

Extended postscript on science and bias – or, Haven't we been here before?

Although our study of dolphin brain structure didn't give us definitive conclusions about the cognitive abilities of the dolphin brain, it was important for us to explore the available research in detail for two reasons.

- First, as I mentioned at the start of this chapter, humans define ourselves by our brains. So unless the dolphin brain is impressive in its own right, most humans would refuse to consider the possibility that dolphins may be worthy of genuine respect and that there might be something wrong in how we treat them. Hopefully, our review of the research keeps that possibility alive.
- Second, humans have an unfortunate history of using brain data in a way that supports a society's prejudices. And only if we know exactly what the brain research has uncovered, can we assess if this data is used appropriately in conclusions that humans might draw about dolphin "intelligence." Only if we're properly informed about the scientific data, can we be alert to the matter of how "species bias" could inadvertently creep into scientific research or the interpretation of data. Before we close our discussion of brain research, then, we need to be sensitive to its misuse.

It's no secret that humans have a vested interest in being able to claim that we have the best brains on the planet. For thousands of years, this belief has allowed us to justify the idea that we are the only "intelligent" species on Earth, and that the rest of

creation lies at our feet, waiting for us to do with it as we please. As long as no other beings “think” or “feel,” we don’t need to have any moral qualms about how we treat them. After all, they’re “just animals,” while we’re “people.” Accordingly, in light of the obvious temptation to protect the primacy of humans, it’s important for us to ask ourselves if we’re being as objective as we should be. That is, when we discuss topics of the sort we’re involved in, could we—even unintentionally or unconsciously—interpret data about the rest of nature so that it supports a preconceived picture of reality and doesn’t challenge our privileged status? In particular, is it possible for *scientists* to do this?

Ideally, of course, we would want to answer this question with an unequivocal “no.” Scientists, of all people, are supposed to be devoted to the objective search for truth. Facts stand or fall on their own. They’re determined by impartial, professional and sophisticated research, not the preferences of an individual researcher or the prejudices of a society. And yet, the sad fact is that our species does not have a particularly good track record on this score. So this is an especially important point to reflect on before we bring this discussion of human and dolphin brains to a close and move on the next chapter to the question of “consciousness.”

Unfortunately, humans have a long history of citing “objective facts” in defense of practices that are either firmly rooted in irrational prejudice or at least conveniently self-serving.¹

- The Greek philosopher Aristotle – who was also a proficient empirical student of nature – claimed, on what we would today consider a “scientific” basis, that women and slaves were not fully human.
- In the nineteenth century, a variety of writers argued that “childlike” traits in certain races and women suggested a low level of development.
 - A contributor to *Anthropological Review* wrote, “The leading characters of the various races of mankind are simply the representatives of particular states in the development of the highest Caucasian type. The Negro exhibits permanently the imperfect brow, projecting lower jaw, and slender bent limbs of a Caucasian child some considerable time before the period of its birth. The aboriginal American represents the same child nearer birth. The Mongolian, the same child newly born.”²
 - D. G. Brinton used a similar argument to prove racial inferiority: “The adult who retains the more numerous fetal, [or] infantile . . .

¹ For extended treatments of this issue see, for example, Steven Jay Gould, *The Mismeasure of Man* (New York: Norton, 1996, revised and expanded) and Nancy Tuana, *The Less Noble Sex: Scientific, Religious and Philosophical Conceptions of Woman’s Nature* (Bloomington: Indiana University Press, 1993).

² Cited in Tuana, 41-42.

traits is unquestionably inferior to him whose development has progressed beyond them. Measured by these criteria, the European or white race stands at the head of the list, the African or Negro at its foot.”³

- Edward Cope claimed that because women had so many features in common with children (shorter legs, smaller muscles, no beard, less prominent ridge above the eyes, larger eyes), women therefore represented a less evolved state of evolution than men.⁴
- In the same century, measures ranging from skull angle to the distance between the navel and penis (relative to body height) were cited in support of the inferiority of anyone who wasn’t white, male and of European ancestry.
- Even at the end of the twentieth century, a controversial work appeared that seemed to imply that the careful study of data from “intelligence testing” reveals a meaningful, genetic – and, hence, insurmountable – difference in “intelligence” between blacks and whites in America.⁵
- The use of scientific evidence to prove inferiority, however, has extended beyond claims about intelligence. For example, until relatively recently, women were barred from competing in prominent long distance running

³ Cited in Steven Jay Gould, *Ever Since Darwin: Reflections in Natural History* (New York: Norton, 1977), p. 214.

⁴ Tuana, 43.

⁵ Richard J. Herrnstein and Charles Murray, *The Bell Curve: The Reshaping of American Life by Difference in Intelligence* (New York: Free Press, 1994)

events because of the belief that distance running would “overtax their systems.” It was claimed for years that women did not have the physical capacity to run more than one mile without serious consequences. Women were not allowed to compete officially in the Boston Marathon until 1972 – even though women had been running it unofficially for a few years without injury. It was not until 1984 that a women’s marathon was held in the Olympics.

However, in terms of our investigation, we need to pay special attention to the nineteenth century fascination with “crainiology.”⁶ This was a particularly popular – and methodologically rigorous – approach that claimed that the shape and the size of the skull revealed relative degrees of intellectual development. Various precise details were cited – “the projection of the parietal protuberances, the lesser elevation of the frontal base, the shorter and narrower cranial base . . . the more elliptical dental arch and the inclination to prognathism [having a small facial angle]” – that supposedly proved that women and non-Europeans were intellectually inferior to European men.⁷

The work of two crainiologists – Samuel George Morton and Paul Broca – is worth special note because both men paid careful attention to detail and attempted to

⁶ Gould, *Mismeasure of Man*.

⁷ Herman Schaaffhausen, “On the Primitive Form of the Human Skull,” *Anthropological Review*, 6 (1868), p. 425; cited in Nancy Tuana, *The Less Noble Sex: Scientific, Religious and Philosophical Conceptions of Woman’s Nature* (Bloomington, IN: Indiana University Press, 1993), pp. 45-46.

follow disciplined, scientific methodology. And yet, both came to the conclusion that the “facts” irrevocably proved the intellectual superiority of white males.⁸

Both researchers believed that there is a close relationship between the development of intelligence and the volume of the brain. Morton collected more than 1,000 skulls in order to determine a ranking of races according to brain size. His mean scores put whites at 87 cubic inches, Native Americans at 82, and blacks at 78. Broca came to similar conclusions about the intellectual inferiority of women and blacks through the study of skull size. He even cited the significance of difference parts of the brain.

- Noting that the higher functions took place in the front of the brain, Broca explained that whites had more fully developed frontal lobes; blacks, bigger occipital lobes in the back of the brain.
- He claimed that the sutures between the skull bones close earlier in blacks than in whites – thus allowing for less brain growth. The sutures also close in a different order. In blacks, the front sutures close first, while in whites, they close last – thus giving whites more frontal development.
- Broca even worked with the position of the *foramen magnum* – the hole in the base of the skull. In beings who walk upright, like humans, the hole is under

⁸ On Morton and Broca, see Gould, *Mismeasure of Man*.

the skull; in great apes, it's slightly farther back; in other mammals, it's still farther back. Not surprisingly, he cites data that confirm white superiority.

And Broca's data led Gustave Le Bon, the founder of social psychology, to argue:

In the most intelligent races, such as the Parisians, there is a notable proportion of the female population whose skulls are closer in volume to those of gorillas than to the skulls of the most developed male brains. The inferiority is so obvious that no one can contest it for a moment, only its degree is worth discussion. All psychologists who have studied the intelligence of women, as well as poets and novelists, recognize today that they represent the most inferior forms of human evolution and that they are much closer to children and savages than to an adult, civilized man. They excel in fickleness, inconstancy, absence of thought and logic, and incapacity to reason. Without doubt there exist some distinguished women, very superior to the average man, but they are as exceptional as the birth of any monstrosity, as, for example, of a gorilla with two heads; consequently, we may neglect them entirely.⁹

However, there are two critical points to realize about Morton and Broca.

⁹ Gustave Le Bon, "Recherches anatomiques et mathématiques sur les lois de variations du volume du cerveau et sur leurs relations avec l'intelligence," *Revue d'Anthropologie* 2 (1879), pp. 60-61. Cited in Gould, 136-37.

- First, they not rabid racists and sexists. They truly believed that they were objective scientists who were simply reporting data and following the facts wherever they led.
- Second, despite their stated, conscious desire to be objective, both men were apparently unaware of the fact that they were arguing for conclusions *that their data did not support*. In reviewing Morton's data, the contemporary scientist Stephen Jay Gould discovered that although Morton "finagled" and "juggled" his data to back up his claims, he apparently was not consciously aware of this. (And when recalculated in an objective light, Morton's data reveal no significant differences between the races or sexes.) Gould acquits Morton of fraud, but points to a more insidious process. He writes,

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.¹⁰

Broca, in particular, had a sophisticated understanding of statistics and knew how to correct for various factors that could color the outcome: differences in body size, age, health, and the like. However, like Morton, Broca was a man of his time – and in his time, it was self-evident that blacks and women were intellectually inferior. As Gould explains,

I spent a month reading all of Broca's major work, concentrating on the statistical procedures. I found a definite pattern in his methods. He traversed the gap between fact and conclusion by what may be the usual route – predominantly in reverse. Conclusions came first and Broca's conclusions were the shared assumptions of most successful white males during his time – themselves on top by the good fortune of nature, and women, blacks, and poor people below. His facts were reliable (unlike Morton's), but they were gathered selectively and then manipulated unconsciously in the service of prior conclusions. By this route, the conclusions achieved not only the blessing of science, but the prestige of numbers.

¹⁰ Gould, *Mismeasure of Man*, 101

Broca and his school used facts as illustrations, not as constraining documents. They began with conclusions, peered through their facts, and came back in a circle to the same conclusions.¹¹

Of course, when confronted with the examples of nineteenth-century scientists like Morton and Broca, most of us are probably tempted to find one reason or another to think that this kind of thing couldn't happen in our century. Perhaps we think that contemporary science is more sophisticated and objective than in the past, so questionable data are more readily and effectively challenged. Or maybe we'd say that we live in more egalitarian times with greater sensitivity to human rights. So if there's any preconceived idea in our society that exerts unconscious pressure on scientists, it's the belief in the equality of races and the sexes. However, there are two reasons why we should take the example of Morton and Broca very seriously.

First, the last quarter of the twentieth century saw more than one attempt to use quantifiable data and rigorous methodology in a way that suggests irrevocable racial differences in intelligence.

¹¹ Gould, *Mismeasure of Man*, 117.

- In 1969, Arthur Jensen argued that differences in IQ scores between whites and blacks in America were largely the result of genetic, not environmental, factors.¹²
- In 1971, H. Eysenck argued that African and black American babies develop sensorimotor skills more quickly than whites do, and he then claimed that such speedy development as an infant correlates with lower IQ later in life. “These findings,” he observes, “are important because of a very general view in biology according to which the more prolonged the infancy the greater in general are the cognitive or intellectual abilities of the species.”¹³
- In 1994, Richard Herrnstein and Charles Murray echoed Jensen’s earlier claim that differences in IQ scores between blacks and whites were mainly genetically based.¹⁴

Moreover, Jensen, Herrnstein and Murray clearly link their scientific findings to recommendations regarding social policy. Jensen begins his article by writing, “Compensatory education has been tried, and it apparently has failed.” And his subsequent study allegedly shows why additional compensatory education programs

¹² Arthur Jensen, “How Much Can We Boost IQ and Scholastic Achievement?” *Harvard Educational Review*, 39 (1969): 1-123.

¹³ H. J. Eysenck, *The IQ Argument: Race, Intelligence and Education* (New York: Library Press, 1971). Cited in Gould, *Ever Since Darwin*, p. 220.

¹⁴ Richard J. Herrnstein and Charles Murray, *The Bell Curve: The Reshaping of American Life by Difference in Intelligence* (New York: Free Press, 1994).

would also fail. Herrnstein and Murray similarly use their data to argue that a variety of traditional programs designed to eradicate inequalities can be nothing but fruitless.

But the most important reason to take the examples of Morton and Broca to heart is that it is as “obvious” today that nonhuman beings are “just animals,” as it was in the nineteenth century that blacks and women were inferior. In our culture, it is self-evident that “animals” are completely different from humans. They don’t have self-awareness, and they have very limited cognitive and affective abilities. And because they’re so different from us, we really don’t have to worry too much about harming them. Can we say with certainty that the “objective” research of contemporary science can’t be affected by these beliefs?

Consider one more comment by Gould about the troubling possibility that scientists may not be as free from the attitudes that predominate in the societies in which they live as we would like to think.

Clearly, [in the nineteenth and early twentieth centuries], science did not influence racial attitudes Quite the reverse: an a priori belief in black inferiority determined the biased selection of ‘evidence.’ From a rich body of data that could support almost any racial assertion, scientists selected facts that would yield their favored conclusion according to theories currently in vogue. There is, I believe, a general message in this sad tale. There is not now and there never has been any unambiguous evidence for genetic determination of traits that tempt us to make racist

distinctions (differences between races in average values for brain size, intelligence, moral discernment, and so on). Yet this lack of evidence has not forestalled the expression of scientific opinion. We must therefore conclude that this expression is a political rather than a scientific act – and that scientists tend to behave in a conservative way by providing ‘objectivity’ for what society at large wants to hear.¹⁵

The point to recognize is that nineteenth-century scientists could just as easily have taken the position that differences between races and the sexes did not prove anything about the superiority or inferiority of one group over the other. And yet, instead of concluding nothing, they took a position that not only was unsupported by the facts, but that clearly reflected the dominant attitudes and prejudices operating in their society. Is it possible that contemporary scientists in some way do the same thing when studying dolphins?

Back to dolphins

But is this any more than an idle fear? Do we have any reason to think that contemporary scientists might draw conclusions about dolphins that are unintentionally affected by species bias? Most scientists are appropriately cautious in the conclusions they draw. They recognize that brain structure does not settle the issue

¹⁵ Gould, 216-17.

of general cognitive ability or behavioral flexibility, and they generally call for more research. And contemporary science has progressed in a way that it would be considered bad science to make the sort of heavy-handed pronouncements about the relationship between a single feature (e.g., skull size) and a property like “intelligence” that we find in nineteenth-century science.

However, this does not mean that species bias is impossible – only that it would be expressed in more subtle ways. The language of contemporary science is both more technical and the conclusions more carefully crafted, so any unintentional species bias would come through tone, for example, or in what facts are *not* mentioned. And occasionally we do find scientists discussing matters in a way that lets us ask whether species bias is inadvertently creeping in to the interpretation of the data.

1. In a short article that argues that dolphins fail to show evidence of advanced intelligence, Margaret Klinowska gives the following account of the dolphin brain:

The newest studies of dolphin brains show that they have not developed the latest stage in the evolution of the brain. Their cortex seems to be lacking some features that are characteristic of primates and many other mammals. It seems that these structures started to evolve among land mammals about 50 million years ago, while the ancestors of modern cetaceans returned to the water a few million years earlier. Even the most advanced cetacean brains seem to be stuck at a stage called the

paralimbic-parinsular, which is the most primitive stage in land mammals.

In many respects, then the cetacean brain is actually quite primitive. It retains all the structures found in primitive mammals, such as hedgehogs and bats. It shows none of the structural differences from area to area typical of advanced brains like those of primates. The regions of the cortex are not separated by so-called associative areas, as they are in most other mammals, but they do seem to be arranged in much the same order as we imagine they were in the ancestor of all mammals.¹⁶

The basic facts that this scientist cites about the cortex and the brain structure are correct. However, in the context of her entire article, the unmistakable implication (that these facts suggest that dolphins could not have advanced cognitive abilities) is questionable. Missing, of course, are any of the provisos that we noted earlier in this chapter about what was possible to conclude from features of the dolphin brain—especially given the different evolutionary histories between humans and dolphins.

2. In the course of their commentary on the main study that argues for the “initial brain” hypothesis, Lester Aronson and Ethel Tobach appeal to a variety of grounds to challenge John Lilly’s claim that the size of the dolphin brain suggests remarkable

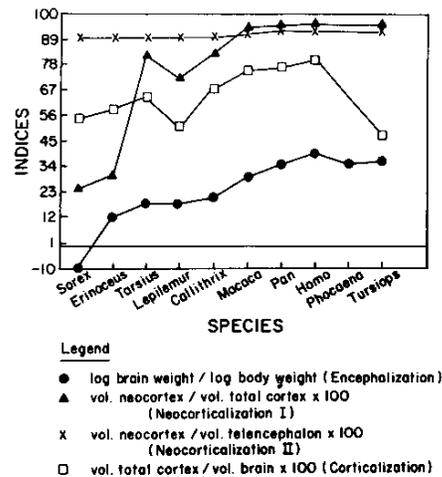
¹⁶ Margaret Klinowska, “How Brainy are Cetaceans?” reprinted in *Oceanus*, Volume 32, Number 1, Spring 1989, 20.

similarities with the human brain. They rely on brain measurements in the following way:

Through the efforts of [Glezer, Jacobs and Morgane], we are now able to correlate the behavioral level with the anatomical level of the neocortex and probably with the physiological level as well. We see at once that the anatomical level is considerably below that of the higher primates, and far below the human level. Those who favor the hypothesis of a high level of cetacean intelligence almost always emphasize the large, highly convoluted cortical surface area which is larger in *Homo* and which forms a vast array of sulci and gyri. But [the authors of this study] show paradoxically that the corticalization index in *Tursiops* (volume of cortex over volume of brain x 100) is even below that of the basal insectivore which is their extant model of the hypothetical "initial" mammalian ancestor.¹⁷

Again, there is a factual basis for these claims. However, the facts show only that the anatomical level of the dolphin brain is "different from" not "considerably below" the human brain. In addition, Aronson and Tobach ignore significant facts. The "corticalization index" is not the only measure that Glezer, Jacobs and Morgane note in their research. Three other ratios are cited (for "encephalization" and "neocorticalization") that show rough equivalence between humans and dolphins.

¹⁷ Ilya I. Glezer, Myron S. Jacobs and Peter J. Morgane, "Implications of the "Initial Brain" Concept for Brain Evolution in Cetacea," *Behavioral and Brain Sciences*, (1988), 90.



At the very least, this argues for a more cautious conclusion than the one that Aronson and Tobach indulge in:

We think that Gaskin put it well: “If I may borrow and embellish a phrase from a paper by the Caldwells, there is abundant evidence that dolphins communicate information about ‘what,’ ‘where’ and ‘who.’ There is no substantive evidence that they transmit information about ‘when,’ ‘how’ or ‘why.’ So, no matter what some might wish to believe, with respect to Kipling’s ‘six honest serving men’ of learning and intellect, the dolphin appears to be three servants short.”¹⁸

3. And even though Glezer, Jacobs and Morgane offer a carefully worded caution in a reply to Aronson and Tobach’s comments about intelligence, note how they conclude their comments:

¹⁸ Intial Brain, 90.

Relative to certain points brought up by Aronson and Tobach, it is likely that the behavioral status of the dolphin is exaggerated in the literature. Obviously, caution is needed in comparing intelligence among different species living in various ecological niches. Our investigations do not suggest any direct correlations between neocortical morphology and behavior, but they point out the obvious morphological fact that dolphin neocortical organization bears a close resemblance to that of the hedgehog.¹⁹

What they give with one hand (“caution is needed in comparing intelligence”); they take away with the other (“close resemblance to [the brain] of a hedgehog”).

In each of these three cases, no scientist explicitly says, “Specific features of the dolphin brain prove that dolphins cannot have advanced cognitive abilities.” However, the authors clearly imply what they think is *probably* the case—despite the existence of a large body of data that essentially precludes any judgment based on structure alone.

Why does the conflicting data not simply lead them to an absolutely noncommittal stance? Perhaps we have the same phenomenon that Steven Gould described above. In other words, it’s possible that these scientists—even though operating in good faith—might nonetheless be influenced in how they view and interpret data by their society’s overwhelming belief that only humans have advanced intellectual and emotional abilities.

¹⁹ Intial Brain, 107.