

***Psychophysical Genius: a Theory, a Controversy, a Refinement***

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Sir Francis Galton developed a theory that the human population could be improved by controlled breeding, and defined this belief as the term “eugenics.”<sup>1</sup> Francis Galton was born February 16<sup>th</sup>, 1822 into a rich family in Birmingham, Britain.<sup>2</sup> Galton had realized at a young age that his parents wanted him to triumph like his grandfather, a prominent physician, naturalist, and freethinker.<sup>3</sup> In beginning his scholarly future, Galton had pursued a medical career at King’s College Medical School in London, but decided leave his studies because of his pure dislike for the subject and took a “short tour to the east” in 1840.<sup>4</sup>

Later in the same year of 1840, Galton returned from his travels and pursued an honors degree of mathematics at Trinity College in Cambridge, but failed to follow through.<sup>5</sup> Galton had suffered a nervous breakdown and said later in his autobiography that, “It would have been madness to continue the kind of studious life that I had been leading... ..I had been much too zealous.”<sup>6</sup> After his father died in 1844, Galton had set out to travel abroad. Some believe that it was his years spent traveling abroad and the book by his cousin Charles Darwin, *The Origin of Species*, that may have inspired Galton’s developed interests in the heredity of mental characteristics.<sup>7</sup>

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<sup>1</sup> Galton, F., (1883/1907/1973). *Inquiries into human faculty and its development*. AMS Press, New York. section, “Energy.”

<sup>2</sup> Galton, F., (1908). *Memories of my life*. Methuen & Co. 36 Essex Street, W. C. London.

<sup>3</sup> Kevles, J. D., (1985). *In the name of eugenics: genetics and the uses of human heredity*. Published by Alfred A. Knopf, Inc. 1<sup>st</sup> ed. pg. 8.

<sup>4</sup> Galton, F., (1908). *Memories of my life*. Methuen & Co. 36 Essex Street, W. C. London.

<sup>5</sup> Galton, F., (1908). *Memories of my life*. Methuen & Co. 36 Essex Street, W. C. London.

<sup>6</sup> Galton, F., (1908). *Memories of my life*. Methuen & Co. 36 Essex Street, W. C. London.

<sup>7</sup> Kevles, J. D., (1985). *In the name of eugenics: genetics and the uses of human heredity*. Published by Alfred A. Knopf, Inc. 1<sup>st</sup> ed. pg. 1.

Francis Galton became a supporter of the hereditary basis of intelligence and credited with familiarizing the phrase “nature and nurture.” His years of research and findings abroad developed into the eugenics movement, which aimed to control the genetic make-up of the human race through selective parentage. Furthermore, the ideals behind Galton’s term continued to be controversial, one of which being the control and observation of human intelligence.<sup>8</sup>

At the time of the eugenics movement, much interest was devoted towards Galton’s impact on psychology and his measurement of intelligence theory.<sup>9</sup> Galton believed that intelligence was passed down from generation to generation based on psychophysical measurements: such as reaction times, movement times, and other mental processes. He had also believed that he was able to measure a person’s intelligence as a single entity. To legitimize his theory, he and psychologist and mathematician Charles Spearman, coined biological statistical methods such as the normal distribution and “factor analysis” technique to quantify the single intelligence entity.<sup>10</sup> Psychologist, James McKeen Cattell also collaborated with Galton and promoted his single entity of intelligence theory through conducting studies of his own. Just as Galton’s theory of measuring intelligence became widely accepted, psychologist Clark Wissler

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<sup>8</sup> Kevles, J. D., (1985). *In the name of eugenics: genetics and the uses of human heredity*. Published by Alfred A. Knopf, Inc. 1<sup>st</sup> ed. pg. 1.

<sup>9</sup> Fancher, R. E., (1985). *The intelligence men: makers of the IQ controversy*. New York: W.W. Norton & Company. pg. 47-48.

<sup>10</sup> Simonton, D. K., (2003). *Francis Galton's hereditary genius: its place in the history and psychology of science*. In R. J. Sternberg (Ed.), *The anatomy of impact: What makes the great works of psychology great* (pp. 3-18). American Psychological Association: Washington, D.C.

disproved the single entity of intelligence theory directly from Cattell's own Columbia University mental test data. Additionally, psychologist Louis Lion Thurstone disproved the connection Galton, Cattell, and Spearman had derived between their developed statistical methods of intelligence measurement.

Some historians feel it is accurate to conclude that the field of psychophysical measurement has changed forever because of Wissler's findings.<sup>11</sup> Yet, others remain in support of the eugenic theory of intelligence and its measurement as a single entity. Despite these disagreements, the ability to quantify human intelligence continued to be a research interest of Galton and others.<sup>12</sup> But from the evidence presented by Galton, Cattell, Spearman, Wissler, and Thurstone, and its analysis through the eyes of historians, it is evident that the theory of intelligence being a single measurable entity was falsely justified through developed statistical methods that remain credible in the present day.

In the 1880s, Galton established an anthropometric research facility known as London's South Kensington Museum to quantify mental and physical characteristics.<sup>13</sup> In Galton's paper "The Anthropometric Laboratory", published in the Fortnightly Review in 1882, he describes why such a measurement facility is necessary. He begins his paper by questioning:

"When shall we have anthropometric laboratories, where a man may from time to time get himself and his children weighed, measured, and

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<sup>11</sup> Murdoch. S., (2007). *IQ: a smart history of a failed Idea*. John Wiley & Sons, Inc.

<sup>12</sup> Fancher, R. E., (1985). *The intelligence men: makers of the IQ controversy*. New York: W.W. Norton & Company. pg. 88-89.

<sup>13</sup> Galton, F., (1882). "The anthropometric laboratory." *Fortnightly review*. Vol. 31. pg. 332-8.

rightly photographed, and have each of their bodily faculties tested, by the best methods known to modern science?”<sup>14</sup>

Throughout the paper he answers and supports his question and continues to defend the necessity of the laboratory. Galton then briefly summarizes that there are four general motives for why one would undergo the mental tests at his laboratory:

- (1) “Their biographical interest to the person himself, to his family, and descendants.
- (2) Their utility, especially from a medical point of view, to himself in after life.
- (3) The information they might give of hereditary dangers and vital probabilities to his descendants.
- (4) Their value as future materials for much-needed investigations into the statistics of life-histories.”<sup>15</sup>

At three pence apiece [Galton said], visitors were administered psychological and intelligence tests, which also provided amusement to the museums visitors.<sup>16</sup>

Galton continued to publish numerous papers in the Journal of the Anthropological Institute concluding on his anthropometric, or physical human body measurement, findings. Also with the establishment of his laboratory, he was able to produce an overwhelmingly large amount of data.

In 1885, Galton published his first paper summarizing results of the anthropometric laboratory. He stated that, “9,337 persons were measured, of

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<sup>14</sup> Galton, F., (1882). “The anthropometric laboratory.” Fortnightly review. Vol. 31. pg. 332-8.

<sup>15</sup> Galton, F., (1882). “The anthropometric laboratory.” Fortnightly review. Vol. 31. pg. 332-8.

<sup>16</sup> Galton, F., (1884). “The cost of anthropometric measurements.” Letter. Vol. 31. pg. 150.

whom 4,726 were adult males, and 1,657 adult females.”<sup>17</sup> With his mathematical background, specifically in biological statistics, Galton understood that data was most reliable when the size of the sampled population was large. He summarized his findings, such as recordings of height, weight, breathing capacity, strength of pull, strength of squeeze, swiftness of blow, and sight distance in tables. He then categorized the measurements by age and gender and summarized his correlations throughout the paper. Galton continued his research in anthropometrics in Cambridge, Amherst College (U.S.A), and Boston, and began to generalize his findings over the next decade to in an effort to understand the measure of an average human.<sup>18</sup>

Ultimately, in 1892, Sir Francis Galton coined the term “eugenics” meaning to:

“express the science of improving stock, which is by no means confined to questions of judicious mating, but which, especially in the case of man, takes cognizance of all influences that tend in however remote a degree to give to the more suitable races or strains of blood a better chance of prevailing speedily over the less suitable than they otherwise would have had.”<sup>19</sup>

From his observations he had believed that human talent was distributed across the human race in a certain way and passed down hereditarily. Galton was

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<sup>17</sup> Galton, F., (1885). *Some results of the anthropometric laboratory*. Journal of the Anthropological Institute. Vol. 14. pg. 275-87.

<sup>18</sup> Galton, F., (1885). *Some results of the anthropometric laboratory*. Journal of the Anthropological Institute. Vol. 14. pg. 275-87.

<sup>19</sup> Galton, F., (1883/1907/1973). *Inquiries into human faculty and its development*. AMS Press, New York. section, “Energy.”

credited with naming and describing the statistical term “normal distribution” and applying it to biological statistic methods like his psychophysical and mental tests. The normal distribution is the idea that data is less likely to produce unusually extreme values. For example, Galton and others had believed that traits such as intelligence and height “regress to the mean” and follow a “normal distribution pattern” in which these inherited results become average in future generations.<sup>20</sup> This conclusion, and Galton’s years of research and findings in anthropometrics and ancestry, developed into the eugenics movement.

Like Galton, James McKeen Cattell was also a major contributor to experimental psychology and the study of human intelligence. As Galton was performing anthropometric research, the American doctoral student, Cattell, was contemporaneously conducting a series of reaction time experiments in Germany. When he found out about Galton’s similar research at the Anthropometric Laboratory, they began exchanging letters. Inspired and based on Galton’s earlier work, Cattell developed 50 psychophysical tests and founded his own Anthropometric Laboratory at Cambridge University.<sup>21</sup>

Also, one of Cattell’s goals was for psychology to be viewed as equally important as the physical and life sciences. Cattell wrote in his 1896 presidential address to the American Psychological Association that, “...psychology now rivals the other leading sciences in the number of students attracted and in the

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<sup>20</sup> Simonton, D. K., (2003). *Francis Galton's hereditary genius: its place in the history and psychology of science*. In R. J. Sternberg (Ed.), *The anatomy of impact: What makes the great works of psychology great*. (pp. 3-18). American Psychological Association: Washington, D.C.

<sup>21</sup> Fancher, R. E., (1985). *The intelligence men: makers of the IQ controversy*. New York: W.W. Norton & Company. pg. 47-48.

amount of original work accomplished.”<sup>22</sup> He also concludes in this article that, “The twilight of philosophy can be changed to its dawn only by the light of science, and psychology can contribute more light than any other science.”<sup>23</sup> Once Cattell returned back to the United States, he shared his views after working with Galton in his article entitled “Mind”<sup>24</sup> and his co-authored article published in The Psychological Review entitled “Physical and Mental Measurements of the Students of Columbia University” with Dr. Livingston Farrand. In this article he explained that he gathered quantitative facts from 100 students at Columbia University, and that these facts should be considered the basis of science. He defined the instrument he used to collect this data as the “mental test.” In the conclusions of his study conducted with Farrand, he stated that future studies should observe “the interrelations of the traits which we define and measure” and that “we must use our measurements to study the development of the individual and of the race, to disentangle the complex factors of heredity and environment.”<sup>25</sup> From his conclusions in these articles, it is evident that Cattell’s goals may have been (1) to develop a way to measure the entity of human intelligence and (2) to strengthen psychology’s scientific

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<sup>22</sup> Cattell, J. M., (1896). *Address of the president before the American Psychological Association*, 1895. Psychological Review, 3 (2), 1-15. pg. 1.

<sup>23</sup> Cattell, J. M., (1896). *Address of the president before the American Psychological Association*, 1895. Psychological Review, 3 (2), 1-15. pg. 1.

<sup>24</sup> Cattell, J. M., (1890). *Mental tests and measurements*. Mind, 15, 373-381.

<sup>25</sup> Cattell, J. M., (1896). *Physical and mental measurements of the students of Columbia University*. Psychological Review, 3 (6), 618-648. pg. 648.



credentials, perhaps both. Either way, Cattell's work has greatly contributed to the field of experimental psychology.<sup>26</sup>

Like Galton and Cattell, Charles Spearman was also a major contributor to the development of intelligence research. Spearman proposed in his 1904 American Journal of Psychology paper entitled "General Intelligence, Objectively Determined and Measured" that intelligence can be quantified as a single entity. In the article he defined this single entity as the "general factor" or *g*. To measure *g* Spearman had developed the "factor analysis" technique. He developed this technique to describe correlations of a "mental test" through a set of varying conditions. Spearman also believed that by defining his general factor, "he had discovered the elusive entity that would make psychology a true science", as agreed by Cattell.<sup>27</sup> In fact, this technique remains an important factor in present day statistical analysis methods.<sup>28</sup> He used his factor analysis method to portray that the scores on mental tests, specifically ones of Cattell, are all positively correlated. Spearman therefore believed that his "factor analysis" technique proved that all intelligent behavior is derived from a single measurable entity, but in reality, he only developed another mathematical analysis method, as many historians would agree.<sup>29</sup>

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<sup>26</sup> Chamorro-Premuzic, T., (2007). *Personality and individual differences*. Blackwell Publishing. BPS Textbooks in Psychology. pg. 72.

<sup>27</sup> Gould, J. S., (1996). *The mismeasure of man*. W. W. Norton & Company, Inc. pg. 291.

<sup>28</sup> Fancher, R. E., (1985). *The intelligence men: makers of the IQ controversy*. New York: W.W. Norton & Company. pg. 49.

<sup>29</sup> Spearman, C., (1904). *General intelligence, objectively determined and measured*. American Journal of Psychology, 15, 201-293.

As Cattell and Spearman began to think that their “mental test” and “factor analysis” techniques correctly defined and quantified human intelligence, Clark Wissler and Luis Lion Thurston were determined to challenge and disprove what they believed were flawed claims. Wissler was one of Cattell’s graduate students at Columbia University at the time of his doctoral dissertation. He conducted his dissertation to suggest that Cattell’s “mental test” work was wrong. He believed that “the times demand that the results obtained by the various tests [Cattell’s mental tests] be made an object of study.”<sup>30</sup> In doing so, he applied the Pearson correlation factor to disprove Cattell’s findings, specifically the relationship between each student’s score on each of the tests and their undergraduate grades. The Pearson correlation, coined by mathematician Karl Pearson, compares the degree of association between two variables, and describes the degree as a number between +1 and -1.<sup>31</sup> A positive correlation implies a positive association between the variables (X and Y), and its magnitude describes how related X and Y are, and vice versa. Like Spearman’s factor analysis technique, this statistical method remains used as credible in the present day as well.<sup>32</sup>

Wissler described in the beginning of his dissertation entitled “The Correlation of Physical and Mental Tests” that:

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<sup>30</sup> Wissler, C., (1901) *The correlation of mental and physical tests*. Psychological Review. Monograph Supplements, 3 (6). pg. 1.

<sup>31</sup> Stigler, S. M., (1989). "Francis Galton's Account of the Invention of Correlation." *Statistical Science* 4 (2): 73–79.

<sup>32</sup> Fancher, R. E., (1985). *The intelligence men: makers of the IQ controversy*. New York: W.W. Norton & Company. pg. 49.

“In correlation it need only be borne in mind that we are using an accepted method [Pearson coefficient] to estimate the relative necessary relation between the phenomena under consideration. To make any such comparison at all we must assign our results a place in the scale of values. This is what the method of correlation does.”<sup>33</sup>

Through his dissertation, Wissler also explains and comments on every aspect of Cattell’s mental test. He includes Cattell’s tables and diagrams from his tests at Columbia University and states that most of the correlations are due to chance and “below the limit of certainty”<sup>34</sup> as a statistical argument. For example, when Wissler discusses quickness in relation to class standing he states, “Here we are face to face with another cold fact: the tests of quickness seem to hold a chance relation to class standing, and ability to do well in the memory tests has but little significance.”<sup>35</sup> Finally, Wissler used Cattell’s data to form three general conclusions in his dissertation:

1. “That the laboratory mental tests show little intercorrelation in the case of college students.
2. That the physical tests show a general tendency to correlate among themselves but only to a very slight degree with the mental tests.

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<sup>33</sup> Wissler, C., (1901) *The correlation of mental and physical tests*. Psychological Review. Monograph Supplements, 3 (6). pg. 62.

<sup>34</sup> Wissler, C., (1901) *The correlation of mental and physical tests*. Psychological Review. Monograph Supplements, 3 (6). pg. 46.

<sup>35</sup> Wissler, C., (1901) *The correlation of mental and physical tests*. Psychological Review. Monograph Supplements, 3 (6). pg. 35.

3. That the markings of students in college classes correlate with themselves to a considerable degree but not with the tests made in the laboratory.”<sup>36</sup>

Wissler had found that there was no correlation between scores on Cattell’s mental test and academic achievement, and that there was no correlation between the tests themselves. Therefore, if the data didn’t correlate with itself or with academic grades (mental ability), then, Wissler concluded, Cattell’s mental tests could not be a valid measure of intelligence. Although Clark Wissler was a supporter of the Galton Society and “...dedicated to the active promotion of eugenics research and policies,”<sup>37</sup> he publicized his conclusions just as the eugenics movement was gaining support and when psychophysical measurement was the primary research standard for intelligence testing.<sup>38</sup> From his findings, Wissler was “...convinced that heredity was more important than factors in the environment in determining a person’s character and behavior.”<sup>39</sup> Consequently, in improving the eugenics theory of intelligence, Wissler’s dissertation confirmed that psychophysical measurements were neither accurate nor correlated to the measure of intelligence; however, Wissler remained in support of the underlying idea of hereditary intelligence.

Also, Louis Lion Thurstone challenged Spearman’s idea of the ability to quantify intelligence as a single entity; specifically his “general factor” *g*.

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<sup>36</sup> Wissler, C., (1901) *The correlation of mental and physical tests*. *Psychological Review*. Monograph Supplements, 3 (6). pg. 62.

<sup>37</sup> Fish, M. J., (2002). *Race and intelligence: separating science from myth*. Lawrence Erlbaum Associates, Inc. pg. 167-68.

<sup>38</sup> Fancher, R. E., (1985). *The intelligence men: makers of the IQ controversy*. New York: W.W. Norton & Company. pg. 49.

<sup>39</sup> Fish, M. J., (2002). *Race and intelligence: separating science from myth*. Lawrence Erlbaum Associates, Inc. pg. 167-68.

Thurstone was a major contributor to psychology, measuring psychometrics, statistics, and human intelligence. He developed a newly revised and approved concept of factor analysis that Spearman had originally coined. In his address of the president before the American Psychological Association entitled “The Vectors of Mind” he reviewed the single-factor theory of Spearman, described his new general-factor theory, and then applied his new factor notion to a number of psychological problems. He stated in his address that:

“Professor Spearman deserves much credit for initiating the factor problem and for his significant contribution toward its solution, even though his formulation is inadequate for the multidimensionality of the mental abilities.”<sup>40</sup>

Thurstone gave credit to Spearman for deriving and initiating the factor analysis technique, but he had revised it in a more adequate and reliable way. In his later publication entitled “The Theory of Primary Mental Abilities” Thurstone claimed that intelligent behavior originates from seven primary abilities (word fluency, verbal comprehension, spatial visualization, number facility, associative memory, reasoning, and perceptual speed), unlike Spearman’s belief of intelligence being a single entity, or *g*.<sup>41</sup> To test his theory of primary abilities, Thurstone gathered others similarly scored mental test data and found that the results did in fact portray different mental abilities, supporting his model and disproving Spearman’s original theory. But, when Thurstone conducted his own

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<sup>40</sup> Thurstone, L. L., (1933) *The vectors of mind*. *Psychological Review*. pg. 1-34.

<sup>41</sup> Thurstone, L. L., (1938). *Primary mental abilities*. Chicago: University of Chicago Press.

similar test, he initially found evidence of  $g$  and no separate primary abilities, contradicting his previous results. Accordingly, Thurstone was able to derive an elegant mathematical solution that compromised findings for both his seven mental abilities and Spearman's single-factor theory.<sup>42</sup> Even despite Thurstone's disproving of Spearman's  $g$ , Spearman still "felt sure that he had discovered the basis of intelligence, so sure that he proclaimed his concept impervious to disprove."<sup>43</sup> Additionally, Harvard professor and historian, Stephen Gould analyzes the theories of Thurstone and Spearman and states in his book "The Mismeasure of Man" that "Since either solution resolves the same amount of information, they are equivalent in mathematical terms. Yet they lead to contrary psychological interpretations."<sup>44</sup> Thurstone's findings helped revise the basic understanding of quantifying human intelligence, which allowed for future development and theories to build upon his correct method.

The works of Wissler and Thurstone had an affect on the interest in psychophysical measurement and the measurement of human characteristics itself. Spearman was disheartened by Wissler's results and Cattell discontinued his psychophysical measurement testing.<sup>45</sup> However, Spearman believed that if he applied his correction formula to Cattell's original data, the real correlations and relationships could be assessed, disproving Wissler's conclusions.<sup>46</sup> Yet,

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<sup>42</sup> Thurstone, L. L., (1933) *The vectors of mind*. Psychological Review. pg. 1-34.

<sup>43</sup> Gould, J. S., (1996). *The mismeasure of man*. W. W. Norton & Company, Inc. pg. 297.

<sup>44</sup> Gould, J. S., (1996). *The mismeasure of man*. W. W. Norton & Company, Inc. pg. 299.

<sup>45</sup> Fancher, R. E., (1985). *The intelligence men: makers of the IQ controversy*. New York: W.W. Norton & Company. pg. 49.

<sup>46</sup> Fancher, R. E., (1985). *The intelligence men: makers of the IQ controversy*. New York: W.W. Norton & Company. pg. 88-89.

Spearmen's calculations had been previously outdated by Thurstone's theory of the general-factor and his seven primary mental abilities. Therefore, Wissler's conclusions stood as credible, despite the continuing controversy. Galton continued to be in support of his original eugenic and hereditary theory until his death in 1911.<sup>47</sup> Although Cattell and Galton abolished their psychophysical testing research, critics were devoted to disprove Wissler, but none were successful.

The Wissler controversy has been of much debate through the eyes of many historians. Some believe that even if Wissler's correlations and conclusions were correct, the inferences based on his results were not.<sup>48</sup> Others also argued that because Cattell's students were all from the same "homogeneous group," that correlations would be expected to be lower.<sup>49</sup> However, American psychologist Robert Sternberg claimed that Wissler's dissertation was the "coup de grace"<sup>50</sup> and others believed that Wissler's dissertation "...permanently changed the dominant research paradigm for intelligence testing."<sup>51</sup> Additionally, journalists have commented on Wissler's dissertation as having "devastated the field" of experimental psychological testing.<sup>52</sup> Yet, Gould analyzes the intelligence controversy in its entirety and more accurately concludes that, "We learn about

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<sup>47</sup> Fancher, R. E., (1985). *The intelligence men: makers of the IQ controversy*. New York: W.W. Norton & Company. pg. 82.

<sup>48</sup> Sternberg, R. J., (1990). *Metaphors of mind: conceptions of the nature of intelligence*. Cambridge: Cambridge University Press. pg. 73-74.

<sup>49</sup> Sternberg, R. J., (1990). *Metaphors of mind: conceptions of the nature of intelligence*. Cambridge: Cambridge University Press. pg. 72.

<sup>50</sup> Sternberg, R. J., (1990). *Metaphors of mind: conceptions of the nature of intelligence*. Cambridge: Cambridge University Press. pg. 72.

<sup>51</sup> Fancher, R. E., (1985). *The intelligence men: makers of the IQ controversy*. New York: W.W. Norton & Company. pg. 49.

<sup>52</sup> Murdoch. S., (2007). *IQ: a smart history of a failed Idea*. John Wiley & Sons, Inc. pg. 27.

diversity in order to understand, not simply to accept.”<sup>53</sup> Meaning that one can only learn and move forward by understanding different points of view, not merely by accepting a select few established arguments and theories. Gould’s conclusion can be directly applied to the refinements Wissler and Thurstone implemented towards the field of intelligence testing and the eugenic theory.

From reviewing Wissler’s dissertation and its impact through the eyes of many historians, it can only be believed that his argument, and Thurstone’s ability to correct Spearman’s theory had greatly impacted the field of intelligence testing. If Wissler had not made the effort to disprove the underlying theories set forth by Galton and Cattell, there may not have been a revision in quantifying intelligence instead as multiple mental abilities. This is also true with Thurstone; even though he found a compromise with Spearman’s single-factor theory and his own seven mental abilities, if he had not made this argument, the present intelligence tests may not be structured based off of multiple categories of mental abilities, and still categorized as a single score; there would have still been a link between developed statistical methods of determining human intelligence. Also, since Galton believed that a normal distribution could be applied to human intelligence measurements, his theory may be flawed because of Thurstone’s method of several mental abilities. Additionally, Wissler’s dissertation amended Galton and Cattell’s theories and confirmed that psychophysical measurements did not, in fact, correlate with intelligence testing. Most importantly, it is clear that

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<sup>53</sup> Gould, J. S., (1996). *The mismeasure of man*. W. W. Norton & Company, Inc. pg. 424.



Galton, Spearman, and Cattell developed statistical methods to prove their theory true, but did not analyze their results with already accepted methods of correlation. This is exactly what Clark Wissler did, and because of doing so, his dissertation explains that there was an established split between certain statistical analysis techniques and intelligence measurement (specifically Spearman's *g* and the "normal distribution"). Like how the phenomenon of Gravity initiated the derivation of Newton's three Law's of Motion—Galton, Spearman, and Cattell had established a theory of intelligence measurement and developed statistical analysis methods; the only difference being that Clark Wissler disproved the latter and the former still holds true. However, it is important to remember that it was the works of these men and many others that developed ideas and produced an understanding for the development of the future of intelligence testing.

Therefore, it is the understandings of the brave arguments established by Clark Wissler and Luis Lion Thurstone that allowed future generations to reformat intelligence testing, develop new (even though unrelated) statistical analysis methods, and which in turn, refined its eugenic roots.

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