.4	.....	40	..
6	1701	39	Negro	Male	1400	1355	715	185	79.4	.....	37	..
6	1702	45	Caucasian	Male	1200	1132	620	163	54.4	.....	..	..
6	1704	50	Negro	Male	1340	1275	710	163	63.5	.....	43	..
6	1706	73	Negro	Male	1335	1255	735	175	63.5	.....	28	..
6	1707	77	Caucasian	Male	1275	1175	465	160	72.6	.....	..	..

TABLE I. — CONTINUED.

Group.	Number of Cadaver.	Age of subject.	Race.	Sex.	Weight of brain in gm. (fresh).	Weight of brain in gm. (when measured).	Area of corpus callosum in sq. mm.	Length of body in cm.	Weight of body in kilos.	Cause of death.	Color of body (Broca's standard).	Number of days between death and removal of the brain.
6	1708	60	Caucasian	Male	1350	1295	610	183	77.1	.....	..	..
6	1709	26	Negro	Male	1475	1410	825	165	77.1	.....	43	..
6	1711	80	Negro	Male	1175	1090	620	173	68.5	.....	29	..
6	1712	70	Caucasian	Male	1325	1210	710	185	76.0	.....	..	..
6	1713	49	Negro	Male	1240	1175	680	175	49.4	Asthenia	29	..
6	1715	20	Negro	Female	950	860	405	137	21.3	.....	53	..
6	1716	48	Caucasian	Male	1265	1238	500	167	57.5	.....	..	..
6	1718	22	Negro	Male	1200	1130	765	170	70.3	Tuberculosis	29	3
6	1719	46	Caucasian	Male	1445	1355	880	193	79.4	Nephritis	..	2
6	1720	53	Caucasian	Male	1430	1245	790	186	59.0	Pneumonia	..	1
6	1722	19	Negro	Female	1050	1010	520	173	39.0	.....	46	4
6	1723	38	Caucasian	Male	1275	1250	545	165	50.3	.....	..	5
6	1727	55	Negro	Male	1265	1227	710	157	Light	Tuberculosis	22	4
6	1728	50	Negro	Male	1330	1270	675	162	56.7	Accident	50	0
6	1729	53	Negro	Male	1410	1460	..	182	Medium	Heart disease	50	5
6	1730	22	Negro	Female	1005	915	525	150	Light	Tuberculosis	36	2
6	1731	70	Negro	Male	1450	1415	820	179	67.0	Nephritis	35	4
6	1734	50	Caucasian	Male	1360	1305	710	172	Heavy	Nephritis	..	2
6	1736	82	Negro	Male	1310	1245	570	162	53.0	Asthenia	28	..
6	1738	22	Negro	Male	1275	1240	535	168	49.9	Tuberculosis	27	5
6	1739	73	Negro	Male	1120	1060	..	168	Light	Tuberculosis	29	5
6	1741	50	Negro	Male	1220	1175	..	163	Heavy	Heart disease	46	3
6	1748	60	Caucasian	Male	1520	1475	820	175	56.0	Tuberculosis	..	4
6	1749	74	Caucasian	Male	1040	1030	750	160	57.6	Nephritis	..	2
3	2469	35	Negro	Male	..	1150	585	180	..	.....	..	0
3	2521	23	Negro	Male	1395	1290	490	172	Heavy	Pneumonia	27	0
3	2522	38	Negro	Male	1350	1270	640	170	Heavy	Pneumonia	42	0
3	2524	45	Negro	Male	1350	1230	660	154	Heavy	Heart disease	36	0
3	2535	24	Negro	Male	..	1065	615	170	Medium	Tuberculosis	34	0
4	87	..	Negro	Male	..	1150	583	..	..	.....	..	0
3	163	48	Negro	Female	1130	920	485	165	Heavy	Cancer	Brown	0
3	164	57	Caucasian	Male	..	1145	575	..	..	Nephritis	..	0
3	169	87	Caucasian	Male	1110	1060	430	..	..	Cancer	..	0
4	172	45	Negro	Male	..	1020	625	..	..	.....	..	0
4	173	45	Negro	Male	..	1245	690	163	Heavy	Nephritis	..	0
3	177	15	Caucasian	Male	..	950	420	..	..	Tuberculosis	..	0
3	193	29	Negro	Male	..	910	430	175	Light	Tuberculosis	Brown	0
9	1G.	58	Caucasian	Male	1240	990	588	..	..	.....	..	..
9	2G.	48	Caucasian	Female	1106	900	566	..	..	.....	..	..
9	3G.	48	Caucasian	Male	1250	1110	790	..	..	.....	..	..
9	4G.	53	Caucasian	Male	1300	990	600	..	..	.....	..	..
9	5G.	16	Caucasian	Female	915	840	613	..	..	.....	..	..
9	6G.	25	Caucasian	Male	1460	1080	520	..	..	.....	..	..
8	105	1	Negro	Male	..	860	445	..	..	.....	..	..
8	107	2	Negro	Male	..	830	540	81	..	.....	39	..
8	108	1*	Negro	Female	..	435	155	58	3.4	.....	53	2
8	109	2*	Negro	Male	..	700	245	58	4.0	.....	52	1
8	110	†	Negro	Male	..	525	190	55	3.4	Birth	53	..
8	111	6*	Negro	Male	..	600?	255	..	..	.....	..	..
8	112	6*	Negro	Male	..	600?	232	..	..	.....	..	..
8	113	†	Negro	Male	..	..	..	..	..	Birth	..	..
8	114	2	Negro	Male	..	800?	390	..	..	.....	..	..

* Months. † Birth.

TABLE I.
RECORD OF MATERIAL TAKEN FROM RETZIUS AND SPITZKA.¹

Number.	Sex.	Age.	Body length.	Occupation.	Cause of death.	Brain weight.	A rea of corpus calosum.	Splenium.	Isthmus.	Body.	Genu.
			cm.			g.	sq. cm.				
1	Female	29	163	Chambermaid	Pul. tuberculosis	1201	8.00	2.10	.90	1.70	3.30
2	Female	63	156	Workwoman	Carcinoma	....	6.70	1.80	1.00	1.60	2.40
3	Male	50	143	Typesetter	Nephritis	1376	7.00	1.70	1.10	1.70	2.60
4	Female	37	156	Workwoman	Pul. tuberculosis	1194	5.40	1.40	.80	1.10	2.20
5	Male	26	179	Laborer	Pul. tuberculosis	1446	6.10	1.60	.70	1.50	2.20
6	Female	29	161	.....	.....	1088	6.40	1.60	.90	1.50	2.40
7	Female	76	151	.....	Arteriosclerosis	1101	6.40	1.80	1.20	1.40	2.10
8	.....	..	....	.....	.....	....	7.10	1.90	.90	1.40	2.80
9	.....	..	....	.....	.....	....	4.00	1.10	.40	.80	1.70
10	.....	..	....	.....	.....	....	6.90	1.80	.90	1.70	2.40
11	.....	..	....	.....	.....	....	6.60	1.70	1.00	1.40	2.50
12	Male	64	167	Builder	Pul. tuberculosis	1179	8.40	2.00	1.30	1.80	3.30
13	Male	44	170	Joiner	Pneumonia	1206	7.70	1.90	1.30	1.80	2.80
14	Male	48	178	.....	Pul. tuberculosis	1465	7.70	2.10	1.00	1.60	3.10
15	Male	58	166	Laborer	Carcinoma	1587	9.80	2.70	1.40	1.90	3.70
16	Male	23	175	Bookbinder	Pul. tuberculosis	1357	6.10	1.40	.90	1.40	2.50
17	Male	52	179	Laborer	Tuberculosis	1518	7.00	1.80	.90	1.40	2.80
18	Male	36	166	Laborer	Tuberculosis	1284	7.30	2.00	.80	1.60	2.80
19	.....	..	....	.....	.....	....	5.30	1.40	.60	1.10	2.20
20	Male	27	163	Shoemaker	Pul. tuberculosis	1383	6.40	1.80	.80	1.10	2.70
21	Male	52	169	Waiter	Nephritis	1346	7.20	1.80	.90	1.40	3.10
22	Male	22	182	Painter	Vit. org. cond.	1351	7.00	1.70	1.10	1.80	2.40
23	Male	55	Medium	Astronomer	Arteriosclerosis	1452	8.40	2.60	1.20	1.70	2.90
24	Female	41	Medium	Mathematician	Pleurisy	1108?	7.00	1.90	1.10	1.50	2.40
25	Male	76	...	Pedagogue	Influenza	1422	6.00	1.70	.90	1.30	2.20
26	Male	..	...	Statesman	.....	1489	7.20	2.20	1.00	1.50	2.50
27	Male	..	...	Morphologist	.....	1545?	10.60	...	...	...	...
28	Male	..	...	Neurologist	.....	....	8.00	...	...	...	...

¹ Nos. 1 to 26 are from cuts by Retzius in *Biologische Untersuchungen*, Vols. 8, 9, 10, and 11. Nos. 27 and 28 are from cuts by Spitzka in *Connecticut Magazine*, 1905, and *Am. Jour. Anat.*, Vol. 4.

Group 1 contains brains that were removed from the body after it had been injected in the usual way with carbolic acid, alcohol, and glycerine through the femoral artery under five pounds' pressure, and afterwards with shellac in the same way. The brains were then placed in 10% formalin, vertex down, no weight being taken at the time. Sixty-four brains were treated in this manner.

Group 2 contains brains treated in the same way, except that they were weighed at the time of removal from the body, and placed, vertex up, in 10% formalin.

Brains in Group 3 were weighed when removed from the body, which had not been injected, and placed, vertex up, in 10% formalin.

In Group 4 the brains were weighed a few days after being removed from the body, which had had no previous injection, the brains being placed in 10% formalin, vertex up, after removal.

Brains in Group 5 were weighed at the time of removal from the

body, which had been injected with carbolic acid in the usual way. These brains were *suspended* in a solution of 40% formalin and 6% sodium chloride, vertex up.

In Group 6 the brains were treated in the same way as in Group 5, except that they were *suspended* in 10% formalin and sodium chloride. Thirty-eight brains were preserved in this manner.

Group 7 contains brains that were obtained from frozen and sawed sections of cadavers previously injected with formalin.

Group 8 contains brains of infants preserved *in situ* by immersion of the head in 10% formalin after opening the membranes so as to allow the fluid to permeate the cerebral structures.

Group 9 contains brains of Germans from Prof. Waldeyer's laboratory in Berlin. The brains were weighed at the time of removal from the body and had been preserved in alcohol several years.

Perfect preservation of the shape of the brain may be obtained by injecting the bodies of fresh cadavers with carbolic acid, alcohol, and glycerine through the femoral arteries under 120 mm. Hg. pressure, leaving the body for 12 hours, then after removing the brain, which is firm and solid, suspending it in 10% formalin and sodium chloride. All brains from No. 1593 onward were suspended base down, thus favoring retention of their shape. The first seventy-three brains, up to No. 1659, were removed prior to the time at which I began the personal supervision of their preservation; those following were personally attended to and all data concerning them is personal. The brain weights given are with the dura mater removed, leaving the pia mater and vessels intact. The brain weights given in parenthesis are estimated from specimens in which the weight, both fresh and after hardening, had been taken. The weight of the hardened brain was taken after it had been thoroughly drained.

The actual weights and areas taken at the time the drainings were made are the ones used in the construction of the tables and charts.

BRAIN OUTLINES.

Outline drawings are made of the brains in their normal position, looking from above; lateral and mesial outlines are drawn after the hemispheres have been separated by a sagittal cut through the corpus callosum and brain stem. Outlines are also made of the lateral border of each hemisphere looking from above, the hemispheres being rotated through an angle of 45° on an axis passing beneath the splenium, above the anterior commissure, and through the foramen of Munro. This axis is drawn in every outline and from it all measurements are made; it is dis-

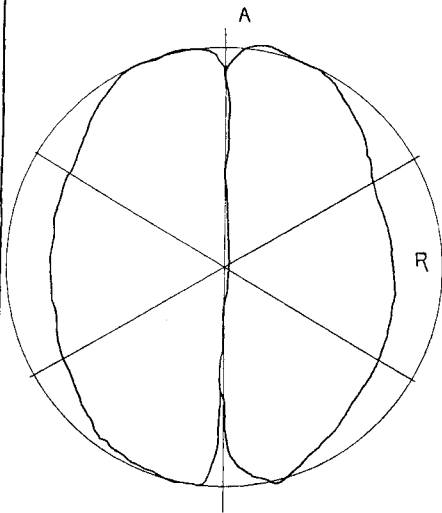


Fig. 1^a

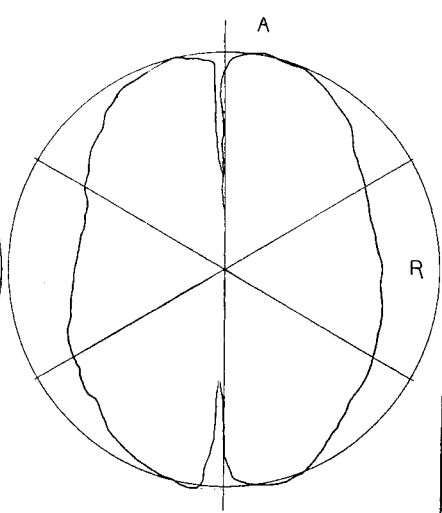


Fig. 1^b

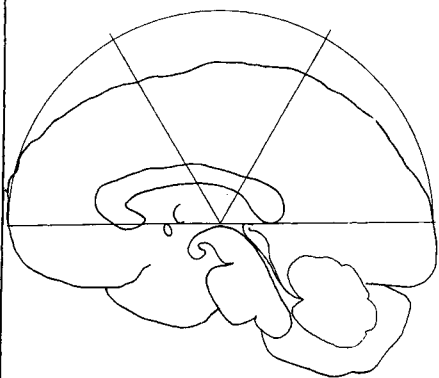


Fig. 2^a

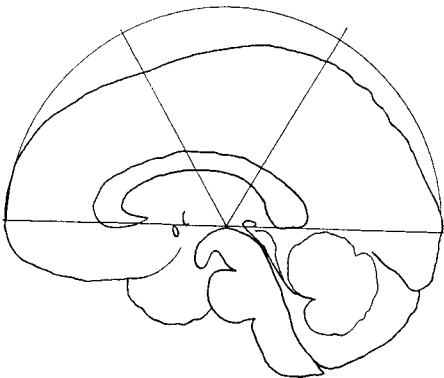


Fig. 2^b

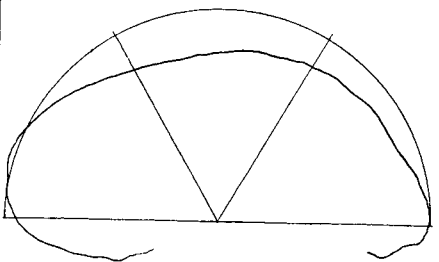


Fig. 3^a

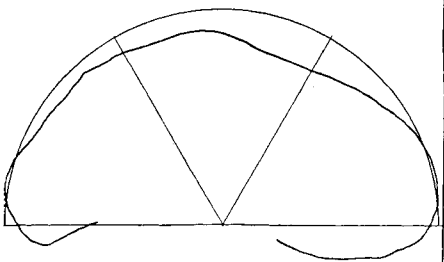


Fig. 3^b

FIG. 1a. Caucasian male, age 40, No. 1690, length 168 cm. Brain outline as viewed from above, horizontal plane. *A*, anterior end; *R*, right side. One-third natural size.

FIG. 1b. Negro male, age 37, No. 1528, length 176 cm., weight 81.6 Kg. Brain outline as viewed from above, horizontal plane. *A*, anterior end; *R*, right side. One-third natural size.

FIG. 2a. Caucasian male, age 40, No. 1690, length 168 cm. Brain outline as viewed from within, mesial view, vertical plane. Right hemisphere. One-third natural size.

FIG. 2b. Negro male, age 37, No. 1528, length 176 cm., weight 81.6 Kg. Brain outline viewed from within, mesial view, vertical plane. Right hemisphere. One-third natural size.

FIG. 3a. Caucasian male, age 40, No. 1690, length 168 cm. Brain outline as viewed from above and from the left at an angle of 45° , the outline at 45° . Right hemisphere. One-third natural size.

FIG. 3b. Negro male, age 37, No. 1528, length 176 cm., weight 81.6 Kg. Brain as viewed from above and from the left at an angle of 45° , the outline at 45° . Right hemisphere. One-third natural size.

cussed on page 404 in connection with the brain center. It passes through the longest diameter of the brain between the hemispheres, and its midpoint is taken as the brain center. From this center radii are drawn on all the outlines at 60° and 120° , the anterior end of the axis being marked 0° , the posterior end 180° . The point of contact of the anterior radius (60°) with the brain outline is invariably over the anterior association center (Broca's convolution on the left side), while the point of contact of the posterior radius (120°) is invariably over the posterior association center. These two points are meant whenever the anterior or posterior association centers are referred to unless otherwise expressed or implied.

Outlines with brain axis, and these points located on the brain of an adult male Negro (No. 1528) and of an adult male Caucasian (No. 1690) are seen in figures 1^a to 3^b, there being semicircles drawn around each hemisphere to facilitate comparison. These two brains are selected because they are nearly alike in many respects, but still show the racial characteristics. They are taken from young adult males of about the same age, the brains being of about the same size and weight. From these outlines it is observed that the Caucasian brain conforms more nearly to a circle in its contour in the different planes than does that of the Negro, which is squared at the ends, and flatter on the sides and above, especially along the frontal lobes, thus exhibiting a distinct box-shaped appearance. This shape of the Negro brain is manifested in the mesial outline by the abrupt rise of the contour from the axis at its posterior end, by the nearly straight line over the anterior association center, by the nearly

Fig 4

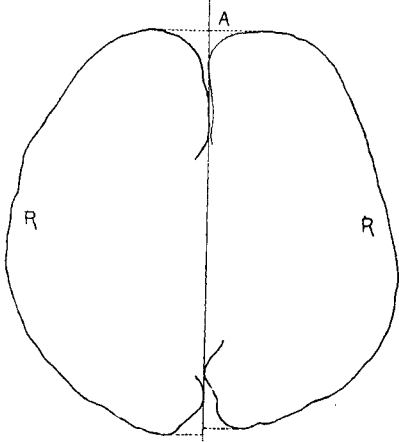


Fig 5

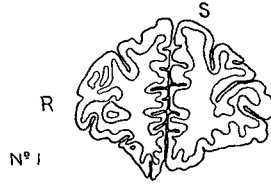
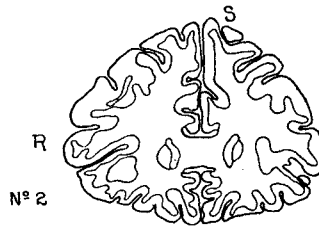


Fig 6

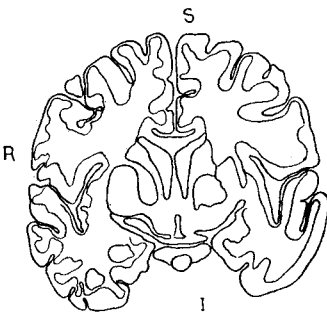


Fig. 7



Fig 8^a

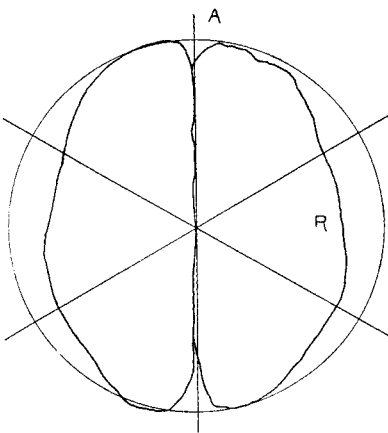
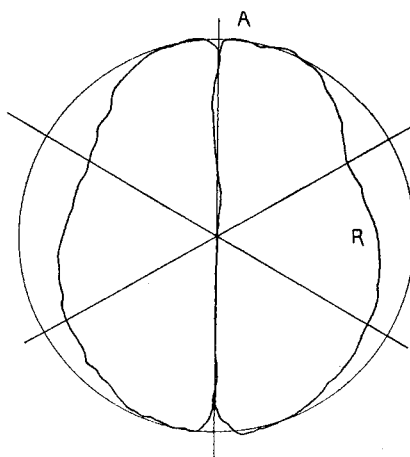


Fig 8^b



FIGURES 4 TO 8b ON PAGE 362.

FIG. 4. Left side of the figure, Caucasian male, age 67, No. 1538, length 185 cm., weight 77.1 Kg. Brain outline as viewed from above and from the left at an angle of 45°. Right hemisphere. (The outline is inverted).

Right side of the Figure, Negro male, age 25, No. 1473, length 165 cm., weight 72.6 Kg. Brain outline as viewed from above and the left at an angle of 45°. Right hemisphere. *A*, anterior end; *R*, right side. One-third natural size.

FIG. 5. Negro male, age 45, No. 1681, length 163 cm., large and fat. Vertical, transverse sections. Section not quite transverse. No. 1 about 15 mm. from anterior end of brain; No. 2, about 45 mm. *S*, superior surface; *R*, right side. One-third natural size.

FIG. 6. Negro male, age 45, No. 1681. Vertical transverse and slightly oblique section. The section is about 75 mm. from the anterior end of the brain. One-third natural size.

FIG. 7. Negro male, age 45, No. 1681. The section is about 105 mm. from the anterior end of the brain, just anterior to external auditory meatus. One-third natural size.

FIG. 8a. Caucasian female, age 36, No. 1522, length 154 cm., weight 59.2 Kg. Brain outline as viewed from above, horizontal plane, i. e., at 90°. *A*, anterior extremity; *R*, right side. One-third natural size.

FIG. 8b. Negro female, age 27, No. 1544, length 168 cm., weight 45 Kg. Brain outline as viewed from above. One-third natural size.

vertical line along the anterior aspect of the frontal lobe, and by the horizontal line along the inferior border of this lobe; it is manifested in the outline from above by the square front and sides of the outline; and in the outline with the brain rotated laterally 45°, by the more abrupt rise posteriorly, and the depression or apparent flattening over the anterior association center, along with the relative bulging of the posterior association center. These differences are seen more plainly in Figure 4 (brains No. 1473 and 1538) which represents the 45° outlines of a fairly typical adult male Caucasian brain, and of a fairly typical adult male Negro brain of about the same weight and length. It is the straight line seen over the anterior association center in this figure on which especial emphasis is laid as a distinctive characteristic of the Negro brain. Looking at the brain directly from above or from the side one does not so readily notice any apparent flattening, but on rotating the brain on its axis slightly to one side a glance will often bring it out distinctly; or a careful examination, revolving the brain from 10° to 60° from its normal position and looking at it from above, will almost invariably disclose this peculiarity. In some brains it is well marked, in others only slightly so. It usually appears most marked when either hemisphere is rotated through an angle of 30° laterally from its normal position and viewed from above. Viewed from the side the Negro brain appears to be pressed back, while

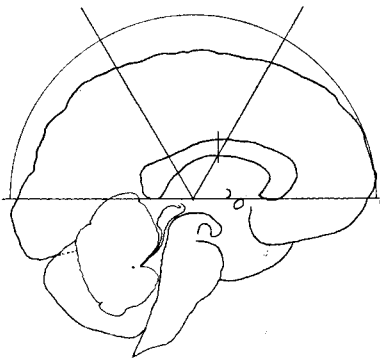


Fig. 9^a

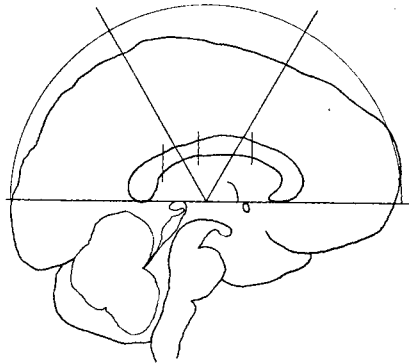


Fig. 9^b

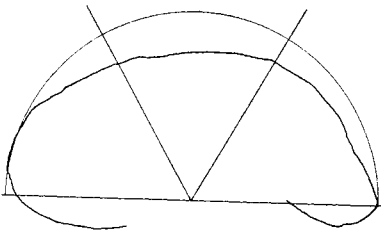


Fig. 10^a

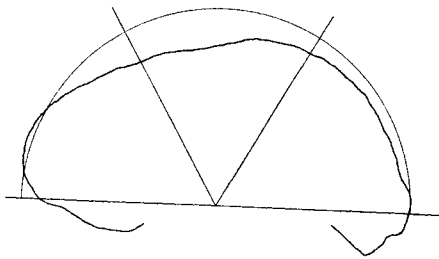


Fig. 10^b

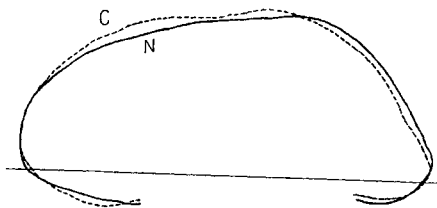


Fig. 11

FIGURES 9^a TO 11 ON PAGE 364.

FIG. 9^a. Caucasian female, age 36, No. 1522, length 154 cm., weight 59.2 Kg. Brain outline as viewed from the mesial side. Left hemisphere. One-third natural size.

FIG. 9^b. Negro female, age 27, No. 1544, length 168 cm., weight 45 Kg. Brain outlines as viewed from the mesial side. Left hemisphere. One-third natural size.

FIG. 10^a. Caucasian female, age 36, No. 1522, length 154 cm., weight 59.2 Kg. Brain outline as viewed from above and to the right at an angle of 45°. Left hemisphere. One-third natural size.

FIG. 10^b. Negro female, age 27, No. 1544, length 168 cm., weight 45 Kg. Brain as viewed from above and to the right at an angle of 45°. Left hemisphere. One-third natural size.

FIG. 11. Unbroken line represents the composite of 45 Negro male outlines as viewed from above and to the left at an angle of 45°. Right hemisphere.

The broken line represents the composite of 45 Caucasian male outlines also viewed from above and to the left at an angle of 45°. Right hemisphere. One-third natural size.

the Caucasian appears to be pushed forward, the result being that the frontal lobe of the Negro brain appears considerably smaller than that of the Caucasian. This difference is greater than is apparent in the outlines, because the gyrus rectus in the Negro brain is low, while the superior orbital plate passes well up into the frontal lobe outside of this, materially diminishing the size of this lobe, the gyrus frontalis superior also projecting upward in Negro brains more than in the Caucasian. This is shown in Figures 5 to 7, brain No. 1681, from a typical adult male Negro. The drawings are made from sawed sections of the frozen head, showing the brain in situ, no distortion of the brain being apparent. In this there may be observed the extremely small frontal lobes; the projection downward of the gyrus rectus; the deep impression of the superior orbital plates; the straight lines along the sides anteriorly, showing the lateral surfaces of the brain to be at an angle of 45° from the vertical plane; the upward projection of the gyrus frontalis superior; the box-like appearance of each outline; and the great bulging in the parietal region. The female Negro brain may differ somewhat from that of the male, but in general the same peculiarities are noticeable in each. Figures 8^a to 10^b exhibit a characteristic adult female Negro brain and a small adult female Caucasian brain for comparison, the two being selected because they are so nearly alike, yet the racial differences are noticeable. The frontal lobes of the female Negro brain are long and slender, while the parietal region is full and bulging. The peculiarities noted in the other outlines may be seen in these also.

Examination of about fifty Negro skulls, and hundreds of Negro heads has convinced me of a noticeable characteristic: the appearance to be

obtained by a view from behind at an angle of about 30° above the horizontal looking directly forward. The outline of the head or skull seen in this way is pointed anteriorly and broad and flattened posteriorly. This may be seen in the Negro brains under the same conditions. Here we see the small frontal lobes, the large parietal region and the straight, flat sides over the anterior association centers. That this is not only apparent, but real, may be determined by measurements of the radii from the brain center to the outlines of the plane passing through the brain axis at an angle of 45° above the horizontal plane of each hemisphere. Such measurements are found in Table II, which gives the dimensions of this plane in each non-distorted brain. Radii are projected from the brain center for each 10° angle, and perpendiculars are dropped from the brain axis for each centimeter on the axis from either end of the brain, and these radii and perpendiculars are measured from their origin out to the surface of the brain.

From Table II the following summary is given:

TABLE II.^a
AVERAGES OF THE ASSOCIATION CENTERS.

	LEFT SIDE					RIGHT SIDE				
	Number of brains.	Brain axis.	Anterior association center.	Posterior association center.	Index association centers.	Number of brains.	Brain axis.	Anterior association center.	Posterior association center.	Index association centers.
	mm.	mm.	mm.			mm.	mm.	mm.		
Caucasian male	34	168	70	71	98	34	167	70	72	97
Negro male	43	168	66	73	90	45	168	66	74	89+
Caucasian female	8	161	64	67	96	8	160	65	67	97
Negro female	22	158	62	68	91	22	158	63	69	91

The numbers represent averages in each case for the number of brains given. The fifth column of numbers on each side represents the averages of indices of the association centers. The index of the association centers for each brain is obtained by dividing the length of the radius for each center by the length of one-half the brain axis, and dividing the result obtained for the anterior association center by the result obtained for the posterior association center. The quotient represents the proportion of the size of the anterior association center in terms of the posterior association center, the latter being 100 in each case, the brain axis also en-

tering as an element. For each increase of 20 mm. in the length of the brain axis there is an increase of about one unit in the index. For example, the index for the left hemisphere of the male Caucasian brain is 98, the length of the radius to the anterior association center is 70 mm., that to the posterior association center is 71 mm. 70 : 71 :: 98 : 100 is correct, considering the brain axis element 84 mm. Increase the latter and the index rises, reduce it and the index falls. The index varies, directly with the size of the anterior association center, and inversely with the size of the posterior association center. Increase 70 and the index is increased; diminish 70 and the index is diminished. Increase 71 and the index is diminished; diminish 71 and the index is increased. The index gives a simple numerical expression that may be used to advantage in the comparison of brains, and in the comparison at present in hand it affords an excellent indication of existing differences. It is observed from the table that the index of the male Caucasian brain is the largest; the index of the female Caucasian comes next; with the female Negro third, and the male Negro the lowest. This indicates that the relations of the brain axis and anterior association centers are similar to the index of the association centers, while the posterior association center is dissimilar in the two sexes and races. The index is slightly larger on the left side, except in the female Caucasian. This may be due to the gyrus frontalis inferior, or to a larger motor area on the left side in the males.

The relative differences of the association centers in the males of the two races on the right side are represented in Fig. 11, which is a composite of the 45° outline of the thirty-four male Caucasian and the forty-five male Negro brains. The brain axis is practically the same length in each (167.8 mm.). A difference in the size and shape of the two outlines is evident on the inferior surfaces of the frontal and occipital lobes below the axis, as well as above it, the Caucasian brain being further below the axis and more curved along the frontal lobe, while the Negro brain is further below the axis and more curved along the inferior surface of the occipital lobe, a difference which materially diminishes the size of the frontal lobe in the Negro and increases the size of the occipital. The flatness of the anterior association center is seen in the Negro outline, and the actual areas of the parts of these outlines are as follows:

Area of the anterior lineal half of the composite Negro outline...	48.4 sq. cm.
Area of the anterior lineal half of the composite Caucasian outline	51.2 sq. cm.
Area of the posterior lineal half of the composite Negro outline...	48.2 sq. cm.
Area of the posterior lineal half of the composite Caucasian outline	56.2 sq. cm.

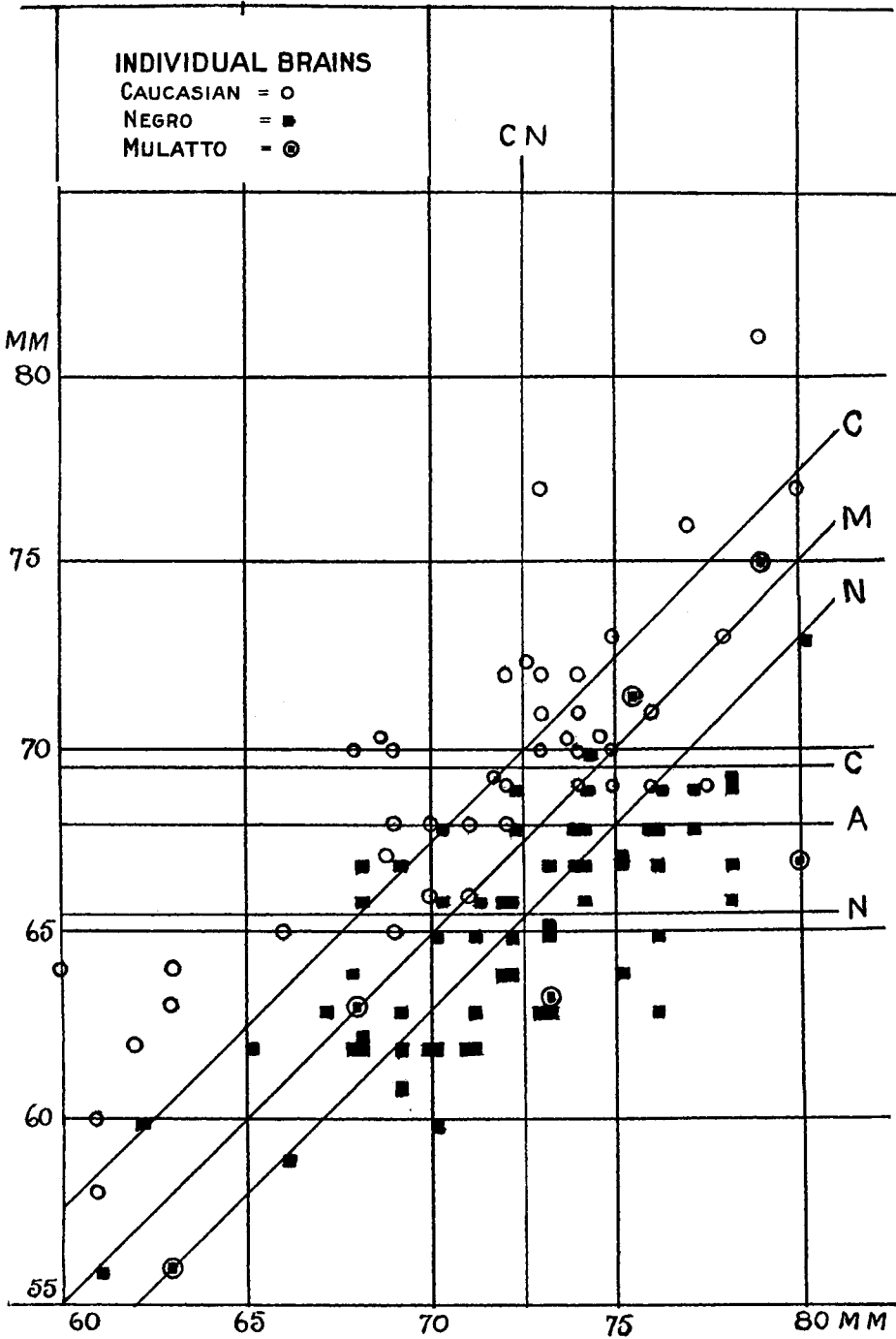


CHART I. *Right Side.*—Relation of the radii of the anterior association center (ordinates) to the radii of the posterior association center (abscisse); taken with the brain tilted 45°, the former at 60° from the anterior end, the latter 120°, as in Figure 3^b. The perpendicular line *CN* gives the mean for the anterior association centers for both races; the horizontal lines *C, N*, for the posterior association centers of the Caucasian and Negro respectively; and the diagonal lines *C, M, N*, for the Caucasian, *C*, for Negroes, *N*, and for both races combined, *M*. This is true of the first four charts.

That these differences are manifested not only in mass, and by averages, but individually, may be determined by examining Table II, and Charts I and II, taken from the numbers in Table II, and giving the relation of the anterior and posterior association centers in each brain. The anterior association center in all cases is represented by the numbers from the column under 60°, the posterior association center by the numbers from the column under 120°. The charts are made up by the use of ordinates and abscissæ, the former representing the length of the radii of the anterior association center, the latter the length of the radii of the posterior association center. An arbitrary line drawn on the charts from the 68-mm. ordinate on each side divides the symbols into racial groups, the Caucasian above the line and the Negro below, indicating a longer radius to the anterior association center in a larger number of brains among Caucasians. This line divides the two sides differently. On the left side a larger number of Caucasian symbols fall below the line and a larger number of Negro symbols fall above the line than on the right side. The symbols that are over the line represent the extremes of each race in relation to the other race. A greater number of Negro extremes have a larger left anterior association center, and conversely, a greater number of Caucasian extremes have a smaller left anterior association center. The extremes may be represented by a table taken from Charts I and II.

TABLE IIb.
EXTREMES OF THE ANTERIOR ASSOCIATION CENTER.

Symbols.	Left Side.		Right Side.	
	Above the arbitrary line.	Below the arbitrary line.	Above the arbitrary line.	Below the arbitrary line.
Caucasian	24	16	27	11
Negro	15	45	10	50

The numbers in this table are of value only in comparing the two sides of the body. On the left side there are 16 Caucasian extremes and 15 Negro extremes. On the right side there are 11 Caucasian extremes and 10 Negro extremes. The deduction from this is that there is greater dissimilarity of the brains of the two races on the right side than on the left side. The majority of the Negro symbols fall below the line, and the majority of the Caucasians fall above on each side, this being the most noticeable difference, that the anterior association is smaller in the Negro than in the Caucasian. The radius to the anterior association center of the left hemisphere invariably passes over the gyrus frontalis inferior, so that this may mean a greater development of the gyrus in the

Negro extremes, and a less development in the Caucasian extremes. It is possible that the size of the motor area may account for this difference on the two sides.

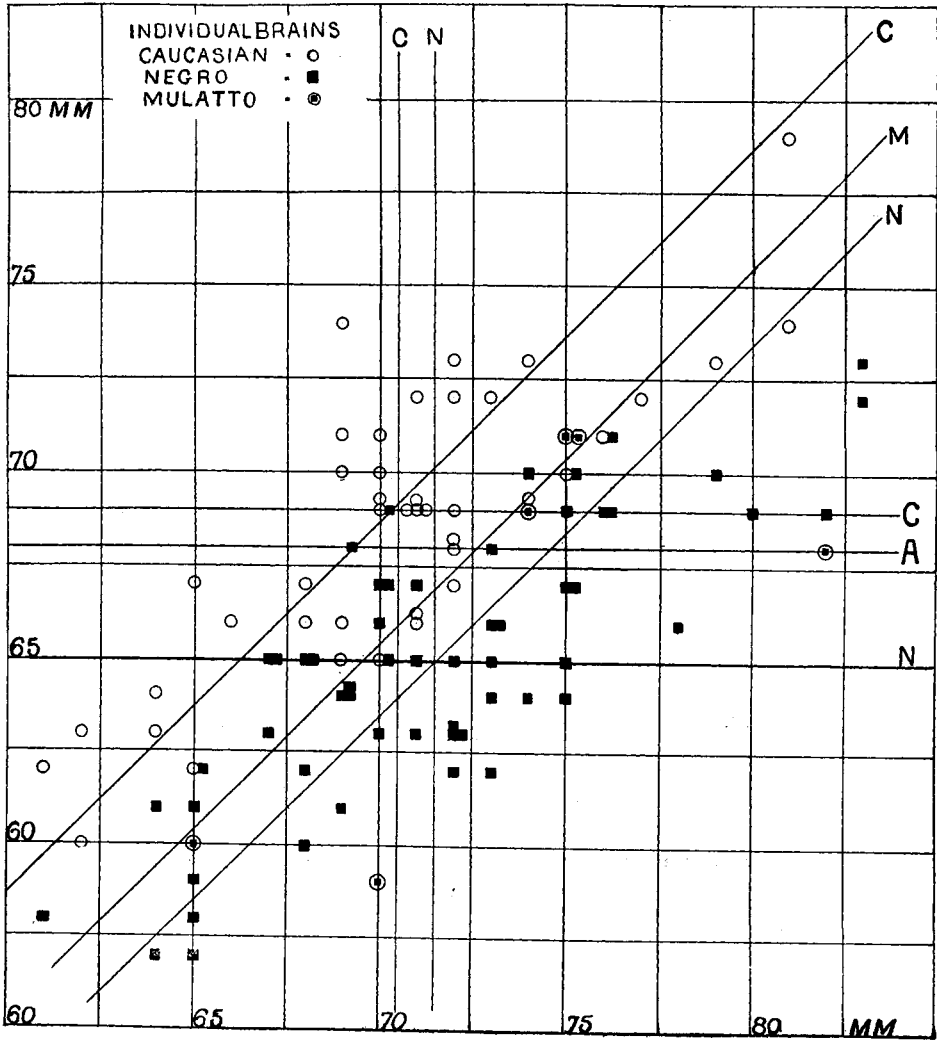


CHART II. *Left Side.*—Relation of the radii of the anterior association center (ordinates) to those of the posterior association center (abscissæ). See Chart I, Legend.

A system of means is adopted for the charts. Extremes are avoided in this way, and a medium for comparison is obtained which is fairer

and more readily visualized on the charts than would be the case with averages or curves. Horizontal lines are drawn on the charts to represent the means of the radii of the anterior association centers (ordinates), vertical lines are drawn to represent the means of the radii of the posterior association centers (abscissæ), and lines are drawn at 45° from these to represent their combined means. In Chart I the Caucasian ordinate mean is 69.5, the Negro ordinate mean is 65.5, *i. e.*, the Caucasian brains have a mean radius to the right anterior association center of 69.5 mm., while the mean radius to this center in the Negro brains is only 65 mm long. The Caucasian and Negro abscissa means are the same, 72.5 mm., therefore the mean radius to the right posterior association center is the same in the two races. A comparison of the means of the two sides taken from Charts I and II is found in the following table:

TABLE IIc.
MEANS OF THE ASSOCIATION CENTERS.

	Left Side.			Right Side.		
	Anterior Ordinate	Posterior Abscissa	Difference of the combined means.	Anterior Ordinate	Posterior Abscissa	Difference of the combined means.
Caucasian ...	69	71.5	71.25 — 70 = 1.25	69.5	72.5	72.5 — 70 = 2.5
Negro	65	72.5	76.5 — 70 = 6.50	65.5	72.5	77 — 70 = 7.0

The ordinate means are slightly larger on the right side than on the left side in the two races, hence the mean anterior association center is larger on the right than on the left. It is demonstrated (Table II^a) that the averages of the anterior association centers are slightly larger on the right side than on the left in the females of the two races, but the relative difference is in favor of the left side in both male and female. This is evident from the index of the association centers (Table II^a) and from the differences of the combined means (Table II^c). The differences of the two sides are slight and may be negligible in the means and the averages. On the other hand the extremes (Table II^b) present a marked racial difference in relation to the two sides of the brain, the left anterior association center being large in the Negro extremes and small in the Caucasian extremes. The conclusion is that the extremes affect both the means and the averages, explaining the apparent contradiction in each. The abscissa means are the same for all, except on the left side of the Caucasian which is 1 mm. less than the others. This indicates a smaller posterior association center on the left side of the Caucasian. The differences of the com-

bined means for the two races (45° lines) are obtained by subtracting the ordinate 70 mm. from the abscissa of the point at which the 45° line crosses this ordinate. The numbers obtained are purely arbitrary, but afford a basis of comparison for the two sides and the two races. The smaller the number the larger the anterior association center in relation to the posterior association center, and the larger the number the larger the posterior association center in relation to the anterior association center. On comparing this with the index of the association centers (Table II^a) it will be found that the deductions are the same from each, *i. e.*, the anterior association center is larger relatively to the posterior association center in the Caucasian than in the Negro, and larger on the left side in each than on the right side, although the latter difference is slight. Or the converse of this proposition may be taken. The posterior association center is relatively larger in the Negro than in the Caucasian and larger on the right side than on the left. A line on the charts at 45° representing the mean of all brains separates the races in much the same way as the arbitrary line before described. A table presents this figuratively:

TABLE II^d.
EXTREMES OF THE COMBINED MEANS OF THE ASSOCIATION CENTERS.

Symbols.	Left Side.		Right Side.	
	Above the line.	Below the line.	Above the line.	Below the line.
Caucasian	32	10	33	3
Negro	18	45	14	48

In this table, as in others, a more marked racial difference is found on the right side than on the left; fewer brains being over the line on the right side. It is interesting to find all of the perfect adult male mulattoes in white territory on the charts, each one being near the line representing the mean of all brains. Examination of the charts will reveal the fact that all the symbols range along this line or in the direction of it from left to right, and from below upwards as the size of the brains are shown to be larger, the Negro symbols being below and to the right of the line, while the Caucasian symbols are above and to the left, except those represented in heavy type in the above table as the "Extremes of the Combined Means of the Association Centers."

To summarize:

An attempt is made to demonstrate that the anterior association center is relatively smaller in the Negro brain than in the Caucasian; that the

left anterior association center of Negro brains resembling the Caucasian brain in shape is larger than the right, while the left anterior association center of Caucasian brains resembling the Negro brain in shape is smaller than the right, although this difference may be in the gyrus frontalis

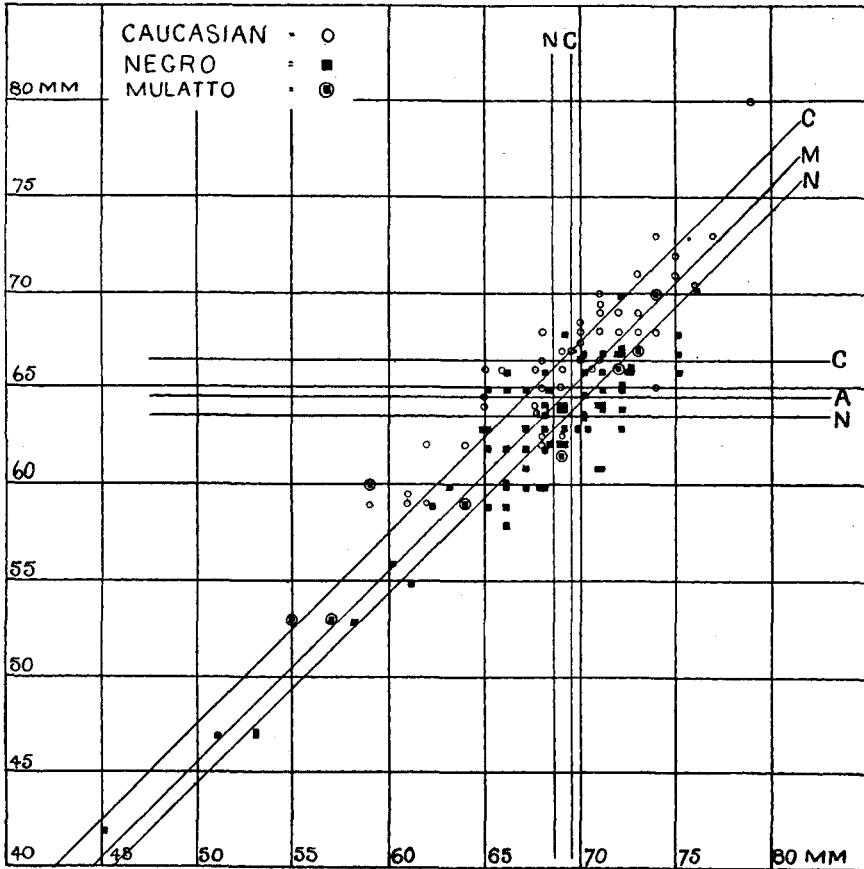


CHART III. *Right Hemisphere.*—Relation of the average length of radii at 60° in the sagittal plane (0°, Fig. 2a), in the horizontal plane (90°, Fig. 1a), and in the plane with the brain tilted at 45° (Fig. 3a); to the average of the radii at 120° in the same plane. The average is obtained by adding the length of the radii in these three positions and dividing by three.

inferior or the motor area, instead of in the anterior association center; and an attempt is also made to point out minor racial differences in individual brains. To accomplish this, outline drawings of individual

brains in various positions are presented; composites are constructed based upon actual measurements; a table of actual measurements is compiled from which an index of the association centers is worked out; and charts and tables are produced to determine the averages, the means, the

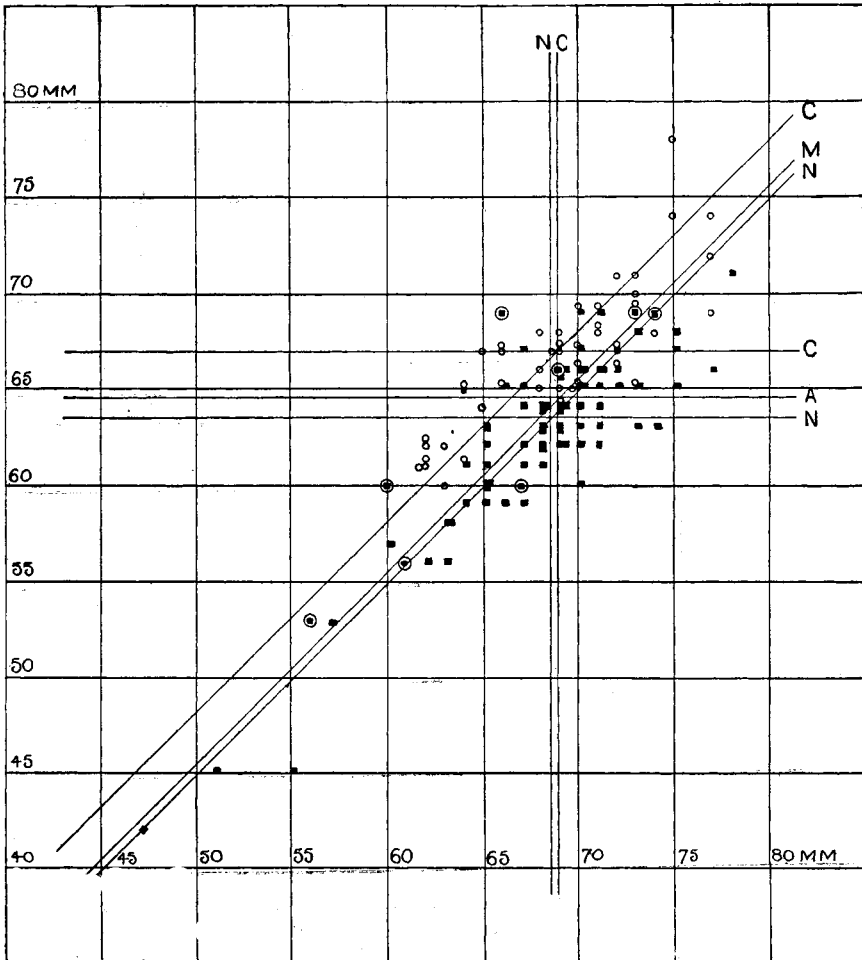


CHART IV. *Left Hemisphere.*—See legends of Charts III and I.

extremes, and the extremes of the combined means, of the association centers.

Not only is the anterior association center smaller in the Negro than in the Caucasian, but the whole frontal lobe of the Negro is smaller, as

may be determined by examining Charts III and IV, constructed from the numbers in Table III, and also from the position of the fissure of Rolando, to be discussed further on, and the areas of the brain outlines anterior to this fissure. The numbers in Table III are obtained by measuring the radii at 60° and 120° of the three outlines of the horizontal, vertical and 45° planes intersecting the brain axis, the numbers representing the average length of these three radii in each instance. Charts III and IV are constructed in a manner similar to that described for Charts I and II, and they are treated throughout in the same way. The *arbitrary line* is found to separate the races similarly, but it passes through the 64.5 mm. ordinate instead of through the 68 mm., which means that the average length of the 45° radii to the frontal lobes for the three planes is less than the average length of the radii to the anterior association center. The arbitrary line is an approximate compound ordinate mean in this table as well as in Table II^b, representing the ordinate mean for all brains on Charts I and II, and III and IV respectively.

A table showing the comparison of the frontal lobes in the two races is as follows:

TABLE IIIa.
EXTREMES OF THE FRONTAL LOBES.

Symbols.	Left Side.		Right Side.	
	Above the arbitrary line.	Below the arbitrary line.	Above the arbitrary line.	Below the arbitrary line.
Caucasian	34	10	32	12
Negro	30	52	29	54

This presents the fact that there is a greater number of large frontal lobes among the Caucasian brains (66 large, 22 small), and a greater number of small frontal lobes among the Negro brains (106 small, 59 large) the relations being nearly proportional, and practically the same on the two sides of the brain in each race. The difference between the two sides found in Tables II^a and II^b evidently lies about a point on the 45° plane where the 60° radius intersects the outline of this plane. This point lies over the anterior association center on the right side, and over the gyrus frontalis inferior on the left side. From Table II^a it is determined that the average for this side is relatively greater on the left side in each race. From Table II^c it is determined that the mean for this point is relatively greater on the left side in each race. From Table II^b it is determined that the extreme for this point is greater in the Negro brain and less in the Caucasian. We may conclude that in general the gyrus frontalis inferior is well developed in the two races, causing the

left side to be more prominent at this point, but extreme Negro brains that approach the Caucasian brain in type have a larger gyrus frontalis inferior and extreme Caucasian brains that approach the Negro brain in type have a smaller gyrus frontalis inferior. Of course this difference may be due to the anterior association center or to the motor area, increase in the size of either causing the gyrus frontalis inferior to bulge.

It is interesting to note in this connection relatively to the arbitrary line in Charts III and IV, that all the adult male mulattoes (3) are above the line on each side, while all the female mulattoes (4) are below, except on the left side. Only three (of 26) female Negroes are above the line on the left side, and five on the right side, and all of these are close to the line. Only four (of 35) male Caucasians are below the line on the right side, and three on the left side, and these are all near the line. This indicates a divergence in the males of the two races and a convergence in the females. Evidence of the same relation is obtained from Table II^a in the index of the association centers, the Caucasian male being 98-97; the Negro male, 90-89; the Caucasian female, 96-97; and the Negro female, 91-91, for the left and right sides, respectively. This fulfills the biological law that the females are more homogeneous, the males more heterogeneous, the latter being more apt to vary from the type, or to be extreme.

A slight difference from that found in the association centers is found in the frontal and parietal lobes of the brain in relation to the means. A table is given for comparison, which is derived from Charts III and IV in the same way that Table II^c is derived from Charts I and II.

TABLE IIIb.
MEANS OF THE FRONTAL AND PARIETAL LOBES.

Symbols.	Left Side.			Right Side.		
	Frontal Ordinate	Parietal Abscissa	Difference of the combined means.	Frontal Ordinate	Parietal Abscissa	Difference of the combined means.
Caucasian	67	69	72 — 70 = 2	66.5	69.5	72.5 — 70 = 2.5
Negro	63.5	68.5	75 — 70 = 5	63.5	68.5	75.5 — 70 = 5.5

On comparing this table with Table II^c, it is found that the differences are similar, but not so great. The inferences are that the frontal lobes are smaller in the Negro than in the Caucasian, but practically the same size on the two sides in each race; that the parietal lobe is slightly larger in the Caucasian than in the Negro, but practically the same size on the

two sides in each race; and that the left frontal lobe is relatively larger than the right in each race, this difference being very slight.

The extremes of the combined means of the two lobes may be represented in a table prepared in the same way as Table II^d, and with like results, except that the differences are not so marked in this table as in Table II^d.

TABLE IIIc.
EXTREMES OF THE COMBINED MEANS OF THE FRONTAL AND PARIETAL LOBES.

Symbols	Left Side.		Right Side.	
	Above the line.	Below the line.	Above the line.	Below the line.
Caucasian	35	9	36	9
Negro	26	55	25	56

A greater racial difference exists on the right side than on the left side, *i. e.*, more Negro brains have a relatively large frontal lobe, and a relatively small parietal lobe on the left side than on the right side; and more Caucasian brains have a relatively small frontal lobe and a relatively large parietal lobe on the left side than on the right side, although this difference is manifested in two Negro brains and one Caucasian brain only. The racial separation of the races by the 45° line representing the mean for all brains is presented in this table by the fifty-five Negro symbols below the line and the thirty-five Caucasian symbols above the line, on the left side, and by the fifty-six Negro symbols below the line, and the thirty-six Caucasian symbols above the line, on the right side.

It is evident that the frontal lobe of the Negro brain is smaller than the frontal lobe of the Caucasian brain, as demonstrated in Charts III and IV, and Tables III^a, III^b and III^c. This racial difference has been recognized by anatomists heretofore, but in only a few individual instances has it been emphasized.¹

Even Tiedemann^{55 56} that eminent continental champion of the Negro, although recognizing few differences between the brains of the Negro and the European, does admit that the frontal lobes of the Negro brain are smaller than those of the European. This difference is not so great, however, as the difference demonstrated between the anterior association centers of the two races, as represented in outlines, tables, and charts.

Flechsig,² in his masterly work on the development of the fiber tracts and cortical areas as represented by myelinization, throws some light on the connections of the great association areas, and on their probable func-

¹ Reference Nos. 1, 2, 3, 8, 10, 17, 20, 23, 24, 32, 33, 35, 36, 39, 52, 59, 62, 65, 66, 68, 79, 82.

² 1, 18, 19, 56.

tion. The cortex may be divided into three grand areas representing the sequence in development. First the primary sensory areas develop, representing the area for smell in the lamina perforata anterior and extending through the septum pellucidum and the fornix to the uncus and cornu ammonis; the area for touch and muscle sense, and the motor area, in the gyrus centralis posterior and anterior, and the gyrus frontalis superior, the sequence for the types of fibers for this area being sensory, motor, callosal, horizontal and arcuate, and association bands; the area for sight around the fissura calcarina, the gyrus descendens and the occipital pole; the area for taste possibly just posterior to the splenium and connected with the subiculum cornu ammonis; and the area for hearing in the gyrus temporalis superior. Next there develop several centers of unknown meaning in the cuneus, the anterior extremity of the temporal lobe, the posterior extremity of the gyrus frontalis inferior, the gyrus subangularis and supramarginalis, their positions being near the primary sense areas but not touching them.

All the areas so far mentioned develop before birth, except the gyrus superangularis, while the remaining areas develop after birth. They make up the third grand division composed of the three association centers, anterior, posterior and temporal, and include the border zones to the areas already developed, these having short fibers, and the terminal or central zones of the association centers with long fibers. The central zones are the last to develop. The anterior association center is in close relation to the areas representing the body, and in slight relation to the olfactory area, while the others are in close relation to the areas of special sense. In his earlier works Flechsig¹⁶ determined that lesions of the anterior association center caused alteration, or loss, of ideas regarding personality, the ego, the relations of self subjectively and objectively; a diminution in capacity for ethical and aesthetic judgment; a loss of self-control, of the powers of inhibition, of will power; and in fact all the symptoms which Bianchi observed on higher apes in which the fore brain on both sides had been extirpated. In simple lesions or in the early stages of the lesion, when the person is "subjected to unaccustomed stimuli, especially to sexual excitement, anger, or vexation, he may lose all control of his movements and acts, so that simple influence may lead him to try to satisfy his desires without any regard to custom or good taste. In later stages of the disease imbecility may appear, with entire loss of the mental pictures regarding his personality" (Barker¹). The individual may distort his own personality, and be unable to distinguish the imagined from the real; thus he may think himself of enormous dignity, of great importance, or that he is possessed of great wealth, or that

he is a genius. Lesions of the posterior association center do not present so clear a picture, and naturally so because of its more intimate connection with the special senses. It is generally understood that the posterior association center is objective, while the anterior is subjective, the one representing the powers of conception in the concrete, the other, the powers of thought in the abstract. The relative differences found in the association centers of the two races is suggestive in relation to the known characteristics of the two, in view of Flechsig's work. The Caucasian is subjective, the Negro objective. The Caucasian—more particularly the Anglo-Saxon, which was derived from the Primitives of Europe, is dominant and domineering, and possessed primarily with determination, will power, self-control, self-government, and all the attributes of the subjective self, with a high development of the ethical and æsthetic faculties. The Negro is in direct contrast by reason of a certain lack of these powers, and a great development of the objective qualities. The Negro is primarily affectionate, immensely emotional, then sensual and under stimulation passionate. There is love of ostentation, of outward show, of approbation; there is love of music, and capacity for melodious articulation; there is undeveloped artistic power and taste—Negroes make good artisans, handicraftsmen—and there is instability of character incident to lack of self-control, especially in connection with the sexual relation; and there is lack of *orientation*, or recognition of position and condition of self and environment, evidenced by a peculiar bumptiousness, so called, that is particularly noticeable. One would naturally expect some such character for the Negro, because the whole posterior part of the brain is large, and the whole anterior portion small, this being especially true in regard to the anterior and posterior association centers. Flechsig's work favors the conclusion that the gyrus rectus may have a definite relation to smell, and the gyrus frontalis superior to muscle, and as both of these gyri are well developed in the Negro, and the motor area and Broca's convolution also being large, the presumption is that the anterior association center is exceedingly small in the Negro. The findings in regard to the relative size of the anterior and posterior portions of the Negro brain correspond to those of Broca's on the Negro cranium. His conclusions are as follows:

1. That the face of the Negro occupies the greater portion of the total length of the head.
2. That his anterior cranium is less developed than his posterior, relatively to that of the white.
3. That his occipital foramen is situated more backwards in relation to the total projection of the head, but more forward in relation to the

cranium only. Topinard⁶⁸ corroborates these statements, and concludes that the Negro has the cerebral cranium less developed than the white, but its posterior portion is more developed than the anterior. It falls within the occipital races of Gratiolet^{23 24} and the Caucasian in his frontal races. Barnard Davis^{13 14} demonstrated practically the same in relation to the radii from the external auditory meatus to the three regions of the skull, frontal, parietal and occipital. The white and the black races are evidently opposites in cardinal points. The one is subjective, the other objective; the one frontal, the other occipital or parietal; the one a great reasoner, the other emotional; the one domineering, but having great self-control, the other meek and submissive, but violent and lacking self-control, especially when the passions are aroused, or any sudden danger appears; the one a greyhound, the other a bulldog.

Spitzka⁶³ emphasizes the differences of the two parts of the brain, anterior and posterior, in comparing the brains of Prof. Joseph Leidy, Maj. J. W. Powell and Prof. Cope, by contrasting the characteristics of these eminent men, and in so doing corroborates Flechsig's work and lends plausibility to the generalizations given above.

Wagner^{68 72 73} gives some interesting figures in relation to the relative size of the various lobes in man and the ourang-outang which may be appropriately presented here.

	Man.	Ourang.
Frontal lobes	43.6	36.8
Parietal and Occipital lobes.....	34.6	43.6

The Negro evidently stands in an intermediate position in this relation, which becomes more evident when the areas anterior and posterior to the fissure of Rolando are considered.

SULCUS CENTRALIS. FISSURE OF ROLANDO.

The racial difference found in the lobes of the brain and in the association centers is also observable in the position of the sulcus centralis and the relation of the amount of brain matter anterior and posterior to it. The position of the fissure is practically the same in the two races in relation to the brain axis and the brain center, but the amount of brain matter anterior to the fissure is less in the Negro, while the amount posterior to it is more than is to be found in the Caucasian. The inferior end, central part, and superior end of the fissure of Rolando are located on the brain outlines of sixty-three brains, in degrees from the anterior end of the brain axis, as in other measurements, with the radii extending from the brain center. The superior terminal point of the fissure is also lo-

cated by direct measurement from the brain center on the horizontal planes. Table IV shows the individual measurements taken in this manner. Table IV^a presents the averages.

TABLE IV^a.
AVERAGE POSITION OF THE FISSURE OF ROLANDO.

	No. of Brains.	Left Side.			Right Side.		
		Inferior.	Middle.	Superior.	Inferior.	Middle.	Superior.
Caucasian male	22	73°	88°	107°	77°	88°	106°
Negro male	27	76	88	108	77	87	108
Caucasian female	3	68	83	107	74	82	107
Negro female	11	80	90	111	81	86	112

A difference of 1° may be allowed for the personal equation in these measurements, and the female Caucasian measurements may be eliminated in the discussion, because only three brains of this kind were measured. The male Caucasian and the male Negro fissure of Rolando have practically identical relative positions, while the female Negro fissure is located nearer the posterior end of the brain than is that of the male in either race. This would seem to indicate that more of the brain lies anterior to the fissure of Rolando in the female Negro than in the males, but by actual measurements of the parts there is less (Table V^a). This apparent discrepancy is due to the fact that the frontal lobes of the female Negro are comparatively longer, but narrower transversely, and from above downward, than those of the males of the two races. The areas of individual brain outlines are found in Table V, and the averages for these are in the following table.

TABLE V^a.
AVERAGES OF AREAS OF THE BRAIN OUTLINES IN RELATION TO THE FISSURE OF ROLANDO. AREAS IN SQUARE CENTIMETERS.

	No. of Brains.	Left Side.		Right Side.	
		Anterior.	Posterior.	Anterior.	Posterior.
Caucasian male	22	146.2	140.5	148.3	139.9
Negro male	22	146.6	145.0	146.7	145.7
Caucasian female	3	118.1	116.6	119.1	115.7
Negro female	10	125.4	122.3	125.1	123.9

To compile these tables the three outlines, such as are taken for each hemisphere shown in Figures 1^a to 3^b, the sulcus centralis was located on each of the three outlines, radii were projected on the horizontal plane to the inferior end of the fissure, on the vertical, or mesial plane, to the

superior end of the fissure, and on the 45° plane to the middle part of the fissure, and lines were drawn from the brain center to the inferior surface of the occipital and frontal lobes, striking them tangentially. These lines are taken as limits of the outlines, because no lines are shown in the drawings. The radius to the sulcus centralis is taken as the dividing line between the anterior and posterior parts of each outline. The temporal lobe is not included in the drawings. The area of each hemisphere, in three planes, both anterior and posterior to the sulcus centralis is determined by means of the planimeter. The results are found in Table V. These results are averaged, the averages for the anterior part of each outline being added to one another, the same being done for the posterior part, and the sums placed together for comparison in Table V^a.

The anterior part of the Negro brain outline is the same size as the anterior part of the Caucasian brain on the left side; the anterior part of the Caucasian brain is larger than the anterior part of the Negro brain on the right side; while the posterior part of the Negro brain is larger than the posterior part of the Caucasian brain on each side. In the right hemisphere the racial distinction is considerable; in the left it is not so great. The similarity of the two races in the apparent size of the frontal lobes on the left side may be due to the greater size of the left motor area and of the left gyrus frontalis inferior in the male negro, as heretofore pointed out. The areas of the female Caucasian brain need not be considered, because only three are given. The areas of the female Negro brains are less than the areas of the males in either race and the racial distinctions are relatively the same as in the male Negro. The distinctions throughout may be expressed in ratios of the anterior to the posterior parts of the brain representing the posterior part by 100 in each case (Table V^b).

TABLE Vb.

RATIO OF THE ANTERIOR TO THE POSTERIOR PARTS OF THE BRAIN.

	Left Side.	Right Side.
Caucasian male	104 : 100	106 : 100
Negro male	101 : 100	100+ : 100
Caucasian female	101 : 100	103 : 100
Negro female	102 : 100	101 : 100

This table brings into clearer view the differences mentioned above. The frontal lobe of the male Caucasian is relatively larger than that of the Negro, and the right frontal lobe is both relatively and absolutely larger than the left. The right frontal lobe of the female Negro is rela-

tively smaller than the Caucasian, and the left is relatively and absolutely larger than the right. The female Caucasian is similar to the male Caucasian and the male Negro is similar to the female Negro, but in a less degree. It might have been supposed that the fissure of Rolando is further posterior in the Negro brain than in the Caucasian, and that the small size of the frontal lobe in the Negro is an apparent and not a real deficiency of brain matter, but the above measurements indicate that the frontal lobe and all the brain matter anterior to the fissure of Rolando is less in the Negro than in the Caucasian. As the gyrus rectus is apparently larger in the Negro than in the Caucasian, and the gyrus frontalis inferior is larger in the Negro than in the Caucasian, and as the frontal lobes in the Negro appear larger than they really are, owing to the projection downward of the convolution just mentioned, as well as to the projection upward of the superior orbital plates and the gyrus frontalis superior, if it be true that the motor area and the left gyrus frontalis inferior are larger in the Negro, then it must be true that the anterior association center is considerably smaller in his case than in the Caucasian, because even the apparent size of the whole frontal lobe is smaller in the Negro. That the anterior association center is smaller in the Negro seems plausible when the corpus callosum is examined, in which the racial distinction is more pronounced than in the brain outlines, the anterior end (genu) being distinctly smaller in the Negro.

CORPUS CALLOSUM.

The cross section area of the corpus callosum is measured with the planimeter from outlines made directly on glass, and from other outlines made on paper by projection. These areas are given in Table I, with the brain weights taken at the time the outlines were drawn. Measurements made from Retzius⁵⁵ photographs and drawings of brains by others are given in Table I', with brain weights, when possible, for comparison. Chart V is made up from these two tables, the brain weights (abscissæ) being given in grams, and the areas of the corpora callosa (ordinates) in square centimeters. There is in general an increase in area of the corpus callosum with each increment of brain weight. There are, however, many individual exceptions. For instance, one Caucasian brain weighing about 1100 grams has a corpus callosum of about 8 square centimeters area, while another brain weighing about 1400 grams has a corpus callosum of about 6 square centimeters area. These are extreme instances,

but there are other similar ones. Spitzka has measured the cross section area of the corpus callosum in the brains of ten eminent men, and he finds the average area higher than in ordinary men. Their average brain weight was also greater than in ordinary men. The weight of Prof. Joseph Leidy's brain was estimated to be 1545 grams or possibly more, and the corpus callosum measured 10.6 sq. cm. in sectional area. The symbol representing this brain may be found in Chart V and its unusual

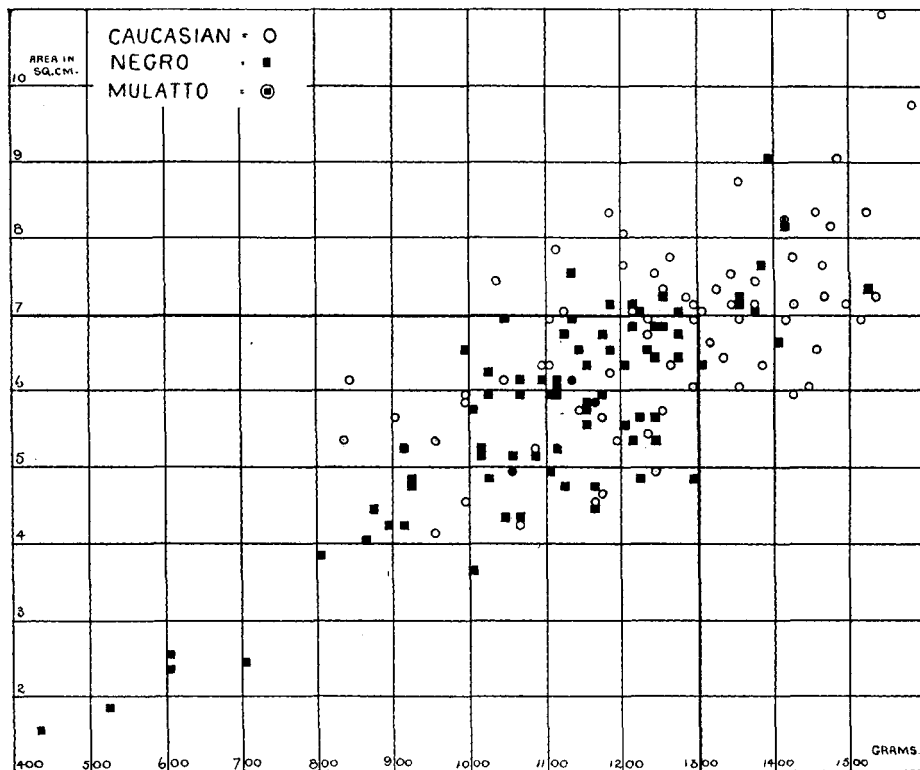


CHART V.—Relation of the area of the cross section of the corpus callosum (ordinates) to brain weight (abscissæ). The heavy black lines enclose the majority of the Negro symbols and exclude the majority of the Caucasian.

position attracts immediate attention. This may be an exception to the rule that the cross section area of the corpus callosum varies directly with brain weight and at a proportionate rate, and exceptional size of the corpus callosum may mean exceptional intellectual activity. One of the Negro brains, however, had a corpus callosum with a cross section area of 9.1 square centimeters, which is nearly 2 square centimeters

above the average Spitzka gives for the ten eminent men, and there is no reason to believe that this Negro had greater mental powers than any one of those eminent men, although he may have been an obscure genius. One Caucasian male brain in my series had a corpus callosum of 9.1 square centimeters cross section area, and eight other brains, six Caucasian male, one mulatto male, and one Negro male had areas between 8 and 9 square centimeters, and there is nothing to indicate that these brains were from exceptional men, although they may have been. The brain of a laboring man pictured by Retzius had a corpus callosum which measured 9.8 square centimeters in area. The brain weight was 1587 grams. The brains in my series with large callosa are invariably large. Of the ten brains mentioned above with large callosa each one weighed about 1500 grams (Table I). The racial distinction in the relation of brain weight to the area of the corpus callosum is not marked, but it is noticeable. To show this, lines are drawn on Chart V through the 7 square centimeter ordinate and through the 1300 gram abscissa, these lines being extended in a horizontal and in a vertical direction respectively, until they intersect. One-third of the brains represented below the horizontal line and to the left of the vertical line are Caucasian, and two-thirds are Negro. Two-thirds of the brains represented above the horizontal line and to the right of the vertical line are Caucasian and one-third are Negro. A majority of the Negro brains are thus represented within the lines and a majority of the Caucasian brains are represented without the lines. It is a noteworthy fact that about half of the Caucasian brains represented within the lines are from women, or from the inmates of Bay View Pauper Asylum, a great many of whom are known to have had dementia—alcoholic, syphilitic, or senile. With them the brains of such noted men as Gyldens⁵⁵ (No. 23), Siljeström⁵⁶ (No. 25), a statesman⁵⁵ (No. 26), and Prof. Leidy⁵⁶ (No. 27), are found.

These men each had a large brain, or a large callosum, or both. Thirteen Negro brains are found without the lines having a corpus callosum of more than 7 square centimeters area, and only eight have a brain weight of more than 1300 grams. These invariably give evidence of Caucasian characteristics. To be found outside of the lines are a mulatto; a Negro who had been instrumental in at least three, and possibly five, murders; a Negro accomplice of the latter; a Negro laborer from North Carolina; a Negro killed in a railroad wreck; and another the victim of a third-rail accident. The racial difference is really more marked than is apparent in the chart (V) because the class of Negroes from which bodies are obtained is comparatively better than the class from which Caucasian bodies are obtained, this being especially marked in the females of the two races.

In dealing with the corpus callosum as a whole, it is found to be smaller in the Negro than in the Caucasian, just as the brain of the Negro is smaller than that of the Caucasian, and in about the same degree. The averages of brain weights and areas of the corpora callosa reveal interesting racial and sexual differences. They are given in Table I^a, with ratios made up from Table I.

TABLE I^a.

THE RELATION OF THE AREA OF THE CORPUS CALLOSUM TO BRAIN WEIGHT.
AVERAGES AND RATIOS.

	No. of Brain.	Area of the Corpus Callosum. sq. cm.	Brain Weight. gm.	Ratio.
Caucasian male	54	7.02	1302	54
Negro male	50	6.27	1208	52
Caucasian female	14	6.40	1087	59
Negro female	26	5.68	1064	53

The average brain weight is greatest in the Caucasian male, least in the Negro female, and intermediate in the Negro male and the Caucasian female. The average cross section area of the corpus callosum is relatively the same, with the Negro male and the Caucasian female transposed in relation to each other. The ratio of area to weight is greatest in the Caucasian female, least in the Negro male, with the Negro female and the Caucasian male respectively a little higher than the Negro male; but the ratio of the Caucasian female is hardly a fair one, because so few brains of this kind are examined, and they are from such varied sources, and with so many methods of preservation. The relation of the anterior and posterior lineal halves of the corpus callosum exhibits a greater racial difference. This is perceived by a glance at Chart VI, compiled from Table VI in a manner similar to that of the charts previously presented. The corpus callosum is divided into halves of equal length by a line perpendicular to the brain axis, at a point intermediate between two lines perpendicular to the brain axis, dropped from each end of the corpus callosum. It is hardly necessary to do more than point out the racial difference indicated in the chart, because it is so plain, even to a casual observer. There is not an absolute separation of the races, but there is a decided difference. In general, as the area of one end of the corpus callosum increases, the other increases also, but the increase in area of the anterior end is greater in the Caucasian than in the Negro, while the increase in the area of the posterior end is greater in the Negro than in the

Caucasian. The relative difference is noticed throughout. The anterior end is relatively larger in the Caucasian, the posterior end is relatively

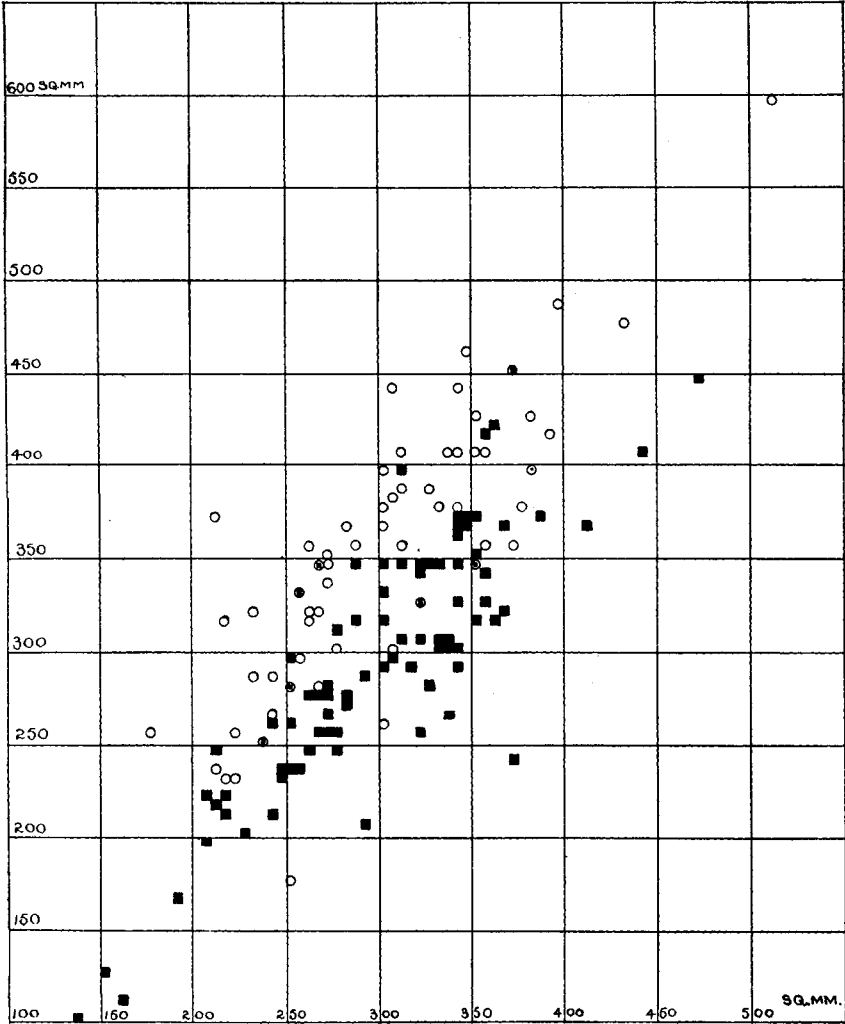


CHART VI.—Relation of the anterior lineal half of the corpus callosum (ordinates) to the posterior lineal half (abscissæ). The races are separated.

larger in the Negro. This may be expressed in averages in a table made up from Table VI.

TABLE VIa.

RELATION OF THE AVERAGES OF THE AREAS OF THE ANTERIOR TO THE POSTERIOR LINEAL HALF OF THE CORPUS CALLOSUM.

	No. of Brains.	Anterior. sq. cm.	Posterior. sq. cm.	Ratio.
Caucasian male	42	3.70	3.04	122 : 100
Negro male	62	3.06	3.02	101 : 100
Caucasian female	9	3.17	2.87	110 : 100
Negro female	25	2.86	2.86	100 : 100

Each end of the corpus callosum is larger in the Caucasian male than in the Negro male or in the others. Likewise the Caucasian female is larger than the Negro female, the anterior end is larger than the Negro male, the posterior end being smaller than the Negro male and about the same size as the Negro female. The anterior end of the corpus callosum is small in the Negro male, and smaller in the Negro female. It is large in the Caucasian female and larger in the Caucasian male. The posterior end is about the same size in each sex, but smaller in the female than in the male, so that the anterior end shows a racial and sexual difference, while the posterior end shows a sexual difference only. This can be located more definitely than in the two lineal halves of the corpus callosum. Comparing the genu and the splenium, leaving aside the intermediate portion of the corpus callosum, a distinct racial difference is found similar to that just discussed. Chart VII taken from Table VII gives a graphic picture of the essential differences, which are about the same as those found in Chart VI. To prepare this chart, the corpus callosum is divided into four parts, six-tenths (.6) anteriorly being separated from four-tenths (.4) posteriorly, and each of these two parts being divided in half. This is done by using lines perpendicular to the brain axis, and parallel to lines used in preparing for measurements for Table VI. This gives the splenium two-tenths of the total lineal length of the corpus callosum anterior to the splenium a narrow part, which I call the isthmus, two-tenths of the total length; anterior to this the body, three-tenths of the total length. These divisions are shown in Figures 9^a and 9^b. Several brains are broken through the fissure of Rolando and the break invariably passes through the isthmus. The conclusion is that the body of the corpus callosum contains the fibers connecting the motor areas of the two hemispheres, and the isthmus and splenium contain the fibers connecting the sensory areas of the two hemispheres, and all areas posterior to these. Eliminating the isthmus and body must leave the fibers that more definitely connect the association centers and

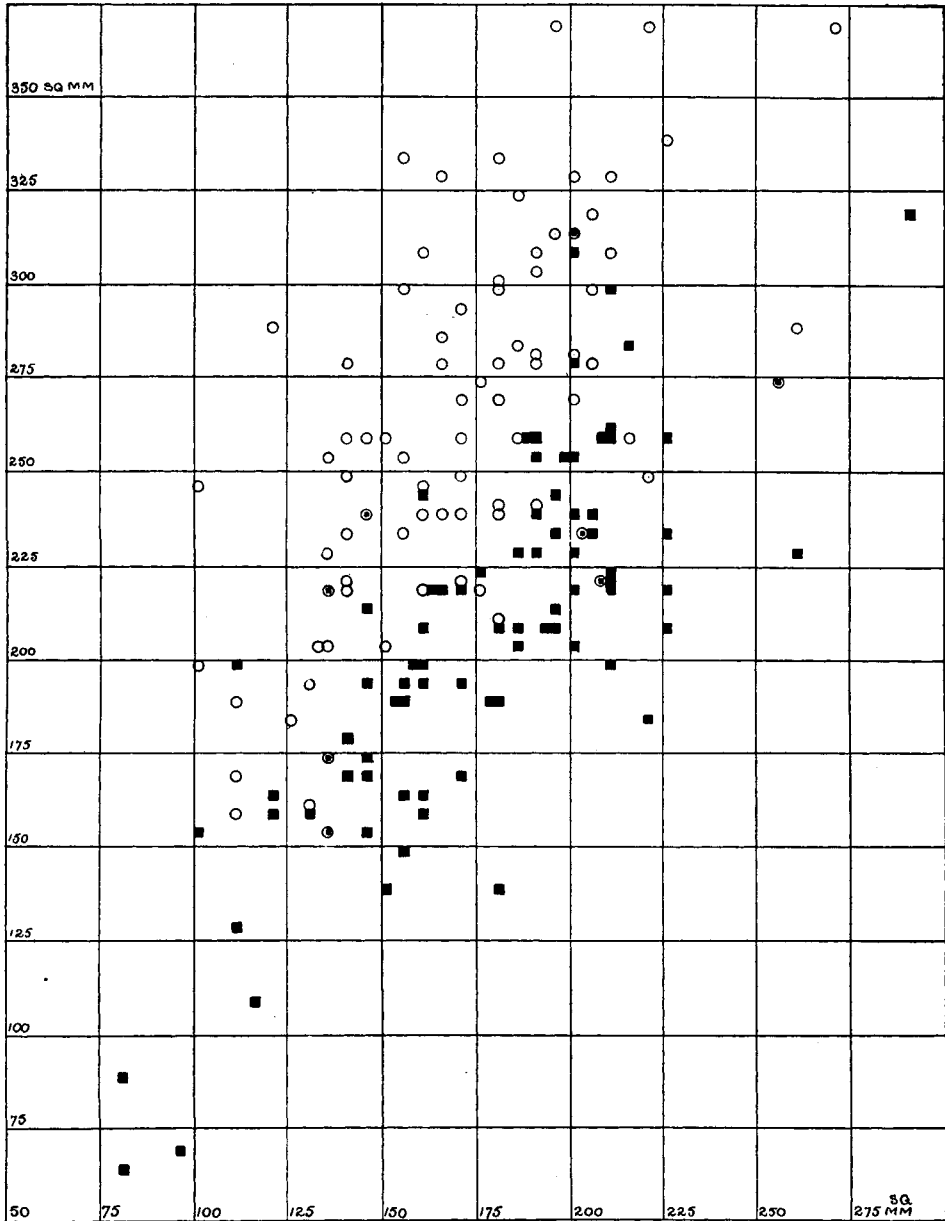


CHART VII.—Relation of the area of the genu (ordinates) to the area of the Splenium (abscissæ). The races are further separated.

to special sense centers in the two hemispheres. Flechsig¹⁸ indicates that part of the centers for smell may lie in the gyri recti, which are larger in the Negro than in the Caucasian. The latter is evidently true from what we know about the sense of smell in the Negro, and the size of the olfactory apparatus in this race. If the fibers connecting the frontal lobes anterior to the motor area are contained in the genu, and a greater number of the fibers in the genu connect the olfactory lobes in the Negro than in the Caucasian, then the genu of the Negro should be larger. But it is really smaller. Consequently the fibers connecting the anterior association centers must be less in the Negro than is indicated by the size of the genu. Comparing the areas of the genu and splenium must give an approximate comparison of the anterior and posterior association centers. They are compared in the two races in Chart VII, made up from Table VII. A more definite racial difference is seen in this chart than in Charts I and II where the association centers are contrasted from brain outlines. A glance at Chart VII convinces that the genu is relatively and absolutely larger in the Caucasian than in the Negro. This may also be expressed in a table of averages taken from Table VII.

TABLE VIIa.

THE RELATION OF THE AVERAGES OF THE AREAS OF THE GENU AND SPLENIUM, ETC., IN SQ. CM.

	Number of Brains.	Genu.	Body.	Isthmus.	Splen- ium.	Ratio Genu to Splenium.	Ratio Body to Isthmus.
Caucasian male	57	2.72	1.49	.94	1.72	158 : 100	160 : 100
Negro male	60	2.12	1.33	.81	1.76	120 : 100	164 : 100
Caucasian female	17	2.41	1.36	.88	1.61	150 : 100	155 : 100
Negro female	25	1.98	1.27	.79	1.73	115 : 100	160 : 100

The genu is absolutely and relatively largest in the Caucasian male, absolutely and relatively smaller in the Caucasian female, absolutely and relatively smaller still in the Negro male, and absolutely and relatively smallest in the Negro female. The relations of the splenium are the converse of this. The relation of the isthmus to the body is similar, but with less marked racial difference. Compare the relation of the ratios of the genu to the splenium in the males of the two races ($158 : 120 = 131$), with the relation of the ratios of the body to the isthmus ($160 : 164 = 97$), and a greater racial difference is evident in the former (131) than in the latter (97). This difference is also evident in the females of the two races ($150 : 115 = 130$. $155 : 160 = 97$). The relation of the ratios of the two-lineal halves of the corpus callosum (Table VI^a) is $122 : 102 = 119$ in the males of the two races, and $110 : 100 = 110$ in

the females of the two races. Compare these results with the results obtained above and there appears a greater racial difference in the relation of the genu to the splenium than in the relation of the body to the isthmus, or in the relation of the anterior to the posterior lineal halves of the corpus callosum. This may be expressed in a table.

TABLE VIIb.

THE RELATION OF THE RATIOS OF THE PARTS OF THE CORPUS CALLOSUM.

Negro and Caucasian.	Genu to Splenium.			Body to Isthmus.			Lineal Halves.		
	Caucasian Ratio.	Negro Ratio.	Relation of Ratio.	Caucasian Ratio.	Negro Ratio.	Relation of Ratio.	Caucasian Ratio.	Negro Ratio.	Relation of Ratio.
Males	158	120	131	160	164	97	122	102	119
Females	150	115	130	155	160	97	110	100	110

The racial difference is greater in the "relation of the ratios" of the genu and the splenium (130) than it is in the "relation of the ratios" of the body and the isthmus (97), or of the lineal halves (119, 110). The sexual difference is slight in the relation of the ratios of the genu to the splenium (131 : 130 = 101); it is more marked in the "relation of the ratios" of the anterior lineal half to the posterior lineal half (119 : 110 = 108); and it is least marked in the "relation of the ratios" of the body to the isthmus (97 : 97 = 100). In other words the above table may be interpreted as follows: The genu of the Caucasian female is larger in proportion to the size of the splenium than it is in the Negro female, and this difference is greater than the racial difference in the females in the proportion of the body to the isthmus, or the anterior lineal half to the posterior lineal half of the corpus callosum, the same difference being noticed in the relative sizes of these, but in a lesser degree. The same racial differences are found in the males, but they are not so marked. The splenium and genu, then, exhibit the most noticeable racial differences. The most striking sexual differences are found in the anterior and posterior lineal halves, the anterior in proportion to the posterior being larger in the males than in the females. The ratio of the body to the isthmus is greatest in the Negro male, least in the Caucasian female and intermediate in the Caucasian male and Negro female. This may be explained by the relative muscular power of the four classes, the commissural fibers of the motor areas forming the body of the corpus callosum. The greatest racial differences being found outside of the motor areas and their commissural fibers gives strong presumptive evidence that the great racial difference lies in the relation of the anterior to the posterior association center.

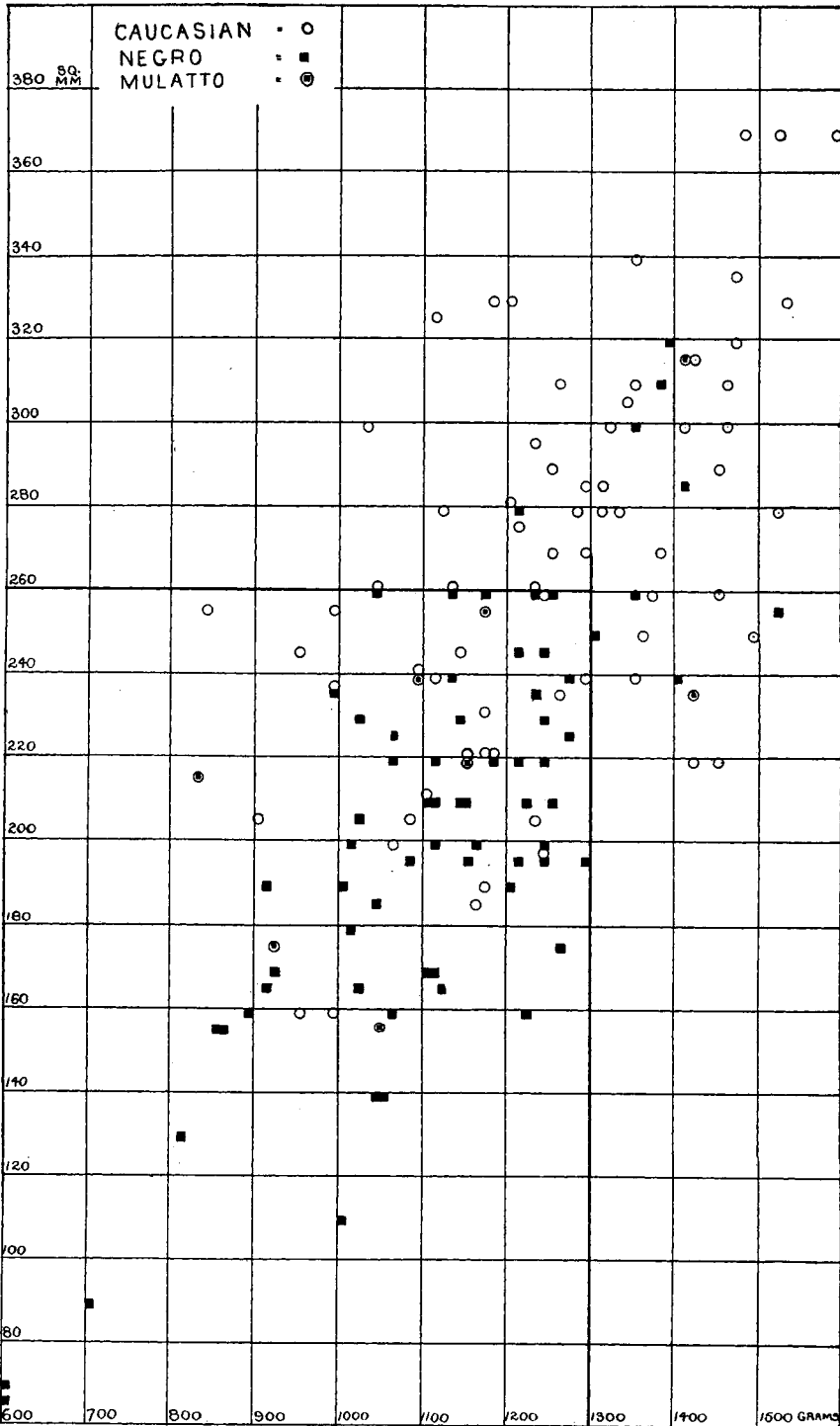


CHART VIII.—Relation of the area of the genu (ordinates) to brain weight (abscisse). The heavy black lines include the majority of the Negro symbols, and exclude the majority of the Caucasian. Cf. Chart V. With equal increments of brain weight there is a proportionate increase in area of the genu.

The genu is not only larger in the Caucasian than in the Negro, but the size of the genu bears a more or less definite relation to brain weight in both races, an increase in brain weight being accompanied by a corresponding increase in the size of the genu. The splenium does not bear so definite a relation to brain weight, although there may be a slight increase in the size of the splenium with increase in brain weight. These statements may be verified by examining Charts VIII and IX, compiled

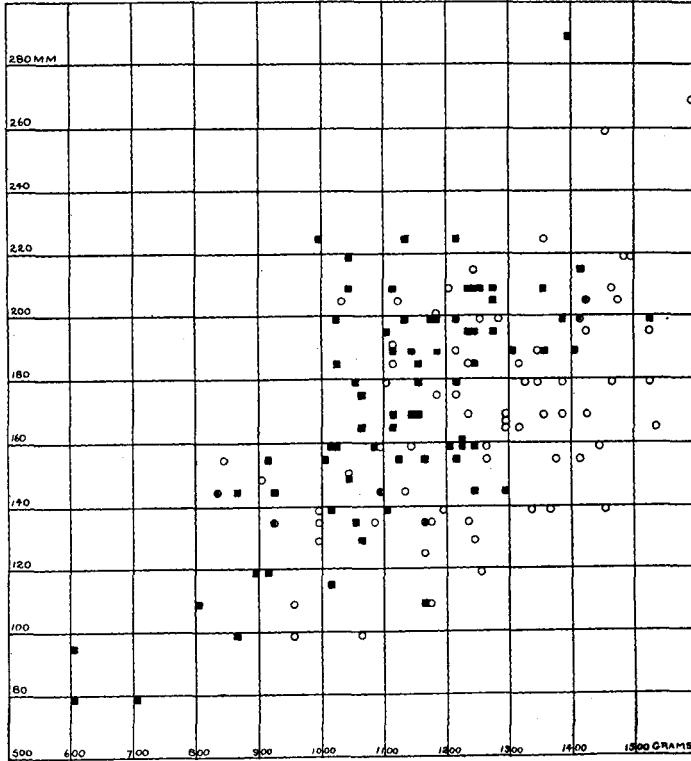


CHART IX.—Relation of the area of the splenium (ordinates) to brain weight (abscissæ). With equal increments of brain weight there is not a proportionate increase in the area of the splenium.

from Tables I, I' and VII. A more or less definite racial difference is noted in the charts, but it is not marked. In Chart VIII draw a line horizontally through the 2.60 square centimeter ordinate, and draw another line vertically through the 1300-gram abscissa until these two lines intersect, and continue them to the limits of the charts. Very few symbols representing Negro brains are found above and to the right of these

Fig. 12.

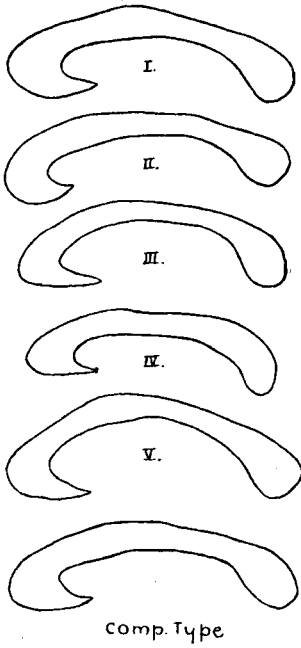


Fig. 13.

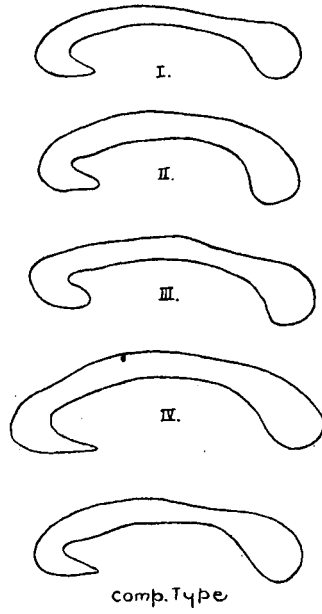


Fig. 14

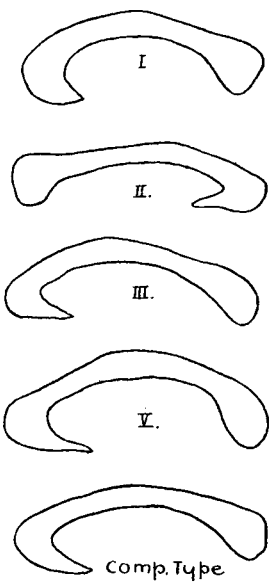


Fig. 15

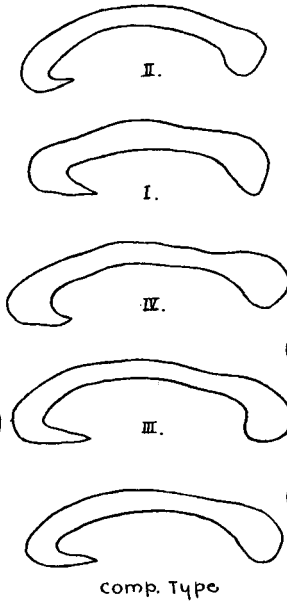


Fig. 16

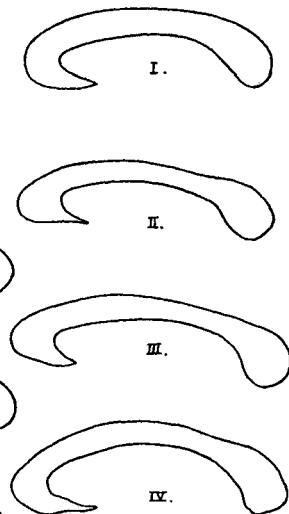


FIG. 12. Types of the corpus callosum in the Caucasian male. Type I, 8 subjects; Type II, 7 subjects; Type III, 7 subjects; Type IV, 6 subjects; Type V, 4 subjects; composite Type made up of the others, 32 in all. One-half natural size.

FIG. 13. Types of the corpus callosum in the Negro male. Type I, 18 subjects; Type II, 8 subjects; Type III, 10 subjects; Type IV, 9 subjects; Composite Type made up of the others, 45 in all. One-half natural size.

FIG. 14. Types of the corpus callosum in the Caucasian female. Type I, 1 subject; Type II, 2 subjects; Type III, 1 subject; Type V, 1 subject; Composite Type made up of the others, 5 in all. One-half natural size.

FIG. 15. Types of the corpus callosum in the Negro female. Type I, 5 subjects; Type II, 3 subjects; Type III, 6 subjects; Type IV, 5 subjects; Composite Type made up of the others, 19 in all. One-half natural size.

FIG. 16. Composite types of both races and sexes. Type I, 22 subjects, 13 Negro and 9 Caucasian. Type II, 29 subjects, 21 Negro and 8 Caucasian. Type III, 22 subjects, 15 Negro and 7 Caucasian. Type IV, 28 subjects, 15 Negro and 13 Caucasian. One-half natural size.

lines, which signifies that very few Negro brains are found with a brain weight of more than 1300 grams, or an area of the genu of more than 2.60 square centimeters. A majority of the symbols representing Caucasian brains are found above and to the right of the lines, signifying that the majority of the Caucasian brains have a brain weight of more than 1300 grams, and an area of the genu exceeding 2.60 square centimeters. The converse of these propositions is true. Few Caucasian brains have a brain weight of less than 1300 grams or an area of the genu less than 2.60 square centimeters, while the majority of the Negro brains are in this class. Compare Chart V with Chart VIII and a similarity is noticed, in fact they are nearly identical, but there is a more decided identity between the area of the genu and brain weight, than between the area of the entire corpus callosum and brain weight. This is due to the less decided identity between the area of the splenium and brain weight. That the size of the genu and brain weight are closely related may be significant in the relation of brain weights in races and in distinguished individuals.

COMPOSITE TYPES.

The corpus callosum may be classified in types racially and sexually according to the size and shape of the outline of its cross section. One hundred and one selected cases are taken and composite outlines are made of each racial and sexual type, as, Caucasian male, 5 types; Negro male, 4 types; Caucasian female, 4 types; and Negro female, 4 types. Composites are made by selecting outlines similar in size and shape, and

placing them over each other so that they coincide throughout as much as possible. The heaviest resulting outline is taken as the composite. Then the types are combined for each race in the same way, and finally the race types are combined. The types are represented in Figures 12 to 16. The type of brain varies with the type of corpus callosum, and the type of individual varies likewise.

Caucasian male type.—There are five types of the corpus callosum in the Caucasian male, but these may be brought together into two groups. Types I, II and IV belong to the primary group, and Types III and V to the secondary group. The primary group represents the young and vigorous, the secondary represents the old and infirm.

The corpus callosum representing Type I is a composite of eight cases. It is large in cross section, and every part is full and well developed. The splenium is of moderate size, the isthmus is not small, the body and genu are large and heavy. The type of brain to which this belongs is large, heavy (1400-1500 grams), and well rounded in all its outlines, approaching the dolichocephalic in shape. The frontal and temporal regions are large, the parietal and occipital regions are relatively not so large. The bodies from which these brains are taken are of men in the prime of life, from 40 to 50 years of age, and in apparently good physical condition, death coming rapidly or suddenly (pneumonia, heart disease, nephritis, galloping consumption, or accident), without great emaciation. The average height is 184 cm. (6 feet, $\frac{1}{2}$ inch), and the average weight is 73 kilo. (161 pounds). There is evidence of average intelligence and individuality among these men. One was manager of a livery stable, another was an eccentric man who became alienated from his family on Long Island and wandered off with considerable money, drifted to Baltimore and died in the Bay View Pauper Asylum, while a third was the victim of a third-rail accident, and apparently a man of affairs. Two are noted as "blonde." The others are not described as to color.

Type II is a composite of seven cases. The cross section of the corpus callosum is longer and narrower than in Type I. The splenium is large, the isthmus is small, the body is of medium size, and the genu is large. The brains representing this type are of medium size (1300-1500 grams), high and narrow (dolichocephalic), and the outlines are squared—not so rounded as in Type I. The frontal and parietal regions are large, the temporal is of fair size, and the occipital hangs low and is long. The bodies from which these brains were removed were in a well nourished condition, death having resulted rapidly (pneumonia, nephritis, etc.) The men were in the prime of life—approaching old age, 40 to 60 years old, with an average height of 172 cm. (5 feet 8 inches) and an average

weight of 75 kilo (165 pounds). Two are noted as "brunette." One is a dark Scandinavian. No records are made of the intellectual condition, or anything that would give a clue to it.

Type III is a composite of seven cases. The cross section of the corpus callosum is long, narrow, and highly arched. The splenium is large, the isthmus and body small, and the genu large with a long beak. The brains of this type are small (1200 to 1350 grams), high, long (dolichocephalic), and oval in shape from the side and from above. The ventricles are large and full of fluid. The bodies from which the brains are obtained are emaciated, the majority weighing little more than 45 kilo. (100 pounds), death being the result of lingering disease (senility, asthenia, etc.). The men were old (60 to 80 years), with an average height of 168 cm. (5 feet 6 inches). There was evidence of dementia in two or three.

Type IV is a composite of six cases. The cross section of the corpus callosum is short, of medium size, and not large anteriorly. The splenium is large, the isthmus is large, the body and genu are relatively small. The brains of this type are of medium size (1200 to 1500 grams), high, short, narrow, and boxlike in appearance, with full frontal and temporo-parietal regions. The men were of average height, 165 cm. (5 feet 5 inches), of ages ranging from 15 to 75 years, and in weight varying from 50 to 80 kilo. (111 to 178 pounds). Two were Germans from Berlin.

Type V is a composite of four cases. The cross section of the corpus callosum is long, and the arch is high and more curved than in any other type. The splenium is large, the isthmus thin, the body of medium size and the genu not large, but having a long pointed beak. The brains vary in weight from 1040 to 1520 grams. They are high, long and rounded in all outlines. The ventricles are large and distended as if by pressure from within. The bodies were in a fair state of nourishment. The men were old (60 to 75 years), and ranged in height from 157 to 186 cm. (5 feet 2 inches to 6 feet 1 inch).

Caucasian female types.—In general the female types are similar to the male types of the same number. So few cases are given that generalization is inadmissible.

Composite Caucasian types.—The composite types are composites of all the Caucasian male types and of all the Caucasian female types. The most noticeable features of the corpus callosum of the Caucasian in comparison with that of the Negro are the high arch, and the greater size of the anterior half of the corpus callosum in the Caucasian. The splenium is of good size in the Caucasian, but not so large as in the Negro, while the isthmus, body, and genu are larger than the same parts in the Negro.

The sexual differences are slight. The cross section area is larger in the male than in the female Caucasian, but the splenium of the female is relatively larger than that of the male, the isthmus likewise, while the body is relatively smaller in the female, and the genu is relatively about the same size. (cf. Table VIII^a et seq.)

Negro male types.—There are four types of the cross section outlines of the corpus callosum in the Negro male.

Type I is a composite of eighteen cases. This type is representative and characteristic of the Negro race. The cross section of the corpus callosum is small. The splenium is large and club shaped, the remainder of the corpus callosum is small, narrow, long, and slender. The brain weight is from 1000 to 1200 grams. The brains are short, with narrow frontal lobes, and wide, bulging parietal region. The mesial outline is oval. The bodies from which the brains are removed are well nourished and muscular. The average height is 162 cm. (5 feet 4 inches), and the average weight is 67 kilo (148 pounds). The age limit is 20 to 40 years. This represents a familiar type of Negro, the low, heavy set, muscular, dark-skinned young Negro, with small head, having the parietal bosses prominent and the frontal region low, narrow and receding. This is the lowest order and most prevalent type of Negro. There is evidence of little foreign blood. This type represents the Guinea Coast Negro, from which the subjects are probably derived. A few may be representative of the Hottentot Negro type.

Type II is a composite of eight cases. The cross section of the corpus callosum is larger than Type I and the anterior end is better developed. The splenium is also large. This may be considered as a sub-type of the one above, with evidence of more mixture with a foreign element. The brains are larger, weighing from 1100 to 1300 grams. The characteristics of the type are otherwise similar to those of Type I.

Type III is a composite of ten cases. The cross section of the corpus callosum is long and large. The splenium is large and club-shaped; the genu is large and round; the isthmus and body are long and narrow. The brains are long (dolichocephalic), high, and narrow in front, wide and bulging in the parietal region. The weight is from 1200 to 1400 grams. The bodies are in a fairly well nourished condition, death being rapid or sudden (accident, pneumonia, heart disease, etc.) The height averages 162 cm. (5 feet 4 inches), and the weight averages 63 kilo. (140 pounds). The men of this type are lighter skinned than those of Type I, and are built on broad lines in general. These are long armed, flat-footed, and loose-jointed individuals, not so compactly built or well knit as those of the previous types, and having long heads and faces, with high foreheads.

Unmistakable evidences of a previous mixture of other races with the Negro exist. Three are mulattoes. Three are accident cases. The majority are between the ages of 50 and 80 years. This type represents the higher and better class of the Guinea Coast Negro.

Type IV is a composite of nine cases. The cross section of the corpus callosum is long, large, and highly arched, resembling Type V in the male Caucasian. The splenium is large and regular in outline, tapering off gradually in the isthmus and body, which are long, curved, and smaller than the splenium. The genu is of medium size and has a long pointed beak. The brains are large, heavy (1300 to 1500 grams), long (dolichocephalic), and high in the frontal region. The frontal lobes are comparatively large and the parietal region is massive and bulging. The bodies are in a well nourished condition. The average weight is 72 kilo. (158 pounds), the average height is 175 cm. (5 feet 9 inches), and the age varies from about 40 to 70 years. This represents the tall, fair-skinned Negro (or mulatto), of the enterprising nature, but the most dangerous of all characters to human society. Rape and murder attach themselves here. Two of them were murderers, four Mulattoes, and the others exhibit traits of considerable Caucasian intermixture. This type represents the Kaffir Negro, probably a mixture of Semitic (Arab), Hamitic, and Negro at a remote period of time, the Zulus being the characteristic tribe of the Kaffir Negro.

Negro female types.—There are four female Negro types, which correspond in general to the four male Negro types. These may be combined into two groups for the two sexes alike. The primary group, composed of Types I and II, is the prevalent Negro type, being purer Negro than the secondary group, composed of Types III and IV, which is largely mixed with Caucasian.

Type I is a composite of five cases. The cross section of the corpus callosum is short, wide, and compact. The splenium, isthmus, body and genu are relatively of good size. The brain is small, short, and boxlike in appearance. The brain weight is from 1000 to 1100 grams. The frontal lobes are small, narrow from side to side and from above downward. The parietal region is large, full, and bulging. The subjects are about 160 cm. (5 feet 3 inches) average height, 50 to 54 kilo (110 to 120 pounds) average weight, and the age is from 20 to 30 years. They represent a class of young, stocky built, dark-skinned Negro women of the Guinea Coast Negro type. There is a trace of racial intermixture in some of them.

Type II is a composite of three cases. The cross section of the corpus callosum is long, arched, and narrow. The splenium and genu are of

good size, the isthmus is not well marked, and the body is slender. The brain is slightly longer than in Type I, but is smaller, the smallest of all brains being in this type. The average weight is 995 grams. The subjects are taller (168 cm.—5 feet 6 inches), and weigh less (45 kilo.—100 pounds or less) than those in Type I. These are probably of the Hottentot or Bosjeswoman type.

Type IV is a composite of five cases. The cross section of the corpus callosum is long, straight and slender. The splenium is large and club-shaped, the isthmus is narrow, the body is long and narrow, and the genu is of good size. The brains are long and narrow (dolichocephalic). The frontal lobes are narrow, low, and long, the parietal lobes are large and prominent. The brain weight ranges from 1000 to 1200 grams. The subjects are in a fairly well nourished condition, weighing from 54 to 59 kilo. (120 to 130 pounds), and having a height of 165 cm. (5 feet 5 inches) average. These are the old women from 60 to 70 years of age, of medium height and weight and light-brown skin. There is evidence of a little white blood. This type is probably of Kaffir origin.

Type III is a composite of six cases. The cross section of the corpus callosum is long, extremely thin and curved. The splenium is large and knob-shaped, the isthmus is narrow, the body long, narrow, and curved, and the genu small, with a long pointed beak. The brains are exceedingly long and narrow, and somewhat high in front. The frontal lobes are long, narrow, and thin, but high, the parietal lobes are full and bulging. The brain weight is from 1000 to 1100 grams. The subjects are low, fat and heavy. The average height is about 155 cm. (5 feet 1 inch), the average weight is 68 kilo. (150 pounds), and the age is from 30 to 50 years. This is the Negro "mammy," who is so well known. We have here a fat, fair-skinned Negro woman, not tall, but of a voluptuous type. There is evidence of white intermixture. This type probably represents the better class of the Guinea Coast Negro. The female types conform to the type of the race more nearly than do the males. The latter show more markedly the traces of racial intermixture.

The composite types for the Negro are made in the same manner as those for the Caucasian. The composite male and female are almost identical in shape, except that the splenium of the male is relatively larger than that of the female, just the opposite of what was found in the Caucasian. The cross section area in the male is altogether larger than in the female. Racial differences are more marked. The cross section area of the corpus callosum is less in the Negro than in the Caucasian.

The area of the posterior lineal half is relatively larger in the Negro, while the area of the anterior lineal half is relatively smaller. The

splenium is absolutely and relatively larger in the Negro than in the Caucasian, while the genu is relatively and absolutely smaller. The isthmus and body are relatively about the same size in the males of the two races, but in the females the isthmus is relatively smaller in the Negro, while the body is relatively larger. The hooked beak of the genu is larger in any case in the Caucasian, especially in the female.

Composite types of both races and sexes.—There are four of these types made up as follows: Type I is a composite of Type II Negro male, and Type I of the others, twenty-two individual cases in all, thirteen Negro and nine Caucasian. The Caucasian traits predominate. This type represents the young, active, vigorous individuals. Type II is a composite of Types I Negro male, II Negro female and Caucasian female, and Type IV Caucasian male, twenty-nine individual cases in all, twenty-one Negro and eight Caucasian. The Negro traits predominate. This type represents the old and the passionate. Type III is a composite of Type II Caucasian male, and Type III Negro male and Type IV Negro female, twenty-one individual cases in all, fifteen Negro and seven Caucasian. The Negro and Caucasian traits are well mixed. This is a Mulatto type. Type IV is a composite of the remaining types, twenty-eight individual cases in all, fifteen Negro and thirteen Caucasian. This type represents the mentally dull, the demented, and the degraded.

Whenever the number of Caucasian exceeds one-third of the whole number of cases in any type the Caucasian traits predominate. This may indicate a certain amount of Caucasian mixtures among the Negroes.

The American Negro may be divided into two groups, each with subdivisions.⁶⁸ The first group comprising the greater number of blacks, being represented by the Negro types I, II and III, and the second group, including only a comparatively small number, being represented by the Negro Type IV. The first group includes the Guinea Coast Negro and may be the few Hottentots in America, and is divided into three classes. First the Hottentot, or Bosjesman, having gray or old yellow skin resembling dirty varnished oak; low, dwarfed stature, either weak, or squat and muscular; long, woolly hair, in small obliquely inserted tufts; very dark eyes, wide apart; extraordinarily broad, flat nose; large mouth, with thick, projecting, turned-out lips; enormous prognathism; heads extremely dolichocephalic; the smallest brains (900-1000 grams) of any human beings probably; and lastly, having the distinctive steatopyga and the tablier which are not always present. This class is comparatively rare. Secondly, the low class Guinea Coast Negro, the most ancient and most classical Negro type, having a cool, velvety skin, glossy, and varying from a reddish, yellowish, or bluish black to jet black; low stature, well knit and

muscular; black hair and eyes; platyrrhine nose; thick lips; prognathous face; beautifully white, sound teeth; small square ears (Hrdlicka⁷¹); long upper and short lower extremities; flat feet; heads dolichocephalic, or even approaching subbrachycephaly; and brains weighing from 1000 to 1200 grams,—possibly more. This is the most prevalent class of Negro in the South. Thirdly, the high class Guinea Negro, similar to the low class, but developed along broader lines, and instead of being ugly, diminutive, with large and squat limbs, and a round or short face, they are comparatively handsome, taller, with well-proportioned limbs and a long face. They exist in fairly large numbers in certain localities, but are much less prevalent than the low-class Guinea Negro. The second group is made up of Kaffirs and other Mulattoes, and Mulattoids, or Mulatto-like individuals. The Kaffirs are represented by the Zulus in Virginia and North Carolina, being particularly noted for their height and intelligence. They have various shades of dark brown skin; very high stature, slim and well made; thick, woolly hair, and dark brown eyes; broad, flat nose, sometimes highly arched, Romanesque, or Arablike; thick lips; long, oval face; slight prognathism and platyrrhiny; long, high heads, with narrow foreheads, and median frontal protuberances; and large brains, weighing from 1300 to 1500 grams. They do not exist in great numbers except in certain sections, as in Virginia and North Carolina where they are fairly prevalent. The Mulattoes are such a heterogeneous conglomeration as to beggar description. Three classes do stand out distinctly though. One is the large, yellow Mulatto with every feature magnified and like the Negro, tremendous frame, sometimes veritable giants, and a conspicuous bumptiousness and volubility. Another is the small, almost white Mulatto, with Caucasian features, neat, compact frame, and partaking of the qualities of the Caucasian mentally. A third is that peculiar mottled Mulatto or Mulattoid mentioned by Shaler.⁵³ There are all sorts of mixtures of all the classes mentioned above forming a not inconsiderable part of the Negro population. There may be a few other types of Negroes here and there, such as the Ethiopians, Papuans, Negritos, and perhaps Australians, and one occasionally sees a red Negro, probably a Foulah from the heart of Africa in the region of the Soudan, or a Dahomian from near there, but these are so rare as to be inconsiderable. A few mixed bloods with Indian characteristics are occasionally observed. This classification is slightly different from that given by Prof. Shaler,⁵³ but only in minor points. It does not differ materially from Tobinard's⁵⁵ classification of the Negro in the West and South of Africa, from which sections nearly all of the Negroes of America are supposed to have been brought.

FORAMEN OF MUNRO.

The position of the foramen of Munro bears an interesting relation to the two ends of the corpus callosum and to the brain center, sexually and racially. Measurements are made on the brain axis, all points not on the axis being projected to it by lines perpendicular to the axis. The average of all measurements is represented in Table VIII in millimeters. In this table "Genu" and "Splenium" mean the anterior and posterior ends, respectively, of the corpus callosum. The "Ratio" is the number preceding it divided by the length of the brain axis for that race and sex. The two hemispheres measure alike practically. A difference of one millimeter in the numbers in the table is to be ignored.

TABLE VIII.
RELATIVE POSITIONS OF THE GENU, SPLENIUM, FORAMEN OF MUNRO, AND BRAIN CENTER. AVERAGES AND RATIOS.

	Center to Splenium.	Ratio.	Center to For. Munro.	Ratio.	Center to Genu.	Ratio.	For. Munro to Splenium.	Ratio.	For Munro to Genu.	Ratio.	Brain axis.
Caucasian male	26	155	18	107	50	300	44	262	32	190	168
Negro male	28	170	16	95	48	285	44	262	32	190	168
Caucasian female	25	155	17	105	47	292	42	261	30	186	161
Negro female	29	186	14	90	43	270	43	276	29	186	156

The splenium is further from the brain center in the Negro than in the Caucasian, and it is further posterior in the female Negro than in the male. The foramen of Munro is nearer the brain center in the Negro than in the Caucasian and it is nearest in the female Negro. The genu is nearer the center in the Negro, and nearest in the female Negro. The splenium is further removed from the foramen of Munro in the female Negro than in any of the others. The genu is nearer the foramen of Munro in the females than in the males, there being no racial difference in either sex here. The corpus callosum and the foramen of Munro are both placed further posterior in the female Negro, indicating that more brain substance lies anterior to these structures in the female Negro than in the others. This corresponds to the findings in relation to the position of the fissure of Rolando. There is less brain substance anteriorly in the female Negro, the apparent discrepancy being due to the fact that the frontal lobes of the female Negro are long and slender. The male Negro has an intermediate position between the female Negro and the Caucasian in regard to the location of the corpus callosum and the foramen of Munro.

BRAIN AXIS.

The brain axis used in the measurements for this study is determined and located by three points, the inferior border of the splenium, the superior border of the anterior commissure and the foramen of Munro. A line is drawn on each outline of the mesial surface of each hemisphere

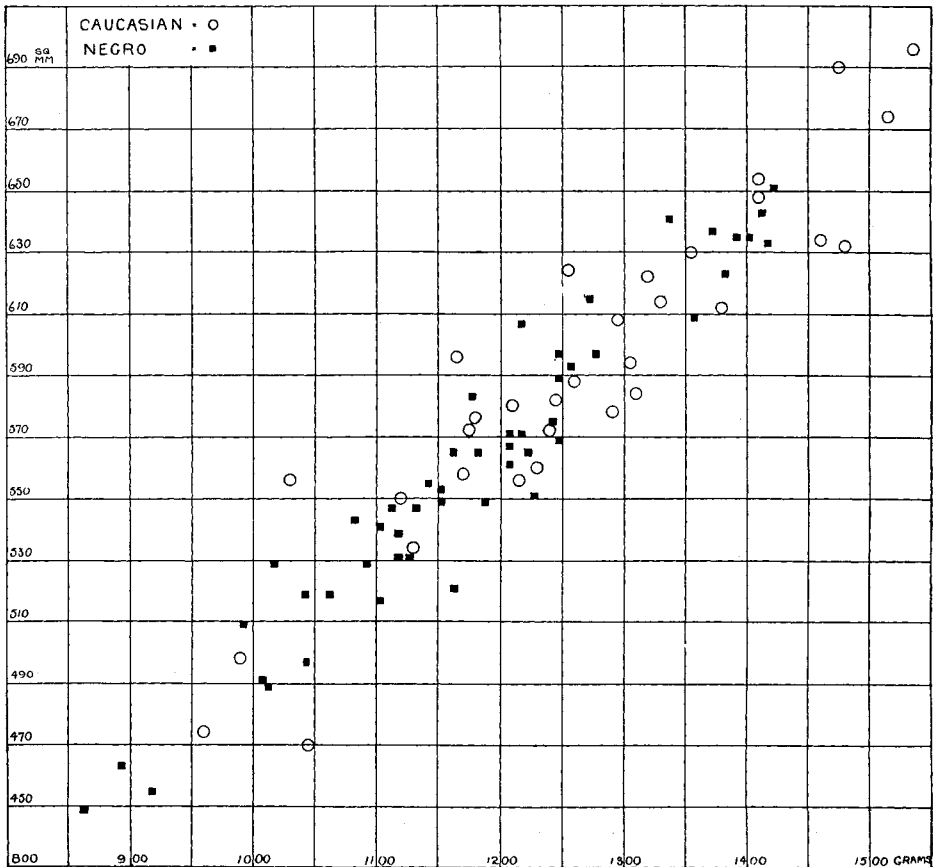


CHART X.—Relation of the area of the brain outlines (ordinates) to brain weight (abscissae). The Caucasian is more variable, the Negro more constant.

through these three points, to each extremity of the brain. This line is arbitrarily made to touch the lower border of the splenium and the upper border of the anterior commissure, and it passes through the foramen of Munro in 90% of the cases, and falls from 1 to 3 mm. below it in 10%.

The line passes through the longest diameter of the brain in 68% of the male Caucasian brains; 70% of the adult male Negro; none of the infant male Negro; 60% of the female Caucasian, and 33 $\frac{1}{3}$ % of the female Negro. The line passes near the longest diameter, below in front and above behind, in 32% of the male Caucasian brains, 30% of the adult male Negro, 40% of the female Caucasian, 66 $\frac{2}{3}$ % of the female Negro, and 100% of the infant male Negro. This gives a distinct gradation from the male Caucasian to the infant male Negro, the female Negro resembling most closely the infant type. In relation to the brain axis the infant has a larger amount of brain substance below the axis posteriorly, and a smaller amount below anteriorly, than is found in any of the others. When the brain axis does not exactly coincide with the longest diameter of the brain, lines are drawn from the ends of the brain perpendicular to the axis, and in all cases the length of the axis between these lines coincides in length, practically, with the longest diameter of the brain. Refer to Figures 1 to 4 and 8 to 12 for evidence of these facts. The average distance between the lower border of the genu and the lower border of the frontal lobe is 22 mm. in the male Caucasian, 21 mm. in the male Negro, and 20 mm. in the female Negro. This difference, in connection with the extreme thinness of this part of the frontal lobe in the Negro, especially the Negro woman, indicates the frontal lobes to be even smaller than is apparent in the outlines, and by measurements taken from them.

The brain axis is used because it is located definitely by three points that seem to be fairly constant in position, relatively; because it passes through the longest diameter of the brain in the majority of cases; because it is a convenient line for measuring all parts of the brain in any position, thus facilitating speed and accuracy in brain measurements, and affording a just basis for comparison of any brain in the relation of its parts to each other and to other brains. By means of the brain axis a brain center is established which is constant within a small circle, and by a composite is shown to retain its position, relatively, in the brains measured. It is located just above and anterior to the opening of the aqueduct of Sylvius into the third ventricle, a line drawn at an angle of 45° above the anterior end of the brain axis through the aqueduct of Sylvius passes through the brain center. It is just posterior to the gray commissure in the sulcus of Munro separating the alar from the basal lamina of the embryonic brain tube at a point that is perhaps as constant in position as any other during development. Shifting of the brain axis by rotation, antero-posteriorly or infero-superiorly, its usual variation when it changes, does not alter the position of the brain center. If its position

is slightly altered by shifting the axis up and down, the relations to different points remain the same. Shifting the position of the brain center forwards or backwards indicates altered relations of the anterior or posterior extremities of the brain outlines and is something to be desired as an indication of existing conditions. The brain center, then, is a comparatively constant point and is a good one to use as a basis for all measurements of the brain. By means of the brain axis and the brain center, racial and sexual differences are demonstrated in the size and shape of the corpus callosum; in the position of the fissure of Rolando; in the amount of brain substance anterior and posterior to this fissure; in the relations of the foramen of Munro to the whole brain, to the whole corpus callosum, to the genu and the splenium, and the relation of these parts to one another and to other parts of the brain; and by means of the brain axis and the brain center a system of notation is devised whereby any point anywhere about the brain may be located definitely and accurately. This may be done by representing the brain as a sphere, and using degrees of latitude and longitude, in this way bringing everything to the brain center as a basis. The degrees of longitude may be represented by semicircles connecting the extremities of the brain axis and extending over the surface of the brain in the direction of its long diameter. Degrees of latitude may be represented by lines joining the terminal points of radii drawn from the brain center to these semicircles. The anterior end of the brain axis represents the north pole, and the posterior end the south pole. The equator is represented by the outline of a vertical plane passing through the vertex of the brain and through the brain center at right angles to the brain axis, supposing the brain to be in its normal position with the body standing erect in all this description. The brain axis will be horizontal under such conditions. A horizontal plane passing through the axis and the right hemisphere will cut a semicircle around the side of this hemisphere and this semicircle represents 0° longitude, which will be called L. 0° . Revolve this plane to the left and upward through a distance of 360° to its original position, and as it traverses the circle its different positions in the course of its transit will vary from 0° to 360° , any one of which may be located on the brain surface. Thus the mesial surface of each hemisphere above the axis will be L. 90° , the mesial surface below the axis will be L. 270° , the horizontal plane of the left hemisphere opposite L. 0° and similar to it will be L. 180° , and intermediate planes likewise according to position. In like manner the planes of the outlines represented in Table II will be L. 45° for the right hemisphere and L. 135° for the left. The degrees of latitude as radii from the brain center begin at the north pole and pass towards the vertex of

the brain through the equator above the axis, through the south pole and through the equator below the axis to the original position, describing a circle of 360° , the north pole being R. 0° , the south pole R. 180° , and intermediate points likewise. These radii are to be represented on any plane of longitude, and they may be placed so close together as to form a plane which will coincide with the anterior halves of L. 0° and L. 180° when the radii are R. 0° , with the equator above the axis when the radii are R. 90° , with the posterior halves of L. 0° and L. 180° when the radii are 180° , and with the equator below the axis when the radii are 270° . L. 0° and L. 360° are identical. R. 0° and R. 360° are identical. By combining the degrees of latitude and of longitude definite points may be located. For example, the vertex of the brain being at the central point of the equator above the axis will be L. 90° R. 90° , and the bifurcation (or junction) of the Crura cerebri will be about L. 270° R. 270° . The point representing the right anterior association center as used in Table II would be L. 45° R. 45° , and a similar point in the left hemisphere would be L. 135° R. 45° . In this way any other point may be determined. The brain center being located, the distance of any point from the brain center may be determined. Degrees of latitude are used instead of parallels of latitude in order to bring everything to the brain center as a basis. To sum up these: There is a north pole, the anterior end of the brain axis (R. 0°); there is a south pole, the posterior end of the brain axis (R. 180°); there is an equator circumscribing a plane which passes through the vertex of the brain and through the brain center at right angles to the brain axis; there are planes of latitude cutting sections of the brain from the periphery to the center beginning at the north pole and completing a circle by passing upward and backward to the south pole, and downward and forward from this point to the original position, the planes being represented by R. 0° to R. 360° ; and there are planes of longitude cutting longitudinal sections of the brain, the planes passing from the horizontal plane of the right hemisphere upwards and to the left through a circle of 360° to the original position and being represented by L. 0° to L. 360° in their course.

ADDENDA.

Certain relevant subjects are not treated at length for various reasons, but are simply added as an appendix that anyone who is interested may examine, and take for what it is worth. Not much value is attached to these subjects, but there may be something of value and interest in them as discussed below.

BRAIN WEIGHT.

So many factors enter into brain weight that it is questionable whether discussion of the subject is profitable here. A few points will be touched on, however. The brain weight (Chart XI), actual or approximate, of seventy-nine Negro brains in the fresh state is given. The average for

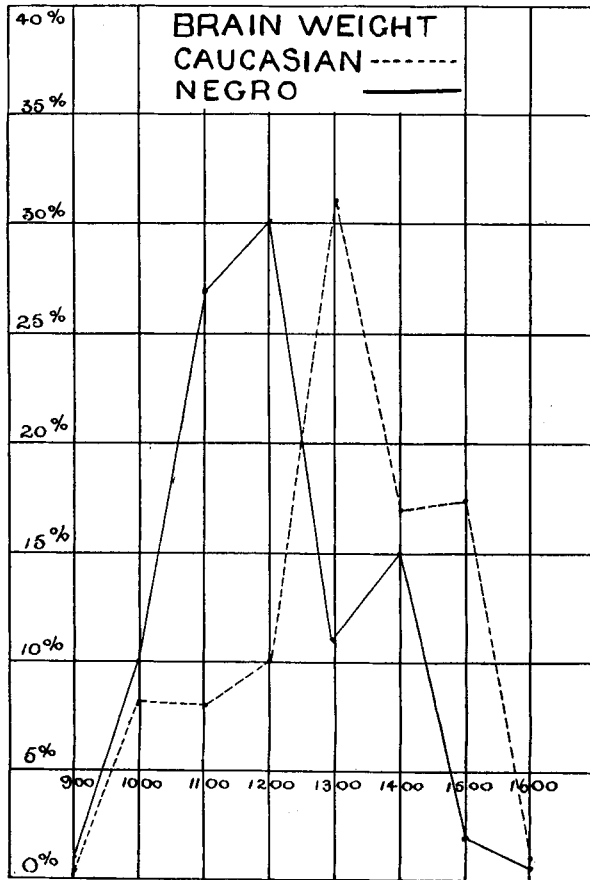


CHART XI.—Percentages of brain weight in the two races.

fifty-one males is 1292 grams; the largest, 1560 grams; the smallest, 1010 grams. The average for twenty-eight females is 1108 grams; the largest, 1320 grams; the smallest, 910 grams. The brain weight, actual or approximate, of forty-six Caucasian brains in the fresh state is given. The average for thirty-seven males is 1341 grams; the largest, 1555 grams; the smallest, 1040 grams. The average for nine females is 1103

grams; the largest, 1275 grams; the smallest, 915 grams. The lot of brains includes a larger number from high-class Negroes than from high-class Caucasians, and a larger number from low-class Caucasians than from low-class Negroes, this being especially true in regard to the Negro males and the Caucasian females. This statement is based on the following facts:

1. There is a larger number of deaths resulting from acute illnesses and from accidents among the Negroes, giving a larger number of brains from normal individuals.^{81 88}

2. That a larger number of Negro bodies are regularly disposed of to anatomists indicates less respect for the dead among Negroes, and it follows that more of the better class of Negroes would be received, since the whites greatly outnumber the blacks in Baltimore.

3. It is well known that only the lowest classes of whites are unclaimed, especially among the women, who are apt to be prostitutes, or depraved, or the like, while among Negroes it is known that even the better class neglect their dead unless provision has been made for their care after death.

4. It is a well attested fact that the Negroes are at present roaming over the country without fixed abode in greater numbers than the whites and this might result in many stray unclaimed bodies of the better class of Negroes being turned over to the anatomists, and finally,

5. Many Mulattoes and mixed bloods are included among the Negroes.

So then the brain weights do not really represent the exact racial difference between the Negro and the Caucasian, but do perhaps show that the low class Caucasian has a larger brain than a better class Negro. Many of the brains are from the senile, the demented, or those dying of wasting diseases, which would tend to make the average weight lower than among normal individuals. The total stature of the Caucasian exceeds that of the Negro, and the total body weight is slightly greater in the Caucasian, the stature and body weight being greater in the males than in the females. The majority of the Caucasian males and Negro females were between the ages of 30 and 50, the majority of the others under 35 or over 45. The percentage curve of brain weight for the two races shows the greater number of Negro brains to be about 1100 to 1200 grams, the greater number of the Caucasian brains being 1300 grams and over, with a drop in the number of Negro brains at 1300 grams and an increase at 1400 grams, indicating a mixture of Caucasian and Negro in the largest brains. There are on record the weights of less than 100 Negro brains,⁸⁹ perhaps, with the exception of 380 weighed by Hunt and Russell,⁸⁹ who include Mulattoes and mixed bloods, as I have done. The

average weight of twenty-two male Negro brains weighed by sundry men, at various times, in divers places with different systems of weights and under dissimilar conditions is 1256 grams; the largest, 1458 grams; the smallest, 1100 grams. The average weight of 10 female Negro brains under similar conditions is 980 grams; the largest, 1325 grams; the smallest, 738 grams. Waldeyer⁷⁴ gives the average weight of twelve Negro brains in the fresh state as 1148 grams; the largest, 1450 grams; the smallest 780 grams. Sandford B. Hunt^{28 29} gives the average weight of 140 male Negro brains as 1331 grams; the largest, 1585 grams; the smallest, 1010 grams; the average of 240 male mixed bloods, Negro and white, 1285 grams; the largest, 1736 grams; the smallest, 980 grams. Hunt concludes by grouping the brains according to the estimated amount of white blood, that the weight varies directly in proportion to the amount of white blood. The mulattoes and those more than one-half white have brains nearly as large as the pure white and larger than the Negro, while those less than one-half white have smaller brains, those with the least amount of white blood having smaller brains than the pure Negro. Practically the same conclusion is reached by a similar classification of the male Negro brains I weighed. The average for the mulattoes is 1347 grams; for those one-fourth white, 1340 grams; for the one-eighth white, 1335 grams; for the one-sixteenth white, 1191 grams; but for the pure Negro 1157 grams. The difficulty about any such classification is that no two individuals may agree as to what constitutes the exact markings of the different grades. Only those Negroes should be considered pure that show no evidence of any previous crossing with another race at a previous time, perhaps the low-class Guinea Coast Negro representing this type in the brains studied. Certainly the high-class Guinea Coast Negro and the Kaffir (Zulu) show unmistakable evidence of a previous mingling of races. (Topinard).⁶⁸

The conclusion is that the brain of the Negro is smaller than the brain of the white, the stature is also lower, and the body weight is less, and any crossing of the two races results in a brain weight relative to the proportion of white blood in the individual.

The skull capacity of the Negro has been repeatedly demonstrated to be less than that of the Caucasian.⁸¹

TEST TO DETERMINE RACE AND SEX OF BRAINS.

When this work was undertaken I had handled comparatively few brains, so I examined about twenty and measured them in various ways before attempting to differentiate the Negro from the Caucasian brain,

or the male from the female. After that a record was kept of the guess made on each brain, except those I could recognize from previous handling, before the race or sex was known, these being looked up afterwards, to determine the degree of accuracy possible in such a guess. The race was determined correctly 70 times, doubtfully 5 times, and incorrectly 5 times in 80 brains. The sex was determined correctly 69 times, doubtfully once, and incorrectly 10 times. The race and sex were determined correctly 60 times, one or the other correctly 15 times, and incorrectly 5 times. Of the 5 incorrect guesses a Caucasian female brain was taken to

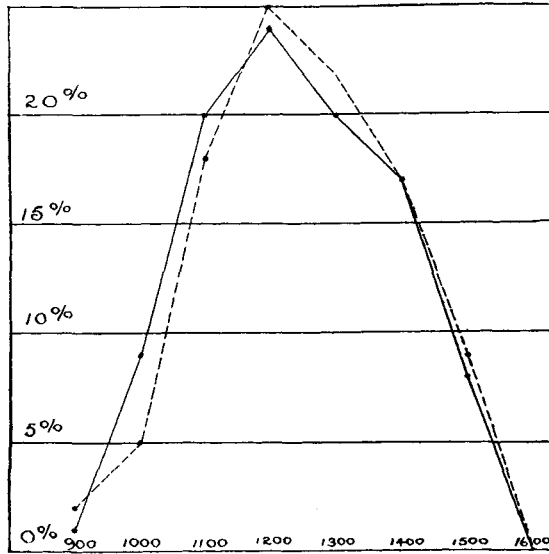


CHART XII.—Percentages of brain weight, in relation to stature and body weight combined.

be a Negro male in one case (No. 1583), a Negro female in another (No. 1527); a Caucasian male brain was taken to be a Negro male in two cases (Nos. 1716 and 1749), but with one of these there was some doubt; and a Negro male was taken to be a Caucasian male in one case (No. 1707). Mulattoes partook of one type or the other as a rule, sometimes resembling the Negro and sometimes the Caucasian more closely.

CONCLUSIONS.

1. The brain of the American Negro is smaller than that of the American Caucasian, the difference being primarily in the frontal lobe, and it follows that the anterior association center is relatively and absolutely smaller.

2. The Negro brain can be distinguished from the Caucasian with a varying degree of accuracy according to the amount of admixture of white blood.

3. The area of the cross section of the corpus callosum varies with the brain weight. However, in the Negro its anterior half is relatively smaller than in the Caucasian, to correspond with the smaller anterior association center; the genu is relatively larger and the splenium relatively smaller.

4. From the deduced difference between the functions of the anterior and posterior association centers and from the known characteristics of the two races the conclusion is that the Negro is more objective and the Caucasian more subjective. The Negro has the lower mental faculties (smell, sight, handicraftsmanship, body-sense, melody) well developed, the Caucasian the higher (self-control, will power, ethical and æsthetic senses and reason).

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APPENDIX.
TABLES II TO VII.

TABLE II.—LENGTH OF THE RADII IN MILLIMETERS FROM THE DEGREE OUTLINE. ALSO DISTANCE OF FRONTAL AND OCCIPITAL CENTIMETER FROM EACH END OF THE BRAIN. DEGREES BE

NEGRO MALE. LEFT SIDE.														
No.	Brain axis.	Degrees												
		0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
1189	176	86	89	87	84	80	75	71	70	68	68	72	75	76
1190	184	89	92	89	82	77	70	66	64	63	66	68	72	73
1456	164	75	82	81	77	73	70	69	65	65	67	71	74	76
1466	180	89	90	89	84	78	73	71	69	69	69	71	73	75
1470	164	78	84	86	80	74	65	61	57	57	57	59	62	64
1472	154	62	78	76	75	71	66	62	60	59	61	64	69	72
1473	160	77	81	82	78	71	64	62	61	61	62	68	71	73
1476	164	79	84	83	78	75	70	67	65	65	67	70	73	75
1478	166	80	83	81	75	71	68	65	62	64	63	67	69	72
1480	180	86	91	90	85	79	74	73	73	73	76	80	80	83
1486	174	85	88	87	82	75	69	67	65	63	63	67	69	71
1492	164	83	85	82	78	71	68	64	63	62	63	66	70	74
1495	170	83	87	85	81	75	69	65	64	63	64	66	72	73
1497	170	79	85	85	82	76	70	63	63	61	60	63	66	71
1502	164	76	84	86	84	80	74	69	66	65	64	65	67	70
1511	158	78	83	83	82	75	71	65	64	62	62	64	66	68
1519	160	74	78	79	75	70	66	64	64	63	65	69	73	75
1528	176	84	87	85	79	76	72	70	67	69	71	74	76	79
1530	158	75	78	77	74	68	64	61	61	61	62	65	67	69
1532	188	92	95	88	81	74	70	68	67	68	70	76	79	82
1533	160	77	82	84	80	76	69	65	62	61	61	63	65	68
1661	156	69	76	77	75	72	66	62	60	59	59	60	62	65
1680	166	78	84	84	80	73	67	65	62	60	61	62	63	67
1691	172	80	90	86	80	74	69	65	63	63	62	63	65	67
1699	166	75	83	85	83	78	71	67	63	62	62	65	68	70
1701	167	80	84	83	81	76	69	67	65	67	68	70	73	75
1704	177	85	92	90	84	78	72	69	67	68	69	71	73	75
1706	173	83	89	89	85	78	74	70	69	69	71	73	75	74
1709	181	88	92	89	84	77	73	71	71	68	70	71	74	75
1711	159	76	80	80	74	68	66	64	62	62	64	67	72	73
1713	171	75	86	87	83	80	73	69	67	67	69	73	77	80
1718	156	72	79	77	75	72	67	65	64	65	67	69	72	75
1727	180	86	91	91	84	79	74	67	64	62	61	62	66	70
1728	182	81	90	91	86	78	72	69	68	68	70	74	78	82
1731	176	80	88	88	84	78	74	72	72	71	75	78	81	83
1736	164	78	82	80	80	75	70	66	66	65	67	71	75	78
1738	173	78	84	86	85	78	73	68	64	61	62	65	67	69
2521	171	84	87	86	82	77	71	69	68	67	71	73	74	76
2522	171	86	87	85	82	77	72	70	67	67	69	71	73	75
2524	165	81	82	83	79	73	69	68	68	68	70	72	73	73
2535	160	75	82	81	78	71	67	63	62	63	65	68	70	72
105	143	70	75	75	73	68	64	62	60	60	60	62	65	68
173	171	83	87	84	78	72	66	63	62	61	62	64	65	67
Avs. 43	168	80	85	84	80	73	70	66	65	65	65	68	71	73
NEGRO FEMALE. LEFT SIDE.														
1449	164	76	83	84	80	74	69	64	62	62	61	62	66	69
1459	162	81	83	78	74	67	64	60	59	67	58	60	65	68
1477	160	78	80	81	76	71	68	65	64	63	63	67	68	70
1479	162	82	82	82	77	72	67	64	60	61	63	65	65	69
1487	150	74	75	73	68	63	60	58	57	56	57	59	63	65
1493	166	80	83	83	78	71	66	61	60	59	58	61	63	65
1500	154	77	78	75	72	66	62	57	57	57	59	61	62	64
1501	144	71	79	82	74	69	65	63	62	61	63	67	69	70
1515	164	80	80	78	74	71	66	64	62	62	63	66	70	69
1544	160	80	81	81	78	72	68	66	64	63	64	68	70	72

BRAIN CENTER FOR EACH TEN DEGREES ON THE FORTY-FIVE-TAL LOBES BELOW THE AXIS OF THE BRAIN, MEASURED AT EACH GIN WITH 0° AT ANTERIOR END OF BRAIN AXIS.

NEGRO MALE. LEFT SIDE.—(Continued across.)

130°	140°	150°	160°	170°	180°	From anterior end.					From posterior end.			Index. association centers.
						1cm.	2cm.	3cm.	4cm.	5cm.	1cm.	2cm.	3cm.	
76	77	77	79	84	88	8	11	13	14	12	11	5	..	93
75	76	77	79	85	92	5	8	10	11	11	12	12	..	89
77	79	79	80	82	80	7	11	12	13	10	6	8	..	90
78	77	80	86	89	88	11	12	13	12	10	9	11	6	94
66	70	72	75	80	82	5	10	12	12	..	22	15	..	95
75	76	76	76	79	69	-2	1	5	8	..	1	10	6	86
74	76	75	76	79	79	5	8	9	11	10	12	14	4	84
76	77	78	79	82	83	7	11	13	14	12	8	9	5	89
74	77	79	81	84	83	11	10	12	14	11	8	11	5	90
84	85	85	89	93	85	5	9	9	9	9	1	2	0	88
73	75	80	81	85	86	7	10	12	14	13	10	8	..	94
76	77	78	79	80	82	8	13	15	16	14	18	18	..	86
74	76	77	78	79	84	5	8	10	9	5	9	10	..	89
73	76	79	83	84	84	8	12	12	13	14	7	14	6	88
72	73	73	74	79	80	1	5	9	10	10	15	12	7	93
70	70	72	73	76	80	4	8	9	9	8	19	16	12	95
77	78	78	78	81	75	5	8	10	9	8	0	1	-2	85
82	84	84	85	89	70	8	12	16	17	15	-2	1	-4	88
71	72	75	75	78	77	5	8	9	10	10	5	6	1	83
83	84	87	91	95	88	15	18	17	15	14	5	9	1	83
70	72	75	76	78	79	4	7	10	10	..	14	..	..	95
66	68	69	71	74	76	4	9	11	10	..	5	8	..	95
70	73	75	77	81	84	5	7	10	11	10	7	10	..	96
71	77	79	81	83	86	5	8	9	15	9	11	12	12	97
73	75	76	77	80	81	1	5	7	9	6	9	10	5	95
76	77	78	80	83	82	6	11	14	14	14	9	3	..	89
77	78	82	84	87	85	5	8	9	10	1	1	5	0	90
75	77	77	80	86	85	5	8	10	11	9	4	4	..	94
79	79	81	83	87	91	8	11	12	13	14	16	14	..	94
76	79	78	80	78	68	6	11	12	12	10	-2	5	0	87
81	82	83	85	84	75	0	2	5	6	4	0	6	2	86
77	78	79	82	78	65	3	9	10	12	12	-2	1	..	86
74	77	80	84	88	90	5	7	9	9	9	7	12	6	95
84	83	84	85	89	88	1	4	6	7	8	2	1	..	84
84	84	85	87	88	71	6	9	9	10	10	-1	0	-1	86
80	80	82	81	83	73	5	6	6	6	4	0	5	0	84
73	75	75	77	82	83	2	6	9	11	11	14	11	..	93
78	81	81	85	86	72	4	9	12	13	9	-4	3	..	90
77	78	78	79	84	80	10	11	11	11	10	5	6	1	93
76	76	76	78	82	79	10	11	12	14	13	5	6	..	93
74	76	77	82	78	78	3	6	7	8	9	4	5	..	87
70	70	70	69	72	71	3	5	7	7	..	5	..	..	91
69	73	76	81	85	83	10	14	15	16	17	6	4	..	94
75	76	78	80	88	80	5	9	10	11	10	6	8	3	90

NEGRO FEMALE. LEFT SIDE.—(Continued across.)

71	75	77	78	79	82	3	7	10	11	7	17	18	10	92
70	74	75	77	80	81	7	12	14	17	17	2	3	..	88
69	69	70	75	80	75	8	9	18	14	11	10	5	..	92
72	74	76	77	79	82	2	7	10	10	10	12	11	..	92
67	69	70	71	74	74	9	12	14	16	15	8	9	..	89
68	72	76	79	82	78	8	11	12	12	10	4	5	..	93
68	72	72	73	77	77	9	14	14	11	7	3	1	..	86
70	70	69	67	68	71	8	11	11	10	..	16	10	..	90
69	70	73	77	83	80	8	9	12	11	6	7	4	..	92
74	75	75	76	77	80	1	4	9	11	8	11	15	7	91

TABLE II.—CONTINUED.

		NEGRO FEMALE. LEFT SIDE.												
No.	Brain axis.	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
1593	148	72	75	74	70	65	62	60	60	59	61	63	65	65
1659	168	80	85	83	78	72	68	66	64	68	65	65	66	70
1678	158	68	79	80	79	74	71	66	63	61	61	64	65	70
1684	176	80	90	87	84	77	72	69	68	65	66	68	70	74
1685	160	70	80	82	79	74	69	63	61	61	61	64	68	72
1686	160	80	81	80	75	70	68	66	65	64	66	69	72	73
1695	158	79	80	76	71	66	62	59	59	58	59	63	68	70
1700	161	74	81	81	80	75	70	66	65	63	65	68	70	73
1715	145	62	73	74	74	68	61	58	57	56	56	57	58	61
1722	149	59	78	82	75	71	68	65	65	62	62	66	70	71
1730	146	57	79	74	72	68	63	59	58	58	58	60	64	65
163	153	69	77	76	73	67	62	57	55	54	57	60	62	65
Avs. 22	158	74	80	79	75	70	66	62	61	60	61	63	66	68
		NEGRO MALE. RIGHT SIDE.												
1189	176	84	87	86	81	78	73	69	66	67	69	72	74	76
1190	180	85	90	90	85	75	68	65	63	61	63	67	70	73
1453	168	70	86	85	78	74	70	67	66	67	69	71	72	75
1456	164	75	81	79	75	71	68	64	63	64	65	70	71	75
1466	180	89	92	89	85	81	77	75	72	71	74	76	77	79
1470	160	76	83	83	80	73	67	62	60	59	59	62	65	69
1472	158	71	81	81	78	72	67	62	59	58	58	62	67	71
1473	160	77	81	80	76	70	64	63	61	63	65	68	71	76
1476	162	78	82	82	79	73	68	65	65	64	64	67	69	72
1478	170	85	85	83	75	70	61	63	63	62	64	66	70	73
1480	180	87	90	88	81	76	70	67	66	66	67	70	73	77
1486	176	82	86	86	82	75	71	67	65	62	64	68	72	76
1492	162	77	80	79	74	69	64	63	61	61	63	66	69	71
1495	166	80	84	85	83	76	71	67	66	65	65	66	71	73
1497	170	77	87	87	83	77	72	69	68	66	66	68	72	74
1502	166	80	84	85	80	75	67	64	63	61	62	64	68	72
1511	160	79	81	82	78	73	67	65	64	64	64	65	68	71
1519	160	75	80	81	79	74	68	65	64	64	67	70	74	76
1528	176	83	89	87	83	80	76	73	72	72	77	78	78	80
1530	158	75	80	80	76	74	70	66	65	65	65	68	69	72
1532	180	86	91	88	81	74	70	67	66	65	67	72	76	80
1533	160	74	79	81	80	77	70	66	62	63	63	64	66	70
1661	156	75	79	78	75	71	61	62	62	64	65	67	69	71
1680	164	80	82	80	75	70	65	62	57	57	57	60	64	67
1691	170	81	87	85	76	70	65	61	60	59	60	62	64	69
1699	168	77	84	86	83	77	72	68	65	65	66	68	71	74
1701	169	82	86	86	82	77	72	69	68	69	71	71	74	77
1704	174	84	89	87	81	77	72	68	66	65	68	70	72	76
1706	169	85	86	84	80	78	70	68	67	69	70	72	74	76
1709	179	86	89	88	82	79	74	71	69	68	68	71	74	76
1711	160	78	81	81	77	74	70	67	66	68	68	71	72	74
1713	174	83	87	86	81	75	70	66	65	64	66	69	73	78
1718	157	75	80	77	72	69	65	63	62	63	65	68	69	73
1727	182	73	91	93	88	80	74	67	62	59	58	60	65	68
1728	180	70	92	95	89	80	74	68	64	64	63	64	69	72
1731	176	82	87	87	82	78	73	69	67	66	67	71	76	78
1736	167	76	78	83	81	76	71	69	68	68	69	73	76	78
1738	174	76	87	87	83	76	73	63	65	63	63	64	68	70
2521	173	83	86	85	81	76	71	69	68	66	68	71	71	72
2522	169	80	84	84	82	75	70	68	67	66	68	71	73	77
2524	163	77	82	81	78	74	71	70	68	68	68	71	71	74
2535	159	75	81	81	78	72	68	65	63	63	64	68	71	73
105	148	65	75	75	74	70	62	63	60	59	60	62	66	67
173	173	82	87	86	80	74	71	67	66	64	66	69	72	75
B. V. 87	162	66	81	83	80	75	71	68	66	65	65	68	72	74
Avs. 45	168	79	84	84	80	75	70	66	64	64	63	66	70	74

NEGRO FEMALE. LEFT SIDE.—(Continued across.)

	From anterior end.						From posterior end.			Index association centers.				
	1cm.	2cm.	3cm.	4cm.	5cm.	1cm.	2cm.	3cm.						
130°	140°	150°	160°	170°	180°	1cm.	2cm.	3cm.	4cm.	5cm.	1cm.	2cm.	3cm.	
65	65	66	71	75	70	12	13	12	10	..	6	2	..	92
71	74	76	79	83	82	7	12	12	13	11	8	13	5	94
73	74	77	77	75	76	0	3	6	7	..	13	11	5	94
77	79	81	83	85	88	0	5	9	9	7	8	12	..	93
74	76	75	74	75	79	1	5	7	8	11	11	15	9	87
72	74	76	78	82	69	9	13	12	11	7	-2	4	-1	90
70	72	74	75	77	79	11	14	16	15	14	5	10	12	84
75	76	76	78	81	70	3	9	12	12	8	0	0	..	98
62	64	66	69	71	72	0	4	7	7	..	12	7	..	95
72	73	72	72	78	74	-3	2	6	8	6	6	7	..	95
67	69	72	74	72	69	-2	1	4	6	4	3	-1	..	90
66	68	70	71	71	76	2	8	10	11	7	20	19	..	87
70	72	73	75	77	77	5	8	10	10	9	9	9	7	91

NEGRO MALE. RIGHT SIDE.—(Continued across.)

76	76	77	80	86	88	9	14	16	18	17	4	11	9	90
75	78	80	81	85	88	8	6	10	11	11	8	17	17	88
77	77	76	83	85	80	-2	3	7	8	8	4	3	..	88
77	78	79	82	84	73	4	10	13	14	12	0	3	..	85
82	81	83	87	91	85	8	13	15	16	16	2	9	8	94
72	74	77	77	80	75	1	7	11	9	..	3	7	..	89
74	77	77	74	78	79	1	7	11	10	..	13	15	8	87
77	78	78	77	80	78	8	10	12	12	10	3	10	5	82
75	76	78	78	81	82	9	12	15	16	16	5	5	2	90
74	76	78	79	82	85	11	14	15	13	10	9	11	10	86
80	82	88	90	91	86	8	12	14	15	11	1	2	0	87
79	81	83	84	87	85	7	11	11	12	13	3	9	6	88
74	75	75	77	80	76	8	15	17	17	16	3	11	11	88
75	76	79	80	84	84	4	7	10	8	7	10	11	..	91
77	79	81	81	85	85	1	6	9	10	8	12	14	..	93
74	74	75	75	81	81	8	14	15	15	13	4	9	5	88
72	72	73	74	78	80	6	10	11	11	11	7	9	5	91
76	76	77	79	81	..	6	8	8	7	7	-6	-4	-8	85
82	82	83	86	88	82	6	11	12	13	11	6	7	2	91
74	76	75	76	80	78	6	7	10	9	8	2	7	1	91
82	83	84	88	92	87	8	13	13	..	..	3	2	5	85
72	75	78	79	81	78	4	7	9	8	..	14	15	..	94
72	74	77	80	71	..	5	9	10	9	..	-9	-5	..	87
70	72	76	77	80	80	7	10	12	12	12	14	12	..	92
70	75	79	80	80	85	6	10	19	19	19	7	20	17	88
77	77	78	79	81	81	4	8	11	11	8	6	8	..	89
78	78	78	82	84	83	4	9	11	12	11	6	14	..	91
77	79	82	88	89	76	5	9	10	10	10	-2	0	..	88
76	76	78	82	87	76	8	10	14	15	14	0	5	..	89
80	82	84	86	91	86	8	11	15	14	13	2	7	..	94
74	75	76	77	80	67	6	11	12	10	..	-2	3	..	90
80	81	82	82	84	86	2	5	8	10	10	13	9	..	84
75	77	78	80	80	70	7	11	14	16	15	0	4	..	85
71	75	79	82	89	90	-2	1	5	10	11	7	15	15	98
74	76	79	82	85	91	-6	0	3	6	7	20	18	..	94
80	82	84	84	89	83	7	10	13	13	12	3	14	..	88
79	80	80	80	83	80	2	9	12	13	12	4	2	..	88
72	73	75	77	83	80	1	6	11	13	11	4	..	..	97
74	75	76	80	84	83	8	12	15	15	12	9	12	..	95
79	80	82	82	84	80	8	10	12	13	12	0	3	..	88
75	76	76	79	82	71	7	10	11	13	14	3	10	..	94
73	73	76	77	80	76	2	4	8	10	8	7	13	..	89
69	70	71	70	73	66	-1	2	6	7	..	3	5	..	94
78	80	80	85	87	76	7	11	13	15	16	0	6	..	89
76	77	77	78	81	76	-4	2	6	9	7	6	7	..	90
76	77	78	80	83	80	5	8	11	12	12	5	8	7	89

TABLE II.—CONTINUED.

NEGRO FEMALE. RIGHT SIDE.														
No.	Brain axis.	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°
1449	162	72	79	80	81	77	73	66	66	63	62	62	64	68
1459	164	81	82	79	73	68	66	62	61	60	61	64	66	70
1477	160	78	80	81	76	70	64	62	61	61	60	63	65	68
1479	162	78	81	82	79	73	69	66	64	62	63	66	68	71
1487	152	68	76	78	77	74	70	67	66	65	65	67	68	69
1493	166	79	81	77	75	69	65	63	62	61	62	63	66	69
1500	164	75	75	74	70	66	61	56	57	58	57	59	59	61
1501	142	71	72	74	75	72	68	65	63	63	65	67	69	70
1515	160	76	76	74	71	66	65	62	60	62	65	69	69	70
1544	160	74	81	81	79	74	69	67	66	65	67	70	73	74
1593	148	74	73	71	66	61	58	56	56	55	55	60	61	63
1659	168	81	82	81	74	68	63	60	60	59	61	63	65	70
1678	160	70	78	80	79	75	69	64	62	60	60	62	65	68
1684	176	82	90	88	84	76	69	63	60	60	60	61	65	68
1685	158	72	79	82	77	71	67	62	59	58	59	59	62	65
1686	160	79	80	82	78	72	69	66	66	67	69	70	72	74
1695	160	76	81	81	72	71	66	63	63	65	66	69	71	73
1700	161	72	82	83	80	75	70	66	65	65	67	69	70	72
1715	147	67	74	75	71	65	62	60	59	57	56	58	60	62
1722	151	65	78	82	75	72	66	64	63	62	62	67	71	73
1730	149	65	75	75	72	67	62	59	59	58	59	63	65	66
163	148	69	79	82	76	71	66	62	60	61	61	65	66	68
Avs. 22	158	74	79	79	75	71	66	63	62	61	62	64	66	69
CAUCASIAN MALE. LEFT SIDE.														
1406	172	82	88	88	86	82	75	72	72	71	70	72	75	77
1455	172	86	88	82	78	75	73	69	68	68	69	68	70	70
1457	165	85	85	85	81	74	69	66	65	64	65	67	67	68
1458	174	85	87	85	82	77	73	71	70	70	70	73	75	76
1463	184	88	92	92	87	81	78	74	73	72	73	77	79	81
1469	172	85	86	85	81	78	73	69	67	66	66	68	71	71
1489	168	84	85	84	80	76	72	69	68	66	67	69	70	71
1490	173	87	88	85	81	77	74	73	74	74	74	74	75	74
1496	174	82	88	88	84	79	73	70	67	65	65	65	68	70
1512	166	74	84	86	85	81	75	71	69	68	66	66	68	70
1514	170	85	86	84	80	75	74	72	70	70	71	72	72	73
1529	172	81	87	90	89	85	81	79	78	77	77	80	81	81
1538	162	81	80	79	78	68	66	65	62	62	63	64	66	69
1591	164	81	82	85	83	77	71	69	68	67	67	70	69	71
1682	170	75	86	89	85	82	76	72	69	67	65	67	69	71
1683	164	81	82	78	77	74	72	69	68	69	70	71	70	72
1690	170	82	87	87	83	77	74	72	70	69	69	70	72	72
1693	166	63	85	88	89	84	77	74	71	67	66	66	67	69
1696	168	81	85	82	78	75	72	69	67	67	68	69	70	71
1702	164	73	82	84	82	76	72	70	66	64	64	66	68	69
1707	177	84	89	90	82	76	72	67	62	61	61	67	66	68
1708	169	82	85	83	80	75	72	71	68	66	66	67	68	69
1712	167	82	81	82	78	69	68	67	66	67	69	70	71	72
1716	165	81	85	82	76	71	69	66	65	67	69	71	70	71
1719	173	86	86	86	81	77	72	70	68	70	71	75	75	75
1723	161	72	81	81	77	75	70	69	68	68	68	69	70	74
1734	166	75	84	86	82	79	73	69	67	65	67	67	68	70
1743	185	89	93	92	90	84	82	77	75	77	77	79	78	79
1749	164	73	84	85	85	82	77	73	68	68	69	69	72	72
177	159	75	79	80	77	70	66	64	60	59	61	63	61	64
1G.	160	78	80	79	74	69	65	66	62	61	62	62	63	66
3G.	162	81	84	82	78	73	69	67	65	64	64	65	65	65
4G.	156	76	79	77	73	69	65	62	58	57	57	58	60	61
6G.	156	70	78	80	78	73	71	68	66	66	67	69	71	72
Avs. 34	168	80	85	85	81	76	72	70	68	67	65	66	70	71

NEGRO FEMALE. RIGHT SIDE.—(Continued across.)

130°	140°	150°	160°	170°	180°	From anterior end.				From posterior end.			Index association centers.	
						1cm.	2cm.	3cm.	4cm.	5cm.	1cm.	2cm.		3cm.
						69	74	75	78	80	80	2		7	9	9	8	14	14	..	96
72	74	75	78	81	78	11	14	16	15	9	2	4	0	88
70	71	73	73	77	78	7	8	12	12	10	12	13	10	91
75	76	76	76	81	77	5	9	11	9	..	3	7	7	92
70	72	73	73	75	72	3	7	11	13	14	5	10	5	97
71	75	77	81	83	77	9	11	14	13	14	6	6	3	91
64	66	67	69	74	73	7	9	9	9	..	7	7	..	91
71	73	72	71	71	70	8	8	7	..	..	11	15	12	92
70	70	72	77	78	..	10	12	13	10	7	-1	-1	..	83
75	75	76	76	78	80	3	9	12	14	12	10	16	7	90
64	66	65	65	73	74	14	15	..	..	..	7	12	9	88
72	77	78	80	84	76	12	15	17	17	16	9	7	4	88
71	72	73	73	76	78	0	4	5	5	..	14	10	..	94
73	75	79	81	85	82	3	8	10	13	12	3	9	..	92
68	70	72	73	74	78	3	6	10	11	11	10	19	16	95
76	77	78	80	82	71	4	5	7	8	7	1	7	1	89
75	77	77	77	79	79	4	7	9	11	8	7	7	..	86
74	76	76	76	81	79	0	5	8	11	12	8	9	..	91
64	66	68	70	72	73	2	5	7	9	..	17	14	..	97
73	73	71	69	74	73	0	5	8	9	4	4	9	..	89
68	70	72	73	74	75	1	7	10	11	..	8	..	..	89
70	70	70	71	73	71	2	6	9	9	7	12	16	..	91
74	73	74	75	78	76	5	9	10	10	7	8	10	7	91

CAUCASIAN MALE. LEFT SIDE.—(Continued across.)

80	85	85	85	84	86	4	7	12	12	10	8	9	5	93
72	71	75	79	84	86	10	19	19	19	15	13	11	4	98
71	72	72	78	83	85	6	8	11	11	10	13	12	..	97
77	78	78	82	87	86	9	14	17	18	17	7	8	7	83
82	83	83	87	90	90	9	14	15	16	14	10	10	..	90
73	76	78	81	84	85	3	7	9	11	11	6	8	5	97
73	74	76	80	84	84	8	18	15	15	11	12	10	..	97
74	74	76	79	84	87	11	15	18	18	15	7	6	3	93
72	74	76	78	84	86	7	11	15	15	14	9	11	12	100
73	74	75	78	83	78	2	6	9	10	10	4	8	6	101
76	76	76	78	82	86	14	17	19	19	15	10	14	..	93
81	80	79	82	87	86	4	9	10	10	10	7	3	1	97
70	73	74	75	79	81	11	16	17	15	15	13	20	..	94
70	71	70	72	79	81	1	5	9	8	..	8	..	..	97
74	74	75	78	86	73	0	4	8	10	7	0	1	1	101
73	74	75	79	83	75	11	17	18	16	13	4	6	..	96
74	75	78	83	85	87	9	19	14	15	14	13	15	..	100
69	71	74	77	82	78	-5	0	4	5	5	2	2	1	107
73	76	77	81	84	82	8	14	16	16	16	12	10	..	97
71	72	73	77	80	78	1	6	10	11	9	7	8	5	101
70	72	73	79	84	86	5	8	11	10	9	7	9	7	98
73	75	78	83	85	80	9	18	16	17	15	1	3	1	103
74	78	83	86	84	..	16	21	22	21	20	-8	-10	..	93
70	71	71	72	78	83	13	16	15	15	14	10	11	6	93
76	80	83	88	87	76	11	14	15	15	16	0	2	..	93
75	75	74	76	79	80	2	7	9	11	9	9	7	..	93
72	74	76	79	81	83	2	5	8	10	9	15	23	..	98
80	80	84	88	93	72	6	10	10	10	10	-4	0	-1	98
75	76	77	80	85	71	0	6	7	7	4	-1	2	..	101
64	66	67	71	75	79	7	10	12	12	11	6	5	3	100
67	69	72	76	82	79	5	10	13	13	11	4	..	..	100
68	70	74	75	80	83	12	16	17	16	14	8	8	..	103
63	65	67	68	74	79	11	16	16	16	11	9	5	..	102
74	74	75	76	79	71	2	9	12	11	8	2	5	..	94
73	74	76	79	83	81	7	11	13	14	12	6	7	4	98

TABLE II.—CONTINUED.

CAUCASIAN FEMALE. LEFT SIDE.															
No.	Brain axis.	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°	
		1510	170	80	85	84	79	72	67	66	65	63	65	67	70	71
1522	160	70	76	76	72	68	65	62	61	59	60	60	62	65	
1527	164	73	82	82	80	74	68	66	63	63	64	66	68	69	
1588	180	85	91	91	85	78	72	68	66	65	65	67	70	72	
1692	162	78	81	80	79	73	69	65	63	62	64	66	69	70	
1697	156	75	78	77	72	68	63	60	58	58	59	60	61	62	
2G.	156	75	78	77	74	69	64	63	62	61	62	62	63	64	
5G.	150	67	75	76	71	67	64	63	59	58	58	59	61	62	
Avs.	8	161	75	81	80	77	71	67	64	62	61	62	63	66	67
CAUCASIAN MALE. RIGHT SIDE.															
1406	174	74	88	90	88	80	75	72	70	69	69	69	71	73	
1455	172	86	86	81	78	75	74	71	70	71	73	75	77	76	
1457	165	75	85	86	78	72	68	67	66	65	65	67	68	69	
1458	172	81	85	81	81	74	70	69	68	69	70	72	75	77	
1463	182	84	91	93	89	86	83	81	78	73	74	76	79	79	
1469	172	80	87	82	79	75	71	68	66	63	64	66	68	70	
1489	166	78	84	83	80	75	72	69	67	66	67	68	70	74	
1490	170	83	86	87	80	78	73	72	70	69	71	73	74	74	
1496	174	82	88	91	88	84	81	77	73	70	70	71	72	73	
1512	170	81	86	91	87	82	74	68	66	65	64	67	68	71	
1514	168	84	84	83	78	74	73	71	70	61	70	73	74	74	
1529	172	82	88	85	84	78	75	73	72	71	71	75	76	78	
1588	162	79	81	78	74	70	68	68	66	67	68	70	71	72	
1591	162	69	82	85	83	79	74	72	72	69	68	71	71	72	
1682	170	77	88	89	84	78	75	73	71	71	71	73	72	75	
1683	164	80	82	79	76	71	67	66	63	65	64	66	69	70	
1690	170	82	86	87	83	79	73	69	66	66	68	69	71	72	
1693	166	65	82	87	87	84	78	76	74	74	73	75	76	77	
1696	170	81	86	85	81	78	73	70	68	67	68	71	71	73	
1702	160	70	80	81	79	75	72	70	68	65	65	66	68	69	
1707	174	75	85	88	83	79	75	70	67	68	67	70	73	74	
1708	170	80	84	85	81	77	74	72	71	70	70	71	72	73	
1712	168	73	83	85	84	78	74	70	70	69	71	73	74	74	
1716	162	77	81	81	78	74	70	69	68	68	69	72	74	75	
1719	176	86	88	84	82	75	72	70	68	70	71	73	75	75	
1723	163	75	81	82	80	75	73	71	71	69	69	72	73	73	
1734	168	69	83	86	83	78	75	70	67	67	65	67	68	69	
1743	183	90	92	91	88	84	80	77	75	76	75	76	78	80	
1749	159	73	79	82	80	75	72	70	68	68	70	72	72	75	
177	158	74	80	83	79	72	66	64	60	59	59	61	63	63	
1G.	160	79	81	79	72	66	63	58	55	55	56	56	59	61	
3G.	160	76	81	80	77	72	68	65	61	61	62	63	65	66	
4G.	152	72	75	76	76	73	71	70	68	67	67	67	67	68	
6G.	156	72	78	81	79	76	72	68	64	63	65	67	67	69	
Avs.	34	167	78	84	84	81	77	73	70	68	65	65	69	71	72
CAUCASIAN FEMALE. RIGHT SIDE.															
1510	168	84	85	84	81	73	71	69	69	66	67	70	72	72	
1522	145	68	73	76	72	64	60	63	61	60	59	61	62	63	
1527	160	75	81	81	80	74	68	65	62	62	65	66	70	69	
1583	176	85	88	88	82	76	72	69	66	66	62	69	73	76	
1692	164	80	88	83	79	73	69	66	64	62	62	65	68	71	
1697	157	75	78	76	64	67	62	60	58	58	57	58	60	61	
2G.	152	72	77	79	76	71	66	62	58	57	56	58	59	62	
5G.	150	64	72	77	72	69	66	64	60	58	56	58	59	60	
Avs.	8	160	75	80	81	76	71	65	62	61	61	63	65	67	

CAUCASIAN FEMALE. LEFT SIDE.—(Continued across.)

130°	140°	150°	160°	170°	180°	From anterior end.					From posterior end.			Index association centers.
						1cm.	2cm.	3cm.	4cm.	5cm.	1cm.	2cm.	3cm.	
72	73	74	77	82	85	3	9	11	13	13	8	9	4	93
66	67	69	69	72	75	6	10	12	12	7	8	3	..	95
72	72	72	75	79	82	0	6	10	10	7	12	14	..	95
76	79	80	84	89	85	5	8	11	11	7	2	14	10	93
72	73	74	74	77	80	10	14	16	17	16	6	10	6	93
64	68	71	77	79	50	9	12	13	13	11	-2	-1	0	97
67	68	71	75	78	75	6	1	12	12	9	8	4	1	98
64	67	70	74	74	..	2	6	9	9	8	-5	-5	..	101
69	71	73	76	79	77	5	8	12	12	10	5	6	4	96

CAUCASIAN MALE. RIGHT SIDE.—(Continued across.)

77	79	79	82	83	88	-2	4	8	10	11	11	10	9	98
76	76	80	85	81	15	20	21	18	8	3	11	8	8	93
72	75	76	79	84	78	1	9	12	12	12	2	7	7	97
77	79	80	82	86	85	8	14	16	17	16	1	5	4	90
79	81	84	87	91	82	2	12	15	15	13	1	10	6	102
71	74	75	75	79	84	2	9	12	14	15	17	15	16	98
76	76	80	81	85	80	8	14	15	14	12	4	4	-1	93
73	75	76	80	81	85	10	13	15	17	17	16	11	..	97
74	76	76	80	87	86	4	10	13	12	12	4	10	10	105
74	77	78	83	88	82	2	7	10	10	..	6	8	..	96
75	78	78	81	86	83	16	20	20	20	15	6	11	..	96
80	79	78	81	86	81	6	11	14	15	14	7	8	3	93
73	75	76	78	81	79	10	13	15	14	12	9	9	..	94
73	72	71	73	78	81	-2	3	6	6	0	3	5	4	100
75	76	75	78	85	85	0	5	8	10	9	4	3	3	97
72	75	75	78	82	75	11	14	16	16	15	2	-1	..	94
74	77	76	78	84	84	8	12	15	16	15	7	12	10	96
77	77	77	79	83	75	-3	0	2	4	5	1	4	2	99
75	76	77	78	84	81	9	12	16	14	14	5	8	5	96
70	71	75	76	80	86	1	4	6	9	6	-2	7	..	101
75	76	78	82	87	..	1	5	9	9	7	-5	-2	-3	93
74	77	78	81	84	83	5	12	14	15	12	8	9	..	98
75	77	79	82	84	75	3	11	12	14	12	9	..	..	94
75	75	74	76	82	78	7	11	14	14	12	1	9	..	93
75	76	78	85	88	88	13	16	17	18	15	4	10	..	94
74	75	74	74	76	90	3	8	13	13	8	8	8	..	97
70	74	75	78	80	82	-3	3	6	7	6	20	22	21	101
82	84	86	89	92	78	9	10	18	15	14	-4	4	2	96
76	76	76	77	78	73	5	10	12	12	8	2	5	..	93
65	65	67	70	75	80	7	10	12	14	13	8	9	..	101
65	68	71	77	61	70	11	13	17	16	14	2	2	..	95
69	72	75	76	80	80	7	12	17	18	15	4	10	..	98
67	66	67	69	75	74	5	10	12	13	9	10	7	..	103
71	73	74	78	80	74	7	11	13	14	10	2	..	..	98
73	75	76	76	81	80	5	9	13	13	11	5	7	6	97

CAUCASIAN FEMALE. RIGHT SIDE.—(Continued across.)

73	72	73	76	80	83	4	7	10	9	7	4	9	4	96
66	67	67	69	70	71	6	10	11	11	8	8	12	6	100
72	73	73	75	80	75	4	7	10	12	8	3	..	..	94
78	81	81	85	88	85	10	14	14	12	9	6	12	9	90
73	75	75	79	80	81	6	12	15	15	14	11	11	..	93
64	66	69	74	78	73	8	11	12	12	9	2	8	..	98
66	67	68	70	75	76	3	8	11	11	7	9	11	8	100
62	64	66	73	76	65	-1	6	9	10	9	0	..	..	106
69	71	72	75	78	76	5	9	12	12	9	5	12	7	97

TABLE III.—AVERAGE LENGTH OF THE RADII IN MM. OF THE ANTERIOR AND POSTERIOR HALVES OF THE BRAIN FOR THE PLANES—HORIZONTAL, VERTICAL, AND AT 45°.

Number.	NEGRO MALE.					
	Left Side.			Right Side.		
	Brain axis.	Anterior.	Posterior.	Anterior.	Posterior.	Brain axis.
1189	176	69	70	68	69	176
1190	184	66	70	67	70	180
1451	178	69	71	70	72	176
1453	168	65	64	67	72	168
1456	164	64	71	61	71	164
1466	180	69	74	70	74	180
1470	164	60	65	62	67	160
1472	154	61	68	60	68	158
1473	160	60	70	61	71	160
1476	164	65	71	64	69	162
1478	166	62	69	63	69	170
1480	180	71	78	67	72	180
1486	174	66	69	64	71	176
1492	164	64	69	62	67	162
1495	170	64	69	64	69	166
1497	170	64	68	66	72	170
1502	164	66	69	64	70	166
1511	158	64	67	64	69	160
1519	160	63	71	62	68	160
1524	160	69	66	66	72	160
1528	176	68	73	70	76	176
1530	158	59	67	63	67	158
1533	160	64	69	64	68	160
1660	182	63	74	67	72	188
1661	156	60	65	60	66	156
1680	166	63	65	59	65	164
1691	172	63	68	60	67	170
1699	166	63	69	65	71	168
1701	167	66	72	67	75	169
1704	177	66	71	64	70	174
1706	173	66	70	66	71	169
1709	181	69	73	67	73	179
1711	159	62	71	63	70	160
1713	171	65	73	63	72	174
1718	156	62	70	63	70	157
1727	180	65	66	65	66	182
1728	182	65	75	64	68	180
1731	176	67	75	66	75	176
1736	164	63	73	65	72	167
1738	173	67	67	66	68	174
1739	157	66	77	65	70	164

TABLE III.—CONTINUED.

Number.	NEGRO MALE.					
	Brain axis.	Left Side.		Right Side.		Brain axis.
		Anterior.	Posterior.	Anterior.	Posterior.	
2469	176	62	68	66	72	176
2521	171	65	72	66	70	173
2522	171	67	72	65	72	169
2524	165	66	71	67	71	163
2535	160	62	69	62	69	159
87	165	65	70	64	69	162
172	168	58	63	60	63	170
173	171	61	67	64	71	173
193	166	58	63	55	61	166
105	148	68	75	61	72	148
107	142	60	60	60	59	143
109	133	53	57	53	58	136
110	...	..	..	47	53	131
111	114	42	47	42	45	115
112	113	45	51	47	53	113
113	126	45	55	47	51	124
	NEGRO FEMALE.					
1449	164	64	68	65	65	162
1452	180	67	70	68	75	177
1459	162	59	65	66	66	164
1477	160	65	67	62	65	160
1479	162	62	67	63	68	162
1487	152	59	64	62	66	152
1493	166	60	65	61	67	166
1500	154	56	62	56	60	154
1501	144	64	68	65	67	142
1515	164	61	64	60	68	160
1521	170	64	68	65	68	166
1544	160	63	70	64	71	160
1659	168	61	65	59	66	168
1662	174	65	70	64	72	172
1678	158	62	65	63	65	160
1684	176	66	69	59	64	176
1685	160	63	69	63	65	158
1686	160	62	68	62	68	160
1687	165	56	61	53	57	165
1695	158	60	67	62	69	160
1700	161	64	70	64	70	161
1715	145	57	60	59	62	147
1722	149	63	68	62	68	151
1730	146	59	66	58	66	149
108	118	53	56	53	55	118
163	153	56	63	60	66	148

TABLE III.—CONTINUED.

Number.	CAUCASIAN MALE.					
	Left Side.			Right Side.		
	Brain axis.	Anterior.	Posterior.	Anterior.	Posterior.	Brain axis.
1405	...	69	73	69	71	...
1455	172	67	69	69	73	172
1457	165	66	68	66	68	165
1458	174	68	74	68	74	172
1463	184	72	77	73	74	182
1469	172	68	71	66	69	172
1489	168	68	70	66	71	166
1490	173	71	73	68	71	170
1496	174	69	71	71	73	174
1512	166	71	72	68	68	170
1514	170	70	73	69	72	168
1520	178	69	77	70	76	176
1529	172	74	77	71	75	172
1538	162	66	72	67	69	162
1591	164	68	69	68	70	162
1682	170	67	66	72	75	170
1683	164	66	70	65	69	164
1693	166	78	75	80	79	166
1696	168	68	71	68	72	170
1702	164	67	66	66	65	160
1707	177	65	66	66	68	174
1708	169	69	70	70	71	170
1712	167	67	69	67	70	168
1716	165	65	70	66	71	162
1719	173	67	72	68	73	176
1723	161	67	70	69	71	163
1734	166	67	69	67	70	168
1748	185	74	75	73	77	183
1749	164	68	68	66	70	159
164	166	61	62	66	66	168
169	175	67	65	62	64	169
177	159	61	62	59	61	158
3G.	162	65	64	64	68	160
4G.	156	61	62	64	65	152
6G.	156	65	70	64	65	156

TABLE III.—CONTINUED.

Number.	CAUCASIAN FEMALE.					
	Brain axis.	Left Side.		Right Side.		Brain axis.
		Anterior.	Posterior.	Anterior.	Posterior.	
1485	158	61	64	62	68	158
1510	170	64	69	67	70	168
1522	150	62	63	62	62	148
1527	164	65	69	62	68	160
1583	180	65	73	65	74	176
1692	162	65	68	65	68	164
1697	156	60	63	59	61	157
1G.	160	64	65	59	59	158
2G.	156	62	62	59	62	152
5G.	150	62	62	62	69	150

TABLE IV.—SHOWING THE POSITION OF THE FISSURE OF ROLANDO IN DEGREES MEASURED FROM THE BRAIN CENTER.

No.	CAUCASIAN MALE.							
	Left Side.				Right Side.			
	Inferior end.	Middle end.	Superior end.	Superior terminal. mm.	Inferior end.	Middle end.	Superior end.	Superior terminal. mm.
1702	76	94	110	15	76	86	108	15
1707	76	83	108	20	78	82	107	20
1708	79	93	102	18	83	98	104	14
1712	68	74	97	9	75	77	99	14
1716	75	88	105	23	80	88	102	26
1719	65	70	100	30	75	80	100	24
1720	70	80	110	30	76	85	105	32
1723	75	88	113	20	70	88	105	18
1734	75	97	114	15	78	93	113	26
1748	70	92	...	28	70	84	107	32
1749	78	90	112	25	83	86	103	25
164	65	99	108	25	75	85	104	16
169	75	84	103	16	77	78	95	16
177	70	97	115	18	75	100	118	18
1490	..	83	110	..	..	93	105	..
1469	..	103	116	..	..	92	118	..
1455	..	104	105	..	..	98	115	..
1514	..	84	107	..	..	90	105	..
1G.	..	78	93	..	..	82	103	..
3G.	..	87	110	..	..	88	105	..
4G.	..	91	113	..	..	93	110	..
6G.	..	86	102	..	..	90	110	..

AVERAGES OF ABOVE COLUMNS—22, 73, 88, 107, 21, 77, 88, 106, 21.

TABLE IV.—CONTINUED.

No.	CAUCASIAN FEMALE.							
	Left Side.				Right Side.			
	Inferior end. o.	Middle end. o.	Superior end. o.	Superior terminal. mm.	Inferior end. o.	Middle end. o.	Superior end. o.	Superior terminal. mm.
1697	68	86	103	15	74	76	105	19
2G.	..	85	113	..	..	88	113	..
5G.	..	78	104	..	..	82	104	..

AVERAGES OF ABOVE COLUMNS—3, 68, 83, 107, 15, 74, 82, 107, 19.

NEGRO MALE.

1699	75	90	112	30	80	85	114	31
1701	79	91	105	17	82	88	105	14
1704	77	85	106	24	77	80	105	23
1706	65	78	102	15	65	83	104	28
1709	83	97	113	32	88	90	113	29
1711	78	92	111	40	73	87	108	40
1713	78	87	108	28	86	93	112	22
1718	..	89	108	..	..	89	108	..
1727	77	86	111	24	75	86	114	24
1728	77	90	110	10	76	88	104	10
1731	80	84	104	32	78	90	107	34
1736	77	95	119	32	71	88	114	32
1738	70	85	103	8	72	86	107	10
1739	77	84	120	35	82	89	116	33
1741	80	88	105	26	80	88	109	26
2521	70	81	105	24	79	81	103	16
2522	76	85	106	20	76	85	110	18
2524	75	84	105	12	80	84	103	12
2535	70	91	110	18	80	85	111	18
173	78	106	105	20	82	92	107	15
193	77	78	105	18	77	76	105	15
107	77	95	107	10	74	95	107	8
109	78	96	..116	20	85	90	110	16
110	..	..	..	..	90	100	114	20
1470	..	88	117	..	..	90	117	..
1190	..	90	110	..	..	90	105	..
1189	..	83	103	..	..	83	103	..

AVERAGES OF ABOVE COLUMNS—27, 76, 88, 108, 22.5, 77, 87, 108, 21.

TABLE IV.—CONTINUED.

NEGRO FEMALE.								
No.	Left Side.				Right Side.			
	Inferior end. °	Middle end. °	Superior end. °	Superior terminal. mm.	Inferior end. °	Middle end. °	Superior end. °	Superior terminal. mm.
1678	78	87	102	15	80	88	116	16
1700	78	90	107	21	80	86	107	21
1715	82	90	112	21	85	93	112	23
1722	78	90	120	24	78	79	117	20
1730	85	92	116	20	85	89	116	14
163	79	95	120	25	79	85	115	23
108	77	92	118	14	84	92	113	14
1515	..	85	108	..	..	83	102	..
1479	..	94	108	..	..	87	108	..
1500	..	78	105	..	..	72	112	..
1684	..	95	106	..	..	93	115	..

AVERAGES OF ABOVE COLUMNS—11, 80, 90, 111, 20, 81, 86, 112, 19.

TABLE V.—GIVING THE AREA OF THE OUTLINE OF THE BRAIN IN FRONT AND BEHIND THE FISSURE OF ROLANDO IN THE DIFFERENT PLANES (45°, 90°, and 0°) WHICH INTERSECT THE BRAIN AXIS. THE MEASUREMENTS ARE IN SQUARE CENTIMETERS.

CAUCASIAN MALE.													
No.	Total end.	Left Side.						Right Side.					
		Plane at 45°.		Horizontal Plane.		Vertical Plane.		Plane at 45°.		Horizontal Plane.		Vertical Plane.	
		Anterior.	Posterior.	Anterior.	Posterior.	Anterior.	Posterior.	Anterior.	Posterior.	Anterior.	Posterior.	Anterior.	Posterior.
1702	532.7	49.5	43.6	36.4	47.9	55.0	40.2	45.3	44.0	34.6	42.2	53.6	40.4
1707	572.6	47.7	49.4	40.0	50.0	57.2	45.0	47.2	48.1	41.4	48.4	55.4	42.5
1708	608.6	53.0	45.2	40.2	46.6	58.6	48.6	57.5	53.4	42.5	48.0	62.0	48.0
1712	679.8	46.8	50.2	35.6	53.2	60.2	41.8	47.0	55.8	39.0	48.7	59.5	42.0
1716	571.4	50.2	47.8	37.7	50.0	56.8	43.8	49.6	48.4	39.6	46.7	55.0	45.8
1719	630.0	47.8	58.5	35.2	55.5	64.4	51.0	52.8	56.2	41.0	58.0	64.0	50.6
1720	582.5	43.6	49.2	36.8	56.2	61.5	44.6	47.7	45.1	41.3	51.6	60.8	44.6
1723	559.5	46.6	48.0	34.7	49.2	57.8	40.8	49.3	47.8	34.7	49.6	56.0	45.0
1734	594.7	52.5	51.2	34.6	49.2	62.0	47.7	49.2	51.6	36.0	49.2	62.0	49.5
1748	689.9	62.7	52.8	43.5	59.1	125.5		60.3	59.1	44.6	62.1	71.5	48.7
1749	556.2	50.4	45.7	36.4	47.7	59.0	42.4	47.4	48.4	37.4	44.8	53.8	42.8
164	563.1	50.4	40.6	29.8	49.0	56.4	43.0	51.4	52.2	36.2	47.0	59.3	47.8
169	553.5	50.5	45.2	40.0	57.5	53.6	37.5	46.7	47.2	39.2	46.2	50.2	39.7
177	494.7	47.2	36.2	33.6	39.0	53.0	37.0	49.0	36.5	36.3	37.6	54.2	35.1
1490	631.2	55.0	53.0	100.0		69.0	45.0	57.5	51.3	88.4		66.4	45.4
1469	596.8	56.6	43.4	92.8		60.0	43.7	51.2	50.8	93.0		58.5	46.8
1455	614.2	62.0	44.0	90.0		62.5	44.2	60.6	48.8	91.7		71.0	39.4
1514	634.1	55.7	55.4	95.2		67.0	43.0	56.4	52.0	95.2		61.8	47.4
1G.	504.6	41.8	44.5	81.5		51.9	40.6	42.0	39.3	74.0		53.2	35.8
3G.	548.5	50.4	45.4	80.2		61.5	30.6	46.5	44.5	80.8		60.6	39.0
4G.	508.0	45.0	38.0	78.1		55.2	36.2	47.7	40.2	76.0		55.8	35.8
6G.	523.8	45.1	45.7	81.8		52.7	38.3	48.3		79.3	58.0	37.4	
Avg. 22	574.9	50.5	47.0	36.7	50.7	59.0	42.8	50.5	48.5	38.8	48.2	59.0	43.2

TABLE V.—CONTINUED.

CAUCASIAN FEMALE.														
	Left Side.						Right Side.							
		Plane at 45°.		Horizontal Plane.		Vertical Plane.			Plane at 45°.		Horizontal Plane.		Vertical Plane.	
No.	Total end.	Anterior.	Posterior.	Anterior.	Posterior.	Anterior.	Posterior.	Anterior.	Posterior.	Anterior.	Posterior.	Anterior.	Posterior.	
1697	475.3	41.4	36.8	30.3	45.3	47.5	35.0	36.8	42.2	32.0	43.5	48.7	35.8	
2G.	484.2	42.5	42.1		73.2	51.7	34.4	41.5	39.4		73.0	50.8	35.6	
5G.	434.6	35.0	37.1		71.4	45.3	28.4	37.5	35.6		70.3	46.0	28.0	
Avs. 3	464.4	39.6	38.7	30.3	45.3	48.2	32.6	38.6	39.1	32.0	43.5	48.5	33.1	
NEGRO MALE.														
1699	562.1	46.5	46.5	34.6	48.6	55.2	44.5	48.0	50.5	37.8	48.0	57.3	44.6	
1701	609.8	52.0	48.5	41.2	50.4	60.4	47.0	52.0	55.4	40.6	51.6	61.5	49.2	
1704	598.5	52.0	52.4	40.6	51.6	60.3	44.2	47.8	53.4	41.0	54.0	58.3	42.9	
1706	594.4	48.6	54.5	34.5	50.8	60.0	48.0	50.4	51.6	34.5	54.5	60.8	46.2	
1709	644.4	60.8	53.8	42.4	47.8	70.6	49.4	56.8	54.8	44.0	48.5	68.7	46.8	
1711	530.4	45.0	45.0	33.5	45.0	56.8	38.6	47.0	46.0	33.2	45.5	55.0	39.8	
1713	583.9	47.5	54.3	38.0	46.2	55.5	46.8	50.4	53.4	39.4	46.4	57.8	48.2	
1718	531.8	44.6	45.2		72.2	56.3	43.1	45.6	46.6		77.2	57.9	43.1	
1727	607.2	51.0	51.9	38.2	48.5	63.0	47.8	50.0	52.6	38.4	49.0	65.7	51.2	
1728	615.3	52.0	53.0	40.4	53.0	61.0	48.8	49.5	55.8	41.5	49.2	60.6	50.5	
1731	634.3	52.0	57.2	40.7	50.5	63.7	50.0	53.2	57.1	42.4	52.5	61.8	53.2	
1736	569.7	48.6	47.6	36.0	50.8	59.2	41.0	49.0	51.1	36.3	50.8	56.5	42.8	
1738	576.2	48.4	49.8	34.4	49.2	61.2	47.9	48.4	45.4	35.2	49.5	62.8	44.0	
2521	598.6	48.6	53.6	35.5	52.2	60.1	47.5	49.4	54.2	41.0	49.1	58.7	48.7	
2522	597.3	51.4	51.0	39.2	50.0	64.4	46.2	48.6	52.0	36.8	48.7	61.8	47.2	
2524	583.4	49.5	50.5	36.6	50.5	60.5	46.0	48.3	51.0	36.9	47.2	59.8	46.6	
2535	539.9	44.7	45.2	29.5	46.2	57.5	45.8	42.8	50.4	34.3	43.6	56.3	43.6	
173	582.1	54.7	41.0	37.7	47.4	60.3	43.5	52.8	50.0	39.1	47.0	62.0	46.6	
193	486.8	40.0	44.0	33.2	45.0	49.6	34.4	38.6	39.4	34.0	46.0	47.1	35.5	
1470	544.9	45.6	48.6		81.2	57.3	43.7	44.8	44.2		79.6	58.2	41.0	
1190	635.3	54.1	52.8		105.6	63.8	50.6	50.4	54.2		88.6	63.4	51.8	
1189	624.4	53.6	56.0		94.4	63.0	47.3	53.2	55.7		92.6	61.3	47.3	
Avs. 22	583.7	49.6	50.1	37.0	49.1	60.0	45.5	48.9	51.1	38.1	49.1	59.7	45.5	
NEGRO FEMALE.														
1678	512.1	42.5	47.0	31.5	42.5	50.0	44.0	42.0	45.2	32.0	40.6	55.8	39.0	
1700	549.5	47.4	44.5	35.7	47.0	55.0	40.4	46.6	49.2	39.7	47.2	55.0	41.8	
1715	449.9	36.7	36.2	29.2	32.8	45.8	36.4	37.8	39.5	32.7	37.8	47.3	37.7	
1722	490.4	41.0	41.6	33.3	43.3	51.2	35.2	37.6	47.3	32.0	41.4	47.9	36.8	
1730	456.4	37.0	35.4	31.6	38.7	48.8	32.8	37.8	41.0	30.4	39.8	49.3	33.8	
163	485.8	40.3	41.7	30.0	38.4	52.9	39.0	39.7	45.0	30.3	37.5	51.0	40.0	
1515	498.0	43.6	45.5		81.8	50.3	34.9	40.0	42.7		76.4	46.6	36.2	
1479	547.5	46.0	45.6		80.4	55.8	48.0	45.0	47.6		80.4	54.4	44.3	
1500	464.5	37.2	41.9		74.6	47.0	38.5	38.5	42.3		72.5	48.6	33.4	
1684	566.2	53.0	51.9		91.8	53.0	44.0	50.8	47.0		80.3	54.2	40.2	
Avs. 10	492.0	42.5	43.1	31.9	40.4	51.0	38.8	41.1	44.7	33.0	40.7	51.0	38.5	

TABLE VI.—AREA OF THE ANTERIOR AND POSTERIOR LINEAL HALVES OF THE CORPUS CALLOSUM IN SQUARE CENTIMETERS.

Negro Male.			Caucasian Male.			Negro Female.			Caucasian Female.		
No.	Anter-ior.	Poster-ior.	No.	Anter-ior.	Poster-ior.	No.	Anter-ior.	Poster-ior.	No.	Anter-ior.	Poster-ior.
1189	4.20	3.55	1216	4.45	3.40	1449	3.20	3.00	1485	1.80	2.50
1190	3.60	3.25	1405	3.85	3.05	1452d	3.50	3.00	1510	3.00	2.55
1246	2.95	3.40	1455	3.60	2.60	1459	3.20	2.85	1522	3.55	2.70
1451d	4.25	3.60	1457	3.05	2.75	1477	2.40	2.50	1527	3.60	3.55
1453	2.35	2.45	1458	3.90	3.25	1479	2.85	3.25	1583	3.60	3.70
1454	2.95	3.15	1463	4.10	3.10	1487	1.70	1.90	1692	3.70	3.00
1456	3.30	3.55	1469	2.35	2.20	1493	2.65	2.50	1697	3.20	2.15
1466m	3.50	3.50	1489	4.10	3.50	1500	2.25	2.05	Ger. 2	2.65	3.00
1467	3.05	3.35	1490	4.00	3.95	1501	2.70	3.35	“ 5	3.40	2.70
1470	2.50	2.75	1496	4.45	3.05	1515	2.40	2.55			
1472	2.05	2.25	1512	3.70	2.80	1521	3.30	3.40			
1473	2.60	2.75	1514	4.00	3.00	1544	3.35	3.00			
1476	2.80	2.70	1520	4.65	3.45	1653	3.70	4.10			
1478	3.20	3.50	1529	3.50	2.70	1659	2.10	2.90			
1480d	4.00	3.10	1538	3.80	3.00	1662	3.75	3.45			
1486	3.45	3.20	1591	3.60	3.10	1678	2.95	3.00			
1492	2.50	2.10	1682	3.90	3.10	1685	3.10	3.20			
1495	2.80	2.65	1683	3.05	3.03	1686	3.75	3.45			
1497	3.10	3.35	1690	4.10	3.55	1687m	2.60	2.20			
1502	2.80	2.75	1693	3.75	2.10	1695m	2.55	2.35			
1511	3.00	3.05	1696	4.10	3.35	1700	3.65	3.40			
1519	2.65	2.40	1702	3.60	2.85	1715	2.00	2.05			
1524m	3.35	2.55	1707	2.40	2.10	1722	2.70	2.70			
1528	4.50	4.70	1708	3.25	2.70	1730	2.60	2.70			
1530	3.45	3.55	1712	3.80	3.30	163	2.50	2.60			
1533	2.75	2.80	1716	2.65	2.40						
1582	2.80	2.80	1719	4.80	4.30						
1650m	4.00	3.80	1720d	3.80	3.75						
1660	3.50	3.40	1723	2.85	2.65						
1661	2.60	2.70	1734	3.80	3.40						
1667m	3.30	3.20	1748	4.30	3.80						
1680	2.15	2.15	1749	4.10	3.40						
1691	2.15	2.40	B. V. 164	3.20	2.60						
1699	3.50	2.85	“ 169	2.60	1.75						
1701	3.70	3.45	“ 177	2.85	2.15						
1704	3.45	3.70	Ger. 1	3.25	2.65						
1706	3.75	3.50	“ 3	4.30	3.50						
1709m	4.55	3.70	“ 4	3.20	2.60						
1711m	3.50	2.65	“ 6	2.90	2.40						
1713	3.55	3.50	Leidy.	6.00	5.10						
1718	3.75	3.85	Seguin.	4.20	3.90						
1727	3.70	3.65	Laborer, S.	2.90	2.30						
1728	3.20	3.60									
1731	4.10	4.40									
1736	2.90	2.90									
1738	2.80	2.60									
1739d	2.60	3.20									
2469d	3.15	2.75									
2521	2.40	2.50									
2522	3.05	3.40									
2524	3.50	3.30									
2535	3.10	3.10									
B. V. 87	3.50	3.10									
“ 172	3.10	3.30									
“ 173	3.25	3.65									
“ 193	2.20	2.10									
105	2.25	2.15									
107m	2.85	2.50									
109	1.30	1.50									
111	1.15	1.60									
112	1.05	1.35									
Laborer, S.	3.00	2.50									

d = distorted. m = mulatto.

TABLE VII.—RELATION OF THE PARTS OF THE CORPUS CALLOSUM TO ONE ANOTHER.

Negro Male.					Caucasian Male.					Caucasian Female.				
No.	Sple-nium.	Isth-mus.	Body	Genu.	No.	Sple-nium.	Isth-mus.	Body	Genu.	No.	Sple-nium	Isth-mus.	Body	Genu.
1189	200	105	145	310	1216	180	110	175	335	1485	130	90	90	160
1190	190	90	145	240	1405	155	100	175	300	1510	135	85	125	230
1246	225	75	130	210	1455	140	90	150	280	1522	150	95	135	260
1458	160	55	115	160	1457	175	85	140	220	1527	205	95	130	280
1454	165	95	140	220	1458	180	105	150	300	1583	200	100	130	270
1456	200	100	165	240	1463	165	115	115	330	1692	170	80	155	295
1466	205	115	160	235	1469	125	65	90	185	1697	100	75	135	245
1467	200	90	140	205	1489	160	120	170	310	2 G.	150	85	130	205
1470	160	75	105	195	1490	220	110	200	370	5 G.	155	65	125	255
1472	150	50	100	140	1496	155	85	175	335	R. 1	210	90	170	330
1473	170	70	110	170	1512	165	85	150	280	R. . .	180	100	160	240
1476	155	70	125	195	1514	180	80	140	300	R. 4	140	80	110	220
1478	200	80	155	220	1520	195	85	160	370	R. 6	160	90	150	240
1480	210	80	145	300	1529	140	85	140	260	R. 7	180	120	140	210
1486	195	80	155	245	1538	170	90	160	270	R. . .	110	40	80	170
1492	110	55	100	200	1591	185	95	150	260	R. . .	170	100	140	250
1495	160	65	135	210	1682	165	110	170	285	§	190	110	150	240
1497	210	85	160	220	1683	155	100	140	235	§ Kovalewski.				
1502	180	60	130	190	1690	195	100	170	315					
1511	190	80	130	210	1693	120	55	115	290					
1519	140	60	120	170	1696	190	90	165	305					
1524	135	90	155	220	1702	145	90	140	260					
1528	290	125	170	320	1707	110	70	100	190					
1530	225	70	150	235	1708	165	65	140	240					
1533	170	60	120	195	1712	175	125	145	275					
1582	180	70	120	190	1716	130	85	105	195	1449	170	90	140	220
1650	255	110	140	275	1719	225	135	205	340	1452	190	85	130	255
1660	200	85	170	255	1720	215	115	175	260	1459	175	70	140	225
1661	155	75	115	190	1723	185	100	120	205	1477	155	70	125	165
1667	210	60	120	220	1734	185	95	165	285	1479	210	80	125	200
1680	130	60	110	160	1748	205	125	170	320	1487	115	45	85	110
1691	155	75	95	150	1749	205	90	155	300	1493	160	65	95	200
1699	160	80	160	245	164	160	70	120	245	1500	120	55	100	160
1701	190	105	170	260	169	100	50	100	200	1501	220	85	135	185
1704	205	120	160	240	177	110	75	110	160	1515	160	65	110	165
1706	210	110	150	260	1 G.	135	90	125	255	1521	225	90	145	220
1709	200	100	210	315	3 G.	185	100	180	325	1544	190	95	150	230
1711	145	85	155	240	4 G.	140	85	140	235	1653	260	85	130	280
1713	200	100	160	255	6 G.	135	75	130	205	1659	180	80	125	140
1718	225	110	170	260	R. 3	170	110	170	230	1662	200	110	155	280
1727	210	85	150	260	R. 5	160	70	150	220	1678	185	60	145	205
1728	210	100	140	225	R. . .	190	90	140	280	1685	195	100	135	210
1731	215	145	185	285	R. . .	180	90	170	240	1686	210	110	140	260
1736	160	80	145	200	R. 16	200	130	180	330	1687	135	60	115	175
1738	145	80	105	195	R. 18	190	130	180	260	1695	135	80	130	155
2469	185	80	110	210	R. 20	210	100	160	310	1700	190	100	165	260
2521	145	70	110	175	R. 22	270	140	190	370	1715	100	65	90	155
2522	195	85	145	215	R. . .	140	90	140	250	1722	140	90	125	180
2524	195	90	155	235	R. 25	180	90	140	280	1730	155	70	120	190
2535	165	85	140	220	R. 28	200	80	160	280	163	145	65	120	170
87	180	90	120	210	R. 30	140	60	110	220					
172	200	100	120	230	R. . .	180	80	110	270					
173	185	110	160	230	R. 33	180	90	140	310					
193	120	55	95	165	R. 38	170	110	180	240					
105	145	65	100	155	*	260	120	170	290					
107	145	65	130	215	†	170	90	130	220					
109	80	40	60	90	‡	220	100	150	250					
111	95	40	55	70										
112	80	40	50	65	* Gylden.	† Siljestrom.	‡ Statesmen.							
114	110	60	85	180										
Avs. 60	176	81	133	212	57	172	76	149	272					

R = Retzius.