# THE VERSATILITY OF GENIUS*[1]

*From the Psychological Laboratories of Stanford University*

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## PURPOSE

The purpose of this study is twofold: (*a*) to estimate the versatility of three hundred eminent men, as an indication of the extent to which specialization is favorable or unfavorable to the attainment of eminence; and (*b*) to discover what kinds of special ability are associated with certain kinds of genius, as an indication of the vocational types to be kept in mind in the education and guidance of gifted children.

## SUBJECTS AND METHOD

The subjects used were the three hundred eminent men studied by Dr. C. M. Cox (1) in her book, *The Early Mental Traits of Three Hundred Geniuses*, and the data on their special abilities are drawn almost entirely from the material collected in the preparation of that book. For a complete description of the method of selection, the composition of the group, and the nature of the data, the reader is referred to that volume. The criterion of inclusion was, almost of necessity, eminence or fame rather than ability estimated directly as such. Only individuals born after 1450 A.D. and before 1850 A.D. were considered.

Some three thousand volumes were consulted by the compilers of the original data, who were instructed to make note (among other things) of all significant facts showing special ability or deficiency along any line. The resulting collection of condensed information, on file at Stanford University, amounts to an average of about twenty typewritten pages per individual included. Because of the extensiveness of the material, only a very much condensed account of each individual case study, chiefly drawn from the material which had

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the most direct bearing on the estimation of the IQ, was published in the form of case studies (1, Part II).

The writer derived most of his material from the manuscript biographies; that is, from the twenty-page biographies, and not from the far more condensed case studies published in Dr. Cox's book. He transcribed or paraphrased, on a separate sheet of paper for each man, all items of information there collected in regard to special abilities or deficiencies. The information on versatility thus collected was then evaluated by two independent raters, Mrs. Ruth H. Thomson (formerly Mrs. Ruth Haines Livesay) and the writer. Mrs. Thomson, under Dr. Cox's direction, had collected the material for about one third of the original case studies, and was familiar with the general plan of the work. Both raters used the original files freely in supplementing the selected items on the "versatility sheets."

About ten per cent of the scores were later modified, and some new ones added, by Dr. L. M. Terman, and by Dr. E. M. Hulme and Dr. R. H. Lutz of the Stanford History Department, who very kindly looked over the records of men about whom they possessed special information. The scores given by them were averaged with those of the writer. (In computing reliability coefficients their ratings were simply substituted for those of Mrs. Thomson, in the few cases where such substitution was necessary.)

It was found that the data could be conveniently classified under 23 fields of ability, more or less arbitrarily defined as follows:

1. *Administration*: executive work in religious, educational, or scientific organizations. Business, politics, and warfare are not included.
2. *Art*: drawing, painting, sculpture, architecture, or unusual appreciation.
3. *Business*: money-making ability, or business administration. Negative scores denote, in some instances, general absentmindedness or impracticality.
4. *Conversation*: the non-scholastic, purely human side of conversation. "Charm."
5. *Drama*: writing or unusual appreciation.
6. *Handwork*: non-creative manual ability.
7. *History*: history and biography.
8. *Humor*: wit and humor shown in conversation or inferred from writings, the latter being discounted as less spontaneous.
9. *Invention*: creation of new mechanical devices.

10. *Languages*: foreign languages, ancient and modern.
11. *Law*: theory or practice of law.
12. *Mathematics*: pure mathematics, astronomy, engineering, surveying, navigation.
13. *Medicine*: medical practice or knowledge (research being included under "science").
14. *Music*: composing, performing, or unusual appreciation.
15. *Non-fictional prose*: essays, criticism, letters, controversial writing, journalism, or an excellent literary style in science, philosophy, etc.
16. *Novels*: novels or short stories; writing, story-telling, or unusual appreciation.
17. *Philosophy*: epistemology, ethics, theology, and theoretical psychology.
18. *Poetry*: verse of any kind; writing or unusual appreciation.
19. *Politics*: participation in politics or diplomacy; not political theory.
20. *Public speaking*: political speaking, lecturing, preaching, teaching (in some cases), acting.
21. *Science*: the relatively non-mathematical sciences; not astronomy.
22. *Social theory*: political, economic, and educational theory.
23. *Warfare*: military and naval activity; exploration.

Each man was given a rating in each of these 23 special abilities except the one in which his own primary achievement was assumed to lie. The rating was done on a subjective scale, with scores running from minus 5 to plus 5, 0 representing the assumed ability of the average college graduate of today in the trait in question.

"Versatility" was defined in terms of ability; but, to a certain extent, interest was taken as an indication of ability, and activity as an indication of interest. For example, in the single field of musical ability, our only information about the astronomer Kepler was that he "began to learn music at the age of eight."[2] He was given a score of 1 by both raters, because both believed that this activity indicated slightly more than a fifty-fifty chance that Kepler possessed musical

[2]References are not given for any of the numerous but fragmentary quotations scattered throughout this paper. The relative reliability of sources has, however, been definitely considered in the evaluation of data. A bibliography for each man is given by Cox (1). The source of any specific quotation will be furnished gladly, on request.

ability slightly greater than that which the average American college graduate would have had at the same age. Though positive, this piece of information is so meager as to be almost negligible. A score of 5, or the highest possible (since no scores were given in music to men who achieved eminence primarily in music), was granted to the astronomer Herschel, who played the violin at four, was later an oboist, bandmaster, manager of concerts, and organist, and who, at the ages of 21 and 22, wrote 12 symphonies. An attempt was then made to divide the difference between Kepler and Herschel into four equally-noticeable intervals, and individuals falling between were scored accordingly. For instance, a score of 2 was given to the poet Longfellow, who was fond of playing the flute. A score of 3 was granted to Washington Irving because, at the age of ten, he had "a love of music which became later in life a passion." The philologist Wolf earned a score of 4 by studying music (singing and clavier playing) at the age of three, becoming accomplished later in string and wind instruments, and composing new airs between the ages of fourteen and eighteen. In each field, mere interest or activity was rarely given a score above 2; definite evidence of ability without originality was rarely scored above 3; and the scores of 4 and 5 were reserved for creative achievement of a rather high order. Concrete evidence of achievement coming from a reliable source was also, of course, scored higher than subjective estimates or information coming from questionable sources.

Individuals about whom there was no information (there were 213 in the field of music, for example) were given scores of 0. On the other side of the zero line, the same method was used. For example, Immanuel Kant was given a score of —2 because he "disregarded music." The lowest score in music (or any other field) was given to Alexander Humboldt, who considered music a "social calamity." One rater gave him —5, the other —4. Here, as always when the ratings differed (as they did in about 40% of the cases), the average, or —4.5, was taken as the final score.

Reliability coefficients, measuring correspondence between the two raters' estimates, were computed for only two abilities; but, since these agreed fairly closely and seemed by inspection to be representative of the whole, it was not considered necessary to go further. The coefficients (not stepped up in any way) were, for languages, $.75 \pm .02$, and for politics, $.78 \pm .03$.

This surprisingly high reliability does not imply, of course, equally

high validity. The two raters were using almost exactly the same information, limited in scope, and usually quite specific. The fact that they tend to interpret it in the same way does not remedy the fact that the original biographical information depends in many cases upon subjective estimates made by the associates of the individual, who were untrained observers, or even on hearsay evidence. (See criticism, page 480).

As a partial check on validity, three individuals were investigated with considerably more thoroughness than any of the others. These were the chemist Davy, the philosopher Spinoza, and the statesman Webster. They were selected in order to be as nearly as possible representative of the group as a whole in number of versatility-points given previously (an extremely rough measure, not used anywhere else in this study), in amount of additional material available, and in eminence as indicated by Cattell's ranking. An average of 5.7 volumes were consulted for each of the three, and, in the light of the new information, each score previously given was re-examined. Only one person, unfortunately, was able to do this re-examination (the writer). As a result of it, the number of abilities on which there was some information was increased 30%. The average excess of positive over negative scores was increased; that is, these men seemed to be slightly more versatile after the follow-up than they had seemed before. The excess of positive scores decreased from 18.5 to 18 in the case of Davy, increased from 18.5 to 23.5 in the case of Spinoza, and remained unchanged at 20 in the case of Webster.

The scores obtained were recorded on a large chart, and the average score in each kind of ability was computed separately for 12 classes of geniuses. In at least 95% of the cases the classification of the subjects was that given by encyclopedias, but in a few the writer used his own judgment in order to bring the classification into conformity with the definitions of special abilities given above, on pages 461-462. The number of individuals included in each class was as shown in Table 1.

These types of genius were then ranked for each ability, and each type compared with the mean for the whole three hundred. Since there are no norms derived from comparable or control groups, this comparison with the mean of the group as a whole seemed to be the only method that could be used in constructing a trait profile, in terms of special abilities, for each type.

TABLE 1

| Class | Number |
|---|---|
| Statesmen | 57 |
| Novelists and dramatists | 32 |
| Soldiers and explorers | 32 |
| Philosophers and social theorists | 31 |
| Poets | 26 |
| Scientists | 26 |
| Religious leaders | 22 |
| Historians and philologists | 19 |
| Non-fictional prose writers | 19 |
| Artists | 13 |
| Mathematicians and astronomers | 12 |
| Musicians | 11 |
| Total | 300 |

## RESULTS

### *General Versatility*

*Positive vs. negative scores.* There was an overwhelming preponderance of positive as compared with negative scores in ratings of the separate abilities (Table 2).

TABLE 2

| | Number | Percentage of total |
|---|---|---|
| Scores above zero | 2015 | 30.5 |
| Scores below zero | 141 | 2.1 |
| Zeros (no information) | 4450 | 67.4 |
| Total | 6606 | 100.0 |

The ratio of positive to negative scores is approximately 14.3 to 1. There was almost complete agreement of the two raters on this point; the ratio of positive to negative in the original ratings by Mrs. Thomson was approximately 14.5, and, in the original ratings by the writer, 14.4. Only two men (Ney and Rembrandt) had more negative than positive scores, and only three others (Palestrina, Mozart, and Van Dyke) had an equal number of positive and negative. That is, of 300 subjects, 295 had an excess of positive scores.

At least 90% of the additions made by Professors Terman, Hulme, and Lutz were also on the positive side. In the additional information obtained about Davy, Spinoza, and Webster, positive corrections predominated, but to a less extent. Eight positive and three negative corrections were made; these resulted in 12.5 additional positive points, and 7 additional negative points.

The objection may be raised that the zero point has been set too low, i.e., that both raters have too low an opinion of the capacities of the "average college graduate." Though the raters were familiar with college communities in Connecticut, Michigan, California, and the Hawaiian Islands, and though they arrived independently at almost exactly the same conclusion (a positive-negative ratio of 14.5 in one case and 14.4 in the other), they are quite willing to admit that this criticism may be valid. The reader is urged to judge for himself on the basis of a few examples of the kind of data given a score of 1, or the lowest possible positive score:

Darwin, to whom "algebra was repugnant," but who "took great pleasure in Euclid," was scored 1 in mathematics. (He may easily have deserved a score of 3 or 4, but our data were not full enough to warrant more than 1.) Byron, who read Blackstone and Montesquieu for pleasure, was scored 1 in law. The poet Klopstock, said to possess "personal attractiveness and sociability," was scored 1 in conversation. Admiral Farragut, whose "graphic account of what he saw in the various cities (age 15) would put many an older traveler to shame," was scored 1 in non-fictional prose. The novelist Dumas, who "picked up a knowledge of drugs and of anatomy," was scored 1 in medicine. Victor Hugo, who "obtained some distinction" in physics at school, was scored 1 in science. The figures 2015 and 141, then, mean that there were about two thousand cases in which the available evidence was as favorable as this or more favorable, and about one-fourteenth as many in which the available evidence was distinctly less favorable than the examples just cited.

It should be noted, too, that while the average negative score was very small, the average positive score was distinctly larger and hence more reliable than the examples just cited. The distribution, in percentage, of all the positive or negative scores given, is shown in Table 3. The same distribution is presented graphically in Figure 1. The mean positive score was 2.43, and the mean negative score, —1.40. The mean score of both classes together, disregarding zeros, was 2.18.

TABLE 3

| Score | Percentage of total |
|---|---|
| 5 | 4.1 |
| 4.5 | 4.1 |
| 4 | 6.0 |
| 3.5 | 7.0 |
| 3 | 13.3 |
| 2.5 | 12.3 |
| 2 | 19.5 |
| 1.5 | 10.0 |
| 1 | 13.1 |
| 0.5 | 4.1 |
| —0.5 | .9 |
| —1 | 2.4 |
| —1.5 | 1.5 |
| —2 | 1.1 |
| —2.5 | .3 |
| —3 | .2 |
| —3.5 | .0 |
| —4 | .0 |
| —4.5 | .1 |
| —5 | .0 |

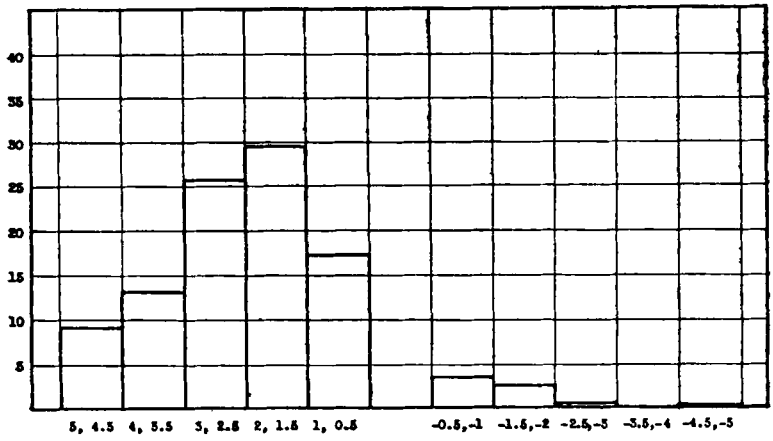


FIGURE 1
DISTRIBUTION OF 2015 POSITIVE AND 141 NEGATIVE SCORES

It is clear that the scores form a rather normal distribution, with the exception that the upper extreme is cut short, and that there is a gap between 0.5 and —0.5 representing the 4450 abilities about which there was no information at hand.

Typical positive scores would be the following: John Quincy Adams, who acquired a "passion for versification" at the age of 14, was scored 2 in poetry. The poet Béranger, who "outlined some comedies" at the age of 21, was scored 2 in drama. Edmund Burke, who "turned back to logic and metaphysics" at the age of 16, indulging in what he later called his "furor logicus," and who described philosophy as "queen of arts and daughter of heaven," was scored 2 in philosophy. The philosopher Campanella, who at the ages of 15 to 22 "minutely compared the Greek, Latin, and Arabian commentators" on Aristotle, was given a score of 3 in languages. Other examples will be found in the case notes given as an appendix to this paper.

On the other hand, typical negative scores would be the following: Victor Hugo, who confessed that philosophy did not interest him, was scored —1 in philosophy. The scientist Hunter, whose "lectures were not always clear," and who "preferred not to lecture," was scored —1 in public speaking. And, because his manners were "impatient, blunt, and unceremonious," and because he was "usually taciturn," he was scored —2 in conversation. The reader will probably agree that these typical negative scores seem to be more tentative and unreliable than the typical positive scores cited above, which outnumber them 14 to 1.

*Interest vs. ability.* The objection may be raised (see criticism on page 481) that no adequate distinction has been made between versatile abilities and versatile interests. An attempt was made to check up on this point, as far as possible, by going over all of the data once more and classifying each item as either an "interest item" (interest alone mentioned in the records) or an "ability item" (ability, or both interest and ability, mentioned in the records). It was found that 515, or 24%, belonged to the former class, and 1568, or 76%, to the latter. It was also found that the ratio of the number of positive scores to the number of negative scores was 6.6 to 1 in the interest items, and 21.5 to 1 in the ability items. In other words, the men studied seem to stand out from the average more in versatile ability than in versatile interest.

This accounts in large part for the fact that positive scores were

higher on the average (2.4) than negative scores (—1.4). Interest items were deliberately given lower scores than ability items by both raters. Nearly all of the positive scores above 2 were based on evidence of real ability; but, since evidence of real disability was very scanty, there were very few negative scores above 2 to counterbalance them.

*The age factor.* Many of these scores are based on information which applies directly only to the early years of a man's life. Robert Burns was given a score of 1 in drama because at the age of 17 he "sketched the outlines" of a tragedy. Others are based on information which applies only to the later years; Copernicus, for instance, was scored 2 in social theory because at the age of 49 he wrote a "memorandum on the confused state of the currency." Dr. Cox's data, collected primarily to throw light on the "early mental traits" of three hundred geniuses, were necessarily incomplete for the later years. It was suggested that perhaps the versatility found in this study is a temporary thing, a kind of "exploratory behavior" which tends to pass away as the man grows older and settles down to his main business in life.

To check up on this hypothesis, so far as it was possible to do so from the data at hand, the first 150 men in the alphabetical series were reviewed by the writer, and their positive scores classified as follows:

301, or 32%, apply directly to ages before 26 only.
214, or 22%, apply directly to ages after 26 only.
441, or 46%, probably or certainly apply to both periods.

## SUMMARY

In other words, although clearly inadequate with respect to the age factor, the data are not very conspicuously onesided in their emphasis on the early years.

*Relation to achievement.* The writer also reviewed the first 150 men and checked each score which, in his opinion, represented an ability that contributed directly to achievement in the individual's major field. For example, Gibbon's score of 2 in languages, Burke's score of 3 in history, Drake's score of 4 in mathematics (navigation), and Heine's score of 5 in humor, were checked as probable examples of this type. Thirty per cent of the scores were checked off on this basis.

The remaining 70% were then subdivided again into abilities that,

in the writer's judgment, might have taken time away from the occupation by which eminence was achieved, and those that apparently could not. The arbitrary criterion used was 50 hours; for instance, when Burns sketched the outlines of a tragedy, it probably took up less than 50 hours of his time, but when Goethe is given a score of 5 in science because of volumes on comparative anatomy, geology, and the psychology of color, it undoubtedly represents much more than 50 hours. If he had not spent so much time on science, he might have written more novels or poetry. Fifty hours is nothing in comparison with a lifetime, of course, but the criterion was intentionally set low in order to give minimum figures for the non-time-consuming group. Even with this low criterion, it was found that about 4/7 of the 70%, or 40% of the total, belong with Burns' tragedy in the non-time-consuming category; and 3/7 of the 70%, or 30% of the total, belong with Goethe's science in the more time-consuming category.

To express the same facts more concretely, it can be said that the average genius is represented in our data as taking part in:

About 2.0 activities which contribute to eminence.

About 2.7 activities which probably neither contribute to nor hinder the attainment of eminence.

About 2.0 activities which *possibly* hinder the attainment of eminence.

These are, perhaps, the roughest, most subjective, least reliable figures in this study. They are presented, not as valuable data in themselves, but as a warning against the uncritical assumption that all positive scores should be given equal weight, or that versatility is often carried to the point where it actually interferes with achievement in the primary field.

*Relative frequency of abilities.* The distribution of the scores in each special ability was as shown in Table 4.

This rank order, of course, has little meaning. The fact that 17 received positive scores in invention is probably much more significant than the fact that 67 received positive scores in music. Three hundred college graduates picked at random might easily include 67 who were very musical, but would hardly be expected to furnish 17 inventors. Each figure should also be interpreted in terms of what was expected of individuals of the same social status and at the same period of history. For instance, the low position of science as compared with languages and philosophy may simply reflect the lack of recognition

TABLE 4

| | Positive | Negative | No information | Positive, percentage of total |
|---|---|---|---|---|
| Conversation | 189 | 29 | 82 | 63.0 |
| Languages | 175 | 7 | 113 | 61.7 |
| Poetry | 156 | 2 | 116 | 56.9 |
| Philosophy | 136 | 5 | 150 | 46.4 |
| Non-fictional prose | 119 | 0 | 162 | 42.3 |
| Social Theory | 113 | 1 | 164 | 40.7 |
| History | 115 | 1 | 171 | 40.1 |
| Science | 106 | 4 | 164 | 38.7 |
| Humor | 109 | 10 | 181 | 36.3 |
| Public speaking | 104 | 7 | 179 | 35.8 |
| Politics | 80 | 0 | 163 | 32.9 |
| Mathematics | 92 | 25 | 171 | 31.9 |
| Drama | 76 | 0 | 210 | 26.6 |
| Art | 67 | 2 | 218 | 23.3 |
| Music | 67 | 9 | 213 | 23.2 |
| Law | 66 | 9 | 224 | 22.1 |
| Administration | 62 | 4 | 232 | 20.8 |
| Novels | 43 | 2 | 235 | 15.4 |
| Medicine | 37 | 2 | 235 | 15.4 |
| Business | 35 | 19 | 246 | 11.7 |
| Handwork | 28 | 3 | 269 | 9.3 |
| Warfare | 23 | 0 | 245 | 8.7 |
| Invention | 17 | 0 | 281 | 6.0 |

given to science in education before the second half of the nineteenth century; and the low rank of business as compared with politics, strange as it seems today, may simply reflect the fact that until recently politics was generally held to be more "respectable" than business.

*Ranking of types in general versatility.* To obtain anything like a true measure of "general versatility" it would be necessary to weight each item according to the number and complexity of the component abilities included under it, according to its overlapping with other abilities taken account of, according to its lack of direct relationship with the main field of achievement, and according to its frequency in the social group to which the individual belonged. Since few if any of these corrections are feasible in the present state of our knowledge,

none of them have been applied. The simple average of the number of positive and negative scores has been computed, and the types ranked accordingly. The method is extremely crude, and cannot be relied upon except when differences are very well marked.

TABLE 5

| Type | Av. no. of positive scores per individual | Av. no. of negative scores per individual | Difference |
|---|---|---|---|
| Non-fictional prose writers | 8.2 | .6 | 7.6 |
| Statesmen | 7.9 | .5 | 7.4 |
| Philosophers | 7.8 | .5 | 7.3 |
| Scholars | 7.4 | .6 | 6.8 |
| Religious leaders | 7.1 | .4 | 6.7 |
| Scientists | 7.2 | .5 | 6.7 |
| Poets | 7.4 | .7 | 6.7 |
| Mathematicians | 6.7 | .1 | 6.6 |
| Novelists and dramatists | 7.1±.3 | .6±.1 | 6.5±.3 |
| Soldiers | 4.7±.2 | .4±.1 | 4.3±.2 |
| Artists | 4.2 | .2 | 4.0 |
| Musicians | 3.3 | .6 | 2.7 |

Probable errors have been computed for only two types, but the others are of the same order. It will be observed that differences within the first nine groups are not significant, but that the last three seem to form a group by themselves. The difference between novelists and soldiers, divided by its standard error, is 3.8; and the difference between musicians and any one of the first nine groups is correspondingly more dependable.

The reader is urged to interpret these figures in the light of his own interpretation of the more specific facts on pages 473-474. Except in verbal abilities, which probably made up an undue proportion of the 23 abilities considered, the soldiers and artists do not seem unversatile. The musicians, on the other hand, seem relatively weak not only in verbal abilities but also in all non-verbal abilities except art and humor.

*Criteria of Vocational Types.* The fact that a certain type of genius tends to possess a certain kind of special ability may be explained in at least four ways. It may indicate that the special ability is of direct value for the attainment of eminence in the major field, as Bacon's scientific interests contributed directly to the value of his philosophical writings. It may indicate a fundamental similarity

of mental processes or mental capacities, as Leibnitz's mental processes while working at mathematics may have been similar to his mental processes while working at philosophy. It may be that the temperament which is *interested* in one thing is attracted by similar elements in another; Madison's great interest in history would seem natural even though, possibly, it did not make him a much better statesman. Or, in some cases, the correspondence may be due to purely irrelevant factors, such as the nature of the particular educational system to which the individual was subjected. One should step very carefully, therefore, when attempting to formulate "vocational types" from such data as have been collected in this study. Each one of the correspondences listed below should be examined in the light of the four possible explanations stated above:

*Artists.* The 13 artists, including several who combined painting with sculpture or architecture or both, scored above the average of the three hundred eminent men in invention, *science,*[3] *mathematics,* handwork, *conversation,* and administration.

*Mathematicians.* The 12 mathematicians, including 5 astronomers, scored above average in *science, invention,* art, medicine, handwork, business, administration, philosophy, and public speaking.

*Musicians.* The 11 musicians scored above average in *art* and in *humor.*

*Non-fictional Prose Writers.* The 19 non-fictional prose writers (Carlyle, Erasmus, Samuel Johnson, Voltaire, etc.) scored above average in *conversation, humor, novels, history, poetry, drama,* business, *languages, social theory, philosophy, politics, public speaking,* and law.

*Novelists and Dramatists.* Eighteen novelists (ranking second in *drama*) and 14 dramatists (ranking ninth in novels) scored above average in *poetry,* music, *humor, history,* non-fictional prose, conversation, languages, and art.

*Philosophers.* The 22 philosophers strictly so-called (ranking first in *social theory*) and 9 "social theorists" (ranking second in *philosophy*) scored above average in *mathematics, non-fictional prose, science,* law, music, history, languages, politics, and administration.

*Poets.* The 26 poets scored above average in *drama, non-fictional*

[3]Italics indicate a rank order of fourth or better in comparison with the other eleven types of genius, *and* an average score of 1.0 or better including zeros. Abilities have been listed in rank order. The artists *rank* higher in invention than in science, but it is hardly as reliable, because of the large number of zeros (no information) and consequent low average score.

*prose,* music, *languages, conversation, humor, history,* novels, art, handwork, politics, and philosophy.

*Religious Leaders.* The 22 religious leaders included 8 who were classed as primarily preachers, 12 who were classed as primarily writers or philosophers, and 2 who were classed as administrators. The philosophers and administrators ranked second in *public speaking;* the preachers and administrators ranked first in *philosophy;* the preachers and philosophers ranked first in *administration.* The group as a whole scored above average also in warfare, *poetry, politics,* music, *languages,* and invention.

*Scholars.* The 18 "scholars" (including 13 historians, who ranked first in *languages,* 5 philologists, who ranked fourth in *history,* and 1 lawyer) scored above average also in *administration, politics,* law, *philosophy, science, non-fictional prose,* drama, and music.

*Scientists.* The 26 scientists scored above average in *medicine,* handwork, *mathematics,* invention, *public speaking* (i.e., teaching, in most cases), *administration,* and art.

*Soldiers.* The 32 "soldiers" (including 18 generals, 4 admirals, 3 explorers, and 7 soldier-statesmen such as Cromwell and Napoleon) scored above average in *politics,* business, medicine, mathematics (artillery, navigation), and art.

*Statesmen.* The 57 statesmen scored above average in *public speaking, law,* warfare, business, *social theory, conversation,* nonfictional prose, humor, handwork, and history.

In general, these relationships correspond to what would be expected on the basis of common sense. Some of the more noteworthy exceptions are the high rank of artists in science and mathematics; the lack of interrelationship between mathematics and music, in either direction; the high rank of scholars, philosophers, and prose writers in politics; the high rank of statesmen, conversely, in scholarly pursuits; and the rather low rank of scientists in other scholastic pursuits.

In attempting to generalize from the preceding facts, it can be observed, first of all, that there are certain abilities which tend to appear together. For example, science, mathematics, medicine, invention, and handwork form a rather closely-knit cluster which is common to the scientists, mathematicians, and, to some extent, to the artists and philosophers. The relation of art to the science-cluster is especially interesting. Leonardo da Vinci is a supreme example, and Dürer, Michelangelo, Raphael, Rubens, Copernicus, Galileo,

Huygens, Newton, and Fulton, lesser ones, of combined artistic and scientific ability. Science, like art, usually involves both manual and visual abilities; to this extent, at least, their fields overlap.

Philosophy, social theory, history, and languages form a less closely knit cluster, allied to science on one side and to non-fictional prose on the other.

Politics, warfare, and business seem to form another cluster. Politics and warfare, at least, have had in the past a very close interrelationship; and the statesmen and soldiers rank first and third, respectively, in business. Statesmen, however, tend to be much more scholarly than soldiers.

Finally, it is clear that novels, poetry, and drama form a compact cluster. Though it is true that the dramatists ranked low in novel-writing, the novelists ranked second in drama, the poets ranked first in drama and second in novels, and every one of the 32 novelists and dramatists was given a positive score in poetry. This cluster is rather closely allied to non-fictional prose, and all four groups are characterized by high scores in conversation, and languages, combined with low scores in science and mathematics.

Religious leadership seems to be allied with politics and administration on one side, and with scholarship on the other.

Musicians appear to have no special relationship with any other group except, possibly, the artists. Five of the 11 musicians showed artistic ability; on the other hand, only one of the 13 artists (da Vinci) was recorded as possessing musical ability.

In general, then, it can be said that there are two well-defined clusters, the *scientific* (science, mathematics, medicine, handwork, invention, and possibly art) and the *literary* (novels, drama, poetry, and perhaps non-fictional prose). There are also two less well-defined clusters, the *scholastic* (philosophy, social theory, history, languages) and the *administrative* (politics, warfare, business). The musicians are the only group that could not be made to fit into the scheme in any way.

Though he fully expected to do so, the writer found no evidence of what could be called an aesthetic cluster. The poet seems more like the novelist or essayist than like the musician or artist; the artist is more like the scientist than like the poet or musician; the musician is like no one except himself.

In addition to these minor clusters, there is one major cluster which is very much in evidence, and which may have theoretical signifi-

cance, namely, the cluster of *verbal abilities*. If a man achieved eminence in any one of several different occupations involving the use of words, he was very likely to show ability in several other activities also involving the use of words. The literary and scholastic types seem to have a great deal in common. Poet and philosopher alike were likely to distinguish themselves in the study of French or ancient history; while scientist, musician, and soldier, though one would expect them to be unlike in almost every other respect, were similar in their relative inability to manipulate words. To illustrate this tendency, let us select five types of genius which seem to involve the use of words (non-fictional prose writers, poets, novelists and dramatists, philosophers, and scholars) and eleven abilities which also seem to involve words (non-fictional prose, poetry, novels, drama, philosophy, social theory, law, public speaking, history, languages, and conversation). These types rank as shown in Table 6 in regard to the number of these abilities in which they are above the average of the whole group.

TABLE 6

| Type | Number of verbal abilities | | Av. corrected IQ (1, p. 84) |
|---|---|---|---|
| *Verbal* | | | |
| Prose writers | 9 | Philosophers | 180 |
| Poets | 7 | Scientists | 175 |
| Scholars | 6 | "Writers EHCS" | 170 |
| Novelists, Dramatists | 5.5 | Relig. Leaders | 170 |
| Philosophers | 5 | Poets, Nov., Dram. | 165 |
| | | Statesmen | 165 |
| *Non-verbal* | | Artists | 160 |
| Statesmen | 4 | Musicians | 160 |
| Religious Leaders | 3 | Soldiers | 140 |
| Mathematicians | 2 | | |
| Artists | 1 | | |
| Scientists | 1 | | |
| Musicians | 0 | | |
| Soldiers | 0 | | |

The correspondence is complete. Every one of the verbal types surpassed every one of the non-verbal types in number of verbal abilities shown outside its own field. Cox's IQ ranking of her types, classified somewhat differently, is given for the sake of comparison. In broad outline, the rankings correspond. In both of them the most clearly non-verbal types, artists, musicians, and soldiers, are near the bottom (cf. the ranking for "general versatility," page 465). The one

outstanding exception is the scientists, who rank near the bottom in verbal abilities and near the top both in IQ and in "general versatility."

This correspondence was to be expected, since the same information which led to the ranking of verbal abilities was used in estimating the IQ. At the same time, it suggests in a rather striking way the existence of a more or less general mental capacity, manifesting itself here in a verbal or linguistic form, and related in some way to intelligence.

## Discussion of Results

The first purpose of this study was "to estimate the versatility of three hundred eminent men, as an indication of the extent to which specialization is favorable or unfavorable to the attainment of eminence." If bare figures told the whole story, the answer would be decisive. We could say, not only that these geniuses were not one-sided freaks, overdeveloped on one side of their natures and atrophied on all the rest, but that they were actually far more versatile than the average college graduate of today. They were judged superior to the average graduate in 2015 instances, and inferior in only 141. Even if 30% of the positive scores were disregarded because they represent abilities which contributed to eminence, and 40% more were disregarded because they represent activities which took up only a very small amount of time (these percentages are very unreliable), there would still remain 605 positive scores in contrast to the total of 141 negative scores. Positive scores would still be more than 80% of the total (746), and negative scores less than 20%.

There is one very important possibility, however, preventing complete confidence in the verdict. The halo factor is an uncontrolled variable which quite possibly accounts for much of the difference found. It seems probable that many biographers, writing largely because of interest in and admiration for the individual studied, quite innocently suppress unpleasant facts in their efforts to present an admirable figure. The 2015 positive scores, usually based on concrete evidence, are probably relatively reliable, but the total of 141 negative scores is possibly only a fraction of what it should be. Since there are 4450 cases about which there is no information at hand, it is possible that a large number of these should be added to the negative total.

The writer himself believes that this is only a remote possibility.

The fact that the negative scores tend to be smaller and less reliable than the positive scores, the fact that positive scores still predominated in the additional information he obtained during a more intensive study of three typical cases, and the fact that each one of three men supplementing the data from their own rather extensive knowledge of biography inserted positive scores far more often than negative, all seem to show that the conclusion drawn is not fundamentally wrong. In spite of the halo factor, and the other very definite limitations of the method used—limitations which would be prohibitive if individuals and not groups were being considered—the writer believes that the excess of positive scores is about as well established as it can be by any biographical method. Crucial evidence, of course, can be furnished only by a direct study of living individuals, by men experienced in the analysis of human traits, and by tests standardized in relation to definite norms. Such evidence would probably change what is now a very high probability into almost a certainty. But its great value would come, not in verifying our main conclusion, but in testing out the specific, qualitative hypotheses discussed below.

The first of these specific hypotheses is that the versatility of genius is more a matter of ability than of interest. The ratio of positive to negative scores was 6.6 to 1 in items representing interest alone, and 21.5 to 1 in items representing definite evidence about ability or both interest and ability. This suggests that possibly, in relation to their own abilities and opportunities, the geniuses are actually narrower, more concentrated and focused, as it were, than the average man. The same theory is supported by the extremely tentative findings on pages 469-470. It appears that corparatively few of the scores represent a large amount of time. The typical genius seems to have superabundant energy combined with ease and rapidity in a broad range of activities. With such a combination, he can show creative achievement in several fields without ever endangering the one field—often a broad one—on which his fame primarily rests.

This point is a fundamental one for the theory and practice of education. Superficially considered, the versatility of genius would seem to indicate that versatility should be rather indiscriminately encouraged in gifted children; but if it is really accounted for by ability, energy, and opportunity rather than by diversity of interest *per se,* the educational implications are very different. In that case

the duty of the teacher would be, rather, to see to it that the potential genius did not fritter away his time in too great a variety of miscellaneous interests.

To determine this point, it is absolutely essential to study living individuals in order to obtain accurate records of time. In the last analysis it comes down to a question of days and hours. Does the man who achieves great things do so partially because he concentrates his days and hours on those things more than the man of mediocre accomplishment would? There is now evidence that even with such concentration he might appear to be a more versatile person, simply because the hours which he does spend on other activities are so much more productive. But the more fundamental question remains to be answered.

What kinds of ability do our data indicate, and what kinds of deficiency? The list of abilities given in Table 4 gives some indication that the "average" genius is likely to possess a kind of all-round verbal ability. The first seven items on the list (although this is an extremely rough criterion) all depend greatly on the use of words. Only one of the last seven items depends on words to the same extent. If there is any deficiency at all, it is in such relatively non-verbal activities as mathematics, music, business, and handwork. There are certainly no consistent indications of deficiency in such general categories as "social ability" (note the high rank of conversation), "practical ability" (note the 80 positive scores in politics), or "aesthetic ability" (note the high rank of poetry).

It should be remembered, however, that the "verbal type" of genius predominates in our group. What has been said above about an all-round verbal capacity probably does not apply to artists, musicians, or soldiers as much as to novelists and philosophers.

What kind of genius is the most versatile, and what kind the least? We cannot say. Our data furnish no basis for comparing the value of versatility along such diverse lines as music, conversation, politics, and mathematics; and until that is done the use of such a term as "general versatility" will be a hindrance to clear thinking, rather than an aid. We can say only that, on the basis of a crude mathematical average, our eleven musicians were decidedly less versatile than most of the other men studied; and possibly the same could be said of the artists and soldiers.

The low rank of musicians may be due to a lack of overlapping between the abilities involved in music and the abilities involved in

most other sorts of achievement. The musician may have less in common with the poet than the poet has with the philosopher. Or it may be that music is a harder taskmaster, and demands a more complete consecration, than other types of achievement. If so, there is a real danger that some of our child-musicians today are being dwarfed, musically, by the "broadening" process of public school education.

For almost all the other varieties of genius, however, the fact of versatile ability seems well established. It can be said with some assurance that they are able to carry on a surprisingly wide range of activities without seriously impairing achievement in the major field. To what extent this is a by-product of their extraordinary intelligence, and to what extent it actually subtracts from the hours devoted to their primary occupations, cannot be determined without a direct study of living individuals.

The second purpose of the study was "to discover what kinds of special ability are associated with certain kinds of genius, as an indication of the vocational types to be kept in mind in the education and guidance of gifted children." The findings are given in detail on pages 373-374, and do not require any general discussion. The existence of "ability-clusters," on the other hand, has some theoretical interest. It would, of course, be going entirely too far to claim that the scientific, literary, administrative, and scholastic clusters observed in our data correspond to general personality types. It is not claimed that they classify any aspects of personality except those entering into the choice of a vocation; but, as vocational types, they probably represent a simple and convenient classification that can be used tentatively in future work on the nature and causes of genius. The distinction between verbal and non-verbal types is especially important. If it could be verified with a large group of living eminent men, it would have a direct bearing on the much-discussed problem of "the nature of *g*."

On all of these more special questions, the need of such confirmatory evidence is painfully obvious. The reasons for it will be discussed in detail in the following section.

## Criticism of Method

Several criticisms of the method used in this study may be made, of which the most outstanding will be stated and discussed.

1. *The data are second-hand, and therefore fundamentally un-*

*reliable.* The writer believes this to be the most valid of the criticisms to be discussed. Biographical data of the usual type are by their very nature relatively unreliable. It is exasperating, for one who tries to hold before himself a high standard of scientific precision, to be eternally conscious that his rock-bottom facts are not scientifically precise. On the contrary, they are often snap judgments, made by untrained observers, often by prejudiced observers, without reference to established norms. Even with the most careful discrimination of good and bad sources, and with the most impartial treatment of the data so obtained, the fundamental handicap cannot be overcome to any great extent.

On this account, the writer believes that a thorough study of living eminent men, with modern testing techniques, would be far more valuable than the biographical approach here used. It would, of course, be far more time-consuming also, but it would lay a firm foundation for itself that is entirely lacking in the present study.

At the same time, one fact should be kept in mind: errors that are due to chance alone, and not to some persistent bias of observation or interpretation, can be expected to cancel each other out to a large extent when the number of separate items is more than two thousand, as it is here. The broad conclusions are far more likely to be correct than any one score given to any one man. It is in our more specific conclusions, such as the finding that our eleven musicians were less versatile than the other geniuses studied, that the danger of chance errors becomes really great.

2. *Educational and cultural conditions of the present day are so different from those of past ages that no true comparison is possible.* This is another reason, almost equally important, for verifying the tentative conclusions of the present study by a really thorough study of living eminent men. What was true in eighteenth-century France or sixteenth-century Italy may easily be false in twentieth-century America.

When this has been done, however, a comparison with the present results will be of interest not only to the psychologist, but also to the historian and sociologist. Significant changes, during the past century or two, may be found. For example, it may appear that the percentage of eminent men who write poetry (at least 40% of our 300 did so) has declined during the last century, in both Europe and the United States.

3. *The results are ambiguous because they do not differentiate*

*between versatile interests and versatile ability.* This difficulty is inherent in the nature of the data, and is yet another reason for verifying the results with a group in which the two factors can be more adequately distinguished. It is not so much that intense interest cannot be taken as an indication of some ability. When we read, for instance, Byron's statement that "from the moment I could read, my grand passion was history," and his voluminous list of the histories and biographies he had read before the age of 19, it would be absurd not to give him a positive score in history. But even if such statements were disregarded, the fundamental ambiguity would remain. There would still remain thousands of positive or negative scores which might have been given if the subject had shown enough interest in a given activity to demonstrate his fitness or unfitness for it. Perhaps Byron was also above average in mathematical ability, or business ability, or musical ability. We do not know, because his interest in those fields was not great enough to figure in our records.

Here again it is the more specific conclusions that are the least reliable. We are almost as sure that the typical genius surpasses the typical college graduate in range of interests as that he surpasses him in range of ability. It will be remembered that the ratio of positive to negative was found to be 7 to 1 in interest scores and 22 to 1 in ability scores. On the other hand, it is impossible to tell how far our "ability-clusters" are in reality interest-clusters, or how far the seeming non-versatility of our musicians was due simply to a lack of interest in other fields.

* * * *

Since various other criticisms have been anticipated on pages 463, 466, 469, and 472, they need not be discussed here.

1. Three hundred eminent men were judged to possess special abilities superior to those of the average college graduate in 2015 instances, and inferior in 141. Insofar as this result is not caused by the halo factor (biographers failing to record unfavorable facts), it probably indicates that the abilities of the typical genius are decidedly more versatile than those of the average college graduate of today.

2. There are some indications that the typical genius is more superior in range of ability than in range of interests.

3. The musicians, and possibly also the artists and soldiers, were less versatile than most of the other types.

4. Four "ability-clusters" (or perhaps "interest-clusters") were suggested. Of these the scientific and literary clusters are well marked; the scholastic and administrative are less well marked. There was almost no evidence of an "aesthetic type."

5. A tendency to intercorrelation of many different verbal abilities was apparent.

6. A study of living eminent men, using standard tests of some sort, is essential for real proof of the suggestions made by this investigation.

## Appendix: Case Notes

To give a more definite idea of the nature of the data, condensed case notes are added for seven subjects. The first two, Goethe and Franklin, have the highest total number of points of any in the group, and may be said to indicate roughly the upper limit of human versatility. The next two, Rembrandt and Ney, are at the opposite extreme of the distribution, and represent roughly the lower limit of versatility as found in the men studied. The last three are the cases selected from the center of the distribution for further, more intensive study. They may be considered rather typical of the group as a whole.

### *Most Versatile Cases*

### *Goethe*

Main field of eminence: poetry. Positive scores: drama 5, novels 5, philosophy 4.5, conversation 4.5, science 4, languages 4, nonfictional prose 4, administration 3.5, art 3.5, history 3, medicine 3, handwork 3, politics 2.5, humor 2.5, law 2, social theory 2, music 1, invention 0.5. Positive scores: 18. Negative scores: none. Total points: 58.5.[4]

In poetry, novels, and drama, Goethe ranks with the greatest writers of all time. The philosophy incorporated in many of his works, though he never formulated a "system," is all-embracing in its scope. As a statesman, he was the guiding spirit of the little duchy of Weimar for more than fifty years. As a scientist, "in his work on the metamorphosis of plants and on animal morphology, he

[4] This measure has not been used at all in the body of the article.

foreshadowed the work of Darwin as no other of his contemporaries," also writing works on geology and on the psychology of color. As a friend he was charming, and had many love affairs. As an artist, he made caricatures, etched, and wrote much criticism of art and architecture. In languages, we find that at the age of 11 he was learning Hebrew on his own initiative, and that at the age of 16 he was writing verses in French, English, and Italian. Not to mention his ability in medicine, handwork, social theory, music, or invention, we may add that "in the political and legal history of Germany his knowledge extended to minute details."

### *Franklin*

Main field of eminence: politics (including diplomacy). Positive scores: science 5, non-fictional prose 5, humor 5, conversation 5, business 4.5, administration 4.5, philosophy 4, social theory 4, invention 4, handwork 3, poetry 2, public speaking 1, drama 1. Positive scores: 13. Negative: none. Total points: 48.

A statesman and a diplomat of the first order, Franklin was also an eminent scientist at a time when science in America hardly existed, and a delightful writer at a time when "the stilted, verbose and turbid habit was tediously prevalent." His educational experiments embodied theories that were generations ahead of his time. He was also an expert printer, a very able financier, a master of propaganda, and "perhaps the most agreeable conversationist of his age."

(Although there are no other names that could easily challenge Goethe's right to first place, there are several that could challenge Franklin's to second. Jefferson, da Vinci, Galileo, Hugo, Voltaire, Constant, Beaumarchais, and Alexander Hamilton are next to him in total points, and a different importance attached to individual items might easily give any one of them the second place.)

## *Least Versatile Cases*

### *Rembrandt*

Main field of eminence: art (painting and etching). Positive scores: none. Negative scores: Languages —1.5, business —2.5. Total points: —4.

Though 6 works are listed in the bibliography, and there are 16 typewritten pages in the manuscript biography, the data are really relatively scanty. Little is known of Rembrandt's private life, and

almost nothing of his childhood. Perhaps he would appear more versatile if more were known.

It was said that he "proved but an indifferent scholar" at school, and that he "seems to have had little taste for reading, to judge by the small number of books to be found in the inventory of his effects in later life." Since scholarship and reading in Holland imply linguistic ability primarily, he was given a negative score in languages. The low score in business was given because he was said to be "a child in his relations with the world outside his doors," and because we have definite evidence that he was declared bankrupt at the age of 50 and spent the remainder of his life in poverty. At the same time, it should be noted that he was pre-eminent both in etching and in painting, and that this is not taken account of in our scoring.

### *Ney*

Main field of eminence: warfare. Positive scores: none. Negative scores: law —1.5. Total points: —1.5.

In Ney's case the lack of data is much more apparent than in that of Rembrandt; only four works are listed in the bibliography, and Cox's manuscript biography consists of only seven pages. Ney's education was only rudimentary. He then tried to take up law, but gave it up in disgust, as nothing but warfare could satisfy his craving for adventure. Eventually he became one of Napoleon's generals.

(Rembrandt and Ney are the only men whose total of points was negative. Three others—the painter Van Dyke and the musicians Palestrina and Mozart—maintained an even balance of positive and negative points. The other 295 were all positive.)

## *Average Cases*

### *Davy*

Main field of eminence: science (chemistry). Positive scores, before intensive study: invention 3, poetry 3, philosophy 3, non-fictional prose 2, novels 2, public speaking 2, art 1.5, history 1.5, languages 1, medicine 1. Negative scores: conversation —1.5. Number positive: 10. Number negative: 1. Total points: 18.5.

Sir Humphrey Davy was an English scientist, famous for his discovery of "laughing gas," for his work in establishing the analogous nature of chlorine, fluorine, iodine, and for his invention of the miner's safety lamp. His career as a poet began at the age of five, and he wrote verses throughout his life. Coleridge, who was an

intimate friend, once said that if Davy had not been the first chemist, he would have been the first poet of his age. The score of 3 in philosophy is based on a thick notebook which he kept at the ages of 16 to 19, crammed full of metaphysical discussions. He was scored 2 in non-fictional prose because he was said to have "a force of eloquence (in his scientific writings) which could issue only from a mind of the highest powers and of the finest sensibilities." He was scored 2 in novels because of the wonderful and terrible tales he used to invent, as a boy of 8. His "extraordinary popularity as a lecturer" accounts for the score of 2 in public speaking; his rather crude paintings of birds, fishes, and landscapes account for the score 1.5 in art; his extensive reading in history accounts for the score of 1.5; the fact that he learned to speak French, apparently in not much more than a year, accounts for his score of 1 in languages; and his work in medicinal chemistry accounts for the score of 1 in medicine. But, since it was said that he had a "brusqueness and superciliousness due to an ungraceful timidity which he could never conquer," he was scored —2 in conversation. This was questioned by Dr. Terman, and as a result the score of —2 was changed to —1.5.

Three of these scores were changed, and three added, as a result of the more intensive follow-up. The score of 1 in languages was changed to —1 because of the discovery that he never did learn to speak French fluently or pronounce it correctly, though he lived for a short time in France. The score in non-fictional prose was raised from 2 to 3 by the discovery of two books of semi-philosophical essays which he wrote in later life. The score of —1.5 in conversation was raised to 1 by the discovery of a great deal of material tending to show that he was a vivacious, and at times an eloquent, conversationalist. A new score of 1 was given in mathematics because he taught himself the fundamentals of the subject at the age of 18; a new score of 1 in administration because for seven years he was president of the Royal Society, ultimately unpopular, but fairly efficient; and a new score of —4 in music, because it was once said that his friends could not even teach him the air of "God Save the King." The net result of this revision was to change his point score from 18.5 to 18.0.

### *Spinoza*

Main field of eminence: philosophy. Positive scores: social theory 4, science 3.5, handwork 3, languages 3, mathematics 2.5, conver-

sation 1.5, medicine 1. Number positive: 7. Negative: none. Total points: 18.5.

Spinoza's writings on free speech and on the theory of government rank with his best work. A tolerable physicist, and a pioneer in biblical criticism, his scientific temper is shown also in the subject-matter and the mathematical structure of his philosophy. He obtained his living by grinding lenses, and was a "proficient optician." He knew Spanish, Portuguese, Hebrew, Latin, and some Greek, as well as enough Dutch for simple conversation with his fellow-countrymen; possibly also French, German, and Italian. Although extremely quiet and frugal, taking almost no time for recreation, he had several intimate friends, and "people of culture felt a peculiar charm in his presence."

As a result of the intensive follow-up three new scores were added, but none of the original ones were changed. A score of 1 in law was given because of his knowledge of Hebrew law; a score of 1 in non-fictional prose was given because "his library was as rich in *belles lettres* as it was poor in philosophy;" and a score of 3 in art because he was said to be "an accomplished draughtsman, and left at his death a portfolio full of sketches which he had drawn for his own pleasure." The net result of the revision was to increase the total of points from 18.5 to 23.5.

### *Webster*

Main field of eminence: politics. Positive scores: public speaking 5, law 4, conversation 3.5, social theory 3, history 2, languages 2, poetry 2, novels 1. Negative scores: handwork —1, business —1.5. Number positive: 8. Negative: 2. Total points: 20.

Daniel Webster's reputation as a lawyer rests upon his defense of the principle of nationalism in the Dartmouth College case, etc. He was said to be "greatly distinguished for his conversational powers and genial temper in society." The score of 2 in languages rests upon his translation of two law volumes from Latin and Norman French; the score of 2 in poetry, upon the fact that some of his companions (age 17) thought he should be a poet; the score of 2 in history upon his very extensive reading in this field; and the score of 1 in novels on "moderately extensive reading in English generally." But, because of his admission, "somehow I could never learn to hang a scythe," he was scored —1 in handwork; and be-

cause he "habitually lived beyond his means," he was scored —1.5 in business.

The follow-up resulted in conflicting statements about his manual ability, which may be considered to cancel each other and leave the previous score of —1 unchanged. The previous score of 3.5 in conversation was reduced to 2.5 in the light of his college roommate's statement that he was "not very popular with the class," and the lack of confirmatory evidence for the statement on which the original score was mainly based. A new score of 1 in science was given in view of the statement that "minute observation of nature" was one of his strongest characteristics. The net result of the revision was to leave the previous total of 20 points unchanged.

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*Stanford University*
*California*

## LA DIVERSITÉ DES APTITUDES CHEZ LES HOMMES DE GÉNIE

(Résumé)

Pour estimer la valeur de la spécialisation, et aussi pour contribuer à une classification inductive du génie en termes de "groupes d'aptitudes," on a fait une étude des aptitudes de 300 hommes éminents dans les domaines autres que leurs domaines spéciaux. On a obtenu les données dans les biographies en manuscrit rédigées par C. M. Cox, lesquelles ont été plus complètes de beaucoup que les données qu'elle a publiées. Ces faits ont été ensuite évalués par deux personnes. Les corrélations entre elles-mêmes de leurs évaluations en rapport aux traits spécifiques ont donné un moyenne de 0,76±0,02. L'évidence obtenue indique que le génie est décidément d'esprit souple. On a jugé que les 300 hommes possèdent des aptitudes spéciales supérieures à celles du diplomé universitaire moyen américain en 2015 cas, et inférieures en 141 cas. On a noté des aptitudes différentes telles que musique, politique, histoire, drame, mathématiques, et conversation. Dans la plupart des cas l'évidence a suggéré l'intérêt aussi bien que l'aptitude. On a tiré la conséquence que l'aptitude d'un homme éminent est ordinairement d'une nature si générale qu'il peut cultiver des intérêts en plusieurs domaines ans nuire à son oeuvre dans son propre domaine. On a trouvé aussi que quatre "groupes d'aptitudes" semblent exister. Parmi ceux-ci les groupes scientifique et littéraire sont bien marqués; les groupes "scolaire" et administrateur sont moins marqués. On n'a qu'une petite tendance à la corrélation entre elles-mêmes des aptitudes "esthétiques", mais il s'est montré une corrélation entre elles-mêmes de toutes les aptitudes verbales.
WHITE

## DIE VIELSEITIGKEIT DES GENIES

(Referat)

In der Absicht, den Wert der Spewzialisierung abzuschätzen und auch zu einer induktiven Klassierung des Genies als Gruppe von Anlagen (ability clusters) betrachtet beizutragen, untersuchte man die Fähigkeiten von 300 hervorragenden Männern ausserhalb des Hauptfeldes ihrer Leistungen. Die Daten Wurden in den in Manuscipt-Form bestehenden, durch C. M. Cox gesammelten Biographien gefunden, welche viel ausgiebiger waren, als die von ihr publizierten Tatsachen. Jene Daten wurden dann von zwei Abrechnern erwertet. Die durchschnittliche Interkorrelation zwischen ihren Erwertungen mit Bezug auf spezifische Züge (traits) war .76±.02. Die ermittelten Daten deuten an, dass Genie entschieden vielseitig ist. In 2015 Fällen hielt man, dass die 300 Männer Sonderfähigkeiten (special abilities) besassen, in Bezug auf denen sie dem durchschnittlichen Graduierten einer Amerikanischen Universität überlegen waren, und in 141 Fällen wurden sie in Bezug auf diese Sonderfähigkeiten als unterdurchschnittlich betrachtet. So verschiedene Fähigkeiten wie sie Musik, Politik, Geschichte, Drama, Mathematik, und Sprachverkehr (conversation) darstellen wurden eingetragen. In den meisten Fällen schloss die Fähigkeit auch Interesse in sich ein. Man folgert, dass die Fähigkeiten eines hervorragenden Menschen gewöhnlich so allgemeiner Natur sind, dass er Interessen verschiedener Artew nachgehen kann, ohne seinen Leistungen in seinem Hauptfelde zu schaden. Man fand auch, dass es vier Gruppen von Anlagen zu geben scheint. Von diesen sind die wissenschaftliche und die literarische Gruppe scharf ausgeprägt. Die "scholastische" und die verwalterische (administrative) sind es weniger. Die Korrelationen unter den "esthetischen" Fähigkeiten erwiesen sich als unbedeutend, aber alle sprachliche (verbal) Fähigkeiten erwiesen sich als unter einander bestimmt korreliert.

WHITE