

himself insofar as the assigned task is concerned but if tests are taken for which he is not prepared it will appear that the adaptation is through loss in some other direction. He may show less permanency of associative bonds, he may have done the work at a greater strain, he may have used some trick to overcome the effect, or he may have grasped fewer of the incidental features of the work; he may show any or all of these effects and others also might be found had we adequate measures, but in some way he pays in order to keep his speed and accuracy up to par.

9. Finally, the value of a group of measurements simultaneously taken cannot we believe, be overestimated. If a dozen tests are given to the same individual at different times he will be able to adapt himself to each test in spite of unfavorable conditions and the pooled results of such a group of measures will show nothing. If however he is given one test and a dozen other measures are taken while he is working, if there is any effect of the conditions it will show itself in some way or other. Any one can adapt himself to conditions so that the work in hand will show little or no effect of any ordinary disturbance or even of an extraordinary one (it is the habit of the human organism to so adapt itself) but the object of studying the effects of environmental conditions is not to find whether one can so adapt himself, it is to see by what means he does so. Regardless of the difficulties involved in the way of technique the method of simultaneous measures must take precedence over the one-test-at-a-time method, the futility of which as a test of conditions has been fully demonstrated in recent years.

THE INTELLIGENCE QUOTIENT OF FRANCIS GALTON IN CHILDHOOD

LEWIS M. TERMAN, Stanford University, Cal.

The writer does not remember to have seen Francis Galton classed among boy prodigies. Indeed, Galton's main contributions to science were given to the world at so late a date in his life that he is not infrequently mentioned as an illustration of late maturing genius. *Hereditary Genius* was published in the author's fiftieth year; *Natural Inheritance* in his sixty-eighth year; and on the practical side the most important work of his life was not accomplished until he was more than eighty years of age.

In the recently published Volume I of Karl Pearson's *Life, Letters and Labors of Galton*, there is ample evidence that Galton was a boy of unusual attainments and that he was extraordinarily precocious. The biography in question departs radically from the usual type of biography by presenting documentary evidence regarding the more important events in the life of its subject, and that concerning Galton's childhood is especially full and significant. From the evidence given, one is justified in concluding that between the ages of three and eight years, at least, Francis Galton must have had an intelligence quotient not far from 200; that is, his mental age at that time was not far from double his actual age.

The significance of this will be apparent when we say that after diligent search in several cities and several counties in California—a search including many thousand of children in scope—the highest intelligence quotient we have yet found is 170. The number that we have found going above 150 can be counted on the fingers of one hand.

From early childhood Galton was under the instruction of his sister, Adèle, herself a mere child. "She taught him his letters in play, and he could point to them all before he could speak. Adèle had a wonderful power of teaching and gaining attention without fatiguing. She taught herself Latin and Greek that she might teach him. She never had him learn by heart, but made him read his lesson, bit by bit, eight times over, when he could say it. He could repeat much of Scott's *Marmion* and understood it all by the time he was

five." (Quoted by Pearson from Elizabeth Anne Galton's *Reminiscences*).

Pearson further informs us that Francis knew his capital letters by twelve months and both his alphabets by eighteen months; that he could read a little book, *Cobwebs to Catch Flies*, when two and a half years old, and could sign his name before three years. The following letter has survived from his fourth year, a letter which has been endorsed by his mother, saying that Francis wrote and spelled it entirely himself:

" My
 dear
 Uncle
 we have
got Ducks. I know
A Nest. I mean
 to make a
 Feast."

The day before his fifth birthday he wrote the following letter to his sister:

" MY DEAR ADELE,

I am 4 years old and I can read any English book. I can say all the Latin Substantives and Adjectives and active verbs besides 52 lines of Latin poetry. I can cast up any sum in addition and can multiply by 2, 3, 4, 5, 6, 7, 8, [9], 10, [11].

I can also say the pence table. I read French a little and I know the clock.

FRANCIS GALTON,
February 15, 1827."

The only misspelling is in the date. The numbers 9 and 11 are bracketed above, because little Francis, evidently feeling that he had claimed too much, had scratched out one of these numbers with a knife and pasted some paper over the other!

This document should have great interest for those who have worked with mental tests. That Francis at less than five years could read any English book demonstrates beyond any possible doubt that he was as far advanced at this time as the average English or American child at nine or ten years. It is an accomplishment which we do not believe is possible to a mental age of less than nine years with any amount of formal instruction. It is certain that our subject's accomplishments did not include merely the ability to pronounce words mechanically, for there is ample evidence from other sources that at this early age he read with understanding.

Again, at this age Francis had learned to do any sum in addition, and had learned all but the hardest part of the multi-

plication table. This indicates, at least, nine-year intelligence, for we have found that, however old a child and however much school instruction he may have had, the multiplication table is seldom mastered thoroughly much below the nine-year level. Further, his knowledge of the "pence table" indicates an acquaintance with the coins and their values such as children ordinarily do not have before something like eight years.

Besides informing us that Francis had, at this tender age, gotten quite a start in French and Latin, the above letter also tells us that he "knows the clock"; that is, presumably, he was able to tell the time of day by the clock. This performance has been definitely standardized at the mental age of 9 to 10 years¹, and it is almost never passed before the mental age of eight years.

The reader may raise the question whether it is safe to accept a child's own statements with regard to the above points. It would not be, of course, if there were no corroborative evidence. The fact that there is such evidence from many sources, and the fact that little Francis was known to be as remarkably conscientious as he was intelligent, justifies us in accepting the above statements without the slightest discount.

The fact that Francis' reading at the age of five years was intelligent and not of the mechanical kind, is demonstrated by his ability at that age to offer quotations which would fit a given situation. For example, when he was five years old, a boy friend asked his advice as to what he ought to say in a letter to his father, who, it seems, was in danger of being shot for some political affair. Little Francis replied immediately from Walter Scott:

"And if I live to be a man,
My father's death revenged shall be."

Again at the age of five, he was found holding a group of tormenting boys at arm's length, shouting meanwhile,

"Come one, come all. This rock shall fly
From its firm base, as soon as I."

By six, under the tutelage of Adèle, he had become thoroughly conversant with the Iliad and the Odyssey. At this age, a visitor at the Galton home made Francis weary by

¹ Gertrude Hall: Eleven Mental Tests Standardized. Bulletin of State Board of Charities, New York, 1915, pp. 79ff.

cross-questioning him about points in Homer. Finally, the boy replied, "Pray, Mr. Horner, look at the last line in the 12th book of the *Odyssey*" and then ran off. The line in question reads, "But why rehearse all this tale, for even yesterday I told it to thee and to thy noble wife in thy house; and it liketh me not twice to tell a plain told tale."

It seems that Adèle also taught Francis a good deal about entomology, and at six and seven years he was active and persistent in collecting insects and minerals, which he is said to have classified and studied in more than a childish way. It has been shown by Mrs. Burk² that collections of an analytical and classificatory type are not common before twelve or thirteen years. Here, again, we find evidence of an intelligence quotient not far from 200.

Pearson quotes the following letter written by a visitor at the Galton home on December 28, 1828:

"The youngest child, Francis, is a prodigy. He is seven next February and reads 'Marmion', 'The Lady of the Lake', Cowper's, Pope's and Shakespeare's works for pleasure, and, by reading a page twice over, repeats it by heart. He writes a beautiful hand, is in long division, and has been twice through the Latin Grammar; all taught by Adèle."

At the age of eight, Francis was taken away from home to attend a boarding school. Here he was placed in a high class, although the boys in it ranged up to fifteen years. Since this was a private school attended by children of a superior social class, it is altogether likely that his fourteen and fifteen-year-old classmates were themselves above the average mental level of that age; hence Francis must by this time have reached a mental level of not far from that which is median for sixteen years.

In his first year at this school, we find Francis writing to his father in these words: "I am very glad that you have left off being a banker, for you will have more time to yourself and better health." This little quotation certainly betokens a degree of filial solicitude by no means common to children of this age. Such altruism does not ordinarily develop so early. The words fit sixteen-year much better than eight-year intelligence.

Francis' interests at the age of ten are indicated by the following letter:

² Caroline Frear Burk: The collecting instinct. *Pedagogical Seminary*, Vol. VII, 1900, pp. 179-207.

December 30, 1832.

MY DEAREST PAPA:

It is now my pleasure to disclose the most ardent wishes of my heart, which are to extract out of my boundless wealth in compound, money sufficient to make this addition to my unequaled library.

The Hebrew Commonwealth by John.....	9
A Pastor Advice.....	2
Horne's commentaries on the Psalms.....	4
Paley's Evidence on Christianity.....	2
Jones Biblical Cyclopedia.....	10

27

It is hardly necessary to comment on the above letter as an indication of the boy's mental maturity. It speaks for itself.

Francis' interests, however, were not wholly literary, for at the age of thirteen he gave us "Francis Galton's Aerostatic Project." It seems this was a series of drawings representing a flying machine. It was to work by large, flapping wings with a sort of revolving steam engine, and was supposed to carry five passengers, a pilot and an engineer.

At the age of fifteen, we find the youth Galton expressing in his letters to his father serious opinions on mind training, the relative value of classics and English, and other matters of educational theory. These opinions were voiced by him again some sixty years later, substantially without change.

At the age of fifteen Francis was admitted to the general hospital at Birmingham as a medical student.

It is well known that, in general, a high correlation obtains between favorable mental traits of all kinds; that, for example, children superior in intelligence also tend to be superior in moral qualities. Francis Galton was no exception to this rule, as indicated by the following letter written by his mother when the boy was only eight years old: "Francis from his earliest age showed highly honorable feelings. His temper, although hasty, brought no resentment, and his little irritations were soon calmed. His open-minded disposition, with great good nature and kindness to those boys younger than himself, made him beloved by all his school fellows. He was very affectionate and even sentimental in his manners. His activity of body could only be equalled by the activity of his mind. He was a boy never known to be idle. His habit was always to be doing something. He showed no vanity at his superiority over other boys, but said it was a shame that their education should have been so neglected."

After Mr. Pearson has given us all the above significant information, it is astonishing to find him commenting upon it as follows: "The letters we have quoted from these early years may appear to the reader to contain little of note. They are, indeed, just what a healthy normal child would write, but it is that very fact that makes them essential human documents and gives them their fundamental interest."

Need we attempt to see signs of exceptional ability or to discover foreshadowings of future achievement in these outpourings of healthy childhood? I do not think we can say more than that Francis Galton was a normal child with rather more than average ability", etc.

Mr. Pearson's error is of a kind which is now coming to be generally recognized by those who work with mental tests; that is, an error due to the failure to take into account the significance of a mental performance *in terms of the mental age to which it corresponds*. Pearson did not know, and the average teacher does not fully appreciate, that a child of four years who is able to do the things characteristic of a child of seven or eight years is a genius of the first order. It is hard to get people to understand that what a child is able to do has no significance unless we take age into account.

The opposite error is no less common; that is, for a mentally retarded child in a grade far below his age to be considered perfectly normal and average in intelligence. Only recently we were consulted by a teacher regarding a child who was described as "slow to learn". The child in question was twelve years old and in the first grade, and we suggested to the teacher that in all probability the child was feeble-minded. We were met, however, with the most positive assurance that the little girl in question could not possibly be feeble-minded, that she was actually learning the work of the first grade, and that her normal mentality was shown by her motherly interest in her little six-year-old classmates. Without arguing the matter further, we urged the teacher to bring the child for a Binet test, with the result that she was found to have a mental age of a little less than 6 years by the Stanford Revision. This child had been in school several years and had had every opportunity to learn, except the advantage of endowment. Experience has taught us that such a subject will never reach the mental level of seven years, however long she may live.

This teacher's error may seem to some almost incredible. In reality it is an error of about the same degree as that made by Mr. Pearson, though in the opposite direction. Similar errors, though perhaps not quite as great, are abundant even

in the writings of psychologists on mental tests. They are to be found over and over, for example, in Professor Holmes' recent book "The Backward Child."

Studies are now in progress at Stanford University on exceptionally intelligent children, and we should especially like to receive information about children who test much above 150 by the Stanford-Binet scale. As already stated, the highest intelligence quotient that we have found is 170. We need accurate case descriptions and follow-up work on cases testing 150 to 200.