

# THE EUGENICS REVIEW

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## Eugenic Bearing of Measurements of Intelligence in the United States Army.

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Eugenics, the art of breeding better men, imperatively demands reliable measurement of human traits of body and mind, of their inter-relations, and of their modification by environmental factors. Scientific method has been commanded effectively to make available facts concerning bodily form and physiological processes. Anthropometry, anthropology, morphology, physiology, pathology, have made their notable contributions and continue to supplement and to render more precise our knowledge of man as organism. But in the case of those human traits or functions which we traditionally call mental, both methodological and observational progress has been more slowly achieved and less satisfactory. At last, however, the method of science is being applied in thorough-going fashion to the investigation of human experience and behaviour.

An historical survey of the development of man's knowledge of man is encouraging, for in the last half century psychology and psychotechnology have progressed steadily, and in some quarters and respects, marvellously. Psychology is now numbered among the natural sciences, and man, as conscious and self-conscious being, is studied intensively. It is assumed that like other natural objects he is understandable, modifiable, controllable. The method of speculative reflection has been replaced largely by systematized, controlled introspection, and that in turn has been supplemented by varied objective methods akin to those of the physical and biological sciences.

Following the determined effort of the psychologists of the last century to measure mental processes, there has developed a technique of research and a body of knowledge which command the respectful attention and hopeful interest of laymen as well as scientists. For this notable change in the status of psychology we are largely indebted to the faith, initiative, energy, and ingenuity of such men as Francis Galton, Alfred Binet, Hugo Muensterberg—to mention only those whose great work is finished—and their successors.

Methods of mental measurement are continually being devised and perfected for the conduct of research, and simultaneously many of them are being adapted and standardized for practical (technological) use. As "mental tests" they do not necessarily lose their scientific character, though often they are used and abused by persons who are incapable of safe observation or interpretation of results. Like other natural sciences, psychology has an exacting technique, a considerable

body of facts and laws, and like every branch of engineering, psycho-technology has its basic information and its scientifically determined and evaluated practices. These essential facts about the science and its technology tend to be overlooked. Anyone, it would appear, may parade as psychologist or psycho-technologist; but only the adequately trained and competent may be relied upon for valuable service. The public has increasing reason to beware of those impostors and charlatans who are psychologists only in name.

Those among us who think of applied psychology or of "mental testing" as the application of the methods of Binet are sadly out of date. Binet's crude but ingenious procedure for the mental classification of children at the beginning of the present century gave an impetus to the educational and medical application of results of mental measurement which is largely responsible for the rapid development of psycho-technology. But more important by far than the Binet tests is the influence of their results on the lay mind and on the interest of professional psychologists. New and better scientific methods of mental measurement, and, indeed, of classifying children are now available, and the time approaches when "Binet testing" will have no other than historical significance.

To-day many of the forms of behaviour which are primarily intellectual can be measured with reasonable facility and accuracy, but by contrast, behaviour of the affective sort,—traits of temperament and emotional expressions,—are imperfectly and incompletely measurable. Doubtless what has been achieved in the measurement of intelligence presently will be achieved also in the measurement of the affective aspects of life. Already indeed, progress in this direction is substantial. Yet, whereas quickness of reaction, sensory acuity, memory span, and scores of other forms or aspects of behaviour may be measured readily and serviceably, interest, timidity, fear, honesty, cannot be so measured. The best we can do at present is to labor over these characteristics with methods of research which are difficult of manipulation, unstandardized, and wholly impracticable for psycho-technological use.

Eugenics needs accurate and reasonably complete description of human behaviour as partial basis for methods of control. It may look to psychology hopefully for accurate descriptions of traits of mind and their expressions in action, for measurements of the manifold features of intellect, feeling, will, temperament, character—in fine for the scientific description of the human personality. When this is possible, and the start already made justifies the prophecy that the coming generation will achieve it, eugenics may fruitfully compare individuals, families, tribes, races, nations, occupational or other social groups, may observe and experiment and above all may intelligently strive for scientifically defined and evaluated ideals of human form and conduct.

The most impressive demonstration of the practical availability and serviceability of methods of mental measurement occurred in the Army of the United States of America during the Great War. I have been asked to tell the readers of the *EUGENICS REVIEW* something about the methods and results of this vast experiment in psycho-technology, and I gladly do so. But in undertaking the task I beg to remind my

readers that it is impossible to do justice to it in a few pages. Even the voluminous official reports are disappointing because of their incompleteness.\*

The methods used to measure intelligence in the United States Army are of two sorts: group examinations and individual examinations. The group examination was developed and perfected in response to the compelling demand for speed, and the individual examination to assure a greater measure of accuracy and fairness in doubtful cases. Although in general army psychological methods were adaptations of those previously used for research or technological purposes, several new tests were devised, and certain of the assemblages of tests for use as group examinations were essentially new. Of peculiar importance are the performance tests, devised by army psychologists for the examination of foreigners and illiterates.

Psychological examining was originally undertaken with a group examination which required ability to read and write English, but the unexpectedly high frequency of men illiterate in English necessitated the development of a non-linguistic type of examination. The group examination for literates finally adopted is known as examination Alpha, that for illiterates as examination Beta. Whereas Alpha consists chiefly of linguistic tests, Beta is made up wholly of non-linguistic or performance tests. By means of Alpha and Beta, men can be examined in as large groups as available space and the vocal power of the examiner make possible. In the Army the numbers usually varied from one to three hundred. As many as five hundred men have been examined simultaneously.

Three principal varieties of individual examination were developed, for different types of subject. They are the Performance Scale Examination, the Yerkes-Bridges Point Scale Examination, the Stanford-Binet Examination. The first was developed primarily for the examination of illiterates and the last two were used mostly for men of low-grade intelligence and limited education in English.

Each examination was made up of tests carefully selected to measure important intellectual processes. It is impracticable to describe

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- \***(1)** Psychological Examining in the United States Army (official report). *Memoirs of the National Academy of Sciences*, Vol. 15. Washington, D. C., 1920. Pp. VI+890. (Available through the Superintendent of Documents, Washington, D. C.)
- (2)** Psychology in Relation to the War. By Robert M. Yerkes. *Psychological Review*, Vol. 25, 1918. Pp. 85—115.
- (3)** Report of the Psychology Committee of the National Research Council. By Robert M. Yerkes. *Psychological Review*, Vol. 26, 1919, Pp. 83—140.
- (4)** Army Mental Tests. Edited by C. S. Yoakum and R. M. Yerkes. Pp. xiii+303. Holt & Co., New York, 1920.
- (5)** Intellectual and Educational Status of the Medical Profession as Represented in the United States Army. By Margaret V. Cobb and Robert M. Yerkes. *Bulletin National Research Council*, Vol. 1, No. 8, 1921. Pp. 76.
- (6)** The Personnel System of the United States Army. Vol. 1. History of the Personnel System; Vol. 2. The Personnel Manual. Published by the War Department, Washington, D. C., 1919. (Available through the Superintendent of Documents, Washington, D. C.)
- (7)** A Study of American Intelligence. By Carl C. Brigham. Princeton University Press (In press.)

all of the tests in detail since there were some two hundred included in the several types of examination. A few of the simplest must serve to indicate general characteristics.

Group examination Alpha consisted of eight tests, the descrip-

FORM 6    GROUP EXAMINATION ALPHA    GROUP NO. ....

Name..... Rank..... Age.....

Company..... Regiment..... Arm..... Division.....

In what country or state born?..... Years in U. S.?..... Race.....

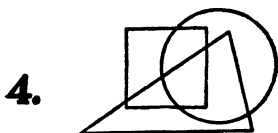
Occupation..... Weekly Wages.....

Schooling: Grades, 1. 2. 3. 4. 5. 6. 7. 8: High or Prep. School, Year 1. 2. 3. 4: College, Year 1. 2. 3. 4.

TEST 1

1. ○ ○ ○ ○ ○

2. ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨



5. ○ ○ ○ Yes No

6. ○ ○ ○ ○ ○

7. ABCDEFGHIJKLMNOP

8. ○ ○ ○ MILITARY GUN CAMP

9. 34-79-56-87-68-25-82-47-27-31-64-93-71-41-52-99

10. 

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11. 

7F	△ 4	○ 3	△ 5A	○ 8	□ 2	△ 6	○ 9B	□ 3
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12. 1 2 3 4 5 6 7 8 9

Division of Psychology, Medical Department U. S. A.  
Authorized by the Surgeon General, Feb. 8, 1918, Edition, Aug. 16, 1918, 200,000.

FIG. 1.

tive titles of which are: (1) oral directions or commands test; (2) arithmetical problems; (3) practical judgment; (4) synonym—antonym; (5) disarranged sentences; (6) number series completion; (7) analogies; (8) general information.

To facilitate description of the oral directions or commands test, the page of the Alpha record-blank which includes this test is reproduced—three-fifths original size, as figure 1. In giving this test the military examiner, after general instructions to his group of subjects, proceeds as follows:

“Attention! ‘Attention’ always means ‘Pencils up.’ Look at the circles at 1. When I say ‘go’ but not before, make a cross in the first circle and also a figure 1 in the third circle—Go!”

After waiting for five seconds to allow the subjects to execute the command the examiner continues:

“Attention! Look at 2, where the circles have numbers in them. When I say ‘go’ draw a line from Circle 1 to Circle 4 that will pass *above* circle 2 and *below* circle 3.—Go!”

So, in accordance with definitely prescribed rules, the examiner continues through the twelve items of the test. The items are arranged in order of increasing difficulty, the initial ones being very easy so that all subjects can respond correctly at the start.

Like the commands test, the remaining tests of examination Alpha consist of numerous items arranged from easy to difficult. Response requires little or no writing, for in almost every test the subject records his response by making some such simple mark as a cross, a check mark or an underscore. This at once facilitates reaction, eliminates difference in ease and speed of writing as a source of error, and makes it possible to score examination records by the use of transparent stencils on which correct responses are indicated by position.

The maximum number of points allowed for examination Alpha was 212. For convenience of report and use of intelligence grades by army officers, the scores for all types of examination were converted into letter grades in accordance with the data of table 1, from which it will be noted that a score of 135 points or more in examination Alpha, or of 100 or more in examination Beta classed a man as of A grade intelligence; and that a score of 14 or less in Alpha or of 19 or less in Beta classed him as D. *It is important to note that the letter-grade classification is somewhat arbitrary. For practical reasons the range of scores included in A, for example, was so chosen that not more than five per cent. of recruits should receive that grade.*

TABLE I.

## DEFINITIONS OF INTELLIGENCE GRADES.

<i>Intelligence</i>	<i>Definition.</i>	<i>Score (Alpha)</i>	<i>Score (Beta)</i>
A	Very superior	135—212	100—118
B	Superior	105—134	90—99
C+	High average	75—104	80—89
C	Average	45—74	65—79
C—	Low average	25—54	45—64
D	Inferior	15—24	20—44
D—	Very inferior	0—14	0—19

Examination Beta consisted of seven tests known as (1) the maze test; (2) cube analysis; (3) X—O series; (4) digit-symbol; (5) number checking; (6) pictorial completion; (7) geometric construction. This

Test 7

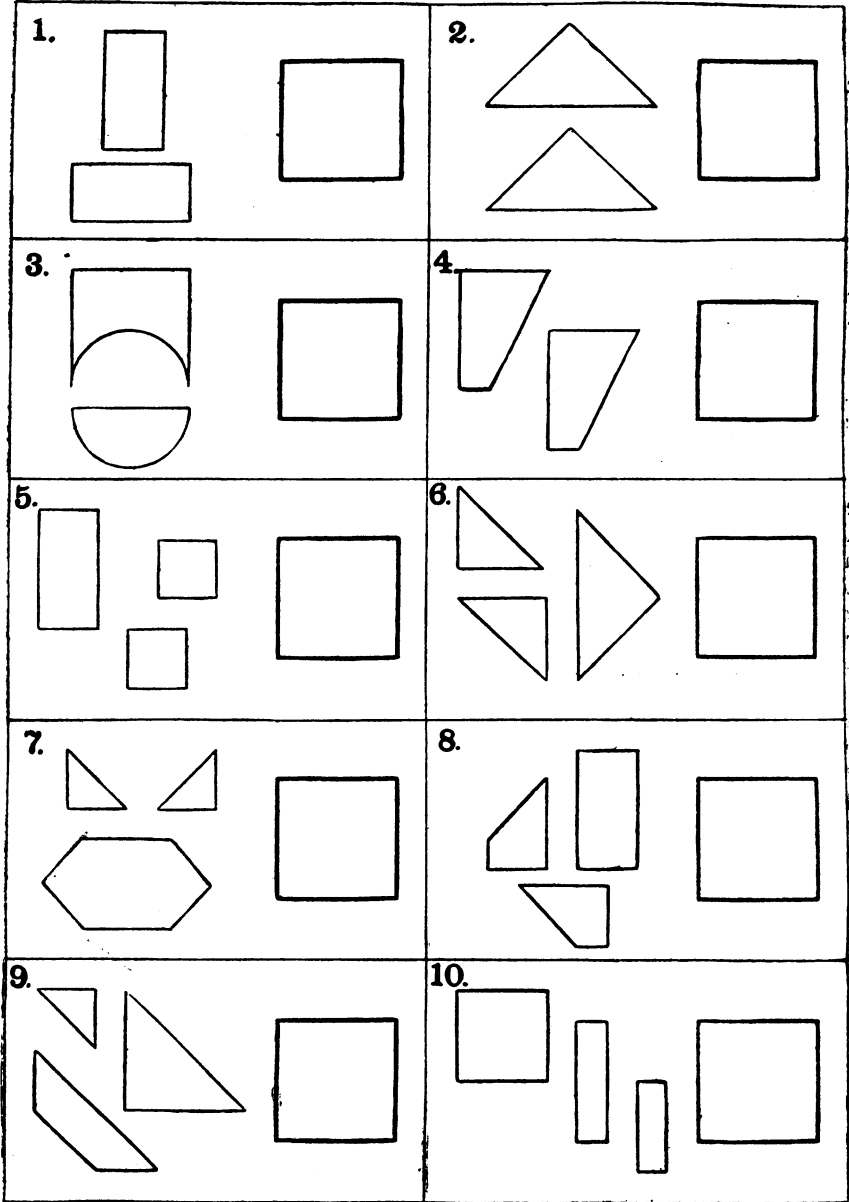


FIG. 2.

examination could be given, if necessary, without the use of language by the employment of pantomime, charts, or blackboard, and demonstration. Whereas in examination Alpha all directions are given orally and the subject must be able to understand English readily, read it and write words and figures, examination Beta can be given satisfactorily to men who are entirely unfamiliar with English, for the examiner in case of each test begins by showing the group what is to be done.

Test 7 of Beta is reproduced, one half original size, as figure 2. In each item or part of the test the geometrical forms at the left can be arranged to make a square. The subject is expected to indicate the proper placement of the forms by drawing with his pencil proper line or lines in the blank square at the right. As a preliminary to the test the examiner demonstrated with blackboard and pieces of cardboard how a certain assemblage of forms can be fitted together to make a square. This pantomime explanation was conducted slowly and repeated with four different sets of forms. Then the subject was required to go ahead with the ten parts of the test and to supply in each the necessary lines.

In the Army non-linguistic or performance tests were devised and used extensively and to excellent purpose. Had the exigencies of the situation permitted, or had the war continued another year, doubtless a single non-linguistic group examination would have been developed as a substitute for Alpha and Beta. The practical importance of performance tests as contrasted with linguistic tests for the comparative measurement of native intelligence is very great. For they escape individual differences in language, dialect, schooling, facility and speed in reading and writing, and native linguistic gift. If available, satisfactory non-linguistic or performance tests and examinations might be given to primitive as well as civilized races, to immature as well as mature individuals, to uneducated as well as educated persons. There is urgent need for a practical system of examination with this degree of flexibility, applicability and comparability of results. The psychologists of the United States Army took a long step toward the development of non-linguistic methods of measuring intelligence, and although examination Beta is not entirely satisfactory for general use, it clearly points the way to further methodological developments which are sure to be of the greatest significance to eugenics.

The several types of individual examination used in the Army are too well known to justify description of the constituent tests. All were adapted to military needs. In some of them new types of tests appear. Those who desire detailed descriptions of methods, with measures of their value should consult the official report.

Probably the most important aspects or characteristics of Army psychological examining are (1) the utilization of mass measurement instead of individual examining. Previously the achievement of an examiner had been limited to ten or at most fifteen examinations per day. In the United States Army a psychologist examined as many as 1000 men in a day. (2) Objectivity of measurement. For all examinations were made in accordance with definite rules, and scored by rule, with the use of stencils so that the scoring clerk performed merely the mechanical function of indicating right or wrong responses. (4)

The use of examinations in series to increase accuracy of measurement and to assure justice to the individual. If a subject failed in examination Alpha it was assumed that inadequate education or familiarity with English might be partially responsible, and he was examined also by means of Beta. Failing in the latter he was given an individual examination, if time permitted. (5) Unprecedented utilization of non-linguistic tests as contrasted with those which demand facility in the use of spoken or written language.

The following "explanation" of intelligence examining and grades was supplied by army psychologists for the enlightenment of officers in command of troops. It will serve at once to indicate briefly the principal purpose or uses of intelligence grades, the meaning of the different letter-grades employed, and important limitations of value.

#### EXPLANATION OF THE INTELLIGENCE GRADES.

*The purpose of the psychological tests.*—In no previous war has military efficiency depended so much upon the prompt and complete utilization of the intelligence of the individual soldier. The purpose of the psychological tests is to give a quick and fairly accurate classification of the men according to general intelligence. They aid:

- (a) In the discovery of men whose superior ability recommends their advancement.
- (b) In the prompt segregation in the Development Battalions of intellectually inferior men whose inaptitude would retard the training of the unit.
- (c) In building organizations of equal or appropriate strength.
- (d) In selecting suitable men for various army occupations or for special training in the technical schools.
- (e) In eliminating the feeble-minded.

*What the tests measure.*—The tests give reliable index of a man's *ability to learn, to think quickly and accurately, to analyse situations, to maintain a state of mental alertness, and to comprehend instructions.* They do not measure loyalty, bravery, dependability, or the emotional traits that make a man "carry on." A man's value to the service is measured by his *intelligence, plus other necessary qualifications.*

*What the grades mean.*—All men are classified by the tests as A, B, C+, C, C-, D, D-, or E, as follows:

- A *Very superior intelligence.*—High officer type, when backed by other necessary qualities.
- B *Superior intelligence.*—Commissioned officer type and splendid sergeant material.
- C+ *High average intelligence.*—Good non-commissioned officer material with occasionally a man worthy of higher rank.
- C *Average intelligence.*—Good Private type, with some fair to good non-commissioned officer material.
- C- *Low average intelligence.*—Ordinary private.
- D *Inferior intelligence.*—Largely illiterates or foreign born. Usually fair soldiers, but often slow in learning.
- D- *Very inferior intelligence,* but considered fit for regular service.
- E *Mental inferiority,* justifying recommendation for Development Battalion, special service organizations, rejection or discharge.

*The grades should be consulted.*—(a) in the selection of candidates for officers' training schools; (b) in the selection of all non-commissioned officers; (c) in balancing organizations; (d) in picking men for special detail; (e) in the classification and training of men in Development Battalions; (f) in court cases; (g) in the better understanding of men who are in any way peculiar or exceptional; (h) the tests have also been used effectively in the selection of nurses, Y.M.C.A. personnel, etc.

#### IMPORTANT POINTS.

1. Commissioned officer material is found chiefly in the A and B groups. Men grading C should be accepted for Officer's Training Camp only after careful scrutiny.



2. The majority of non-commissioned officers rate A, B or C+. Men below C+ should not be entrusted with complicated paper work.
3. D men are rarely suited for tasks requiring special skill, forethought, resourcefulness or sustained alertness.
4. It is unsafe to expect D- or E men to read and understand written directions.
5. Only high score men should be selected for tasks that require quick learning and rapid adjustments.
6. A man's value to the service should not be judged by his intelligence rating alone.

Every effort was made to emphasize the incompleteness of psychological examination of the soldier. It was recognized that the methods employed tested or measured only certain important intellectual processes and that grades were assigned merely for what is popularly known as "brightness," "mental alertness" or "general intelligence." In emphasizing this limitation of psychological report it was pointed out that certain other psychological traits, as for example leadership, courage, reliability, may be equally important with intelligence for success in military duty. These affective or temperamental traits also would have been measured by army psychologists had suitable methods been available or readily developed. It is regrettably true that only half the mind, or reactive capacity, of the soldier was measured. Had it been possible similarly to measure traits of temperament and character, the practical value of psychological examining would have been increased tremendously. But here the army psychologists faced a condition which still persists, namely, the lack of simple, effective, standardized methods of measuring the affective traits or aspects of behaviour.

Description of methods of mental measurement, even of the psychotechnological sort, for the enlightenment of laymen becomes increasingly difficult as the technique of the science grows varied and complex. It is hopeless to give adequate knowledge of even the general characteristics and values of the methods used in the United States Army. Those who desire accurate detailed descriptions are referred to the official report or to manuals of mental tests. Those who are sceptical of the reliability of even the well-established and highly standardized mental tests, and doubtful of the utility of their results, are urged to investigate them directly and especially to have the methods tried on themselves. For there is nothing more illuminating and safely convincing than the self-revelation which comes from a thorough-going psychological examination, *conducted by a competent examiner.*

A disproportionate amount of space has been given to method or technique. We may now turn to results of psychological examining in the United States Army which have significance for the eugenist.

Almost the first achievement in army intelligence examining was the differentiation of important military groups and the revelation that men of inferior intelligence are burdensome in the military machine, as elsewhere. Figure 3, one of the charts early used by army psychologists in describing results and military values, indicates at once the prevalence of superior intellectual ability among officers and among privates rated as "best" by their officers, and the amazing prevalence of inferior intelligence among disciplinary cases and men rated by their officers as of "low military value" or "unteachable."

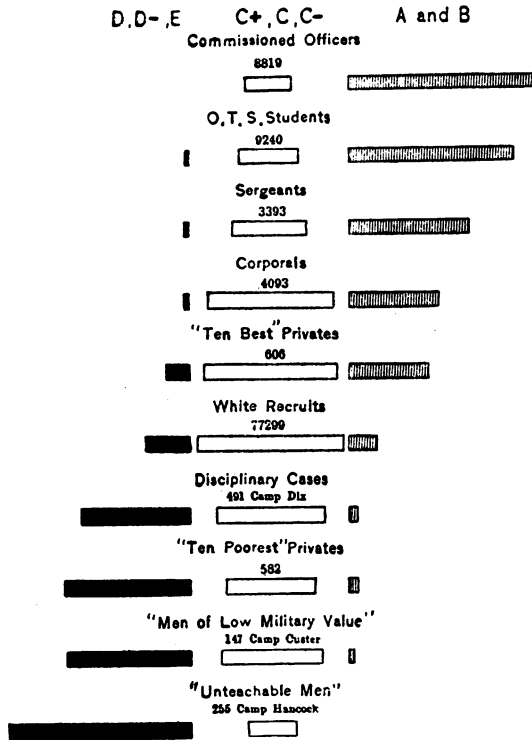


FIG. 3.

It was difficult for the military man to believe that the psychologist in a few minutes, by what appeared to be absurdly simple tests, could obtain an intelligence grade which generally agreed very closely with his own judgment of the man's ability based upon weeks or months of observation in connection with military training and duty.

The most reliable general statements of results of intelligence measurements in the Army of the United States are those based upon the so-called "combined scale," which was fashioned so that the results of all types of examination could be converted into it. The range of scores on the "combined scale" is 0 to 26 points. The percentage distribution of scores for such important army groups as officers, white draft, negro draft, and men individually examined, are presented in the accompanying table 2. Attention is particularly invited to the median scores of these groups and to the fact that almost all of the officers are above the *median* for the white draft, and all but about 11 per cent. of the white draft, above the median for the negro.

The graphical representation of these facts (figure 4) is particularly impressive because it so strikingly indicates the wide range of intelligence and the surprising differences between groups as well as within them. Assuming that the curve for the white draft in this figure applies



to the total adult population of the United States, it appears that a person who scores 15 points on the "combined scale" falls in the

- OFFICERS, GROUP VI -----
- WHITE DRAFT, GROUPS I, II, III =====
- WHITE DRAFT, GROUP X -----
- NEGRO DRAFT, GROUP IV .....
- WHITE DRAFT, INDIV. EXAMS. (SHERIDAN) =====
- NEGRO DRAFT, INDIV. EXAMS. (SHERIDAN) -----
- WHITE DRAFT, DISCHARGE RECOM. (GRANT) .....
- NEGRO DRAFT, DISCHARGE RECOM. (GRANT) -----

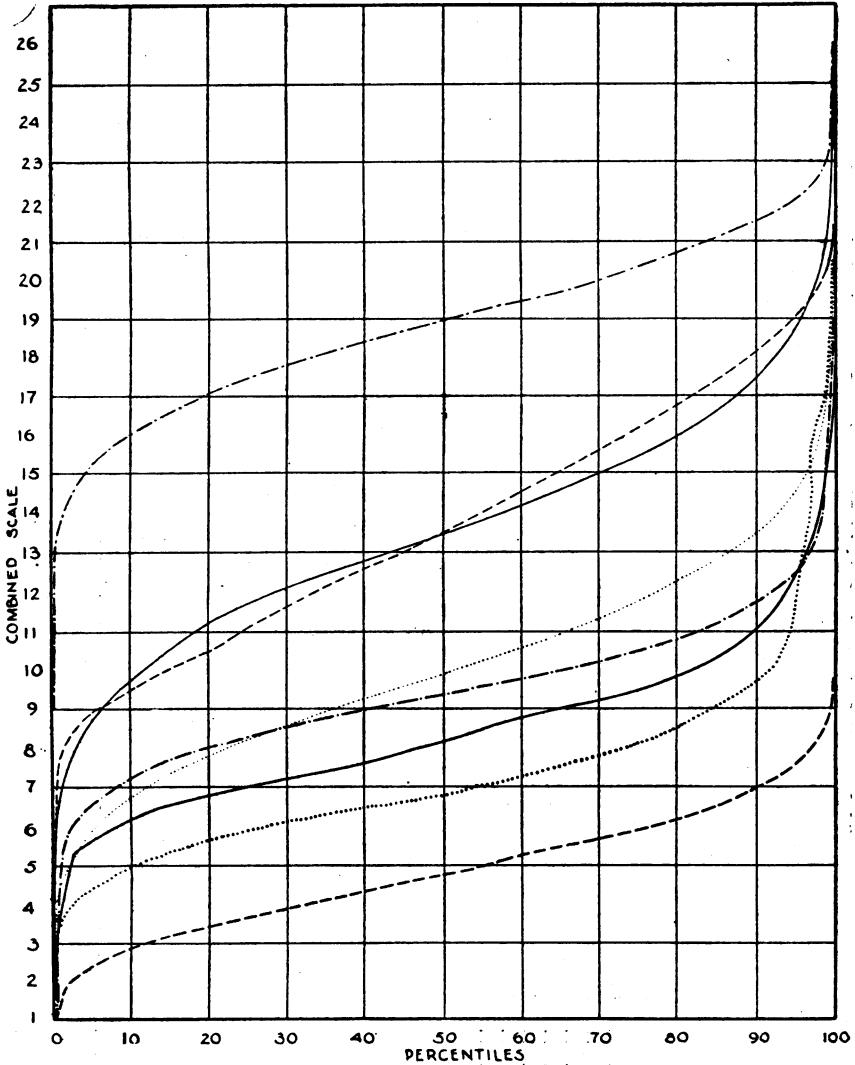


FIG. 4.

seventieth percentile, while he who scores 21 points or over falls in the ninety-ninth or one hundredth percentile. This method of representing the intellectual status of a population, of a racial, institutional, or other group of individuals, is likely to come into general use because of its definiteness of meaning and convenience. It is of considerable interest to the individual, as well as of practical importance to the examiner, to be able to compare a subject's score with the racial distribution of scores, and to read directly the percentile location of the individual.

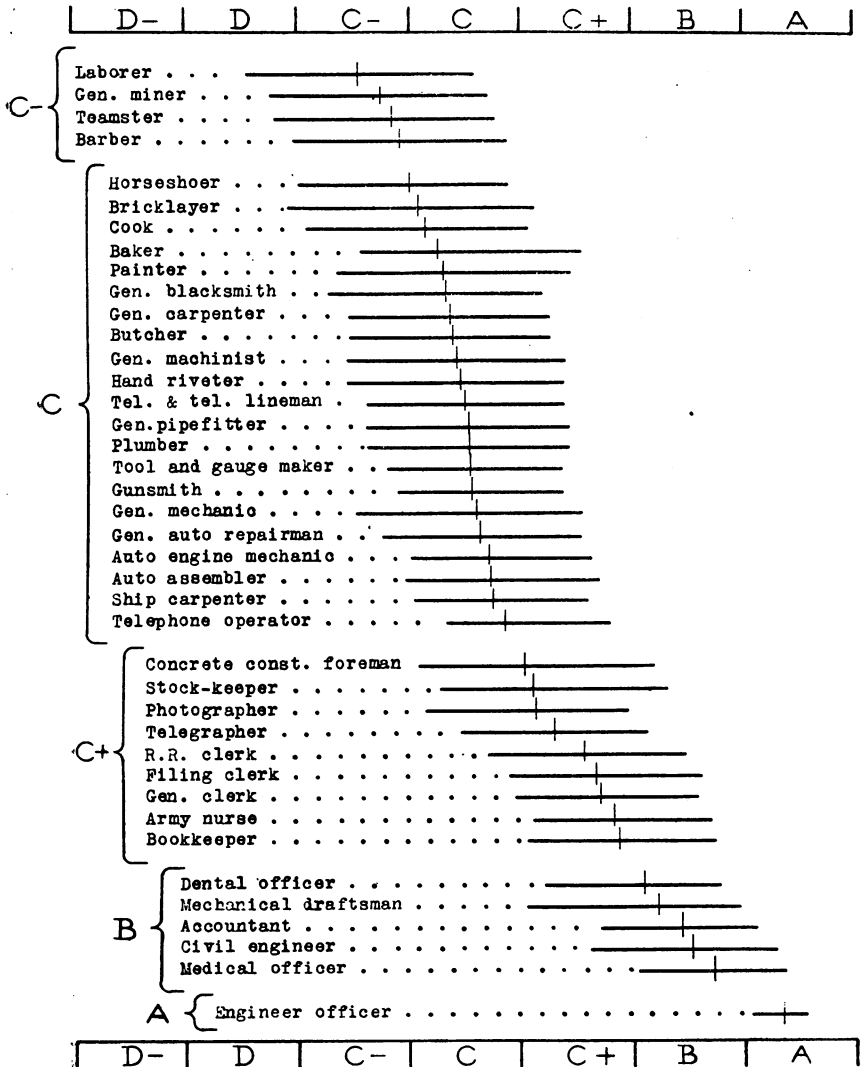


FIG. 5.

Novel and suggestive of varied practical applications in industry as well as in eugenics are the relations of intelligence measurement to civilian occupations, indicated by army statistics. The accompanying figure 5 will serve to show some of the principal points. For the several occupations listed, the median intelligence is indicated by vertical cross lines. The horizontal line represents the middle 50 per cent. of cases under each occupation. It therefore fails to show the complete range of intelligence engaged in an occupation.

The median intelligence for the white draft is practically identical with the median for such occupations as blacksmith, carpenter, butcher, plumber, gunsmith, general mechanic. By contrast, the median intelligence of laborers, miners, teamsters, barbers, is distinctly below the general median, whereas the medians for clerks, book-keepers, draftsmen, accountants, engineers, physicians, are very much higher. These results clearly enough indicate the possibility of securing for practical vocational use reliable intelligence specifications for all important occupations. Both the range of intelligence actually engaged in a given occupation and the median should be known and proficiency or degree of success should be correlated with intelligence score so that limits may safely be fixed on the one hand for the minimum of intelligence necessary for success, and on the other hand for the maximum of intelligence usable without waste. For it is clear that the individual may have either too little or too much intelligence for a given task or occupation. Of course in addition he may be temperamentally qualified or unsuited to the occupation. There unquestionably is quite as serious human wastage on account of needlessly high grade intelligence in a given task as because of inadequate ability.

It would be inexcusable to overlook results which analyse the scores instead of presenting the single intelligence grade. Examination Alpha consists of eight tests which make radically different demands on the intellect of the subject. When the scores on these several tests are computed for individuals or for such groups as medical officers, engineer officers, chaplains, it is manifest that there are significant differences from test to test. Graphic representation of these differences yields what may be called an intelligence profile or psychograph for the individual or the group.

In figure 6, examination Alpha psychographs for nine army groups are presented. All are plotted about the fiftieth percentile and for each test the departure of a given group from that percentile is indicated. In test 1, oral directions, medical corps officers fall below the thirtieth percentile; chaplains at the forty-eighth; engineers at the seventy-second. On test 4, opposite or synonym-antonym, the medical group is relatively much higher, forty-eighth percentile; engineers relatively much lower, sixty-second percentile, and the chaplains unprecedentedly high, eighthieth percentile. On test 6, number series completion, which demands detection of certain types of logical relationship, both medical officers and chaplains are low, whereas engineers are high.

By comparison with the dissimilarity of the psychographs for the several army groups of figure 6 the family resemblance of those of

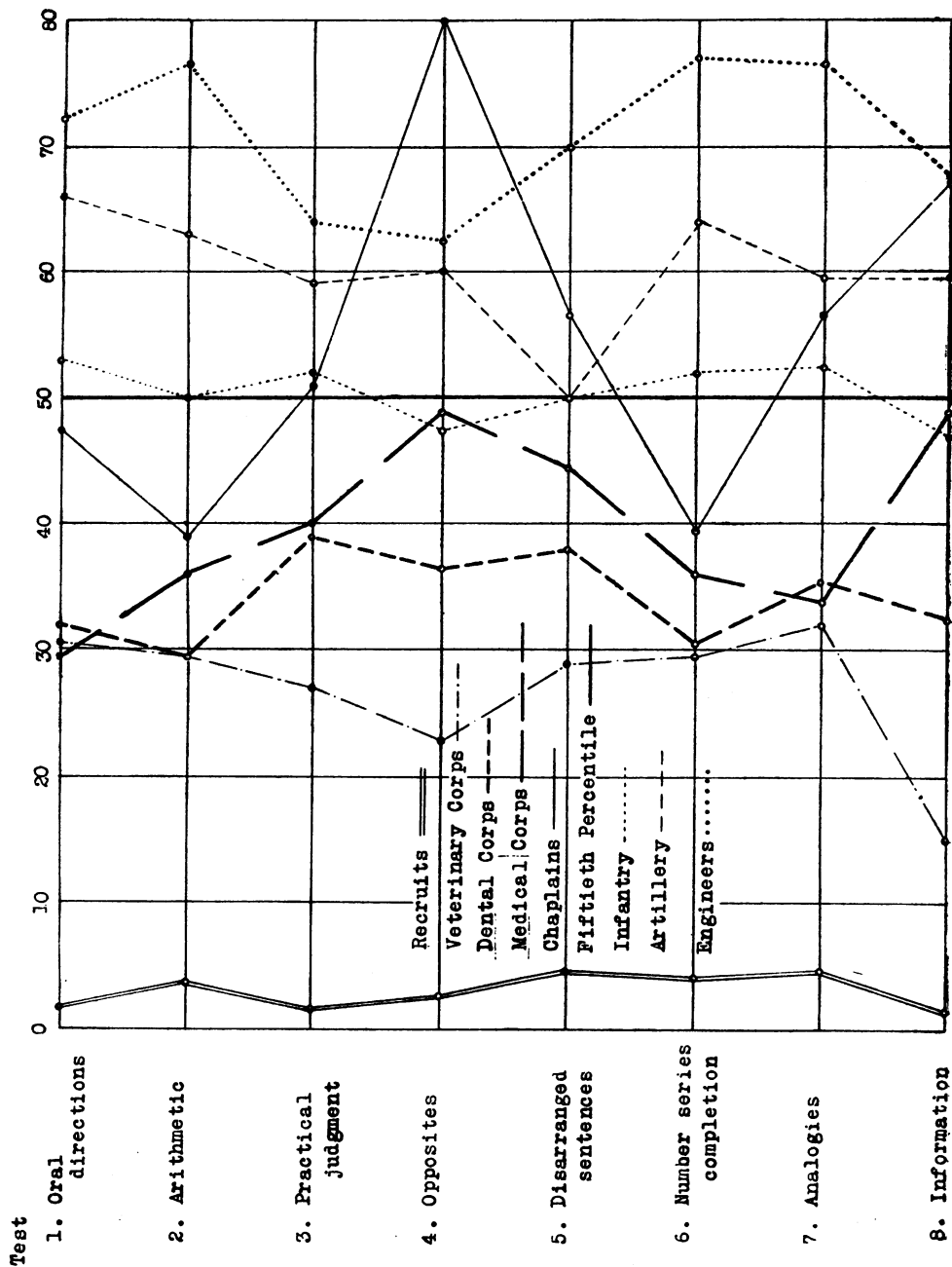


FIG. 6.

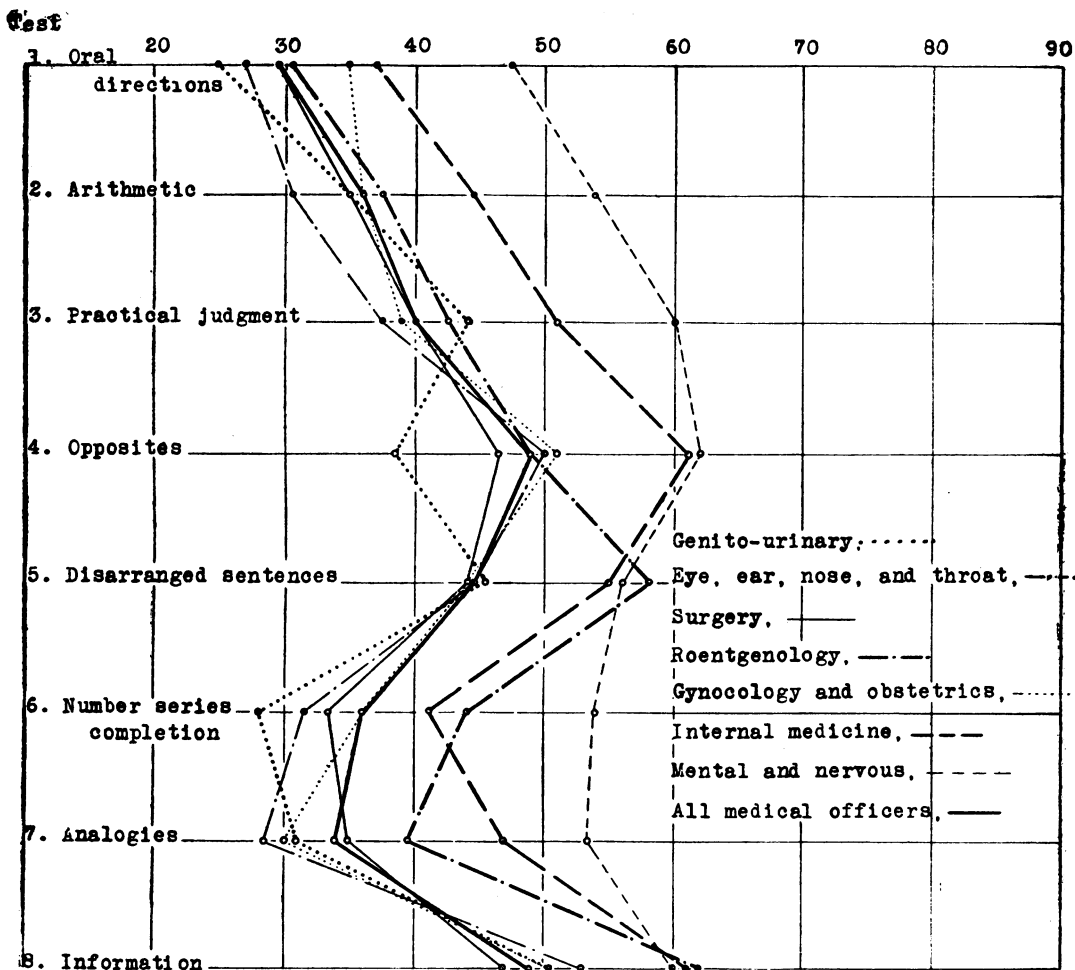


FIG. 7.

figure 7 is significant. In the latter figure the group of medical officers has been resolved into its principal army specialities. It is noteworthy that the several psychographs are closely similar and that except for the somewhat higher scores of "internal medicine" and "mental and nervous" all would fall within a narrow percentile range.

Whether or not the psychograph or some similar method of representing the status of important intellectual functions in the individual will come into general use is difficult to predict. The writer is inclined to think it will, because it gives infinitely more valuable information about the individual than does the intelligence score or grade. Indeed what we most need and desire to know about individual or group is the status of essential traits in relation to the norms for sex, age, race, occupational or other groups.



The psychographic differences appearing in figure 6 may or may not have occupational significance. Perhaps they are due to fundamental differences in the intellectual make-up of men who choose engineering, medicine, or the ministry, or perhaps they are due to professional training and experience. The same possibilities obtain in the case of differences in the psychographs of individuals. For although psychologists are striving to devise methods which shall yield clean-cut measurements of native capacity versus acquired ability, it is clear that they have not ideally succeeded, and that in most instances they measure primarily the one or the other, but something of both. So long as this is true, it will be impossible to say certainly whether and to what extent psychographs are descriptive of mental constitution and possess educational or vocational significance.

I wish to avail myself of this opportunity to emphasize the inexcusable waste of scientific effort in the presentation of mental age, letter grade, or numerical score as the sole descriptive result of "intelligence examination." If and when an individual has been subjected to an examination consisting of a dozen or a score of different types of test, each of which contains from ten to fifty different items, it is only a matter of common sense to present a statement of results which shall indicate achievement in the different types of test. Thus it is possible to exhibit the status of different functions instead of summing up the whole, and, thus hiding perhaps, the most significant features of the results, in such a simple statement as mental age or score. In this respect the so-called "Binet testers" have been, and continue to be, the worst offenders. Little indeed for the advance of scientific knowledge of mental development has resulted from the immense number of Binet examinations made all over the world. If we could to-day replace the Binet tests by a method of measuring specific intellectual and affective functions which would permit of psychographic or other suitable means of indicating the relative status of each function, we should take a tremendously important step forward in the interest alike of eugenics, of education, and of other types of human endeavour.

Far more interesting doubtless to the practical eugenicist than occupational differences in intelligence or specifications are the racial differences which appear when the foreign-born American draft is analysed into its principal constituent groups. The difference even of median score or letter grade distribution are so great as to be significant alike to the American people and to the eugenicists of the world.

The contrasting intellectual status of the white versus the negro constituents of the draft appear from table 3. Few residents of the United States probably would have anticipated so great a difference. That the American negro is 90 per cent. illiterate only in part accounts for his inferior intellectual status.

TABLE 3.  
INTELLIGENCE OF AMERICAN NEGRO VERSUS WHITE.

Race.	Number of		Percentage making grade					
	Cases	A	B	C+	C	C—	D	D—
Whites .. ..	98,973	4.1	8.0	15.0	25.0	23.8	17.1	7.0
Negroes .. ..	18,891	0.1	0.6	2.0	5.7	12.9	29.7	49.0
Northern negroes ..	4,705	0.7	2.7	7.2	18.0	25.8	31.2	14.4
Southern negroes ..	6,846	0.1	0.2	0.7	3.4	9.6	29.2	57.0

Scarcely less marked than the contrast between white and negro are the differences among the white racial groups. Again, the best basis for comparison available in the report of army examining is the "combined scale." By the kindness of Professor Carl C. Brigham of Princeton University, who recently has carefully re-examined the army data relative to nativity and length of residence in the United States, I am able to present in table 4 the median scores on the "combined scale" for those racial groups which were most largely represented in the United States Army. The table presents also the rank-order of the groups with respect to increasing percentage of intellectual inferiors, as designated by letter grades, and similarly the rank-order for diminishing percentages of intellectual superiors.

TABLE IV.

## INTELLIGENCE RANK-ORDER OF NATIVITY GROUPS UNITED STATES ARMY.

Rank order	Average score on "combined scale."		Rank order.	Average score on "combined scale."	
England .. .. .	..	..	14·87	Ireland .. .. .	12·32
Scotland .. .. .	..	..	14·34	Austria .. .. .	12·27
Holland .. .. .	..	..	14·32	Turkey .. .. .	12·02
Germany .. .. .	..	..	13·88	Greece .. .. .	11·90
Denmark .. .. .	..	..	13·69	Russia .. .. .	11·34
Canada .. .. .	..	..	13·66	Italy .. .. .	11·01
Sweden .. .. .	..	..	13·30	Poland .. .. .	10·74
Norway .. .. .	..	..	12·98	Native born white draft	13·77
Belgium .. .. .	..	..	12·79		
Rank order	Percentage D, D—, E.		Rank order	Percentage D, D—, E.	
England .. .. .	..	..	8·7	Norway .. .. .	25·6
Holland .. .. .	..	..	9·2	Austria .. .. .	37·5
Denmark .. .. .	..	..	13·4	Ireland .. .. .	39·4
Scotland .. .. .	..	..	13·6	Turkey .. .. .	42·0
Germany .. .. .	..	..	15·0	Greece .. .. .	43·6
Sweden .. .. .	..	..	19·4	All foreign countries	45·6
Canada .. .. .	..	..	19·5	Russia .. .. .	60·4
Belgium .. .. .	..	..	24·0	Italy .. .. .	63·4
White draft	..	..	24·1	Poland .. .. .	69·9
Rank order	Percentage of A and B.		Rank order	Percentage of A and B.	
England .. .. .	..	..	19·7	Ireland .. .. .	4·1
Scotland .. .. .	..	..	13·0	All foreign countries	3·0
White draft	..	..	12·1	Turkey .. .. .	3·4
Holland .. .. .	..	..	10·7	Austria .. .. .	3·4
Canada .. .. .	..	..	10·5	Russia .. .. .	2·7
Germany .. .. .	..	..	8·3	Greece .. .. .	2·1
Denmark .. .. .	..	..	5·4	Italy .. .. .	0·8
Sweden .. .. .	..	..	4·3	Belgium .. .. .	0·8
Norway .. .. .	..	..	4·1	Poland .. .. .	0·5

It is not suggested, much less maintained, that these general ethnic results indicate the relative intellectual status of the several nationalities concerned, or of the total racial groups, the world over. Selective factors doubtless have markedly affected the intelligence of immigrants. Possibly Poland, Russia, Ireland, have not sent as nearly representative samples of their populations to this country as have England, Scotland, and Germany. In any event, the results offered are terribly significant for the United States of America.

Professor Brigham in a forthcoming book on intelligence and race,\* which is highly commended to the reader in supplementation of this article, uses the effective device of figure 8 to present graphically the conspicuously important results of army psychological examining with respect to racial differences in intelligence.

Too much space has already been given to the sampling of general results. Readers who desire all the facts must be referred once more to the official report. To sum up the story of psychological examining in the United States Army:—One and three-quarter millions of men were examined. In all, more than two and one-half millions of examinations were made. About 42,000 of the number examined were commissioned officers. More than 83,000 enlisted men were given individual examinations in addition to Alpha, Beta, or both. Just about two men in every hundred were found to be so inferior mentally that they could not safely be recommended for regular military training and duty. Some of these were discharged, others were assigned to development battalions or to labour organizations. Had the United States Army rejected or discharged immediately on the basis of psychological examination the lowest one hundred thousand of its recruits, it would have lessened by at least one half military crime, difficulty and delay in training due to stupidity, and inequalities in strength of organization.

As in the light of war-time experience and its conspicuously important psychological results, we consider the relation of psycho-technology to education, industry, and eugenics, we are impressed primarily by the necessity for the wise and skilful development of methods of observation and likewise of safe statistical methods of treating and stating scientific results. No less important is the indicated need of standards of judgment or norms in connection with psychological measurement. In the main, mental testing, so called, has been carried on with no other standard of reference than that of chronological age. Now age undeniably is important, but least important of all ages perhaps is the chronological. Most important of all "ages" is the physiological, and equally important with this, or in certain cases even more important, are norms and standards for sex, race, social or educational status, occupation, etc. Not until we have safe and serviceable standards of judgment can we use to advantage even accurate results of mental measurement. Many, it is true, doubt the importance of special norms for sex, or for race, but whatever may be our belief or conviction regarding sex or ethnic differences in mental constitution, we are compelled to admit that safe comparison must rest on statistically established facts and not upon accidental preconceptions.

All civilized nations periodically take stock of material resources and population, that they may have at hand reliable information for the guidance of their governments. But never yet has census been taken of the mental, or even of the intellectual, resources of a country, nation, or race. The United States of America demonstrated in its army the practicability of a wholesale mental inventory and discovered

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\*A Study of American intelligence. Princeton University Press (In press).

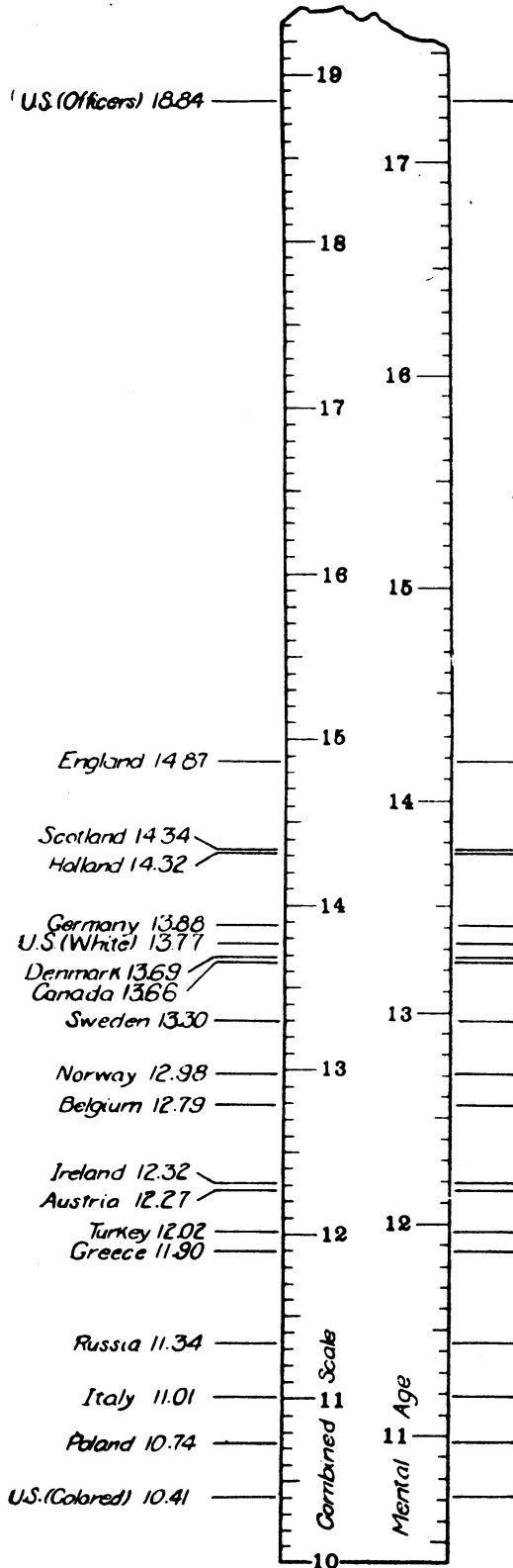


FIG. 8.

certain uniquely valuable results. Is it rash to predict that in the near future, *census or inventory of mental resources* will become established as a means of securing information invaluable for the guidance of national, and ultimately of world, affairs? The group method of examining, given suitable tests for the most important intellectual and affective aspects of behaviour, would enable a country to sample the mentality of its population periodically at reasonable cost.

Not content with prophecy in this matter, I definitely suggest both the extreme desirability and the practicability of mental census, and urge upon all nations the importance of thus providing information essential to the wise direction of educational, industrial, and governmental affairs.

#### EXPLANATIONS OF FIGURES.

- FIG. 1.—Test 1<sub>a</sub> of Examination Alpha.  
 FIG. 2.—Test 7 of Examination Beta.  
 FIG. 3.—Frequency of low, medium, and high grade intelligence in military groups.  
 FIG. 4.—Percentile curves for intelligence scores (on ‘combined scale’) for various military groups. Reproduced from *Memoirs Nat. Acad. Scs.*, vol. 15, p. 786.  
 FIG. 5.—Intelligence by occupations. Vertical bar marks *median*; horizontal bar represents middle 50% of ratings (distance between first and third quartiles). Reproduced from *Memoirs Nat. Acad. Scs.*, vol. 15, p. 829.  
 FIG. 6.—Scores on Alpha tests (profiles or psychographs) for officer groups in the Army of the United States. Reproduced from *Bull. Nat. Res. Council*, No. 8, p. 477.  
 FIG. 7.—Scores on Alpha tests of groups of medical specialists, United States Army. Reproduced from *Bull. Nat. Res. Council*, No. 8, p. 479.  
 FIG. 8.—Relative intelligence of nativity groups, United States Army. Average scores on ‘combined scale’ in left margin; estimated mental age in right margin. Reproduced by the courtesy of Professor Carl C. Brigham.