

Neo-Lysenkoism, IQ, and the press

BERNARD D. DAVIS

STEPHEN JAY GOULD, a professor of geology at Harvard, has become one of the best known American scientists. His many essays on natural history are entertaining and highly readable, and his attack on the "establishment" version of Darwinian evolution has received so much attention that his picture appeared on the cover of *Newsweek*. He personalizes his expository writing in a breezy, self-deprecating manner, and he comes across as warm-hearted, socially concerned, and commendably on the side of the underdog. Hence he is able to present scientific material effectively to a popular audience—a valuable contribution, and a public service, as long as his scientific message is sound.

It is therefore not surprising that Gould's history of the efforts to measure human intelligence, *The Mismeasure of Man*, received many glowing reviews in the popular and literary press, and even a National Book Critics Circle award.¹ Yet the reviews that have appeared in scientific journals, focusing on content rather than on style or on political appeal, have been highly critical of both the book's version of history and its scientific arguments. The paradox is striking. If a scholar wrote a tendentious history of medicine that began with phlebotomy and purges, moved on to the Tuskegee experiment on syphilitic Negroes, and ended with the thalidomide

¹ Stephen Jay Gould, *The Mismeasure of Man* (New York: Norton, 1981).

disaster, he would convince few people that medicine is all bad, and he would ruin his reputation. So we must ask: Why did Gould write a book that fits this model all too closely? Why were most reviewers so uncritical? And how can non-scientific journals improve their reviews of books on scientific aspects of controversial political issues?

Reviews in the popular press

Typical of the literary reviews of Gould's book is the one that appeared in the *New York Times Book Review*. June Goodfield, a historian and popular writer on science, is effusive: In his "most significant book yet, Mr. Gould grasps the supporting pillars of the temple in a lethal grip of historical scholarship and analysis—and brings the whole edifice of biological determinism crashing down." *The Mismeasure of Man*, she writes, also shows that, while science can never be wholly objective, "this gloriously human enterprise does provide us both with a method for challenging the status quo and for revealing true knowledge about the world." Moreover, Gould "affirms that most things are humanly possible, and that attempts to confine human beings to limited categories are both downright wicked and bound to be self-defeating."

In the *New Yorker* the book was reviewed by Jeremy Bernstein, a philosophically-inclined physicist. His analyses of scientific books have in general been excellent, and we might have expected him to be critical of Gould's methodology. But in fact, because Bernstein saw the book as a powerful salvo against racism, he misread it, imputing to Gould his own, different views on intelligence. Bernstein's answer to racism is to emphasize "how numerous the genetically expressed variations are *within* any social group," whereas Gould in fact insists that in the area of behavior, genetic differences should be ignored. Missing this fundamental disagreement, Bernstein uncritically accepts Gould's indictment of intelligence tests: "because of the false reification of intelligence hundreds of thousands—perhaps millions—of people's lives have been circumscribed or even ruined."

The most perplexing review is Richard Lewontin's in the *New York Review of Books*. Lewontin represents a biased choice on the part of that journal, since he and Gould had taught a course together at Harvard on the dangers of applying biology to society, and he has called for the development of a true "socialist science" to challenge the "bourgeois science" of most Western culture. Yet

he turns out to be an interesting choice, for his article is, as usual, brilliant, erudite, and idiosyncratic.

Lewontin agrees that political views, whether good or bad, will inevitably influence the conclusions of scientists, but he chides Gould for ignoring Marxist principles and overemphasizing racism: "*The Mismeasure of Man* remains a curiously unpolitical and unphilosophical book." The emphasis "on racism and ethnocentrism in the study of abilities is an American bias." Further, "In America, race, ethnicity, and class are so confounded, and the reality of social class so firmly denied, that it is easy to lose sight of the general setting of class conflict out of which biological determinism arose." He concludes with a profoundly pessimistic bit of metaphysics: "The reification of intelligence . . . is an error that is deeply built into the atomistic system of Cartesian explanation that characterizes all of our national science. It is not easy, given the analytic mode of science, to replace the clockwork mind with something less silly." But "the wholesale rejection of analysis in favor of an obscurantist holism has been worse. Imprisoned by our Cartesianism, we do not know how to think about thinking." It is unfortunate that this truly gifted scientist trapped himself in evolutionary genetics, a field so at odds with his social convictions.

The popular press has thought the issues to be more clear-cut. *Newsweek* refers to "this splendid new case study of biased science and its social abuse." *The Saturday Review* speaks of "a rare book—at once of great importance and wonderful to read." *The Atlantic Monthly* says, "The tale would be funny if one could overlook the misery that such tests have inflicted on generations of defenseless school children." *The Key Reporter* (of Phi Beta Kappa) calls the book "a strident, polemical, effective critique."

The scientific reviews

While the nonscientific reviews of *The Mismeasure of Man* were almost uniformly laudatory, the reviews in the scientific journals were almost all highly critical. In *Science*, a widely read American publication that covers all the sciences, the book was reviewed by Franz Samelson, a psychologist at Kansas State University. He concludes that as a history of science the book has a number of problems. For example, he notes, Gould claims that Army intelligence tests led to the Immigration Restriction Act of 1925; in fact, no psychologist testified before Congress, and the three reports of the House Committee on Immigration do not mention intelligence tests

at all. On another point, Gould's discussion of the "fallacy of reification"—the grouping of different abilities, such as verbal reasoning and spatial reasoning, into one measure of intelligence—"remains blurred, since Gould's emphasis seems to shift about. Exactly what does he object to? [Gould] never tells us directly what his own proper, unreified conception of intelligence is." Finally, Gould fails to acknowledge that ability testing is "a sizable industry in the real world and a smaller one in academia. And all Gould's incisive thrusts at finagling and fallacies seem to be almost irrelevant. . . . Whatever intellectual victories over the [mostly dead] testers Gould's eminently readable book achieves . . . the real action seems to be elsewhere."

In *Nature*, a distinguished British journal of general science, Steve Blinkhorn, writing from the Neuropsychology Laboratory at Stanford University, is blunt: "With a glittering prose style and as honestly held a set of prejudices as you could hope to meet in a day's crusading, S.J. Gould presents his attempt at identifying the fatal flaw in the theory and measurement of intelligence. Of course everyone knows there must be a fatal flaw, but so far reports of its discovery have been consistently premature." More specifically, "the substantive discussion of the theory of intelligence stops at the stage it was in more than a quarter of a century ago." Gould "has nothing to say which is both accurate and at issue when it comes to substantive or methodological points." Finally, many of his assertions "have the routine flavor of Radio Moscow news broadcasts when there really is no crisis to shout about. You have to admire the skill in presentation, but what a waste of talent."

Science 82, a journal designed for the general public, chose as its reviewer Candace Pert, a biochemist at the National Institute of Mental Health, who has been researching the application of molecular biology and cell biology to the study of the brain. "Gould's history of pseudoscientific racism in measuring human intelligence," she writes, "does not, despite his claims, negate the sociobiological notion that differences in human genetic composition can produce differences in brain proteins, resulting in differences in behavior and personality." In her view, "if modern neuroscience reveals biochemical differences that account for human variability, we must deal with this important knowledge; . . . ignoring differences because they *could* become abuses will not make them go away."

The most extensive scientific analysis of Gould's book appeared in *Contemporary Education Review*. Arthur R. Jensen, of the Institute for Human Learning at the University of California, Ber-

keley, analyzes Gould's technical arguments in great detail and reaches sharply critical conclusions. He also discusses recent research demonstrating a high correlation of IQ with speed of information processing, as measured by simple reaction-time techniques. These findings encourage a hope that a merger with neurobiology may soon make studies of intelligence much more penetrating and less controversial.

The review that appeared in *Scientific American* is an exception to the harsh criticism in the scientific press. Ordinarily *Scientific American* presents solid science in an interesting way to a very broad audience, and it has been restrained and non-partisan in treating most controversial issues of science. However, there is one exception: The publisher, Gerard Piel, and the book editor, Philip Morrison, have long seen the study of the genetics of intelligence as a threat to racial justice. According to Morrison, as "a persuasive chronicle of prejudice in science, founded on scrupulous examination of the record, enlivened by the talent of a gifted writer, this volume takes on some of the sinister appeal of a tale of heinous crime."

Gould's selective history

It is important for the general public to understand why scientists close to the field have reacted so negatively to *The Mismeasure of Man*. The strength of science in analyzing reality comes from its strict separation of facts from values, of observations from expectations. Measurements of intelligence, and of its hereditary and environmental origins, are part of natural science—even though one must go beyond science, bringing in judgments of value, in order to probe the social implications of the results. Hence any purported scientific exposition of these topics must be as dispassionate and objective as possible about the facts, whatever the social views the author favors. These are precious standards, whose corruption we must resist. Unfortunately, throughout Gould's book they are not met.

The early chapters describe in detail some extremely naive nineteenth-century attempts to measure intelligence in terms of brain size or body shape. These are fossils from the history of mental testing, and their excavation would ordinarily bore most readers. Gould, however, uses them skillfully, both to give the impression of a thorough scholarly analysis and to arouse indignation at such evil uses of science. Unfortunately, the advocacy and the emotional

appeal betray the scholarship. In the early stages of any science, naive ideas, often reflecting the prejudice of the time, are inevitable. Gould infers that this legacy will persist; but history demonstrates that the advance of science depends on continually discarding false hypotheses and preconceptions. Gould further arouses the reader's indignation by describing the ill-informed and prejudiced views of Paul Broca and Louis Agassiz on racial differences. But at a time when slavery was legal, and long before the science of genetics revolutionized our understanding of the nature of race, it is hardly surprising that these views were held by leading scientists—and even, as Gould notes, by such enlightened social critics as Benjamin Franklin and Thomas Jefferson. To remind us of these roots in the history of racism is instructive—but to imply a similar prejudice in today's investigators of intelligence is unfair.

After emphasizing that Alfred Binet developed the first intelligence test, in France in 1905, only in order to improve the education of backward children, Gould goes on to describe misuses of the subsequent tests. His most horrifying example is a primitive study conducted in 1912, in which H.H. Goddard administered intelligence tests to a number of Ellis Island immigrants. He set his standards at an absurdly high level, classifying in the end an extraordinarily large percentage of subjects as "feeble-minded"—a term that then included "morons" who could nonetheless manage to make a living, though it is now applied only to those with a more severe deficiency. Probably nothing has so aroused antipathy to intelligence testing as his widely-cited findings that, for example, 83 percent of the Jews and 79 percent of the Italians he tested were "feeble-minded."

Gould's interpretation of Goddard's findings is summarized as follows: "Could anyone be made to believe that four-fifths of any nation were morons?" But let us look at what Goddard actually wrote. The first sentence of his paper states that "this is not a study of immigrants in general but of six small highly selected groups," leaving out those at either end of the scale who were "obviously" either normal or feeble-minded.² At that time immigration officers were using subjective impressions to reject those people who appeared to be too retarded to learn to make a living, and Goddard hoped that tests could provide a more reliable basis for such decisions. Surprised at the results, he added a discussion that Gould conveniently ignores:

² H.H. Goddard, "Mental Tests and the Immigrant," *Journal of Delinquency* 2 (1917): 243.

Are these . . . cases of hereditary defects or cases of apparent mental defects by deprivation? . . . We know of no data on this point, but indirectly we may argue that it is far more probable that their condition is due to environment than it is due to heredity. To mention only two considerations: First, we know their environment has been poor. It seems able to account for the result. Second, this kind of immigration has been going on for 20 years. If the condition were due to hereditary feeble-mindedness we should properly expect a noticeable increase in the proportion of the feeble-minded of foreign ancestry. This is not the case.

Goddard ended up *favoring* the immigration of people who appeared to possess limited present intelligence: Not only would they perform useful work, but “we may be confident that their children will be of average intelligence and if rightly brought up will be good citizens.” Goddard was hardly a great scientist, but he deserves a fair hearing. The statements cited here hardly warrant Gould’s conclusion that to Goddard “the cure [for feeble-mindedness] seemed simple enough: don’t allow native morons to breed and keep foreign ones out.”

After some years, as Gould notes, most of the early enthusiasts changed their views. Goddard, Terman, and Brigham each admitted that he had overestimated the ability of tests to detect innate differences and had underestimated the influence of cultural background. One might take this example of growth in understanding as a sign of the whole field’s increasing maturity and objectivity. Gould, however, sees these confessions only as support for his accusation of bias.

What is “biological determinism”?

Gould’s own degree of bias is unusual in a work by a scientist. What is the source of this passion? Not mental testing itself, he makes it clear. Rather, his arguments against this testing are merely weapons for attacking the real enemy: what he calls “biological determinism.”

As Gould correctly points out, early investigators who tried to measure intelligence were indeed *determinists*: They had the illusion that they were directly measuring a capacity determined by the genes. But while he continues to tar investigators of behavioral genetics with this brush, in fact they are now all *interactionists*. For while genetics necessarily began with the simplest relationships, in which a single gene determines a trait (such as the color of Mendel’s peas, or a human blood type), the science eventually moved

on to the quantitatively varying (metric) physical or behavioral traits, which socially are much more interesting. These were found to depend on multiple genes, and also on their cumulative interactions with the environment. This concept is now precisely formulated as the concept of *heritability*: a measure of what fraction of the total variance in a trait, in a particular population, is due to genetic differences between individuals—the other fraction coming from environmental influences.

Since Gould would prefer to combat the straw man of naive, “pure” determinism, he fails to note that the science of genetics has altogether replaced this concept with interactionism. But since he is too familiar with biology to deny this conceptual shift, he appropriates it for his own ideological argument: “The difference between strict hereditarians and their opponents is not, as some caricatures suggest, the belief that a child’s performance is all in-born or all a function of environment and learning. I doubt that the most committed antihereditarians have ever denied the existence of innate variation among children.” Curiously, “hereditarians” (Gould’s misnomer for interactionists) are not credited with a similar appreciation of both factors. Instead, they are neatly skewered by being called “strict.”

What, then, is the quarrel about? According to Gould, “the differences [between the camps] are more a matter of social policy and educational practice. Hereditarians view their measures of intelligence as measures of permanent inborn limits. Children, so labeled, should be sorted, trained according to their inheritance and channeled into professions appropriate for their biology.” But good investigators, such as Binet, did not want mental testing to become a theory of limits. For them, Gould argues, “mental testing becomes a theory for *enhancing potential* through proper education [emphasis added].”³

This is a deliberate effort to blur the issue. With one hand Gould concedes innate differences, and with the other he takes them away. If the two camps really differ mostly about social policy and not about the importance of hereditary factors, why does he struggle so to deny the latter? Similarly, whether the hereditary component

³ Gould’s reference to “enhancing potential” is revealing, for it confuses *genotype* (an inborn range of potential) and *phenotype* (the actual *ability* developed within that range). He should have spoken instead of enhancing performance, or of enhancing the development of potential. This is not a trivial semantic distinction: It is essential for any clear analysis of the interaction of genes and environment. Gould’s language suggests that he either does not fully understand, or feels compelled to ignore, this key concept in genetics.

is large or small, is it not a fact that individuals differ widely in their phenotypic, developed ability to absorb various kinds of education and to perform various kinds of jobs? Yet the book has not one word about the possible value of mental tests for educational and vocational placement or for comparing educational programs. (However, consistent with Gould's admiration for Binet's circumscribed aim, he does note the value of mental tests in guiding the therapy of his own child.) Finally, in describing the incredibly crude use of the Army's "Alpha" tests in 1917, Gould ignores the current use of sophisticated tests to help the armed forces select candidates for expensive training programs.

It is sad that Gould, preoccupied with the destructive social consequences of earlier biological misconceptions, is convinced that any modern studies on human behavioral genetics must have similar consequences. For to the contrary, modern evolutionary biology has had an opposite effect—by providing a powerful argument against racism. In the past, a widely-accepted justification for race discrimination stemmed from a Platonic doctrine that prevailed for over two millennia: the belief that we can best understand groups of entities (including species and races) in typological (essentialist) terms, i.e., characterizing all the individuals in a group in terms of a hypothetical ideal type or essence, and dismissing differences from the ideal as trivial. Today, however, population genetics has shown that all species are genetically diverse, and that the differences are not trivial but rather are the source of evolution. With this shift from an essentialist to a populationist view, the genetic differences between races (except for some superficial physical traits) are now seen to be statistical rather than essentially uniform. And since the statistical distributions overlap extensively from one group to another, one cannot infer an individual's potential from his race.

If the pre-genetic, typological misconceptions still prevailed, the modern revolt against race discrimination would surely have encountered much greater resistance, and it might even have been impossible. Unfortunately, biology has received little credit for this major social contribution, and none at all from Stephen Jay Gould.

The concept of general intelligence

The historical chapters, constituting most of *The Mismeasure of Man*, serve to convince the reader that the measurement of intel-

ligence is immoral. But after this build-up, Gould, shifting from historian to scientist, offers an even sharper objection: The measurement is also unscientific.

The problem arises because these tests were developed for teachers who often have trouble deciding whether a pupil's poor performance is primarily due to limitations in motivation or to limitations in ability. The original purpose of intelligence tests, as we have noted, was to provide a more objective and reliable supplement to the teacher's subjective impression, in order to help pupils who are doing badly. But this early use of testing inevitably led to the development of additional possibilities. For example, by ranking the whole class, the tests also detected students who could move faster than the average. In addition, more specialized tests have evolved, especially for advanced students and for purposes of job placement. But as practical tools in public education, the most widely used tests are still composite ones designed, like Binet's test, to cover a range of abilities pertinent to the whole curriculum.

Psychologists generally agree that the greatest success of their field has been in intelligence testing—both practical, in estimating individual abilities, and theoretical, in exploring the cognitive functions of the human brain. For it might have turned out that the determinants of different cognitive abilities were uncorrelated: that is, that the levels of abilities might be distributed independently. But in fact, tests for different kinds of intelligence—the ability to assimilate, retain, process, and express different kinds of complex information—show a remarkably high correlation in their results. The rank-ordering of most individuals is similar—but not identical—on a verbal test, an arithmetic test, or a nonverbal test involving spatial patterns. These results confirm an impression that we all tacitly build on in our daily lives: Some people are generally brighter than others, but people also differ in their special aptitudes. Both sets of differences are partly inborn and partly due to factors affecting the development of the inborn potentials.

The common factor shared in different cognitive abilities, as determined by statistical analysis of their correlations, was named *g* by Charles Spearman. In the ordinary IQ tests it contributes well over half the variance within a population, the rest representing uncorrelated differences in special abilities. Someday, the basis for both kinds of variation will no doubt be better understood in cellular and biochemical terms. Indeed, it is encouraging that studies of the brain are rapidly progressing from its simpler integrative functions, such as the processing of visual stimuli, to more complex

cognitive activities. Meanwhile, though, it is fruitful for psychologists to examine intelligence at the level of performance, and to compare ways of improving that performance, just as geneticists could usefully deal with genes as formal units long before discovering their molecular structure and mode of action.

Examined at this level, such tests have unquestionably helped innumerable teachers to identify pupils whose brightness was concealed by shyness, cultural barriers, or rebelliousness. On the other hand, there is also no doubt that the tests have often been interpreted or applied badly. If teachers focus excessively on general intelligence, measured on a one-dimensional scale, they may fail to encourage the development of each individual's particular strengths. Moreover, the assumption that *g* is entirely innate may persist in some quarters even though the concept of heritability (fractionation into genetic and environmental components) has now completely replaced that early view among scientists. But perhaps the greatest danger is that the test results may tend to be regarded as some kind of index of social worth, instead of recognizing that they measure only a limited set of behavioral traits. For while these are key traits for certain educational and vocational purposes, the tests ignore many other traits that also have great social value: for example, physical attractiveness, motor skills, creativity, artistic talent, social sensitivity, and features of character and temperament. The concept of any single scale of social worth has no meaning. Gould, however, keeps the reader's indignation alive by regularly defining the objective of the tests as the measurement of "worth"—sometimes qualified as "intellectual worth," but often unqualified, or even denoted as "innate worth."

Gould is clearly not interested in evaluating the past uses of intelligence tests fairly, or in improving their use. To him the tests must be extirpated because—and here we get back to the real villain—in using them to compare *individuals* one inevitably runs into consistent differences in the mean values for various racial and socioeconomic *groups*. "This book . . . is about the abstraction of intelligence as a single entity . . . invariably to find that oppressed and disadvantaged groups—races, classes, or sexes—are innately inferior and deserve their status."⁴ This statement, for all its hyperbole,

⁴ Gould's broad generalization ignores the fact that the disadvantaged Chinese and Japanese in this country have consistently scored even higher than Caucasians. Moreover, in including sex discrimination in the IQ controversy, he is straying far from reality. In fact, females average the same as males on standard IQ tests: They perform slightly better on verbal tests, and slightly worse on spatial tests, but the tests are constructed to balance these differences.

captures what the book is about: Concerned with group differences, Gould has decided not to add to the polemics on their causes, but to attack the problem at another level. For if he can demonstrate that the very concept of measurable intelligence is meaningless, then it follows that all those disturbing data on group differences are meaningless as well. His weapon is his "discovery," first announced in the *New York Review of Books*, of two alleged "deep fallacies" underlying the concept of general intelligence: reification and the factoring of intelligence.

The "deep fallacies" of reification and factoring

Gould's argument on reification purports to get at the philosophical foundation of the field. He claims that general intelligence, defined as the factor common to different cognitive abilities, is merely a mathematical abstraction; hence if we consider it a measurable attribute we are reifying it, falsely converting an abstraction into an "entity" or a "thing"—variously referred to as "a hard, quantifiable thing," "a quantifiable fundamental particle," "a thing in the most direct, material sense." Here he has dug himself a deep hole. If this implication of localization is a fallacy for general intelligence, why is it not also a fallacy for specialized forms of intelligence, which Gould professes to accept? Going even further, he seems to abandon materialism altogether: "Once intelligence becomes an entity, standard procedures of science virtually dictate that a location and physical substrate be sought for it. Since the brain is the seat of mentality, intelligence must reside there." But we must ask what reasonable scientific alternative there is. A Cartesian dualism, in which mental processes exist apart from a material base?

Indeed, this whole argument is fantastic. The scientist does not measure "material things": He measures properties (such as length or mass), sometimes of a single "thing" (however defined), and sometimes of an organized collection of things, such as a machine, a biological organ, or an organism. In a particularly complex collection, the brain, some properties (i.e., specific functions) have been traced to narrowly-localized regions (such as the sensory or motor nuclei connected to particular parts of the body). Others, however, depend on connections between widely-separated regions. Accordingly, the *reality* of generalized intelligence—or equally, of any specialized cognitive ability—does not require a "quantifiable fundamental particle." Like information transfer in a telephone network or in a computer, cognition would be much the same whether the

cells involved are grouped together in one region of the brain or are connected by fibers running between dispersed locations.

It is astonishing that a scientist with Gould's credentials, and with ready access to colleagues in the relevant fields, would present such a phony "discovery" as the fallacy of reification, and on the basis of truly antiquated views of neurobiology. He writes that the existence of general intelligence could have been proved correct "if biochemists had ever found Spearman's cerebral energy." This phrase refers to a particularly thin speculation, in the 1920s, about the physical basis for differences in IQ. But neurobiologists today simply do not deal in such vague concepts. Instead, they measure variation in the richness of cells, and connections, and neurotransmitter molecules in different areas of the brain.

The molecular studies linking these features of the brain to genes have hardly begun. But it is clear that this molecular biology must build on the principle that genes code for specific molecular components in brain cells, as in all other cells, and that these genes, like other genes, will vary from one individual to another. Moreover, these gene products in the brain will give rise to variation not only in its wiring diagram but also in the switches (synapses) that transmit impulses between its nerve cells. We are unlikely to be able to correlate intelligence with the incredibly complex and subtle circuitry of the brain for a long time to come; but it is not hard to imagine correlation with molecular differences in a class of synapses in different brains, affecting the speed of processing information just like differences in the transistors of different computers.

Gould's second "deep fallacy," factoring, is statistical. Here he reconstructs an old controversy, which the field has long outgrown. In this dispute, Spearman calculated g (the measure of general intelligence) by running tests for different abilities and analyzing their correlations so as to extract their common component. Thurstone, whom Gould admires as "the exterminating angel of Spearman's g ," preferred to focus on the *specialized* differences in intelligence. He therefore analyzed the results in a way that did not extract the overall correlation, but dispersed it among the differentiated primary factors. But the correlation did not disappear: Another calculation could extract it from the primary factors as a "second-order" g . Gould, however, sets out to "prove" mathematically that the primary correlation is a statistical artifact and that the second-order one is negligible.

To analyze Gould's unconvincing argument would be irrelevant. For in the end, after claiming to have disproved the correlations,

he casually accepts them as self-evident: "The fact of pervasive positive correlation between mental tests must be one of the most unsurprising major discoveries in the history of science." This is itself a very curious judgment. In fact, the correlation is not inevitable or self-evident, for the brain might have been so constructed that a strong endowment of cells for verbal skills would leave less room for cells concerned with numerical abilities, etc. Different cognitive abilities might then exhibit no correlation, or even a negative correlation, and psychologists would then have found no general intelligence to measure.

Gould's arguments about *g* are irrelevant for another reason as well: Though he believes they support his aim of slaying the dragon of the heritability of intelligence, the assumed link to that problem does not exist. "The chimerical nature of *g* is the rotten core of Jensen's edifice, and of the entire hereditarian school. . . . Spearman's *g*, and its attendant claim that intelligence is a single, measurable entity, provided the only theoretical justification that hereditarian theories of IQ have ever had." This assertion is utterly false. *Whether an IQ test measures mostly general intelligence or mostly a collection of independent abilities, the heritability of whatever it measures will be precisely the same.* IQ's factor structure simply does not enter the equations for calculating its heritability.

It is unfortunate that Gould contrasts general and special intelligence with such overkill, for the differences deserve serious consideration, and the advance of behavioral genetics, focusing on units of inheritance, will force psychologists to aim for a more refined dissection of cognitive functions. But the prospect of such advances does not require us to deny that a wider, overall measurement might have had historical value, and might still have practical value for educational purposes.

Objectivity in science

In addition to moral and technical objections to mental testing, Gould offers an epistemological argument that has much broader implications: "I criticize the myth that science itself is an objective enterprise. . . . By what right, other than our own biases, can we identify Broca's prejudice and hold that science now operates independently of culture and class?" On the other hand, he adds that "As a practicing scientist, I share the credo of my colleagues: I believe that a factual reality exists and that science, though often in an obtuse and erratic manner, can learn about it." This is all very

well—but throughout the rest of the book he proceeds as though objectivity is a myth and no factual reality can be discovered.

In fact, the key to the success of the scientific enterprise is its passionate dedication to objectivity: Its advance depends on accepting the conclusions dictated by verifiable observations and by logic, even when they conflict with common sense or with treasured preconceptions. To be sure, some years ago Marxist philosophers, generalizing from the influence of social and economic arrangements on many aspects of our behavior, initiated an attack on the objectivity of science. Moreover, this view has become rather widely accepted in the social sciences. But the study of the genetics of intelligence is a part of natural science, rather than of social science, even though its findings have relevance for social questions. If the science is well done it will tell us objectively what exists, without value judgments; these judgments will arise only in the social applications of that knowledge. For example, insights into the range and distribution of abilities do not tell us how much of our educational resources to devote to the gifted and how much to the intellectually handicapped; this knowledge simply improves our recognition of the reality with which we must cope.

The main source of confusion here is that the word “science” is used with three different meanings, in different contexts: science as a set of activities, as a methodology, and as a body of knowledge. The *activities* of a scientist certainly depend heavily on non-objective factors. These include the resources and the incentives that a society provides for pursuing particular projects, and also the personal choice of problems, hypotheses, and experimental design. The *methodology* of science is much more objective, but it is also influenced by fashions in the scientific community. The *body of scientific knowledge*, however, is a very different matter. Its observations and conclusions, after having been sufficiently verified and built upon, correspond to reality more objectively and reliably than any other form of knowledge achieved by man. To be sure, attachment to a cherished hypothesis may lead a scientist into error. Moreover, at the cutting edge of a science, contradictory results and interpretations are common. But the mistakes are eventually discarded, through a finely honed system of communal criticisms and verification. Thus Broca’s name has been immortalized by its assignment to a structure in the brain that he recognized, whereas his premature efforts to correlate gross structural variations with intelligence have left no residue in the body of scientific knowledge.

Accordingly, however much the findings in some areas of science

may be relevant to our social judgments, they are obtained by a method designed to separate objective analysis of nature from subjective value judgments. Long experience has shown that when these findings are well-verified, they have an exceedingly high probability of being universal, cumulative, and value-free. Gould, however, treats the history of science like political history, with which his readers are more familiar: a history in which human motives and errors from the past will inevitably recur. He thus skillfully promotes a doubt that the biological roots of human behavior can ever be explored scientifically.

Politicizing and publicizing science

A left-wing group called "Science for the People," of which Gould is a member, has been particularly active in campaigning against such studies. Instead of focusing, in the earlier tradition of radical groups, on defects in our political and economic system that demand radical change, this group has aimed at politicizing science, attacking in particular any aspect of genetics that may have social implications. Their targets have included genetic engineering, research on the effects of an XYY set of chromosomes, sociobiology, and efforts to measure the heritability of intelligence. Several years ago Gould co-signed their intemperate attack on E.O. Wilson's *Sociobiology: The New Synthesis*.⁵ Now, in *The Mismeasure of Man*, he has extended the attack to cognitive psychology and educational testing, because they may reveal genetic differences.

Gould has spelled out explicitly his ideological commitment, and also its influence on his science. As we shall see, his main scientific contribution has been the claim that evolution has occurred mainly through revolutionary jumps, rather than by small steps. Both in a "Dialectics Workshop"⁶ and in a scientific paper⁷ he supports this claim with a citation from Marx: "Darwin's gradualism was part of the cultural context, not of nature." He adds that "alternate [sic] conceptions of change have respectable pedigrees in philosophy. Hegel's dialectical laws, translated into a materialist context . . . are explicitly punctuational, as befits a theory of revo-

⁵ E. Allen et al., Letter, *New York Review of Books* (November 13, 1975): 43. See also Sociobiology Study Group of Science for the People in *BioScience* 26 (1976): 182. This article includes the remarkable statement that "We know of no relevant constraint placed on social processes by human biology."

⁶ S.J. Gould, "The Episodic Nature of Change versus the Dogma of Gradualism," *Science and Nature* 2 (1979): 5.

⁷ S.J. Gould and N. Eldridge, "Punctuated Equilibria: The Tempo and Mode of Evolution Reconsidered," *Paleobiology* 3 (1977): 115.

lutionary transformation in human society." And, "it may also not be irrelevant to our personal preferences [about evolutionary mechanisms] that one of us learned his Marxism, literally at his Daddy's knee." To most scientists (other than those tethered to a party line) such a claim of support from (or for) Hegel is silly, and such an insertion of an ideological preference, whether from the left or the right, is a corruption of science.

These quotations may help us to understand why *The Mismeasure of Man* ends up as a sophisticated piece of political propaganda, rather than as a balanced scientific analysis. Gould is entitled, of course, to whatever political views he wishes. But the reader is also entitled to be aware of his agenda.

It may also be pertinent to comment briefly on Gould's scientific writing. His claim to have disproved the widely-accepted, "gradualist" view of evolution has had great appeal for science reporters, but it has been subject to intense criticism by his professional colleagues. Of course, controversies in science are not rare, and it would not be appropriate here to try to judge Gould's stature as a scientist. It is pertinent, however, to note features of his professional writing remarkably similar to those that I have criticized in *The Mismeasure of Man*. In both contexts he focuses primarily on older approaches to problems in which genetics is now central; he picks his history; and he handles key concepts in an ambiguous manner. Moreover, he is fond of artificial dichotomies that oversimplify complex issues: evolution by leaps versus evolution by gradual steps; biological determinists versus environmentalists; general intelligence versus specialized intelligence.

While Gould has made a valuable scientific contribution in providing evidence that marked fluctuations in rate are common in evolution, the most general professional criticism is that in dramatizing this contribution he has set up a non-existent conflict with the prevailing gradualist view. For he proceeds as though gradualism implies a relatively constant rate as well as small steps. But even Darwin recognized that the rate of evolution might vary widely, and modern investigators have demonstrated many mechanisms that contribute to such fluctuation.

Neo-Lysenkoism

In *The Mismeasure of Man* Gould fails to live up to the trust engendered by his credentials. His historical account is highly selective; he asserts the non-objectivity of science so that he can test

for scientific truth, flagrantly, by the standards of his own social and political convictions; and by linking his critique to the quest for fairness and justice, he exploits the generous instincts of his readers. Moreover, while he is admired as a clear writer, in the sense of effective communication, he is not clear in the deeper sense of analyzing ideas sharply and with logical rigor, as we have a right to expect of a disciplined scientist.

It has been uncomfortable to dissect a colleague's book and his background so critically. But I have felt obliged to do so because Gould's public influence, well-earned for his popular writing on less political questions, is being put to mischievous political use in this book. Moreover, its success undermines the ideal of objectivity in scientific expositions, and also reflects a chronic problem of literary publications. My task has been all the more unpleasant because I do not doubt Gould's sincerity in seeking a more just and generous world, and I thoroughly share his conviction that racism remains one of the greatest obstacles.

Unfortunately, the approach that Gould has used to combat racism has serious defects. Instead of recognizing the value of eliminating bias, his answer is to press for equal and opposite bias, in a virtuous direction—not recognizing the irony and the danger of thus subordinating science to fashions of the day. Moreover, as a student of evolution he might have been expected to build on a profound insight of modern genetics and evolutionary biology: that the human species, and each race within it, possesses a wide range of genetic diversity. But instead of emphasizing the importance of recognizing that diversity, Gould remains locked in combat with a prescientific, typological view of heredity, and this position leads him to oppose studies of behavioral genetics altogether. As the reviewer for *Nature* stated, *The Mismeasure of Man* is "a book which exemplifies its own thesis. It is a masterpiece of propaganda, researched in the service of a point of view rather than written from a fund of knowledge."

In effect, we see here Lysenkoism risen again: an effort to outlaw a field of science because it conflicts with a political dogma. To be sure, the new version is more limited in scope, and it does not use the punitive powers of a totalitarian state, as Trofim Lysenko did in the Soviet Union to suppress all of genetics between 1935 and 1965. But that is not necessary in our system: A chilling atmosphere is quite sufficient to prevent funding agencies, investigators, and graduate students from exploring a taboo area. And such Neo-Lysenkoist politicization of science, from both the left

and the right, is likely to grow, as biology increasingly affects our lives—probing the secrets of our genes and our brain, reshaping our image of our origins and our nature, and adding new dimensions to our understanding of social behavior. When ideologically-committed scientists try to suppress this knowledge they jeopardize a great deal, for without the ideal of objectivity science loses its strength.

Because this feature of science is such a precious asset, the crucial lesson to be drawn from the case of Stephen Jay Gould is the danger of propagating political views under the guise of science. Moreover, this end was furthered, wittingly or not, by the many reviewers whose evaluations were virtually projective tests of their political convictions. For these reviews reflected enormous relief: A voice of scientific authority now assures us that biological diversity does not set serious limits to the goal of equality, and so we will not have to wrestle with the painful problem of refining what we mean by equality.

In scientific journals editors take pains to seek reviewers who can bring true expertise to the evaluation of a book. It is all the more important for editors of literary publications to do likewise, for when a book speaks with scientific authority on a controversial social issue, the innocent lay reader particularly needs protection from propaganda. Science can make a great contribution toward solving our social problems by helping us to base our policies and judgments upon reality, rather than upon wish or conjecture. Because this influence is so powerful it is essential for such contributions to be judged critically, by the standards of science.