Samuel George Morton

Empiricist of Polygeny

Excerpt from the *Mismeasure of Man*

Stephen Jay Gould

Agassiz did not spend all his time in Philadelphia reviling black waiters. In the same letter to his mother, he wrote in glowing terms of his visit to the anatomical collection of Philadelphia's distinguished scientist and physician Samuel George Morton: "Imagine a series of 600 skulls, most of Indians from all tribes who inhabit or once inhabited all of America. Nothing like it exists anywhere else. This collection, by itself, is worth a trip to America" (Agassiz to his mother,

December 1846, translated from the original letter in Houghton Library, Harvard University).

Agassiz speculated freely and at length, but he amassed no data to support his polygenic theory. Morton, a Philadelphia patrician with two medical degrees—one from fashionable Edinburgh—provided the "facts" that won worldwide respect for the "American school" of polygeny. Morton began his collection of human skulls in the 1820s; he had more than one thousand when he died in 1851. Friends (and enemies) referred to his great charnel house as "the American Golgotha."

Morton won his reputation as the great data-gatherer and objectivist of American science, the man who would raise an immature enterprise from the mires of fanciful speculation. Oliver Wendell Holmes praised Morton for "the severe and cautious character" of his works, which "from their very nature are permanent data for all future students of ethnology" (in Stanton, 1960, p. 96). The same Humboldt who had asserted the inherent equality of all races wrote:

> The craniological treasures which you have been so fortunate as to unite in your collection, have in you found a worthy interpreter. Your work is equally remarkable for the profundity of its anatomical views, the numerical detail of the relations of organic conformation, and the absence of those poetical reveries which are the myths of modern physiology (in Meigs, 1851, p. 48).

When Morton died in 1851, the *New York Tribune* wrote that "probably no scientific man in America enjoyed a higher reputation among scholars throughout the world, than Dr. Morton" (in Stanton, 1960, p. 144).

Yet Morton gathered skulls neither for the dilettante's motive of abstract interest nor the taxonomist's zeal for complete representation. He had a hypothesis to test: that a ranking of races

could be established objectively by physical characteristics of the brain, particularly by its size. Morton took a special interest in native Americans. As George Combe, his fervent friend and supporter, wrote:

> One of the most singular features in the history of this continent, is, that the aboriginal races, with few exceptions, have perished or constantly receded, before the Anglo-Saxon race, and have in no instance either mingled with them as equals, or adopted their manners and civilization. These phenomena must have a cause; and can any inquiry be at once more interesting and philosophical than that which endeavors to ascertain whether that cause be connected with a difference in the brain between the native American race, and their conquering invaders (Combe and Coates, in review of Morton's *Crania Americana*, 1840, p. 352).

Moreover, Combe argued that Morton's collection would acquire true scientific value *only* if mental and moral worth could be read from brains: "If this doctrine be unfounded, these skulls are mere facts in Natural History, presenting no particular information as to the mental qualities of the people" (from Combe's appendix to Morton's *Crania Americana*, 1839, p. 275).

Although he vacillated early in his career, Morton soon became a leader among the American polygenists. He wrote several articles to defend the status of human races as separate, created species. He took on the strongest claim of opponents—the interfertility of all human races—by arguing from both sides. He relied on travelers' reports to claim that some human races—Australian aborigines and Caucasians in particular—very rarely produce fertile offspring (Morton, 1851). He attributed this failure to "a disparity of primordial organization." But, he continued, Buffon's criterion of interfertility must be abandoned in any case, for hybridization is common in nature, even between species belonging to different genera (Morton, 1847, 1850). Species must be redefined as "a primordial organic form" (1850, p. 82). "Bravo, my

dear Sir," wrote Agassiz in a letter, "you have at last furnished science with a true philosophical definition of species" (in Stanton, 1960, p. 141). But how to recognize a primordial form? Morton replied: "If certain existing organic types can be traced back into the 'night of time,' as dissimilar as we see them now, is it not more reasonable to regard them as aboriginal, than to suppose them the mere and accidental derivations of an isolated patriarchal stem of which we know nothing?" (1850, p. 82). Thus, Morton regarded several breeds of dogs as separate species because their skeletons resided in the Egyptian catacombs, as recognizable and distinct from other breeds as they are now. The tombs also contained blacks and Caucasians. Morton dated the beaching of Noah's Ark on Ararat at 4,179 years before his time, and the Egyptian tombs at just 1,000 years after that —clearly not enough time for the sons of Noah to differentiate into races. (How, he asks, can we believe that races changed so rapidly for 1,000 years, and not at all for 3,000 years since then?) Human races must have been separate from the start (Morton, 1839, p. 88).

But separate, as the Supreme Court once said, need not mean unequal. Morton therefore set out to establish relative rank on "objective" grounds. He surveyed the drawings of ancient Egypt and found that blacks are invariably depicted as menials—a sure sign that they have always played their appropriate biological role: "Negroes were numerous in Egypt, but their social position in ancient times was the same that it is now, that of servants and slaves" (Morton, 1844, p. 158). (A curious argument, to be sure, for these blacks had been captured in warfare; sub-Saharan societies depicted blacks as rulers.)

But Morton's fame as a scientist rested upon his collection of skulls and their role in racial ranking. Since the cranial cavity of a human skull provides a faithful measure of the brain it once contained, Morton set out to rank races by the average sizes of their brains. He filled the cranial cavity with sifted white mustard seed, poured the

seed back into a graduated cylinder and read the skull's volume in cubic inches. Later on, he became dissatisfied with mustard seed because he could not obtain consistent results. The seeds did not pack well, for they were too light and still varied too much in size, despite sieving. Remeasurements of single skulls might differ by more than 5 percent, or 4 cubic inches in skulls with an average capacity near 80 cubic inches. Consequently, he switched to one-eighth-inch-diameter lead shot "of the size called BB" and achieved consistent results that never varied by more than a single cubic inch for the same skull.

Morton published three major works on the sizes of human skulls—his lavish, beautifully illustrated volume on American Indians, the *Crania Americana* of 1839; his studies on skulls from the Egyptian tombs, the *Crania Aegyptiaca* of 1844; and the epitome of his entire collection in 1849. Each contained a table, summarizing his results on average skull volumes arranged by race. I have reproduced all three tables here (Tables 2.1 to 2.3). They represent the major contribution of American polygeny to debates about racial ranking. They outlived the theory of separate creations and were reprinted repeatedly during the nineteenth century as irrefutable, "hard" data on the mental worth of human races (see p. 116). Needless to say, they matched every good Yankee's prejudice—whites on top, Indians in the middle, and blacks on the bottom; and, among whites, Teutons and Anglo-Saxons on top, Jews in the middle, and Hindus on the bottom. Moreover, the pattern had been stable throughout recorded history, for whites had the same advantage over blacks in ancient Egypt. Status and access to power in Morton's America faithfully reflected biological merit. How could sentimentalists and egalitarians stand against the dictates of nature? Morton had provided clean, objective data based on the largest collection of skulls in the world.

Table 2.1 Morton's summary table of cranial capacity by race

		INTERNAL CAPACITY (in^3)		
RACE	*N*	MEAN	LARGEST	SMALLEST
Caucasian	52	87	109	75
Mongolian	10	83	93	69
Malay	18	81	89	64
American	144	82	100	60
Ethiopian	29	79	94	65

Table 2.2 Cranial capacities for skulls from Egyptian tombs

PEOPLE	MEAN CAPACITY (in^3)	*N*
Caucasian		
Pelasgic	88	21
Semitic	82	5
Egyptian	80	39
Negroid	79	6
Negro	73	1

During the summer of 1977 I spent several weeks reanalyzing Morton's data. (Morton, the self-styled objectivist, published all his raw information. We can infer with little doubt how he moved from raw measurements to summary tables.) In short, and to put it bluntly, Morton's summaries are a patchwork of fudging and finagling in the clear interest of controlling a priori convictions. Yet—and this is the

most intriguing aspect of the case—I find no evidence of conscious fraud; indeed, had Morton been a conscious fudger, he would not have published his data so openly.

Table 2.3 Morton's final summary of cranial capacity by race

Races and Families	*N*	Cranial capacity (in^3)			
		Largest	Smallest	Mean	Mean
		Modern Caucasian Group			
Teutonic Family					
Germans	18	114	70	90	92
English	5	105	91	96	
Anglo-Americans	7	97	82	90	
Pelasgic Family	10	94	75	84	
Celtic Family	6	97	78	87	
Indostanic Family	32	91	67	80	
Semitic Family	3	98	84	80	
Nilotic Family	17	96	66	80	
		Ancient Caucasian Group			
Pelasgic Family	18	97	74	88	
Nilotic Family	55	96	68	80	
		Mongolian Group			
Chinese Family	6	91	70	82	
		Malay Group			
Malayan Family	20	97	68	86	85
Polynesian Family	3	84	82	83	
		American Group			
Toltecan Family					
Peruvians	155	101	58	75	79
Mexicans	22	92	67	79	
Barbarous Tribes	161	104	70	84	
		Negro Group			
Native African Family	62	99	65	83	83
American-born Negroes	12	89	73	82	
Hottentot Family	3	83	68	75	
Australians	8	83	63	75	

Conscious fraud is probably rare in science. It is also not very interesting, for it tells us little about the nature of scientific activity. Liars, if discovered, are excommunicated; scientists declare that their profession has properly policed itself, and they return to work,

mythology unimpaired, and objectively vindicated. The prevalence of unconscious finagling, on the other hand, suggests a general conclusion about the social context of science. For if scientists can be honestly self-deluded to Morton's extent, then prior prejudice may be found anywhere, even in the basics of measuring bones and toting sums.

The case of Indian inferiority: Crania Americana[1]

Morton began his first and largest work, the *Crania Americana* of 1839, with a discourse on the essential character of human races. His statements immediately expose his prejudices. Of the "Greenland esquimaux," he wrote: "They are crafty, sensual, ungrateful, obstinate and unfeeling, and much of their affection for their children may be traced to purely selfish motives. They devour the most disgusting aliments uncooked and uncleaned, and seem to have no ideas beyond providing for the present moment. . . . Their mental faculties, from infancy to old age, present a continued childhood. . . . In gluttony, selfishness and ingratitude, they are perhaps unequalled by any other nation of people" (1839, p. 54). Morton thought little better of other Mongolians, for he wrote of the Chinese (p. 50): "So versatile are their feelings and actions, that they have been compared to the monkey race, whose attention is perpetually changing from one object to another." The Hottentots, he claimed (p. 90), are "the nearest approximation to the lower animals. . . . Their complexion is a yellowish brown, compared by travellers to the peculiar hue of Europeans in the last stages of jaundice. . . . The women are represented as even more repulsive in appearance than the men." Yet, when Morton had to describe one Caucasian tribe as a "mere horde of rapacious banditti" (p. 9), he quickly added that "their moral

[1] This account omits many statistical details of my analysis. The complete tale appears in Gould, 1978. Some passages in pp. 88-101 are taken from this article.

perceptions, under the influence of an equitable government, would no doubt assume a much more favorable aspect."

Morton's summary chart (Table 2.1) presents the "hard" argument of the *Crania Americana*. He had measured the capacity of 144 Indian skulls and calculated a mean of 82 cubic inches, a full 5 cubic inches below the Caucasian norm (Figs. 2.4 and 2.5). In addition, Morton appended a table of phrenological measurements indicating a deficiency of "higher" mental powers among Indians. "The benevolent mind," Morton concluded (p. 82), "may regret the inaptitude of the Indian for civilization," but sentimentality must yield to fact. "The structure of his mind appears to be different from that of the white man, nor can the two harmonize in the social relations except on the most limited scale." Indians "are not only averse to the restraints of education, but for the most part are incapable of a continued process of reasoning on abstract subjects" (p. 81).

Since *Crania Americana* is primarily a treatise on the inferior quality of Indian intellect, I note first of all that Morton's cited average of 82 cubic inches for Indian skulls is incorrect. He separated Indians into two groups, "Toltecans" from Mexico and South America, and "Barbarous Tribes " from North America. Eighty-two is the average for Barbarous skulls; the total sample of 144 yields a mean of 80.2 cubic inches, or a gap of almost 7 cubic inches between Indian and Caucasian averages. (I do not know how Morton made this elementary error. It did permit him, in any case, to retain the conventional chain of being with whites on top, Indians in the middle, and blacks on the bottom.)

But the "correct" value of 80.2 is far too low, for it is the result of an improper procedure. Morton's 144 skulls belong to many different groups of Indians; these groups differ significantly among themselves in cranial capacity. Each group should be weighted equally, lest the final average be biased by unequal size of subsamples. Suppose, for

example, that we tried to estimate average human height from a sample of two jockeys, the author of this book (strictly middling stature), and all the players in the National Basketball Association. The hundreds of Jabbars would swamp the remaining three and give an average in excess of six and a half feet. If, however, we averaged the averages of the three groups (jockeys, me, and the basketball players), then our figure would lie closer to the true value. Morton's sample is strongly biased by a major overrepresentation of an extreme group—the small-brained Inca Peruvians. (They have a mean cranial capacity of 74.36 cubic inches and provide 25 percent of the entire sample). Large-brained Iroquois, on the other hand, contribute only 3 skulls to the total sample (2 percent). If, by the accidents of collecting, Morton's sample had included 25 percent Iroquois and just a few Incas, his average would have risen substantially. Consequently, I corrected this bias as best I could by averaging the mean values for all tribes

This revised value is still more than 3 cubic inches from the Caucasian average. Yet, when we examine Morton's procedure for computing the Caucasian mean, we uncover an astounding inconsistency. Since statistical reasoning is largely a product of the last one hundred years, I might have excused Morton's error for the Indian mean by arguing that he did not recognize the biases produced by unequal sizes among subsamples. But now we discover that he understood this bias perfectly well—for Morton calculated his high Caucasian mean by consciously eliminating small-brained Hindus from his sample. He writes (p. 261): "It is proper, however, to mention that but 3 Hindoos are admitted in the whole number, because the skulls of these people are probably smaller than those of any other existing nation. For example, 17 Hindoo heads give a mean of but 75 cubic inches; and the three received into the table are taken at that average." Thus, Morton included a large subsample of small-brained people (Inca Peruvians) to pull down the Indian average, but excluded just as

many small Caucasian skulls to raise the mean of his own group. Since he tells us what he did so baldly, we must assume that Morton did not deem his procedure improper. But by what rationale did he keep Incas and exclude Hindus, unless it were the a priori assumption of a truly higher Caucasian mean? For one might then throw out the Hindu sample as truly anomalous, but retain the Inca sample (with the same mean as the Hindus, by the way) as the lower end of normality for its disadvantaged larger group.

I restored the Hindu skulls to Morton's sample, using the same procedure of equal weighting for all groups. Morton's Caucasian sample, by his reckoning, contains skulls f r om four subgroups, so Hindus should contribute one-fourth of all skulls to the sample. If we restore all seventeen of Morton's Hindu skulls, they form 26 percent of the total sample of sixty-six. The Caucasian mean now drops to 84.45 cubic inches, for no difference worth mentioning between Indians and Caucasians. (Eskimos, despite Morton's low opinion of them, yield a mean of 86.8, hidden by amalgamation with other subgroups in the Mongol grand mean of 83). So much for Indian inferiority.

The case of the Egyptian catacombs: Crania Aegyptiaca

Morton's friend and fellow polygenist George Gliddon was United States consul for the city of Cairo. He dispatched to Philadelphia more than one hundred skulls from tombs of ancient Egypt, and Morton responded with his second major treatise, the *Crania Aegyptiaca* of 1844. Morton had shown, or so he thought, that whites surpassed Indians in mental endowment. Now he would crown his story by demonstrating that the discrepancy between whites and blacks was even greater, and that this difference had been stable for more than three thousand years.

Morton felt that he could identify both races and subgroups among races from features of the skull (most anthropologists today would deny that such assignments can be made unambiguously). He divided his Caucasian skulls into Pelasgics (Hellenes, or ancient Greek forebears), Jews, and Egyptians—in that order, again confirming Anglo-Saxon preferences (Table 2.2). Non-Caucasian skulls he identified either as "negroid" (hybrids of Negro and Caucasian with more black than white) or as pure Negro.

Morton's subjective division of Caucasian skulls is clearly unwarranted, for he simply assigned the most bulbous crania to his favored Pelasgic group and the most flattened to Egyptians; he mentions no other criteria of subdivision. If we ignore his threefold separation and amalgamate all sixty-five Caucasian skulls into a single sample, we obtain an average capacity of 82.15 cubic inches. (If we give Morton the benefit of all doubt and rank his dubious subsamples equally—as we did in computing Indian and Caucasian means for the *Crania Americana*—we obtain an average of 83.3 cubic inches.)

Either of these values still exceeds the negroid and Negro averages substantially. Morton assumed that he had measured an innate difference in intelligence. He never considered any other proposal for the disparity in average cranial capacity—though another simple and obvious explanation lay before him.

Sizes of brains are related to the sizes of bodies that carry them: big people tend to have larger brains than small people. This fact does not imply that big people are smarter—any more than elephants should be judged more intelligent than humans because their brains are larger. Appropriate corrections must be made for differences in body size. Men tend to be larger than women; consequently, their brains are bigger. When corrections for body size are applied, men and women have brains of approximately equal size. Morton not only

failed to correct for differences in sex or body size; he did not even recognize the relationship, though his data proclaimed it loud and clear. (I can only conjecture that Morton never separated his skulls by sex or stature—though his tables record these data—because he wanted so much to read differences in brain size directly as differences in intelligence.)

Many of the Egyptian skulls came with mummified remains of their possessors (Fig. 2.6), and Morton could record their sex unambiguously. If we use Morton's own designations and compute separate averages for males and females (as Morton never did), we obtain the following remarkable result. Mean capacity for twenty-four male Caucasian skulls is 86.5 cubic inches; twenty-two female skulls average 77.2 (the remaining nineteen skulls could not be identified by sex). Of the six negroid skulls, Morton identified two as female (at 71 and 77 cubic inches) and could not allocate the other four (at 77, 77, 87, and 88).[2] If we make the reasonable conjecture that the two smaller skulls (77 and 77) are female, and the two larger male (87 and 88), we obtain a male negroid average of 87.5, slightly above the Caucasian male mean of 86.5, and a female negroid average of 75.5, slightly below the Caucasian value of 77.2. The apparent difference of 4 cubic inches between Morton's Caucasian and negroid samples may only record the fact that about half his Caucasian sample is male, while only one-third the negroid sample may be male. (The apparent difference is magnified by Morton's incorrect rounding of the negroid average down to 79 rather than up to 80. As we shall see again, all of Morton's minor numerical errors favor his prejudices.) Differences in average brain size between Caucasians and negroids in the Egyptian

[2] In his final catalogue of 1849, Morton guessed at sex (and age within five years!) for all crania. In this later work, he specifies 77, 87, and 88 as male, and the remaining 77 as female. This allocation was pure guesswork; my alternate version is equally plausible. In the *Crania Aegyptiaca* itself, Morton was more cautious and only identified sex for specimens with mummified remains.

tombs only record differences in stature due to sex, not variation in "intelligence." You will not be surprised to learn that the single pure Negro skull (73 cubic inches) is a female.

Table 2.4 Cranial capacity of Indian groups ordered by Morton's assessment of body stature

Stature and group	Cranial capacity (in^3)	*N*
Large		
Seminole-Muskogee	88.3	8
Chippeway and related groups	88.8	4
Dacota and Osage	84.4	7
Middle		
Mexicans	80.2	13
Menominee	80.5	8
Mounds	81.7	9
Small		
Columbia River Flatheads	78.8	10
Peruvians	74.4	33

The correlation of brain and body also resolves a question left hanging in our previous discussion of the *Crania Americana*: What is the basis for differences in average brain size among Indian peoples? (These differences bothered Morton considerably, for he could not understand how small-brained Incas had built such an elaborate civilization, though he consoled himself with the fact of their rapid conquest by the conquistadores). Again, the answer lay before him, but Morton never saw it. Morton presents subjective data on bodily statures in his descriptions of the various tribes, and I present these

assessments along with average brain sizes in Table 2.4. The correlation of brain and body size is affirmed without exception. T h e low Hindu mean among Caucasians also records a difference in stature, not another case of dumb Indians.

The case of the shifting black mean

In the *Crania Americana*, Morton cited 78 cubic inches as the average cranial capacity for blacks. Five years later, in the *Crania Aegyptiaca*, he appended the following footnote to his table of measurements: "I have in my possession 79 crania of Negroes born in Africa . . . . Of the whole number, 58 are adult . . . and give 85 cubic inches for the average size of the brain" (1844, p. 113).

Since Morton had changed his method of measurement from mustard seed to lead shot between 1839 and 1844, I suspected this alteration as a cause for the rising black mean. Fortunately, Morton remeasured most of his skulls personally, and his various catalogues present tabulations of the same skulls by both seed and shot (see Gould, 1978, for details).

I assumed that measures by seed would be lower. Seeds are light and variable in size, even after sieving. Hence, they do not pack well. By vigorous shaking or pressing of the thumb at the foramen magnum (the hole at the base of a skull), seeds can be made to settle, providing room for more. Measures by seed were very variable; Morton reported differences of several cubic inches for recalibrations of the same skull. He eventually became discouraged, fired his assistants, and redid all his measurements personally, with lead shot. Recalibrations never varied by more than a cubic inch, and we may accept Morton's judgment that measures by shot were objective, accurate, and repeatable—while earlier measures by seed were highly subjective and erratic.

I then calculated the discrepancies between seed and shot by race. Shot, as I suspected, always yielded higher values than seed. For 111 Indian skulls, measured by both criteria, shot exceeds seed by an average of 2.2 cubic inches. Data are not as reliable for blacks and Caucasians because Morton did not specify individual skulls for these races in the *Crania Americana* (measured by seed). For Caucasians, 19 identifiable skulls yield an average discrepancy of only 1.8 cubic inches for shot over seed. Yet 18 African skulls, remeasured from the sample reported in *Crania Americana*, produce a mean by shot of 83.44 cubic inches, a rise of 5.4 cubic inches from the 1839 average by seed. In other words, the more "inferior" a race by Morton's a priori judgment, the greater the discrepancy between a subjective measurement, easily and unconsciously fudged, and an objective measure unaffected by prior prejudice. The discrepancy for blacks, Indians, and Caucasians is 5.4, 2.2, and 1.8 cubic inches, respectively.

Plausible scenarios are easy to construct. Morton, measuring by seed, picks up a threateningly large black skull, fills it lightly and gives it a few desultory shakes. Next, he takes a distressingly small Caucasian skull, shakes hard, and pushes mightily at the foramen magnum with his thumb. It is easily done, without conscious motivation; expectation is a powerful guide to action.

Table 2.5 Corrected values for Morton's final tabulation	
PEOPLE	CRANIAL CAPACITY (in^3)
Mongolians	87
Modern Caucasians	87
Native Americans	86
Malays	85
Ancient Caucasians	84
Africans	83

The final tabulation of 1849

Morton's burgeoning collection included 623 skulls when he presented his final tabulation in 1849—an overwhelming affirmation of the ranking that every Anglo-Saxon expected.

The Caucasian subsamples suffer from errors and distortions. The German mean, reported at 90 in the summary, is 88.4 from individual skulls listed in the catalogue; the correct Anglo-American average is 89 (89.14), not 90. T h e high English mean of 96 is correct, but the small sample is entirely male.[3] If we follow our procedure of computing averages among subsamples, the six modern Caucasian "families" yield a mean of 87 cubic inches.[4] The ancient Caucasian average for two

[3] To demonstrate again how large differences based on stature can be, I report these additional data, recovered from Morton's tabulations, but never calculated or recognized by him: 1) For Inca Peruvians, fifty-three male skulls average 77.5; sixty-one female skulls, 72.1. 2) For Germans, nine male skulls average 92.2; eight females, 84.3.

[4] My original report (Gould, 1978) incorrectly listed the modern Caucasian mean as 85.3. The reason for this error is embarrassing, but instructive, for it illustrates, at my expense, the cardinal principle of this book: the social embeddedness of science and the

subsamples is 84 cubic inches (Table 2.5).

Six Chinese skulls provide Morton with a Mongolian mean of 82, but this low value records two cases of selective amnesia: First, Morton excluded the latest Chinese specimen (skull number 1336 at 98 cubic inches), though it must have been in his collection when he published his summary because he includes many Peruvian skulls with higher numbers. Secondly, although Morton deplored the absence of Eskimos from his collection (1849, p. iv), he did not mention the three Eskimo skulls that he had measured for *Crania Americana*. (These belonged to his friend George Combe and do not appear in Morton's final catalogue.)

Morton never remeasured these skulls with shot, but if we apply the Indian correction of 2.2 cubic inches to their seed average of 86.8 we obtain a mean of 89. These two samples (Chinese with number 1336 added, and Eskimo conservatively corrected) yield a Mongolian average of 87 cubic inches.

By 1849 Morton's Indian mean had plummeted to 79. But this figure is invalid for the same reason as before, though now intensified—inequality of numbers among subsamples. Small-headed (and small-statured) Peruvians provided 23 percent of the 1839 sample, but their frequency had risen to nearly half (155 of 338 skulls) by 1849. If we use our previous criterion and compute the average of

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frequent grafting of expectation upon supposed objectivity. Line 7 in Table 2.3 lists the range of Semitic skulls as 84 to 98 cubic inches for Morton's sample of 3. However, my original paper cited a mean of 80—an obvious impossibility if the smallest skull measures 84. I was working from a Xerox of Morton's original chart, and his correct value of 89 is smudged to look like an 80 on my copy. Nonetheless, the range of 84 to 98 is clearly indicated right alongside, and I never saw the inconsistency—presumably because a low value of 80 fit my hopes for a depressed Caucasian mean. The 80 therefore "felt" right and I never checked it. I am grateful to Dr. Irving Klotz of Northwestern University for pointing out this error to me.

all subsamples weighted equally, the Indian average is 86 cubic inches.

For the Negro average, we should drop Morton's australoids because he wanted to assess the status of African blacks and we no longer accept a close relationship between the two groups—dark skin evolved more than once among human groups. I also drop the Hottentot sample of 3. All skulls are female, and Hottentots are very small in stature. Native and American-born blacks, amalgamated to a single sample, yield an average value between 82 and 83, but closer to 83.

In short, my correction of Morton's conventional ranking reveals *no* significant differences among races for Morton's own data (Table 2.5). All groups rank between 83 and 87 cubic inches, and Caucasians share the pinnacle. If western Europeans choose to seek their superiority in high averages for their subsamples (Germanics and Anglo-Saxons in the Caucasian tabulations), I point out that several Indian subsamples are equally high (though Morton amalgamated all North American Indians and never reported averages by subgroup), and that all Teutonic and Anglo-Saxon averages are either miscalculated or biased in Morton's table.

Conclusions

Morton's finagling may be ordered into four general categories:

1. Favorable inconsistencies and shifting criteria: Morton often chose to include or delete large subsamples in order to match group averages with prior expectations. He included Inca Peruvians to decrease the Indian average, but deleted Hindus to raise the Caucasian mean. He also chose to present or not to calculate the averages of subsamples in striking accord with desired results. He made calculations for Caucasians to demonstrate the superiority of Teutons

and Anglo-Saxons, but never presented data for Indian subsamples with equally high averages.

2. Subjectivity directed toward prior prejudice: Morton's measures with seed were sufficiently imprecise to permit a wide range of influence by subjective bias; later measures with shot, on the other hand, were repeatable, and presumably objective. In skulls measured by both methods, values for shot always exceed values for the light, poorly packing seed. But degrees of discrepancy match a priori assumptions: an average of 5.4, 2.2, and 1.8 cubic inches for blacks, Indians, and whites, respectively. In other words, blacks fared poorest and whites best when the results could be biased toward an expected result.

3. Procedural omissions that seem obvious to us: Morton was convinced that variation in skull size recorded differential, innate mental ability. He never considered alternate hypotheses, though his own data almost cried out for a different interpretation. Morton never computed means by sex or stature, even when he recorded these data in his tabulations—as for Egyptian mummies. Had he computed the effect of stature, he would presumably have recognized that it explained all important differences in brain size among his groups. Negroids yielded a lower average than Caucasians among his Egyptian skulls because the negroid sample probably contained a higher percentage of smaller-statured females, not because blacks are innately stupider. The Incas that he included in the Indian sample and the Hindus that he excluded from the Caucasian sample both possessed small brains as a consequence of small body size. Morton used an all-female sample of three Hottentots to support the stupidity of blacks, and an all-male sample of Englishmen to assert the superiority of whites.

4. Miscalculations and convenient omissions: All miscalculations

and omissions that I have detected are in Morton's favor. He rounded the negroid Egyptian average down to 79, rather than up to 80. He cited averages of 90 for Germans and Anglo-Saxons, but the correct values are 88 and 89. He excluded a large Chinese skull and an Eskimo subsample from his final tabulation for mongoloids, thus depressing their average below the Caucasian value.

Yet through all this juggling, I detect no sign of fraud or conscious manipulation. Morton made no attempt to cover his tracks and I must presume that he was unaware he had left them. He explained all his procedures and published all his raw data. All I can discern is an a priori conviction about racial ranking so powerful that it directed his tabulations along preestablished lines. Yet Morton was widely hailed as the objectivist of his age, the man who would rescue American science from the mire of unsupported speculation.

Stephen Jay Gould (1996). *The Mismeasure of Man: Revised and Expanded.* New York: W. W. Norton & Company, pp. 82-101.