Racial Differences in the Range of Brain Capacity

By NATHANIEL WEYL

Various studies have shown consistent, but rather low, positive correlations between brain capacity and intelligence.[1] That such a relationship exists should surprise no one. Throughout the animal world there is a positive association between the mental ability of a species and its brain-weight-to-body-weight ratio. We find a similar progression in the various anthropoid apes, pre-hominids, hominids and *Homo erectus* and *Homo sapiens* types to Cro-Magnon man.[2] Brain growth parallels mental growth in the human child and by the time mental growth ceases brain growth has also ceased. There is evidence that microcephalic individuals—say those with brains of less than 900 c.c.—may be incapable of rational thought. Most primitive, vestigial races which have failed to make the transition from pre-literate to literate societies have very small brains. Thus, three studies made in the 1930s showed that adult male Bushmen have brains in the 930 c.c. to 1170 c.c. range.[3]

If these *prima facie* reasons exist for assuming a correlation between brain-size and intelligence, there are also good reasons for anticipating that the observed correlations would be low, as

[1] Eleven of these studies are reported by Leona E. Tyler, *The Psychology of Human Differences*, Appleton-Century-Crofts, New York, 1956, p. 422, and two others by Nathaniel Weyl and Stefan T. Possony, *The Geography of Intellect*, Henry Regnery Company, Chicago, 1963, pp. 57-58.

[2] Figures taken from E. Adamson Hoebel, *Man in the Primitive World*, McGraw-Hill, New York, 1958, show brain capacity in cubic centimeters rising from 450-700 for *Australopithecus*, to 1000 for *Pithecanthropus*, to 1325 for pre-Mousterian Neanderthals. Cro-Magnon man had a brain with about 1650 c.c. capacity.

Crossing the boundary lines not merely of species, but of orders, John C. Lilly has argued (*Man and Dolphin*, Doubleday, New York, 1961) that the dolphin (*Tursiops truncatus*) has a larger brain than man and more cells, folds, fissures, sulci and gyri in his cortex than man has. Dr Lilly advances the bold theory that *Tursiops* may possess parahuman intelligence, may have a language of his own and may be capable of learning human speech. A more pedestrian appraisal of *Tursiops*, whose intellectual powers are unquestionably very large within the animal range, will be found in Anthony Alpers, *Dolphins, Myth and Mammal*.

[3] R. Ruggles Gates, *Human Ancestry from a Genetical Point of View*, Harvard University Press, Cambridge, 1948, p. 160. The figures are taken from studies by Wells (1937) and Slome (1932) and are arithmetic means. Hence, the actual range must be considerably larger. I have converted Gates' figures for brain weight to volume by using 1.037 for brain density.

in fact they are. First, in considering the intelligence-to-brain-size relationship, adjustment should be made for the size of the individual. Ten to 12 per cent of the brain weight of modern man will vary directly with body size, whereas the other part of the brain will vary only slightly or not at all with body size.[4] Second, there is a slight positive correlation between brain size and the degree of brachycephalization.

In the third place and more fundamental is the fact that we are not primarily interested in the total weight or capacity of the brain, even after these adjustments have been made. What we would like ideally to have is the area of the flattened-out cerebral cortex. This, unfortunately, is unobtainable. In accepting total brain weight as a substitute, we are ignoring two major modifying factors. The first is the degree of fissurization of the brain.[5] The second is the ratio of the weight of the cerebral cortex to total brain weight.

Thus, in the case of the racially pure Negro, aggregate brain capacity probably averages about 10 per cent to 12 per cent less than among Caucasoids.[6] In addition, sulcification appears to be less marked: at least Gordon and Vint both found the convolutional patterns of the African brains they examined to be less complex than those of typical European brains.[7] Finally, Connolly found the frontal and occipital portions of the Negro brain to be proportionately smaller, and the parietal portion to be proportionately larger, than in white brains.[8] In the case of Australoids, Shellshear found "clear evidence of a lack of development of the precuneal, parietal, temporal and frontal regions, as shown by the general pattern of the sulci . . ."[9]

[4] H. J. Jerison, "Brain to Body Ratios and the Evolution of Intelligence," *Science*, Vol. CXX, No. 3144, 1955, pp. 447-449.

[5] The case of Anatole France, whose brain weighed only 1017 grams at death as against a normal weight of 1360 grams for a man of his height is generally advanced by those who deny that any significant association between intelligence and brain weight exists. However, long and tortuous convolutions and unusually complex foldings were found which would have made the area of his flattened-out brain much larger than one would have supposed on the basis of mere weight. L. Guillon *et al, Bulletin Académie Médecine,* Vol. XCI, 1927, pp. 328-336.

[6] There are exceptions. Thus, O. H. Klineberg, *Race Differences,* New York, 1935, reported average brain weights of 1460 c.c. for the Kaffirs, a tall Negro people inhabiting a temperate upland area.

[7] H. L. Gordon, "Amentia in the East African," *Eugenics Review*, Vol. 25, January 1934, pp. 225-231; and F. W. Vint, "The Brain of the Kenya Native." *Journal of Anatomy,* Vol. LXVIII, Cambridge, 1934, pp. 216-222.

[8] Cornelius J. Connolly, *External Morphology of the Primate Brain,* C. C. Thomas, Springfield, 1950, p. 146.

[9] J. L. Shellshear, "The Brain of the Aboriginal Australian. A Study in Cerebral Morphology," *Phil. Trans. Royal Society*, London, Series B, 227:293-409.

The final qualification to be made concerning the association between brain size and intelligence is that possession of an extraordinarily large brain may cause birth trauma or subsequent damage.

As for injuries at birth, Lightwood and MacGregor in a standard British medical text estimate that intracranial injury is responsible for about 24 per cent of stillbirths and 28 per cent of neonatal deaths. Cases of slight subdural or subarachnoid bleeding can be saved, but "a cautious prognosis must be given for those infants who survive" for "mental retardation or other neurological sequels may occur . . ."[10]

Other things being equal, the larger the brain the greater the danger of birth trauma. It is not at all impossible that some of the cases on record of mentally defective individuals with giant brains may represent unfortunates whose exceptional genetic endowment in terms of intelligence was crippled by the act of being born.

A pint of blood must circulate through the normal adult brain every 60 seconds, carrying oxygen and glucose. The average healthy adult brain of modern man consumes 25 per cent of total oxygen intake as against only about half that proportion in the case of anthropoid apes. An exceptionally large and powerful brain will make more than average demands on the organism for blood, oxygen and sugar. As long ago as 1917, Havelock Ellis suggested that a large brain may be "a perilous possession."[11]

Toward the end of the last century, fantastically large brains were reported, often on the basis of inadequate evidence and measuring techniques of dubious competence. David Wechsler, designer of the Wechsler-Bellevue Intelligence Scale, urged almost 25 years ago that many of these claims should be dismissed as unprovable and asserted that the largest authenticated brain on record was that of the great Russian novelist, Ivan Turgenev (2015 grams). Oliver Cromwell's brain allegedly weighed 2231 grams and Lord Byron's 2200 grams, but these figures have been rejected by Spitzka.[12] "It is to be noted that 'heavy' brains have generally been those of men of genius . . ." Wechsler concluded.[13]

The apparent fact that very large brains are most commonly found among men of genius (though they are also sometimes

[10] Geoffrey Evans (editor), *Medical Treatment, Principles and Their Application*, Butterworth, London, 1951, pp. 434-435.

[11] Havelock Ellis, *Man and Woman*, Scribner's, New York, 1917, p. 128.

[12] Havelock Ellis, *op cit.*, p. 128, states that the largest brain recorded was described in Holland in 1899 (G. C. van Walsem, *Neurolog. Centralbl.*, July 1, 1899) weighed 2850 grams and belonged to "an epileptoid idiot."

[13] David Wechsler, *The Measurement of Adult Intelligence*, Williams and Wilkins, Baltimore, 1941, p. 89.

encountered among apparently average, or, for that matter, mentally defective, people) suggests that an examination of the *range* of brain capacity may be more significant than an examination of *average* brain sizes. If there is a strong correlation between the production of very large brains and the production of genius, then the strength of intellectual élites will be indicated by high proportions of macrocephalic individuals in a population.

With this thought in mind, I made a cursory examination of the brain size tables in Karl Saller's great source book on anthropology.[14] Dr Saller reproduces the ranges and arithmetic means of 32 series on adult male brain capacity, as measured by the shot method. Of these, 15 are European, five African, five Asian, six Oceanian and one American. A later table gives 21 other series, measured by the grain and water method, which generally yields about 80 c.c. less than the shot method. Of these, nine are European, six Oceanian, four Asian and two American.

When the shot series are arranged in rank order according to the largest individual brains in each, we get the picture shown in Table I.

The table reveals interesting differences. We find that Europeans are in the first nine places and that the lowest European group ranks 20th out of 32 groups. The four series with individual brains of 1900 c.c. and over and the four series with brains above 1800 c.c. are all European. The spread between the largest European brain (1990 c.c.) and the largest non-European brain (1799 c.c.) is almost 200 c.c. The series with individual brains in the 1700 to 1800 c.c. range are, in three instances, primarily Caucasoid (Polynesians and Egyptians of the fourth and tenth Dynasties); Caucasoid or Australoid in one instance (Ainu); and Mongoloid in one case (Javanese). The lowest ranking groups are Australoids, Negroids and Polynesians (Tasmania, Australia, Nubians and Moriori Islanders).

On the whole, the European series have larger ranges. The unweighted average range of the 15 European groups is 555 c.c., that of the 17 non-European groups is 376 c.c.[15]

The differences between the arithmetic means are much less marked than those between the largest individual brains. Of the ten groups with the largest average brains, eight are European. The list is: Auvergnois, 1609 c.c.; Merovingians, 1596 c.c.; Javanese, 1590 c.c.; Spanish Basques, 1584 c.c.; Lower Brittany, 1564 c.c.; Parisians, 1559 c.c.; Valais Swiss, 1546 c.c.; French Basques 1544 c.c.; Savoyards 1538 c.c.; and Eskimos, 1535 c.c.

[14] Karl Saller, *Lehrbuch der Anthropologie in systematischer Darstellung*, Gustav Fischer Verlag, Stuttgart, Volume II, 1959, pp. 1210-1211.

[15] The ranges are 471 c.c. for the Asians, 385 c.c. for the Africans (including two Dynastic Egyptian groups), 351 c.c. for the Oceanians and 206 c.c. for the Eskimos.

TABLE 1

Brain capacities by shot method (in c.c.)

	Origin	*Largest brain*	*Average brain*	*Source*
1.	Tyrol	1990	1508	Tappeiner
2.	Spanish Basques*	1932	1584	Pittard
3.	French Basques*	1932	1544	Pittard
4.	Swiss (Valais)	1930	1546	Broca
5.	Parisians	1900	1559	Broca
6.	Auvergnois	1894	1609	Broca
7.	Lower Brittany	1887	1564	Broca
8.	Scots	1855	1478	Broca
9.	French (Cave of Baye)	1854	1534	Broca
10.	Javanese	1799	1590	Broca
11.	Gauls	1775	1529	Broca
12.	Parisians (12th century)	1775	1531	Broca
13.	Polynesians	1742	1500	Broca
14.	Merovingians	1727	1596	Broca
15.	Maori	1725	1476	Scott
16.	Savoyards	1712	1538	Broca
17.	Ainu	1705	1462	Kogänei
18.	Egyptians (4th Dynasty)*	1700	1532	Broca
19.	Egyptians (10th Dynasty)*	1700	1443	Broca
20.	Dutch	1680	1530	Broca
21.	Chinese	1674	1518	Broca
22.	Alsatians	1635	1501	Broca
23.	New Caledonians	1632	1460	Broca
24.	Japanese	1630	1485	Adachi
25.	Arabs	1628	1474	Broca
26.	Negroes	1627	1462	Broca
27.	Eskimos	1624	1535	Broca
28.	Hottentots and Bushmen	1620	1317	Broca
29.	Tasmanians	1518	1406	Broca
30.	Australian Aborigines	1507	1347	Broca
31.	Nubians	1429	1329	Broca
32.	Moriori	1416	1455	Scott

*Same range, but different arithmetic means.

The advantage of the European groups in respect to macrocephalic individuals is less visible in the nine European and 12 non-European groups measured by the grain and water method for which ranges are shown. The 11 ranking groups (with maxima in c.c.) are: Tyrol, 2020; Czechs, 1800; Maori, 1795; Upper Bavaria, 1780; Eskimo, 1775; Swiss, 1760; Loyalty Islanders, 1755; "Telengets," 1740; Saxons and Tahitians tied at 1720. Of

these leading groups, six are European and five non-European. Of the non-European series, the Maori, Tahitians and Loyalty Islanders are, of course, Polynesians. The other two are northern Mongoloids if one can safely assume that the German word *Telengets* refers to the Teleuts, a branch of the Altai Tartars inhabiting the Kuznetz district of Siberia.

Obviously firm conclusions concerning the extent of difference in the proportion of macrocephalic individuals among different races and peoples cannot be drawn from this brief and impressionistic presentation. A large number of series on brain capacity should be compared in terms of range, deciles, standard deviations and size and reliability of samples. The data presented here merely suggests that large and significant differences may well exist. If so, their extent should be determined and their causes investigated.

The "Collective" Soul: Part III

By RICHARD SWARTZBAUGH

CULTURE IN SPACE (continued)

Individual space is that space each person considers his own. It is movable and follows him around — like his shadow or the shell of a snail. He is never "outside" it. Whoever enters this space from outside must enter on the owner's terms, or else the space is annihilated. The barbarians differ from inner spacemen with respect to individual space in that they lack a defined collective space and emphasize in its place movable individual space. Outer spacemen dislike crowding. For instance, Hall[1] said that the European or American, in face-to-face relations with foreigners, often feels that his space is violated. The foreigner feels uncomfortable communicating with him from a distance and will crowd him. The latter tends to back away in repugnance. Also, the Europeans and Americans dislike packing their houses together when there is room to spread out. The Germans of Tacitus' time[2] lived in widely scattered houses.* Even many Europeans of today have in common with Americans the fact that they find suburban houses preferable to houses in the center of the city. Amongst savages, closely packed community life is most desirable. In civilizations, the wealthier citizens reflect the public ideal by living close to the center of the town.

Collective space is space defended by an alliance of individuals, or a group. The group is a defensive alliance by definition, since the outer spaceman, the traditional aggressor, does not have the collective space. Even when a savage or civilized group takes the offensive in a territorial war, a chief objective in this war usually is a buffer area against outside groups, not an addition to its own inner space. The inner spaceman wants security above all.

Collective space is potentially movable. However, movement of territory, or migration, always reflects, for the inner spaceman, a deviation from the ideal: he wants to stay where he is. The outer spaceman on the other hand, restlessly moves out over territorial boundaries, both those he has temporarily erected around himself or those put up by other peoples. This is not to

[1] Edward Hall, *The Silent Language,* Fawcett, Greenwich, Connecticut, 1959, pp. 146-164.

[2] K. F. Reinhardt, *Germany: 2000 Years,* Ungar, New York, 1966, p. 8.

* The Germanic peoples lived in agglomerated settlements, as distinct from the Slavonic *strassendorf* (street village) and the Celtic scattered isolated settlements.—EDITOR.