

## High Impact Science and the Case of Arthur Jensen

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Great science, whose importance is recognized, always has high impact. But not all high impact science is great science.

No other statement about citation analysis needs as much repetition. However, only on rare occasions can we identify specific examples of high impact papers that have a large percentage of critical or negative citations. The reason for this is simple. Scientists generally disregard the obviously erroneous or the trivial. Yet in the case of Arthur Jensen's 123-page work, "How much can we boost IQ and scholastic achievement?"<sup>1</sup> they did not disregard it. Perhaps scientists felt they *could not* disregard it.

To appreciate the impact of Jensen's article in the 1969 *Harvard Educational Review* one only has to look at the large number of citations it has received. The *Science Citation Index*® (*SCI*®) and the *Social Sciences Citation Index*™ (*SSCI*™) indicate it was cited 638 times between 1969 and 1977. The data for each year are as follows: 1969, 20 times; 1970, 62 times; 1971, 103 times; 1972, 74 times; 1973, 110 times; 1974, 67 times; 1975, 75

times; 1976, 66 times and 1977, 61 times. Many of these citations, 101 to be exact, appeared in letters, notes and editorials in journals. The rest, 537, were references in articles. We are unable to report in how many books it was cited.

Since Jensen's article was cited so often it proved to be one of the papers on our list of 100 most-cited *SSCI* articles.<sup>2</sup> Consequently we wrote to Jensen asking him to write a commentary on his article for *Citation Classics*. We are publishing that commentary in this issue.

As I promised in the essay accompanying the *SSCI* 100 most-cited articles list, we have conducted an investigation into why the Jensen article was so frequently cited. Later in this editorial I will present the results of that investigation.

Arthur Jensen was born August 24, 1923 in San Diego, California.<sup>3</sup> He has a BA in psychology from the University of California, Berkeley (1945); MA in psychology from San Diego State College (1952) and a Ph.D. from Teachers College of Columbia University (1956). Jensen's dissertation was entitled "Aggression in fantasy and overt

behavior.” After graduation, Jensen worked for a time with Hans Eysenck, whose views on genetic determination of intelligence were expressed in his 1971 book *The IQ argument*.<sup>4</sup> His views seem to closely parallel Jensen’s.<sup>5</sup> At the time he wrote his controversial article, Jensen was a member of the faculty of the University of California at Berkeley and of the Institute of Learning, where he still works.

According to Stanford University education professor Lee Cronbach, Jensen’s article was prepared in relative haste.<sup>6</sup> In his preface to *Genetics and education*<sup>7</sup> Jensen himself notes that the article grew out of two lectures he gave. One was on “Social class, race, and genetics: implications for education” and dealt with the question of educating children of differing learning abilities. The other, on intelligence testing, presented Jensen’s findings on the interaction among social class, intelligence, and rote learning ability. The graduate student editors of the *Harvard Educational Review* asked Jensen to synthesize the lectures into one statement of views conforming to an outline they presented. He did so. Cronbach points out that Jensen let other work crowd his schedule “until mid-September and then put together 50,000 words in two months.”<sup>6</sup>

The Jensen article<sup>1</sup> covers a lot of territory. Some of its main points are listed below. In the article Jensen:

1. Argued that the failure of compensatory education ef-

forts to produce lasting changes in the IQs of disadvantaged children meant that the programs should be reevaluated.

2. Questioned the prevailing idea that IQ differences are the result of environmental factors.
3. Discussed the nature of intelligence and gave a history of IQ testing.
4. Correlated occupation with intelligence.
5. Using evidence presented by Sir Cyril Burt, showed how IQ can be viewed as nearly normally distributed throughout a population. He then provided a variance model to explain how IQ could be broken into its genetic and environmental components.
6. Discussed heritability — a statistical tool used to assess the degree to which differences in intelligence within a population are due to genetic factors. Backed by kinship studies by Burt and others, Jensen proposed that there is a .8 heritability factor. This means that 80% of the variance of intelligence in the observed population can be attributed to genetic factors.
7. Said that some environmental factors such as prenatal care can influence intelligence. However, he asserted that social class and racial variations in intelligence (such as the one standard deviation, 15 point IQ difference between groups

of blacks and groups of whites) cannot be accounted for by environmental factors.

8. Argued that a deprived environment can keep a child from performing up to his genetic potential, but that an enriched educational program cannot push the child above that potential.
9. Presented his own theory that people are endowed with two kinds of learning ability, associative or Level I and cognitive or Level II. According to Jensen, disadvantaged children do better on Level I tasks and not as well as advantaged children on Level II tasks. Level I tasks include rote learning and selective trial and error learning with feedback for correct responses. Level II tasks include concept learning and problem solving. He concluded that education should be changed. "Diversity rather than uniformity of approaches would seem to be the key to making education rewarding for children with different patterns of ability."

From a quick reading of the above highlights it is easy to see that many of Jensen's conclusions were likely to provoke controversy. So sure of this were the editors of *Harvard Educational Review* that they "arranged for a panel to provide comments" on the work, Cronbach said.<sup>6</sup> Those comments were later published in book form.<sup>8</sup> Subsequent comments on the Jensen

paper were also gathered together in book form.<sup>9</sup>

To examine the nature of the Jensen controversy we decided to do an in-depth citation study at ISI®. Using both the *SSCI* and the *SCI* we randomly selected 60 articles, (every 9th article) or about 10% of the items that cited the 1969 Jensen work, to see why the authors did so.

Of the 60 papers in our sample, 29 cited Jensen's article negatively. This number includes articles that took exception to almost every point presented in the paper. It also includes those in which the authors debated specific points Jensen made. Eight of the articles cited Jensen's paper as an example of a controversy. Eight more used the article as a background reference. Only fifteen of the articles cited Jensen in agreement with his positions, and seven of them only on minor points. Further readings have confirmed that our sample is typical of the way authors have cited the Jensen work.

Fourteen of the 60 papers cited Jensen's article as part of the continuing "gene vs. environment" controversy. This familiar argument, sometimes known as the nature/nurture debate, pits those who believe in environmental determination of IQ or other traits against those who believe that these traits are genetically determined. Of the 14 papers, five were clearly against Jensen's stand that genetic factors, more than environmental factors, account for differences in

IQ between individuals and between racial and cultural groups. Four of the papers supported his stand. Five more used Jensen's article as an example of a study embroiled in the controversy.

Eleven of the articles we selected called into question Jensen's use of data. None of them specifically supported his methodology. One of the articles attacking Jensen's use of data was by David Layzer of the Harvard College Observatory.<sup>10</sup> In the article, called "Science or superstition (a physical scientist looks at the IQ controversy)," Layzer "analyzes the implicit assumptions underlying Jensen's theoretical analysis and demonstrates that they are untenable." He points out that the IQ measurements do not satisfy certain formal requirements needed to make them reliable and meaningful. Thus, according to Layzer, the estimates of heritability given by Jensen are meaningless. He also says that the data Jensen provides do not support his view that children with low IQs or children of parents with low IQs have limited capacity for acquiring cognitive skills.

Another of these articles on Jensen's use of data, this one by M. Golden and W. Bridger,<sup>11</sup> "A refutation of Jensen's position on intelligence, race, social class and heredity," attacked his use of statistics. The researchers flatly said, "Jensen's fundamental error lies in his misuse of statistics to make unwarranted statistical or logical inferences from one set of data or facts to another set of facts." Golden and Bridger note that mean IQ differ-

ences and the correlations between any two sets of measures are completely independent of one another. There is no statistical basis "for predicting one on the basis of knowledge of the other," as Jensen seems to do in his article.

Eight of the papers in the sample specifically mentioned Jensen's use of IQ measurements. Six of the eight expressed opposition to the way the measurements were used. M. W. Feldman and biologist R. C. Lewontin, for example, discussed Jensen's use of a variance model to measure IQ populations in "The heritability hang-up."<sup>12</sup> The analysis of variance cannot really "separate variation that is a result of environmental fluctuation from variation that is a result of genetic segregation," the authors said. The two articles not negatively citing this aspect of Jensen's work referenced the article as part of the debate over using IQ measurements.

Eleven of the articles referred to Jensen's correlation between race and genetic inferiority. Nine of these attacked Jensen's conclusions, one agreed with them and one cited Jensen's work as an example of an idea involved in the controversy. A typical article in this group was Richard Wienke's on racial differences in educability which presents evidence "that black students learn as well as white."<sup>13</sup>

Seven of the papers on the list referenced Jensen's remarks on the failure of compensatory education. Three of them agreed that these programs had failed and four did not agree. One paper that agreed with Jensen's views was "Compensa-

tory education and contemporary liberalism in the United States: sociological view" by D. C. Morton and D. R. Watson. The authors cited Jensen to counter the liberal argument that working-class groups are in need of "compensation" at school.<sup>14</sup> On the other hand, Martin Deutsch presented data to support his argument that Jensen "prematurely classified compensatory education as a failure."<sup>15</sup> In the article "Happenings on the way back to the forum: social science, IQ and race differences revisited," Deutsch concluded that "continuous and carefully planned intervention procedures" could have a positive influence on the performance of disadvantaged children.

The remainder of the papers in our sample cited Jensen for reasons ranging from disagreement with his definition of intelligence to observations about the lack of new data presented in the work. The authors claimed that Jensen just rearranged existing data from studies done by others, relying on the previous data as accurate.

We end our citation study here. But in order to further understand the impact of the Jensen paper we did some additional research. We found that Jensen's reliance on the original work of others to make his case has brought much vocal criticism from educators, psychologists, scientists and others. Probably the most outspoken of the experts who attacked Jensen's use of data developed by others is psychologist Leon Kamin of Princeton University. Kamin, who wrote a book and has delivered lectures on the sub-

ject, closely examined Jensen's sources to see if their work really backed his conclusions.<sup>16</sup> Although he found many instances where Jensen seemingly misused the data that others reported, he also found some startling inconsistencies in the work of one of Jensen's primary sources.

To back much of his line of reasoning, Jensen relied on the data assembled by Sir Cyril Burt, the late British psychologist. Burt's kinship studies had been looked upon as standards for the scholarly community. Jensen particularly leaned on Burt's studies of separated identical twins to draw his conclusions. According to Kamin, with support from others who have now closely examined Burt's data, the numbers Burt supplied are unusable.

For three of the twin studies, which included 21 pairs, "over" 30 pairs and 53 pairs of twins respectively, the correlation between the IQ scores of the separated twins, given by Burt, was .771. This correlation remained the same through three studies of unequal size. Not only did that particular correlation remain constant over the different sample sizes but the IQ correlations between identical twins reared together also stayed the same over three sample sizes.

Kamin also charged that Burt's papers "are often remarkably lacking in precise descriptions of the procedures and methods that he employed."<sup>16</sup> Items such as the children's ages, sexes, name of the test administered and how and when the tests were given are often missing from the data supplied in the published version. When these find-

ings began to cast some doubt on Burt's work, others began to investigate. Out of these investigations came further charges, well-reported in the science press,<sup>17</sup> that Burt may even have "invented" the data and "made-up" the co-workers he said collaborated with him on some of his studies.

Some researchers have pointed out that the discrediting of Burt's data does not remove the "underpinnings of the view that intelligence has a large genetic component."<sup>18</sup> According to Bernard Rimland of the Naval Electronics Laboratory and Harry Munsinger of the Department of Psychology of the University of California at San Diego, "Such a conclusion is unwarranted." In a letter to *Science*, the two researchers presented a chart of correlation coefficients for "intelligence" test scores from 52 studies. They asserted that "the deletion of Burt's data would have no appreciable effect on the overall picture." The data "demonstrating the heavy dependence of IQ on genetic factors are far too solid to be shaken by the rejection of the work of any single investigator — even Sir Cyril Burt."<sup>18</sup>

The validity of the IQ test itself to give accurate measures of the capabilities of a group of people has been questioned by many critics. Kamin in *The science and politics of IQ*<sup>16</sup> pointed out that IQ tests administered in the early part of this century "proved" the inferiority of certain immigrants to the US. No reputable scientist today would, for example, agree with Henry God-

dard's assessment that "83 percent of Jewish immigrants were feeble-minded." Yet many are willing to agree with Jensen when he states that "on the average, Negroes test about 1 standard deviation (15 IQ points) below the average of the white population" and draws his conclusions as to what this test score means.

In the chapter "IQ, heritability and inequality," in *The IQ controversy*, N. J. Block and Gerald Dworkin attack, among other aspects of the Jensen article, the correlations he drew between IQ and job categories. According to the researchers, "Even if the number of hairs in a person's nose correlated with success in the same way IQ does, no one would be entitled to conclude that a certain level of nose hair numerosity is a requirement or a condition of eligibility for any level of success" (p. 414).<sup>5</sup>

Of course, not all those who found fault with the Jensen article were as vehement as those mentioned above. The early reaction of Lee Cronbach, for example, in his 1969 paper "Heredity, environment and educational policy" was to disagree with several aspects of the Jensen article.<sup>8</sup> Nevertheless he said, "Professor Jensen is among the most capable of today's educational psychologists. His research is energetic and imaginative." Cronbach called the Jensen paper "an impressive example of [Jensen's] thoroughness." He added, "Dr. Jensen has girded himself for a holy war against 'environmentalists' and his zeal leads him into over-

statements and misstatements.” Cronbach went on to say, “Because learning abilities are plural, they are not adequately conceptualized by Jensen’s Level I–Level II systems.” He also disagreed with Jensen on the implications of his findings for educational policy.

In a subsequent article that appeared in *American Psychologist* in 1975, Cronbach analyzed the controversies over mental testing that have developed in the last five decades. He noted, “Our scholars chose to play advocate when they went before the public, and they abandoned scholarly consistency . . . . The academic needs writing skills of an entirely unaccustomed order if he is to make sure that no unwanted implication will be drawn from a buried sentence . . . .”<sup>6</sup>

Jensen had his unabashed supporters within the scientific community. For example, Harvard psychologist Richard Herrnstein in his 1971 *Atlantic* article argued that American society is heading for a meritocracy based on heredity and IQ differences.<sup>19</sup> According to Herrnstein, society in the future will be socially stratified by inborn differences. Social standing will be given to groups with higher IQs. Herrnstein’s arguments have been called the popularization of Jensen.

Nobel laureate physicist William Shockley shared Jensen’s views as well. According to Lewontin,<sup>5</sup> in “Race and intelligence” reprinted in *The IQ controversy*, Shockley distributed Jensen’s paper to every member of the National Academy of Sciences soon after it was pub-

lished. He did so “as part of his continuing campaign to have the Academy study the effects of interracial mating” (p. 78).<sup>5</sup> Shockley also wrote several papers defending the Jensen article. In his 1971 article “Models, mathematics and the moral obligation to diagnose the origin of Negro IQ deficits” Shockley concluded that “nature has color-coded groups of individuals so that statistically reliable predictions of their adaptability to intellectually rewarding and effective lives can easily be made. . . . If those members of our black minority with the least percentage of Caucasian genes are both the most prolific and the least intelligent, then a form of genetic enslavement is the destiny of their next generation.”<sup>20</sup>

Many of Jensen’s supporters say that those who oppose them seek to restrict free scientific inquiry. The result, according to Edward O. Wilson in his article “The attempt to suppress human behavioral genetics,” has been that “studies on the genetics of cognitive abilities including intelligence have been inhibited.”<sup>21</sup> While many scientists would support Wilson’s call to depoliticize science, some will point out that science does not exist in a vacuum. Sensitive subjects can be approached, but the data at least should be accurate, the methodology sound and the conclusions logical.

During the nine years since the publication of his article, Jensen has replied repeatedly to his critics in letters and articles.<sup>22-33</sup> The first major work in response was “Reducing the heredity-environment

uncertainty" which appeared alongside several critical articles in the book *Environment, heredity and intelligence*. In this article, Jensen noted that many of his critics agreed with his major stands but disagreed with him on minor points. He added, "If there are weaknesses in the methods and evidence I have presented, and of course there inevitably are at this stage, we would do well to note them as a basis for seeking more refined research methods and more and better data, rather than as a basis for minimizing the ... importance of these questions."<sup>8</sup>

In some of his responding works, Jensen refuted his critics point by point, prompting counter responses. For example, after Layzer wrote his critical article,<sup>10</sup> Jensen replied with a 26-page detailed work<sup>30</sup> that explains why IQ scores can be viewed as fitting an interval scale and why the concept of heritability could be used to understand human differences, among other things. Layzer, in turn, counterattacked with a 19-page article entitled "Jensen's reply: the sounds of silence," in which he accused Jensen of serious omissions and irrelevancies.<sup>34</sup> This type of exchange was carried on several times with others, as the debate continued and remained unresolved.

After the publication of his 1969 article, Jensen wrote three books. *Genetics and education* (1972) was his first. In his preface he called this work a "book-length treatment of those parts of my HER article which were generally regarded as

the most controversial ..."<sup>7</sup> Included in *Genetics and education* was a reprint of the 1969 article. The second book, *Educational differences* (1973) was a collection of articles dealing with "the psychology of mental abilities."<sup>35</sup> Topics such as the heritability of intelligence, individual differences in learning and culture-fair testing were covered in the book. *Educability and group differences*, also published in 1973, dealt "with the fact that various subpopulations (social and ethnic groups) ... show marked differences in the distributions of those mental abilities most importantly related to educability and its occupational and socioeconomic correlates."<sup>36</sup> All three of the works supported the 1969 article.

Jensen has continued to perform work in the field of genetics and education. Since 1969 he has published well over twenty articles that expanded on or clarified the points made in the 1969 article or represented new research in this field. His recent studies have led him to perform a cautious about-face on his stand that IQ is primarily genetically determined.<sup>37</sup>

In his 1977 article "Cumulative deficit in IQ of blacks in the rural south" Jensen studied 1,479 children in a very poor area of Georgia. He compared IQ test scores of pairs of black siblings and white siblings to test the hypothesis that environmental factors cause IQ scores to decline. The black children showed a decline in IQ scores between the



ages of 5 and 18 while the white children did not. He compared results with those from another study of more affluent blacks in California which he also conducted, and concluded that the Georgia study "would seem to favor an environmental interpretation of the progressive decrement phenomenon . . . . It appears that a cumulative deficit due to poor environment has contributed, at least in part, to the relatively low IQ in the present sample."<sup>37</sup>

Jensen's recent work on the IQ controversy appeared in the March 1978 *Australian Psychologist*.<sup>38</sup> In it, he reviewed the current status of the debate, analyzing several general areas still under discussion by scientists. These include the nature and measurement of intelligence; the heritability of IQ within culturally homogeneous populations; the genetic components in IQ differences between groups and the social and educational implications of a genetic component in IQ variance. The article attempts to place the controversy in perspective some nine years after the publication of the *Harvard Educational Review* piece.

Jensen's role in the IQ controversy continues even as this essay goes to press. An article in the September 9 issue of *Science News* reported a study presented by Jensen at the recent American Psychological Association meeting in Toronto that indicated that IQ "has a definite 'biological basis.'"<sup>39</sup>

According to the article, "the cornerstone of his latest work involves reaction time (RT), as measured on a rather simplistic panel consisting of sets of . . . lights. RT is measured by how long it takes a person to lift his finger off a central pushbutton and move it to the button under the light that has just flashed on . . ." Jensen "found that reaction times of the more than 400 subjects correlated 'across the board' with their performances on a variety of verbal and non-verbal intelligence measures. . . . Although he found no sex differences in performance, Jensen says he did detect 'black-white difference at the junior college level,' with blacks exhibiting somewhat slower reaction times. . . ." According to the *Science News* article, Jensen emphasizes "that these results do 'not at all' alter his previous conclusions that environment contributes to intelligence at some level. 'I'm not putting any stress on the racial aspects,' he says of his latest research. 'That would be kind of a red herring and detract from the use of reaction time' as an indicator of intelligence."

Usually when a researcher presents mediocre or inferior work to the scholarly community that work elicits no response. But when an article is published in a highly visible and reputable journal such as the *Harvard Educational Review*, as was Jensen's article, even if it didn't have methodological problems, it was inevitable that it would not be ignored. Furthermore, scientists of

reputation felt compelled to rebut the article after popular versions of it appeared in the lay press. After all, how many lay people, who would be making the decisions regarding education in this country, would wade through the 123-page study? And if they did, how many would recognize the problems with the research if not pointed out by scientists? Very few, I'm afraid. The Jensen article is certainly a high impact article. But contemporary

scientists must classify it as important but questionable science. Since most high impact science proves to be great science, the Jensen case is an exception that illustrates one must be cautious in using citation data. But clearly it is the extreme of science. The citation data and the realities on which they are based show that Jensen's work is a milestone event in the history of social science.

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