

The Great Physiologist of Heidelberg - Friedrich Tiedemann - Brief Article

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Early in the nineteenth century, Friedrich Tiedemann used science to demonstrate racial equality.

If you suspend both reason and knowledge and then gaze upon the ruins of the medieval castle on the hill, lit so softly at night and visible from all points in the city below; if you recall the lively drinking songs from Sigmund Romberg's *The Student Prince* and conjure up an image of dashing young men purposely scarring their faces in frivolous duels--well, then, the usual image of Heidelberg as a primary symbol of European romanticism and carefree charm might pass muster. But when you trace the tales of internecine destruction that created these sites (and sights), the visions become fiction (while retaining all their potency in this equally evocative mode), and a gritty historical reality emerges from gentle mythology to explain the local geography and architecture.

Heidelberg boasts an ancient pedigree, for the town's name first appears in a document written in 1196, while its university, founded in 1386, ranks as Germany's oldest. But only one or two medieval buildings still stand (while the castle lies in ruins), because the city suffered the architectural equivalent of genocide--"devoured [unto] the foundations thereof" (Lamentations 4:11)--in several disastrous religious and political wars of the seventeenth century. The Thirty Years' War (1618-48) had wrought enough destruction, but when the Protestant elector (ruler) of the Rhenish Palatinate (with Heidelberg as capital) married his daughter to the brother of France's Catholic king, Louis XIV, he only courted further trouble--for the elector's son died without heir in 1685, and Louis then laid claim to the territory. French armies destroyed Heidelberg in 1689, and the few standing remnants then succumbed to the natural disaster of fire in 1693.

If our all-too-human tendencies toward xenophobia and anathematization of differences can place such closely allied and ethnically similar people on paths of total destruction, what hope can we maintain for tolerance or decency toward people of more different appearance and cultural background? A sad chapter in the history of science must chronicle the support provided by supposedly factual arguments for the designation of different people as inferior beings. Science, to be fair, did not invent the concept of inherent gradation in worth, with the promulgator's own group on top and his immediate enemies and more distant prospects for conquest below. But the doctrine of racism--the claim for intrinsically biological (and therefore ineradicable) differences in intellectual or moral status among peoples--has built a powerful buttress for our ancient inclinations toward xenophobia.

During the heyday of European colonialism in the nineteenth century, scarcely any Western scientist denied such gradations of worth--either as ordained by divine or natural law, in the versions favored before Darwin's discoveries, or as developed by the workings of evolution, in the explanations that triumphed in the closing decades of

Queen Victoria's reign. Black Africans of the sub-Saharan received especially short shrift in these racist classifications.

Such opinions flowed with particular ease from basically conservative scientists, including the great French anatomist Georges Cuvier (1769-1832), who also favored strict divisions among social classes back home. Cuvier wrote in 1817:

The Negro race is confined to the area south of the Atlas Mountains. With its small cranium, its flattened nose, its protruding jaw, and its large lips, this race clearly resembles the monkeys. The people belonging to it have always remained barbarians.

But even scientists of more egalitarian bent at home, including such passionate abolitionists as Charles Darwin, did not challenge the general consensus. In his most striking statement (from *The Descent of Man*, 1871), Darwin argues that a gap between two closely related living species does not disprove evolution, because the intermediary stages--linking both forms to a common ancestor--are now extinct. The large gap that now separates the highest ape and the lowest man, Darwin asserts, will grow even wider as extinctions continue:

The civilised races of man will almost certainly exterminate and replace throughout the world the savage races. At the same time the anthropomorphous apes ... will no doubt be exterminated. The break will then be rendered wider, for it will intervene between man in a more civilised state, as we may hope, than the Caucasian, and some ape as low as a baboon, instead of at present between the negro or Australian and the gorilla.

The few "egalitarians" of these times--defined in this context as scientists who denied inherent differences in intellect or morality among races--limited their views to abstract potentials and did not challenge conventional opinions about gradation in actual achievement. Alfred Russel Wallace, for example, strongly supported inherent equality (or at least minimal difference) but did not doubt that English society had reached a pinnacle of realization while African savages languished in barbarity: "Savage languages," he wrote, "contain no words for abstract conceptions.... The singing of savages is a more or less monotonous howling."

Even J.F. Blumenbach (1752-1840), the great Enlightenment thinker who devised the classification of races that became standard in nineteenth-century science, stoutly defended intellectual equality while never doubting gradations in inherent beauty, with his own Caucasian race on a pinnacle obvious to all. Blumenbach devised the term "Caucasian" (still employed today) for the white races of Europe because he regarded the people living near Mount Caucasus as the best of the comeliest--"really the most beautiful form of skull," he writes, "which always of itself attracts every eye, however little observant."

I have, over the years in these essays, written about most of these few egalitarians, if only because iconoclasm always attracts me and moral rectitude (at least by most people's preferences today) always inspires admiration. But I have never treated the single most remarkable document in this small tradition, probably because its largely unknown author never extended his anthropological research beyond this lone foray into

a subject (the status of races) and a language (English) otherwise absent from his extensive and highly valued work.

Perhaps Friedrich Tiedemann (1781-1861) had learned a sad lesson about the fruits of xenophobia from the history of his own adopted city, for "the great physiologist of Heidelberg" (an accolade for Tiedemann from the pen of England's greatest anatomist, Richard Owen) served as professor of anatomy, physiology, and zoology at the university (from 1816 until his retirement in 1849), where the ruined castle, perched on a hill above his lecture hall, stood as mute testimony to human folly and venality.

Following a common pattern among the intellectual elite of his generation (his father served as a professor of Greek and classical literature), Tiedemann wandered among many European universities to study with the greatest teachers of his time. Thus, he learned philosophy from Schelling in Wurzburg, anatomy from Franz-Joseph Gall (the founder of phrenology) in Marburg, zoology from Cuvier in Paris, and anthropology from Blumenbach in Gottingen. Although he did not publish his work on human races until 1836, near the end of his active career in science, he must have internalized the core of this debate during these youthful Wanderjahren.

Tiedemann may have chosen his professors for other reasons, but he studied with the most prominent scholars of both persuasions--the leading egalitarians Blumenbach and Gall (who used phrenology to advocate the material basis of consciousness and who conceived intelligence as a collection of multiple organs, expressed in bumps and other features of cranial architecture, largely because each person would excel in some specific faculty, while no measure could then rank people or groups in a linear order of "general" worth), as well as with such eminent supporters of racial ranking as Cuvier and the medical anatomist S.T. Soemmerring, who landed Tiedemann his first job in 1807. (Interestingly, in Tiedemann's 1836 article on race, the focus of my essay, he quotes both Soemmerring and Cuvier in a strong critique on the opening page but later praises both Gall and Blumenbach. Tiedemann also dedicated his 1816 book on the comparative anatomy and embryology of brains, the second document discussed in this essay, to Blumenbach. Obviously Tiedemann remembered the lessons of his youth and then developed his own critiques and preferences. What more could a teacher desire?)

Tiedemann's career began on a fast track, with a textbook on zoology and anatomical dissertations on fish hearts (1809), large reptiles (1811 and 1817), and the lymphatic and respiratory organs of birds. He did not neglect invertebrates either, winning a prize in 1816 from the Academie des Sciences in Paris for a treatise on the anatomy of echinoderms. He then turned his attention to the first of two major projects in his career--a remarkable study, published in 1816, on the embryology of the human brain compared with the anatomy of adult brains throughout the Vertebrata.

When Tiedemann took up his position as professor in Heidelberg, his interests switched to physiology, largely because he met the remarkable young chemist Leopold Gmelin, and the two men recognized that a combination of anatomical and chemical expertise could resolve some outstanding issues in the mechanics and functioning of human organs. Thus, in the second major project of his career, Tiedemann collaborated with Gmelin on a series of remarkable discoveries about human digestion--discovering, for example, that the intestines and other organs participate in the process, not only the stomach (as previously believed); that digestion involves chemical transformation (the

conversion of starch into glucose, for example), not merely dissolution; and that hydrochloric acid works as a powerful agent of digestion in the stomach.

In 1836 Tiedemann published a stunning article in English--"On the Brain of the Negro, compared with that of the European and the Orang-Outang"--in the *Philosophical Transactions of the Royal Society of London*, Britain's most prestigious scientific journal (then and now). Why such a shift in focus of research, and why such a foray into a language not his own and never before used to express his research? I do not know the full answer to these intriguing questions, for biographical materials on Tiedemann are, to say the least, sparse. But a consideration of his life and work, combined with an exegesis of his two leading publications, provides a satisfactory beginning.

Tiedemann's unusual paper of 1836 states the egalitarian argument pure and simple--with no ifs, ands, or buts about inferior culture or suboptimal beauty. He does follow Blumenbach in accepting European definitions as universal aesthetic norms--a claim that can strike our modern sensibilities only as almost naively humorous. But, unlike Blumenbach, he then holds that Africans measure up to Caucasian standards of beauty. Of Africans living freely, untouched by slavery, in the continent's interior, Tiedemann writes:

Their skin is not so black as that of the Negroes on the coast of Guinea, and their black hair is not so woolly, but long, soft, and silky. They have neither flat noses, thick lips, nor prominent cheekbones; sloping contracted forehead, nor a skull compressed from both sides, which most naturalists consider as the universal characteristics of a Negro. Most of them have well-formed skulls, long faces, handsome, even Roman or aquiline noses, thin lips, and agreeable features. The Negresses of these nations are as finely formed as the men, and are, with the exception of their color, as handsome as European women.

(This remarkable statement illustrates the vintage of conventional prejudice, as the nineteenth century's firmest egalitarian scientist never doubts the greater beauty of light skin, straight hair, thin lips, and even of "Roman or aquiline noses"])

Tiedemann then argues that the false impression of African ugliness arose from limited studies of people suppressed by slavery and living on the continent's coast:

The mistaken notion of these naturalists arose from [the study] of a few skulls of Negroes living on the coasts, who, according to credible travellers, are the lowest and most demoralised of all the Negro tribes; the miserable remains of an enslaved people, bodily and spiritually lowered and degraded by slavery and ill treatment.

The technical argument of Tiedemann's paper follows a clear and simple logic to an equally firm conclusion--an exemplar of scientific reasoning, so long as the data hold up to scrutiny and withstand the light of new findings. Tiedemann develops two sources of data to reach the same conclusion. He first uses his anatomical expertise to search for distinctions among the brains of Caucasians (both males and females), black Africans, and orangutans. And he finds no structural differences among humans of different races and sexes. He begins with the cerebrum, the traditional "seat" of intelligence, and concludes: "In the internal structure of the brain of the Negro I did not observe any difference between it and that of the European." He then studies all other parts used by

scientific colleagues to assert differences in rank--particularly the claim that blacks have thicker nerves than whites. Again he finds no distinction: "Hence there is no remarkable difference between the medulla oblongata and spinal cord of the Negro and that of the European, except the difference arising from the different size of the body."

Tiedemann then moves on to a second and clinching argument based on size, for some colleagues had accepted the conclusion of no structural difference but had defended racial ranking on the venerable criterion of "more is better," arguing that Caucasians possessed the largest brains among the human races and African blacks the smallest. Tiedemann understood the complexity of this subject and the consequent need for statistical analysis. He recognized that weighing a brain or two could not decide the issue, because brains grow in correlation with bodies, and larger bodies therefore house bigger brains, quite independently of any hypothetical differences caused by racial inequalities. Tiedemann understood, for example, that small brains of women only reflected their smaller bodies--and that appropriate corrections for body size might put women ahead of men. He therefore writes, controverting the greatest and most ancient authority of all:

Although Aristotle has remarked that the female brain is absolutely smaller than the male, it is nevertheless not relatively smaller compared with the body for the female body is in general lighter than that of the male. The female brain is for the most part even larger than the male, compared with the size of the body.

Tiedemann also recognizes that brain size varies greatly among adults of any individual race. Therefore, a prejudiced observer can tout any desired view merely by choosing a single skull to fit his preferences, no matter how unrepresentative such a specimen may be as a surrogate for an entire group. Thus, Tiedemann notes, many anthropologists simply chose the smallest-brained and biggest-jawed African skull they could find and then published a single drawing as "proof" of what every (Caucasian) observer already "knew" in any case! Tiedemann therefore labored to produce the largest compilation of data ever assembled, with all items based entirely on his own measurements of skulls for all races. (He followed the crude but consistent method of weighing the skull, then filling the cavity with "dry millet-seed," weighing again, and finally expressing the capacity of the brain case as the weight of the skull filled with seed minus the weight of the empty skull.)

From his extensive tables (38 male African and 101 male Caucasian skulls, for example--see my later comments on his methods and results), Tiedemann concludes that no differences in size can distinguish human races. In one of the most important conclusions of nineteenth-century anthropology--a statement, based on extensive data, that at least placed a brake upon an otherwise unchallenged consensus in the opposite direction--Tiedemann writes:

We can also prove, by measuring the cavity of the skull in Negroes and the men of the Caucasian, Mongolian, American, and Malayan races, that the brain of the Negro is as large as that of the European and other nations.... Many naturalists have incorrectly asserted that Europeans have larger brains than Negroes.

Finally, Tiedemann closes the logical circle to clinch his argument by invoking the materialist belief of his teacher F. J. Gall: brain stuff engenders thought, and brain size

must therefore correlate at least roughly with intellectual capacity. If the brains of all races are equal in size and indistinguishable in anatomy, we can assert no biological basis for differences in intellect between groups and must, on the contrary, embrace the opposite hypothesis of equality unless some valid argument, not based on size or structure, can be advanced (an unlikely prospect for scientific materialists like Tiedemann and Gall). Tiedemann writes:

The brain is undoubtedly the organ of the mind.... In this organ we think, reason, desire, and will. In short, the brain is the instrument by which all the operations called intellectual are carried on.... An intimate connection between the structure of the brain and the intellectual faculties in the animal kingdom cannot be doubted. As the facts which we have advanced plainly prove that there are no well-marked and essential differences between the brain of the Negro and the European, we must conclude that no innate difference in the intellectual faculties can be admitted to exist between them.

Claims for African inferiority have almost always been based on prejudiced observation of people degraded by the European imposition of slavery. Tiedemann continues:

Very little value can be attached to those researches, when we consider that they have been made for the most part on poor and unfortunate Negroes in the Colonies, who have been torn from their native country and families, and carried into the West Indies, and doomed there to a perpetual slavery, and hard labor.... The original and good character of the Negro tribes on the Western Coast of Africa has been corrupted and ruined by the horrors of the slave trade, since they have unfortunately become acquainted with Europeans.

I have now done my ordinary duty as an essayist: I have told the forgotten story of the admirable Tiedemann with sufficient detail, and in his own words, to render the flavor of his concerns, the compelling logic of his argument, and the careful documentation of his empirical research. But, curiously, rather than feeling satisfaction for a job adequately done, I am left with a feeling of paradox, based on a puzzle that I cannot fully resolve but that raises an interesting issue in the social and intellectual practice of science--thus giving this essay a fighting chance to move beyond the conventional.

The paradox arises from internal evidence of Tiedemann's strong predisposition toward belief in the equality of races. I should state explicitly that I refer, in stating this claim, not to the logic and data so well presented in his published work (as discussed above) but to evidence, based on idiosyncrasies of presentation and gaps in stated arguments, that Tiedemann undertook the research for his 1836 article with his mind already set (or at least strongly inclined) to a verdict of equality. Such preferences--especially for judgments generally regarded as so morally honorable--might not be deemed surprising, except that the ethos of science, both then and now, discourages such a priori convictions as barriers to objectivity. An old proverb teaches that to err is human. To have strong preferences before a study may be equally human, but scientists are supposed to disregard any biases they manage to recognize or be so unconscious of their sway that a heartfelt and genuine belief in objectivity persists in the face of contrary practice.

But Tiedemann's preferences for racial equality did not arise from either of the ordinary sources for such a predisposition: social or political attitudes, or his scientific judgment

based on hard data of his own research. These preferences, in an ironic sense, therefore become all the stronger for not originating in an obvious manner that life's circumstances might easily have altered.

First, I could find no evidence that Tiedemann's political or social beliefs led in any expected "liberal" or "radical" direction toward an uncommon belief in egalitarianism. Tiedemann grew up in an intellectually elite and culturally conservative family. He particularly valued stable government and strongly opposed popular uprisings. Three of his sons served as army officers, and the eldest was executed under martial law imposed by a temporarily successful revolt during the revolutions of 1848. When peace and conventional order returned, the discouraged Tiedemann retired from the university and published little more (largely because his eyesight had become so poor) beyond a final book (in 1854) entitled *The History of Tobacco and Other Similar Means of Enjoyment*.

Second, some scientists do incline toward boldly hypothetical pronouncement and exposure of exciting ideas before adequate documentation can affirm their veracity. But Tiedemann built a well-earned reputation for exactly the opposite behavior of careful and meticulous documentation combined with extreme caution in expressing beliefs that could not be validated by copious data. The definitive eleventh edition of the *Encyclopaedia Britannica* (1910-11), in its single, short paragraph on Tiedemann, includes this sole assessment of his basic scientific approach: "He maintained the claims of patient and sober anatomical research against the prevalent speculations of the school of Lorenz Oken, whose foremost antagonist he was long reckoned." (Oken led the oracular movement known as *Naturphilosophie*. He served as a sort of antihero in my first book, *Ontogeny and Phylogeny*, published in 1977--so I have a long acquaintance, entirely in Tiedemann's favor, with his primary adversary.)

I have found, in each of Tiedemann's two major publications, one on brains and the other on human races, a striking indication--rooted in what he does not use, or does not present (for surprising or illogical absences often speak more loudly than vociferous assertions)--of his predisposition toward racial equality.

1. Creating the standard argument and then refraining from the usual interpretation: Tiedemann's masterpiece of 1816. By the customary criteria of new discovery, copious documentation, and profound theoretical overview, Tiedemann's 1816 treatise on the embryology of the human brain as contrasted with adult brains in all vertebrates (fish to mammals) has always been judged his masterpiece. Scientists of Tiedemann's generation yearned to know the answer to a central question in pre-Darwinian biology: Do all developmental processes follow a single general law, or does each pursue an independent path? Two processes stood out for evident study: the growth of organs in the embryology of "higher" animals, and the sequence of structural advance (in created order, not by evolutionary descent) in a classification of animals from "lowest" to "highest" along the chain of being.

In rough terms, both sequences seemed to move from small, simple, and homogeneous beginnings to larger, more complex, and more differentiated endpoints. But how similar might these two sequences be? Could the adults of lower animals really be compared to transitory stages in the embryology of higher creatures? If so, then a single law of development might pervade nature to reveal the order and intent of the universe and its creator. This heady prospect drove a substantial amount of biological research during

the late eighteenth and early nineteenth centuries. Tiedemann, beguiled by the prospect of discovering such a universal pattern, wrote that the "two routes" to such knowledge "are those of comparative anatomy and the anatomy of the fetus, and these shall become, for us, a veritable thread of Ariadne." (When Theseus ventured into the labyrinth to battle the Minotaur, Ariadne gave him a thread to unwind along the path so that he could find his way out after his noble deed of bovicide. The "thread of Ariadne" thus became a standard metaphor for a path to the solution of a particularly difficult problem.)

Tiedemann's densely documented treatise announced a positive outcome for this grand hope of unification: the two sequences of human fetal development and comparative anatomy of brains from fish to mammals coincide perfectly. He wrote in triumph:

I therefore publish here the research that I have done for several years on the brain of the [human] fetus.... I then present an exposition of the comparative anatomy of the structure of the brain in the four classes OF vertebrate animals [fish, reptiles, birds, and mammals, in his taxonomy]--all in order to prove that the formation of his organ in the [human] fetus, followed from month to month during its development, passes through the major stages of organization reached by the [vertebrate] animals in their complexity. We therefore cannot doubt that nature follows a uniform plan in the creation and development of the brain in both the human fetus and the sequence of vertebrate animals. (Author's translation from the 1823 French edition of Tiedemann's 1816 monograph)

Thus, Tiedemann had reached one of the most important and most widely cited conclusions of early-nineteenth-century zoology. Yet he never extended this notion, the proudest discovery of his life, to establish a sequence of human races as well, although virtually all other scientists did. Nearly every major defense of conventional racial ranking in the nineteenth century expanded Tiedemann's argument from embryology and comparative anatomy to variation within a sequence of human races as well--by arguing that a supposedly linear order from African to Asian to European expresses the same universal law of progressive development.

Even the racial "liberals" of nineteenth-century biology invoked Tiedemann's linear sequence of progress when the doctrine suited their purposes. For example, as an argument for evolutionary intermediacy, T. H. Huxley proposed a linear order of races to fill the gap between apes and humans: "The difference in weight of brain between the highest and the lowest man is far greater, both relatively and absolutely, than that between the lowest man and the highest ape."

But Tiedemann himself, the inventor of the basic argument, would not extend his doctrine into a claim that variations within a species (distinctions among human races, in this case) must follow the same linear order as differences across related species. I can only assume that he demurred (as logic surely permits and as later research has confirmed, for variations within and among species represent quite different biological phenomena) because he did not wish to use his argument as a defense for racial ranking. At least we know that one of his eminent colleagues read his silence in exactly this light--for Richard Owen, refuting Huxley's claim, honored Tiedemann's conclusion when he penned the accolade used as a title to this essay:

Although in most cases the Negro's brain is less than that of the European,

I have observed individuals of the Negro race in whom the brain was as large as the average one of Caucasians; and I concur with the great physiologist of Heidelberg, who has recorded similar observations, in connecting with such cerebral development the fact that there has been no province of intellectual activity in which individuals of the pure Negro race have not distinguished themselves.

2. Developing the first major data set and then failing to notice an evident conclusion not in your favor (even if not particularly damaging either). When I wrote *The Mismeasure of Man*, first published in 1981, I discovered that most of the major data sets presented in the name of racial ranking contained evident errors that should have been noted by their authors and would have reversed their conclusions, or at least strongly compromised the apparent strength of their arguments. Even more interestingly, I found that these scientists usually published the raw data that allowed me to correct their errors. I therefore had to conclude that these men had not based their conclusions upon conscious fraud--for fakers try to cover up the tracks of their machinations. Rather, their errors had arisen from unconscious biases so strong and so unquestioned (or even unquestionable in their system of beliefs and values) that information now evident to us remained invisible to them.

Fair is fair. The same phenomenon of unconscious bias must also be exposed in folks we admire for the sagacity, even the moral virtue, of their courageous and iconoclastic conclusions--for only then can we extend an expose about beliefs we oppose into a more interesting statement about the psychology and sociology of scientific practice in general.

I have just discovered an interesting instance of nonreporting in the tables that Tiedemann compiled to develop his case for equality in brain size among human races. (To my shame, I never thought about pursuing this exercise when I wrote *The Mismeasure of Man*, even though I reported Paul Broca's valid critiques of different claims in Tiedemann's data to show that Broca often criticized others when their conclusions denied his own preferences but did not apply the same standards to "happier" data of his own construction.)

Tiedemann's tables, the most extensive quantitative study of variation available in 1836, provide raw data for more than 200 male skulls in all five of Blumenbach's major races, including 101 "Caucasians" and 38 "Ethiopians" (African blacks). But Tiedemann only lists each skull individually (in old apothecaries' weights of ounces, drachms, and grains) and presents no summary statistics for groups--no ranges, no averages. However, these figures can easily be calculated from Tiedemann's raw data, and I have done so in the chart "Tiedemann's Data" be.

Tiedemann's Data

Sample	Number of Skulls	Smallest	Largest	Average
		weight in ounces		
Caucasian (all)	101	28	57	40.08
European Caucasian	77	33	57	41.34
Asian Caucasian	24	28	42	36.04
Malayan	38	31	49	39.84
American	24	26	59	39.33
Mongolian	18	25	49	38.94
Ethiopian	38	32	54	37.84

Tiedemann bases his argument entirely on the overlapping ranges of smallest to largest skulls in each race, and we can scarcely deny his correct conclusion that no difference exists between Ethiopians (32 to 54 ounces among 38 skulls) and Caucasians (28 to 57 ounces for a larger sample of 101 skulls). But as I scanned his charts of raw data, I suspected that I might find some interesting differences among the averages for each racial group--the obvious summary statistic (in Tiedemann's time as well as today).

Indeed, as my table and graphs show, Tiedemann's uncalculated mean values do differ--in the traditional order advocated by his opponents, with a gradation from a largest average, for Caucasians; through intermediary values for Malaysians, Americans (Native Americans, not European immigrants), and Mongolians; to the lowest value, for his Ethiopian group. The situation becomes even more complicated when we recognize that these mean differences do not challenge Tiedemann's conclusion, even though an advocate for the other side could certainly present this information in just such a manner. (Did Tiedemann calculate these means and not publish them because he sensed the confusion that would then be generated--a procedure that I would have to label as indefensible, however understandable? Or did he never calculate them because he got what he wanted from the more obvious data on ranges and then never proceeded further--the more usual situation of failure to recognize potential interpretations as a consequence of unconscious bias? I rather suspect the second scenario as more consistent with Tiedemann's personal procedures and the actual norms--as opposed to the stated desirabilities--of scientific study in general. But I cannot disprove the first conjecture.)

My appended graph of Tiedemann's uncalculated data (see "Tiedemann's Data and Ranges," below) does validate his position. The ranges are large and fully overlapping for the crucial comparison of Caucasians and Ethiopians (with the substantially larger Caucasian sample including the smallest and the largest single skull for the entire sample of both groups, as expected). The differences in mean values are tiny compared with the ranges and, for this reason, probably of no significance in the judgment of intelligence. Moreover, the small variation among means probably reflects differences in body size rather than any stable distinction among races. (As previously cited, Tiedemann had documented the positive correlation of brain and body size in asserting the equality of brains in men and women.) His own data indicate the probable correlation of mean differences in brain weight with body size. He divides his Caucasian category into two parts by geography--Europeans and Asians (mostly East

Indians). He also states that Caucasian males from Asia tend to be quite small in body size. Note that on the chart of Tiedemann's raw data, which appears on the previous page, the mean brain size for these (presumably smallest-bodied) Caucasians from Asia stands at 36.04 ounces, the lowest value of his entire chart, lying well below the Ethiopian mean of 37.84 ounces.

But data can be "massaged" to advance almost any desired point, even when nothing "technically" inaccurate mars the presentation. For example, the mean differences in Tiedemann's data look trivial when properly scaled against the large ranges of each sample. But if I expand the scale (above, left), amalgamate the European and Asian Caucasians into one sample (Tiedemann kept them separate), omit the ranges, and plot only the mean values in the conventional order of nineteenth-century racial rankings, the distinctions can be made to seem quite large, and an unsophisticated observer might well conclude that significant differences in intrinsic mental capacity had been documented.

In conclusion, since Tiedemann clearly approached his study of racial differences with a predisposition toward egalitarian conclusions, and since he differed from nearly all his scientific colleagues in promoting this result, we must seek the source for his beliefs in racial equality largely outside the persuasive character of his data. Indeed (and scarcely surprising for an issue so salient in Tiedemann's time and so continually troubling and tragic ever since), he based his judgment on a moral question that, as he well understood, empirical data might illuminate but could never resolve: the social evils of racism, and particularly of slavery.

Tiedemann recognized that scientific data about facts of nature could not validate moral judgments about the evils of slavery--for conquerors could always invent other justifications for enslaving people judged equal to themselves in mental might, while many abolitionists accepted the inferiority of black Africans but argued all the more strongly for freedom because decency requires special kindness toward those not so well suited for success. But Tiedemann also appreciated a social reality that blurred the logical separation of facts and morals. In practice, most supporters of slavery promoted inferiority as an argument for tolerating an institution that would otherwise be hard to justify under the rubric of supposedly Christian values: if "they" are not like "us," and if "they" are too benighted to govern themselves within the complexities of modern living, then "we" gain the right of conquest and subjugation. If scientific facts pointed to equality of intellectual capacity, then many conventional arguments for slavery would fall.

Modern scientific journals generally insist upon the exclusion of overt moral arguments from ostensibly factual accounts of natural phenomena. But the more literary standards and interdisciplinary character of Tiedemann's time permitted far more license, even in leading scientific journals like the *Philosophical Transactions* (an appropriate, if now slightly archaic, name used by this journal since its foundation in the seventeenth century). Tiedemann could therefore state his extrascientific reasons literally "up front"--for the first paragraph of his article announces both his scientific and his ethical motives and also resolves the puzzle of his decision to write in English:

I take the liberty of presenting to the Royal Society a paper on a subject which appears to me to be of great importance in the natural history, anatomy, and physiology of Man; interesting also in a political and

legislative point of view. Celebrated naturalists ... look upon the Negroes as a race inferior to the European in organisation and intellectual powers, having much resemblance with the Monkey.... Were it proved to be correct, the Negro would occupy a different situation in society flora that which has been so lately given him by the noble British Government.

In short, Tiedemann wrote his paper in English to honor and commemorate the abolition of the slave trade in Great Britain. The process had been long and tortuous (also torturous). Under the vigorous prodding of such passionate abolitionists as William Wilberforce (whose son, Bishop Samuel "Soapy Sam" Wilberforce, became an equally passionate anti-Darwinian--for what goes `round admirably can come `round ridiculously, and history often repeats itself according to Marx's motto "the first time as tragedy, the second as farce"), Britain had abolished the West Indian slave trade in 1807 but had not freed those already enslaved. Full manumission, with complete abolition, did not occur until 1833--a great event in human history that Tiedemann chose to celebrate in the most useful manner he could devise in his role as a professional scientist: by writing a technical article to promote a true argument that, he hoped, would do some moral good as well.

I cited Tiedemann's opening paragraph to praise his wise mixture of factual information and moral concern and to resolve the puzzle of his composition in a foreign tongue. I can only end with his closing paragraph, an even more forceful statement of the moral theme and a testimony to a most admirable man, whom history has forgotten but who did his portion of good with the tools that his values, his intellectual gifts, and his sense of purpose had provided:

The principal result of my researches on the brain of the Negro is, that neither anatomy nor physiology can justify our placing them beneath the Europeans in a moral or intellectual point of view. How is it possible, then, to deny that the Ethiopian race is capable of civilisation? This is just as false as it would have been in the time of Julius Caesar to have considered the Germans, Britons, Helvetians, and Batavians incapable of civilisation. The slave trade was the proximate and remote reason of the innumerable evils which retarded the civilisation of the African tribes. Great Britain has achieved a noble and splendid act of national justice in abolishing the slave trade. The chain which bound Africa to the dust, and prevented the success of every effort that was made to raise her, is broken.

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