

## New Methods for the Diagnosis of the Intellectual Level of Subnormals Alfred Binet (1905)

### Classics in the History of Psychology

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Introduction to:

"New Methods for the Diagnosis of the Intellectual Level of Subnormals."

Alfred Binet & Theodore Simon (1905).

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Sir Francis Galton, who pioneered the study of individual differences in the late nineteenth century, was the first to attempt to measure intelligence. Following in the tradition of British empiricism, Galton believed that intelligence was a function of sensory acuity. Thus, individuals who exhibited high degrees of sensory discrimination were assumed to be highly intelligent. Moreover, because sensory acuity reflected native endowment, individual differences in intelligence were assumed to be primarily a function of heredity. In support of his hereditarian views, Galton had argued in his 1869 book, *Hereditary Genius*, that high levels of intellectual achievement followed genealogical lines; that is, eminent fathers tended to have eminent sons. In 1888, Galton set up an "anthropometric laboratory" in which he used such measures of sensory discrimination as visual acuity, auditory accuracy, and breathing capacity to assess levels of intelligence. Galton's efforts were followed up in the United States by psychologist James McKeen Cattell. Cattell coined the term, "mental tests" to refer to Galtonian measures. By 1901, however, after a series of studies by Cattell and his students that showed no relationship between sensory discrimination and indices of intellectual performance (academic grades), the Galtonian approach to measuring intelligence was generally abandoned. It appeared as though the "mental testing movement" was at an end.

It was against this backdrop of Galtonian measurement that Alfred Binet began his work on intelligence scales. Binet was a leading French psychologist with diverse interests in hypnosis, thinking, and individual differences. In contrast with Galton's use of sensory discrimination, Binet had argued in the 1890s that individual differences in intelligence had to be detected through measures of such complex processes as memory, imagination, attention, comprehension, and suggestibility. In 1904, Binet was appointed by the French minister of public instruction to a commission concerned with the problem of retardation among public schoolchildren in Paris. The early twentieth century was a period of time, both in Western Europe and North America, when public education was rapidly expanding in urban centers, a reflection of the increasing effects of urbanization and industrialization. School administrators turned to social scientists for expertise in reorganizing schools for more efficient classroom management. Such issues as how to handle slow learners was thus of paramount importance to educators.

It was clear to the commission that in order to address the problems of retarded children, special education programs had to be developed. It was therefore necessary to devise a means of

identifying retarded children. Binet thus set about developing a scale that could differentiate those children who were slow learners from those who were able to keep pace with the level of instruction (normal children). He collaborated with Théodore Simon, a young physician who had worked with retarded children. Binet and Simon proceeded to assemble a scale composed of measures of the kinds of higher mental processes that Binet had argued were central to the assessment of intelligence. They constructed some of the specific cognitive tests themselves but they also modified a number of tests that had been developed by two French physicians, Drs. Blin and Damaye. Binet and Simon drew samples of "normal" children and children thought to be retarded from schools, hospitals, orphanages, and asylums. The children ranged in age from two to twelve. They used these samples to try out the various tests with the goal of selecting those tests that clearly discriminated between the two groups of children. By this means, they selected thirty tests arranged roughly in ascending order of difficulty.

In this 1905 paper, Binet and Simon spell out the rationale for their scale and provide guidelines for its administration. The scale, in its entirety (thirty tests) is included. Thus, this paper served as the source for disseminating information about the first Binet-Simon scale, as well as the source for the practical use of the scale. In the introduction, the authors state that the scale is intended to study the child's condition at the time of administration. The goal is to determine the child's present mental state so that a decision can be made about the appropriate curriculum placement; that is, special education or regular classroom instruction. The authors caution that in cases of retardation, it is irrelevant to consider etiology; that is, whether the retardation is acquired or congenital. In pioneering a new assessment method, the authors also make a point of distinguishing the target group the scale is aimed at. As they indicate, the scale is only appropriate for assessing the mental performance of children. It is thus not concerned with identifying the psychologically unstable, insane, or organically deteriorated; only in comparing inferior and normal intelligence.

In justifying the value of their method, Binet and Simon note that its objective grounding in normative data, it avoids the subjective bias inherent in the traditional practice of basing diagnoses of retardation on medical observation. The psychological method measures the state of general intelligence at the present moment. The child's mental capability is assessed through exercises of comprehension, judgment, reasoning, and invention. These tests reflect the nature of intelligence, which is based on the practical ability to adapt to one's circumstances. The scale thus does not assess special abilities or acquired information (achievement). Rounding out the introductory section, Binet and Simon provide guidelines for administration, underscoring the training necessary for being able to establish rapport and achieve unbiased test administration.

The major part of the paper is concerned with presenting the thirty tests, starting with the least difficult. For each test, the procedure of administration is spelled out and guidelines are provided with respect to the normative performance expected. The first six tests assess the earliest signs of attention and memory. These include the coordination of the head to follow a lighted match, hand coordination to tactile and visual stimuli, unwrapping food covered by paper, and the imitation of gestures and following simple commands. Normal two-year old children could pass all of these tests but severely retarded children (the category of idiocy) could pass only a few or none. Tests seven, eight, and nine assess communication skills beyond the two-year level. These tests distinguished between severe retardation (idiocy) and moderate retardation (imbecility). In tests ten and twelve, children are asked to compare lines and weights. Failure reflects the inability to understand what is required. In repeating three digits (test eleven) it is important to note the kind of error. Slight errors may simply indicate distraction, while totally wrong answers indicate a lapse of judgment that suggests retardation. Suggestibility (test thirteen) can also point to signs of retardation if the child responds without resistance to absurd requests by the examiner, such as asking for a button when such an object is not present. Definitions and repetition of sentences (tests fourteen and fifteen) differentiate between younger and older children.

As Binet and Simon reported in a later publication, test sixteen (differences between words, e.g. paper and cardboard) discriminated between moderately and slightly retarded children. Tests seventeen through twenty-six measure various cognitive abilities, including memory, similarities, and language usage. These tests discriminated between younger and older normal children. Test twenty-seven, assessing comprehension (responses to abstract questions like "When a person has offended you, and comes to offer his apologies, what should you do?"), was especially useful for differentiating between the slightly retarded and the normal. As Binet and Simon state, "any mind which is not apt in abstraction succumbs here." Tests twenty-eight and twenty-nine assess attention,

reasoning, and visual ability. Test thirty, the final and most difficult, measures abstraction as reflected in accounting for the difference between abstract words, such as boredom and weariness.

The major intent of the 1905 scale was to differentiate the slightly retarded (Henry H. Goddard's category of "moron") from the normal school population. Children who were classified as slightly retarded could then be targeted for special education. In a 1907 book written for the general public, Binet provided guidelines on the admission of retarded children to special education classes and underscored the need for assessment. In 1908, Binet and Simon revised their scale, arranging the tests by age levels. This reorganization was based on the age norms that they had established with the 1905 scale, which had been administered to a large sample of normal children between the ages of three and thirteen. A criterion of 75% passing was used to determine each test's placement. Thus, if 75% or more of six-year-olds passed a given test, it was placed at the six-year level. An especially useful aspect of the 1908 scale was that it provided for the possibility of expressing a child's level of intelligence in relation to the age group whose performance he or she matched. A six-year old child, for example, who performed as well as the average eight-year old would have a "mental level" of eight. The mental level represented the averaging out of successes and failures that matched the given age norm. When Binet's writings were translated by the American mental testers, the term "mental age" was used and implied an ordered developmental progression that Binet had not intended. The Binet-Simon scale was revised again in 1911, the year of Binet's death, and included normative data on an adult sample (fifteen-year olds).

Before explaining these methods let us recall exactly the conditions of the problem which we are attempting to solve. Our purpose is to be able to measure the intellectual capacity of a child who is brought to us in order to know whether he is normal or retarded. We should therefore, study his condition at the time and that only. We have nothing to do either with his past history or with his future; consequently we shall neglect his etiology, and we shall make no attempt to distinguish between acquired and congenital idiocy; for a stronger reason we shall set aside all consideration of pathological anatomy which might explain his intellectual deficiency. So much for his past. As to that which concerns his future, we shall exercise the same abstinence; we do not attempt to establish or prepare a prognosis and we leave unanswered the question of whether this retardation is curable, or even improvable. We shall limit ourselves to ascertaining the truth in regard to his present mental state.

Furthermore, in the definition of this state, we should make some restrictions. Most subnormal children, especially those in the schools, are habitually grouped in two categories, those of backward intelligence, and those who are unstable. This latter class, which certain alienists call moral imbeciles, do not necessarily manifest inferiority of intelligence; they are turbulent, vicious, rebellious to all discipline; they lack sequence of ideas, and probably power of attention. It is a matter of great delicacy to make the distinction between children who are unstable, and those who have rebellious dispositions. Elsewhere we have insisted upon the necessity of instructors not treating as unstable, that is as pathological cases, those children whose character is not sympathetic with their own. It would necessitate a long study, and probably a very difficult one, to establish the distinctive signs which separate the unstable from the undisciplined. For the present we shall not take up this study. We shall set the unstable aside, and shall consider only that which bears upon those who are backward in intelligence.

This is not, however, to be the only limitation of our subject because backward states of intelligence present several different types. There is the insane type -- or the type of intellectual decay -- which consists in a progressive loss of former acquired intelligence. Many epileptics, who suffer from frequent attacks, progress toward insanity. It would be possible and probably very important, to be able to make the distinction between those with decaying intelligence on the one hand, and those of inferior intelligence on the other. But as we have determined to limit on this side also, the domain of our study, we shall rigorously exclude all forms of insanity and decay. Moreover we believe that these are rarely present in the schools, and need not be taken into consideration in the operation of new classes for subnormals.

Another distinction is made between those of inferior intelligence and degenerates. The latter are subjects in whom occur clearly defined, episodic phenomena, such as impulsions, obsessions, deliriums. We shall eliminate the degenerates as well as the insane.

Lastly, we should say a word upon our manner of studying those whom most alienists call idiots but

whom we here call of inferior intelligence. The exact nature of this inferiority is not known; and today without other proof, one very prudently refuses to liken this state to that of an arrest of normal development. It certainly seems that the intelligence of these beings has undergone a certain arrest; but it does not follow that the disproportion between the degree of intelligence and the age is the only characteristic of their condition. There is also in many cases, most probably a deviation in the development, a perversion. The idiot of fifteen years, who, like a baby of three, is making his first verbal attempts, can not be completely likened to a three-year old child, because the latter is normal, but the idiot is not. There exists therefore between them, necessarily, differences either apparent or hidden. The careful study of idiots shows, among some of them at least, that whereas certain faculties are almost wanting, others are better developed. They have therefore certain aptitudes. Some have a good auditory or musical memory, and a whole repertoire of songs; others have mechanical ability. If all were carefully examined, many examples of these partial aptitudes would probably be found.

Our purpose is in no wise to study, analyze, or set forth the aptitudes of those of inferior intelligence. That will be the object of a later work. Here we shall limit ourselves to the measuring of their general intelligence. We shall determine their intellectual level, and, in order the better to appreciate this level, we shall compare it with that of normal children of the same age or of an analogous level. The reservations previously made as to the true conception of arrested development, will not prevent our finding great advantage in a methodical comparison between those of inferior and those of normal intelligence.

To what method should we have recourse in making our diagnosis of the intellectual level? No one method exists, but there are a number of different ones which should be used cumulatively, because the question is a very difficult one to solve, and demands rather a collaboration of methods. It is important that the practitioner be equipped in such a manner that he shall use, only as accessory, the information given by the parents of the child, so that he may always be able to verify this information, or, when necessary, dispense with it. In actual practice quite the opposite occurs. When the child is taken to the clinic the physician listens a great deal to the parents and questions the child very little, in fact scarcely looks at him, allowing himself to be influenced by a very strong presumption that the child is intellectually inferior. If, by a chance not likely to occur, but which would be most interesting some time to bring about, the physician were submitted to the test of selecting the subnormals from a mixed group of children, he would certainly find himself in the midst of grave difficulties, and would commit many errors especially in cases of slight defect.

The organization of methods is especially important because, as soon as the schools for subnormals are in operation, one must be on his guard against the attitude of the parents. Their sincerity will be worth very little when it is in conflict with their interests. If the parents wish the child to remain in the regular school, they will not be silent concerning his intelligence. "My child understands everything," they will say, and they will be very careful not to give any significant information in regard to him. If, on the contrary, they wish him to be admitted into an institution where gratuitous board and lodging are furnished, they will change completely. They will be capable even of teaching him how to simulate mental debility. One should, therefore, be on his guard against all possible frauds.

In order to recognize the inferior states of intelligence we believe that three different methods should be employed. We have arrived at this synthetic view only after many years of research, but we are now certain that each of these methods renders some service. These methods are:

1. The medical method, which aims to appreciate the anatomical, physiological, and pathological signs of inferior intelligence.
2. The pedagogical method, which aims to judge of the intelligence according to the sum of acquired knowledge.
3. The psychological method, which makes direct observations and measurements of the degree of intelligence.

From what has gone before it is easy to see the value of each of these methods. The medical method is indirect because it conjectures the mental from the physical. The pedagogical method is more direct; but the psychological is the most direct of all because it aims to measure the state of

the intelligence as it is at the present moment. It does this by experiments which oblige the subject to make an effort which shows his capability in the way of comprehension, judgment, reasoning, and invention.

## I. THE PSYCHOLOGICAL METHOD

The fundamental idea of this method is the establishment of what we shall call a measuring scale of intelligence. This scale is composed of a series of tests of increasing difficulty, starting from the lowest intellectual level that can be observed, and ending with that of average normal intelligence. Each group in the series corresponds to a different mental level.

This scale properly speaking does not permit the measure of the intelligence,[1] because intellectual qualities are not superposable, and therefore cannot be measured as linear surfaces are measured, but are on the contrary, a classification, a hierarchy among diverse intelligences; and for the necessities of practice this classification is equivalent to a measure. We shall therefore be able to know, after studying two individuals, if one rises above the other and to how many degrees, if one rises above the average level of other individuals considered as normal, or if he remains below. Understanding the normal progress of intellectual development among normals, we shall be able to determine how many years such an individual is advanced or retarded. In a word we shall be able to determine to what degrees of the scale idiocy, imbecility, and moronity [2] correspond.

The scale that we shall describe is not a theoretical work; it is the result of long investigations, first at the Salpêtrière, and afterwards in the primary schools of Paris, with both normal and subnormal children. These short psychological questions have been given the name of tests. The use of tests is today very common, and there are even contemporary authors who have made a specialty of organizing new tests according to theoretical views, but who have made no effort to patiently try them out in the schools. Theirs is an amusing occupation, comparable to a person's making a colonizing expedition into Algeria, advancing always only upon the map, without taking off his dressing gown. We place but slight confidence in the tests invented by these authors and we have borrowed nothing from them. All the tests which we propose have been repeatedly tried, and have been retained from among many, which after trial have been discarded. We can certify that those which are here presented have proved themselves valuable.

We have aimed to make all our tests simple, rapid, convenient, precise, heterogeneous, holding the subject in continued contact with the experimenter, and bearing principally upon the faculty of judgment. Rapidity is necessary for this sort of examination. It is impossible to prolong it beyond twenty minutes without fatiguing the subject. During this maximum of twenty minutes, it must be turned and turned about in every sense, and at least ten tests must be executed, so that not more than about two minutes can be given to each. In spite of their interest, we were obliged to proscribe long exercises. For example, it would be very instructive to know how a subject learns by heart a series of sentences. We have often tested the advantage of leaving a person by himself with a lesson of prose or verse after having said to him, "Try to learn as much as you can of this in five minutes." Five minutes is too long for our test, because during that time the subject escapes us; it may be that he becomes distracted or thinks of other things; the test loses its clinical character and becomes too scholastic. We have therefore reluctantly been obliged to renounce testing the rapidity and extent of the memory by this method. Several other equivalent examples of elimination could be cited. In order to cover rapidly a wide field of observation, it goes without saying that the tests should be heterogeneous.

Another consideration. Our purpose is to evaluate a level of intelligence. It is understood that we here separate natural intelligence and instruction. It is the intelligence alone that we seek to measure, by disregarding in so far as possible, the degree of instruction which the subject possesses. He should, indeed, be considered by the examiner as a complete ignoramus knowing neither how to read nor write. This necessity forces us to forego a great many exercises having a verbal, literary or scholastic character. These belong to a pedagogical examination. We believe that we have succeeded in completely disregarding the acquired information of the subject. We give him nothing to read, nothing to write, and submit him to no test in which he might succeed by means of rote learning. In fact we do not even notice his inability to read if a case occurs. It is simply the level of his natural intelligence that is taken into account.

But here we must come to an understanding of what meaning to give to that word so vague and so

comprehensive, "the intelligence." Nearly all the phenomena with which psychology concerns itself are phenomena of intelligence; sensation, perception, are intellectual manifestations as much as reasoning. Should we therefore bring into our examination the measure of sensation after the manner of the psycho-physicists? Should we put to the test all of his psychological processes? A slight reflection has shown us that this would indeed be wasted time.

It seems to us that in intelligence there is a fundamental faculty, the alteration or the lack of which, is of the utmost importance for practical life. This faculty is judgment, otherwise called good sense, practical sense, initiative, the faculty of adapting one's self to circumstances. To judge well, to comprehend well, to reason well, these are the essential activities of intelligence. A person may be a moron or an imbecile if he is lacking in judgment; but with good judgment he can never be either. Indeed the rest of the intellectual faculties seem of little importance in comparison with judgment. What does it matter, for example, whether the organs of sense function normally? Of what import that certain ones are hyperesthetic, or that others are anesthetic or are weakened? Laura Bridgman, Helen Keller and their fellow-unfortunates were blind as well as deaf, but this did not prevent them from being very intelligent. Certainly this is demonstrative proof that the total or even partial integrity of the senses does not form a mental factor equal to judgment. We may measure the acuteness of the sensibility of subjects; nothing could be easier. But we should do this, not so much to find out the state of their sensibility as to learn the exactitude of their judgment.

The same remark holds good for the study of the memory. At first glance, memory being a psychological phenomenon of capital importance, one would be tempted to give it a very conspicuous part in an examination of intelligence. But memory is distinct from and independent of judgment. One may have good sense and lack memory. The reverse is also common. Just at the present time we are observing a backward girl who is developing before our astonished eyes a memory very much greater than our own. We have measured that memory and we are not deceived regarding it. Nevertheless that girl presents a most beautifully classic type of imbecility.

As a result of all this investigation, in the scale which we present we accord the first place to judgment; that which is of importance to us is not certain errors which the subject commits, but absurd errors, which prove that he lacks judgment. We have even made special provision to encourage people to make absurd replies. In spite of the accuracy of this directing idea, it will be easily understood that it has been impossible to permit of its regulating exclusively our examinations. For example, one can not make tests of judgment on children of less than two years when one begins to watch their first gleams of intelligence. Much is gained when one can discern in them traces of coördination, the first delineation of attention and memory. We shall therefore bring out in our lists some tests of memory; but so far as we are able, we shall give these tests such a turn as to invite the subject to make absurd replies, and thus under cover of a test of memory, we shall have an appreciation of their judgment.

## MEASURING SCALE OF INTELLIGENCE

General recommendations. The examination should take place in a quiet room, quite isolated, and the child should be called in alone without other children. It is important that when a child sees the experimenter for the first time, he should be reassured by the presence of someone he knows, a relative, an attendant, or a school superintendent. The witness should be instructed to remain passive and mute, and not to intervene in the examination either by word or gesture.

The experimenter should receive each child with a friendly familiarity to dispel the timidity of early years. Greet him the moment he enters, shake hands with him and seat him comfortably. If he is intelligent enough to understand certain words, awaken his curiosity, his pride. If he refuses to reply to a test, pass to the next one, or perhaps offer him a piece of candy; if his silence continues, send him away until another time. These are little incidents that frequently occur in an examination of the mental state, because in its last analysis, an examination of this kind is based upon the good will of the subject.

We here give the technique of each question. It will not suffice simply to read what we have written in order to be able to conduct examinations. A good experimenter can be produced only by example and imitation, and nothing equals the lesson gained from the thing itself. Every person who wishes to familiarize himself with our method of examination should come to our school. Theoretical instruction is valuable only when it merges into practical experience. Having made these

reservations, let us point out the principal errors likely to be committed by inexperienced persons. There are two: the first consists in recording the gross results without making psychological observations, without noticing such little facts as permit one to give to the gross results their true value. The second error, equally frequent, is that of making suggestions. An inexperienced examiner has no idea of the influence of words; he talks too much, he aids his subject, he puts him on the track, unconscious of the help he is thus giving. He plays the part of pedagogue, when he should remain psychologist. Thus his examination is vitiated. It is a difficult art to be able to encourage a subject, to hold his attention, to make him do his best without giving aid in any form by an unskillful suggestion.[3]

## THE SERIES OF TESTS

### 1. "Le Regard" [4]

In this test the examiner seeks to discover if there exists that coordination in the movement of the head and the eyes which is associated with the act of vision. If such coordination does exist it proves that the subject not only sees but more than that he "regards" (that is he is able to follow with his eyes a moving object).

Procedure. A lighted match is slowly moved before the eyes of the subject in such a way as to provoke a movement of the head or of the eyes to follow the flame. If a first attempt does not succeed the experiment should be tried again after a little while. It is preferable to operate in a quiet place where no kind of distraction is likely to occur. It is not important that the subject follow the movements of the match constantly for any length of time or persistently. The least sign of coordination of the movements of vision is sufficient, if it leaves no doubt in the mind of the examiner.

Additional remarks. The observation of a few spontaneous phenomena may well be noted. Thus it is possible sometimes for the examiner, by fixing his gaze steadily upon the child, to satisfy himself that the child really coordinates for a moment. If the subject is afflicted with or suspected of blindness, the visual stimulus may be replaced by an auditory stimulus. For example, call him loudly, or better, ring a little bell behind his head and notice if he turns his head toward the sound, or if he has any peculiar facial expression which would indicate that he hears. The reaction of attention to sound seems to develop later than the reaction to light. We have observed children who, when a bell was rung behind the head, would not make a single movement in order to hear better, and yet would follow with their eyes the lighted match. It is scarcely necessary to add that the child who hides his face behind his hand when questioned, or who replies to your smile by a smile, or who walks about the room without knocking against obstacles, stove, chairs, wall, table, proves by his behavior that he coordinates the movements of vision, and thus he has passed the first test.

### 2. Prehension Provoked by a Tactile Stimulus

Here the purpose is to discover whether the coordination exists between a tactile stimulus of the hand, and the movement of seizing and carrying to the mouth.

Procedure. A small object, easily handled, for example a piece of wood, is placed in contact with the hand of the child in order to determine if he succeeds in seizing the object, holding it in his hand without letting it fall, and carrying it to his mouth. It is well to stimulate the contact either on the back of the hand or on the palm, and note the results. It is possible that the subject, after having taken the little object, loosens his fingers and lets it fall. It is necessary in that case to try again with a little patience, in order to learn if the letting go came of a chance distraction, or if the subject is not capable of performing the muscular act which would consist in carrying it to his mouth.

### 3. Prehension Provoked by a Visual Perception

Here the purpose is to find whether coordination exists between the sight of an object and its prehension, when the object is not placed in contact with the hand of the subject.

Procedure. The object is presented to his view and within reach of his hand, in a manner to provoke an intentional movement of his hand to take it. This third test is passed when the subject, following a visual perception of the object, makes a movement of the hand towards the object, reaches, seizes

and carries it to his mouth. A small cube of white wood, easy to handle is used. In these presentations it is not forbidden to speak and hence the object is offered to the child as follows: "Here is a little object, take it, it is for you -- Come now, pay attention, etc." If the subject understands, so much the better for him; if he does not understand the sound of these words has the advantage of attracting his attention. Moreover the examiner makes gestures and makes them more naturally if he talks at the same time.

#### 4. Recognition of Food

Here the purpose is to discover whether the subject can make the distinction by sight between familiar food and what can not be eaten.

Procedure. A piece of chocolate (half a bar) and a little cube of white wood of similar dimensions are successively presented. The test is to see if the subject, by sight alone, makes the distinction between the two objects before carrying them to his mouth. Does he carry only the chocolate to his mouth and begin to eat it? Does he refuse to take the piece of wood, or having taken it does he push it away, or again does he hold it in his hand without putting it to his mouth?

Tests 3 and 4 can be made rapidly as a single experiment. A piece of chocolate is first shown to the child and his attention is drawn to it. Note whether he tries to take it or not. If he makes no effort to attain it, and is not distracted by anything, place the chocolate in the palm of his hand, and note what happens. If on the contrary he takes the chocolate which is shown him and carries it to his mouth, the chocolate is taken from him, and the piece of wood put in its place, to see if he carries this new object also to his mouth.

Although these tests succeed with very many children by appealing to their greediness, it often happens that a willful child, or one frightened by the sight of the examiner whom he does not know, turns away from him and refuses to look at what is shown him. These movements of defense indicate already a mentality that corresponds most likely to the fourth degree. The experimenter must be armed with patience and gentleness. He may have a relative, an attendant, or any other person who knows the child, present the chocolate, but he must carefully note the behavior of the child throughout the operation. If the attack of anger, or tears, or fear lasts too long, the examination is necessarily suspended to be taken up at a more favorable time. These are the disappointments to which alienists are accustomed.

#### 5. Quest of Food Complicated by a Slight Mechanical Difficulty

This test is designed to bring into play a rudiment of memory, an effort of will, and a coordination of movements.

Procedure. First be sure that the child recognizes the candy or bonbon to be used in this experiment. Then while he is watching you, wrap the bonbon in a piece of paper. Present it to him and carefully note his movements. Does he remember that the paper contains a bonbon? Does he reject it as a useless object, or does he try to pull it apart? Does he carry the covered morsel to his mouth? Does he eat the paper or does he make some effort to unfold it? Does he completely succeed in unfolding it, or does he seem satisfied with one attempt? Does he present the covered morsel to some one else as if to ask his aid?

#### 6. Execution of Simple Commands and Imitation of Simple Gestures

This test involves various motor coördinations, and associations between certain movements, and the understanding of the significance of certain gestures. In these tests the subject enters for the first time into social relations with the experimenter and it is therefore necessary that he understand the will and desires of the latter. It is the beginning of inter-psychology.

Procedure. As soon as the subject enters the room say good morning to him with expression, give him your hand with accentuated gesture to see if he understands the salutation and if he knows how to shake hands. In cases where the subject walks in, ask him to be seated; this permits one to see whether he understands the meaning of the invitation and if he knows the use of a chair. Throw some object on the floor and request him by gestures as well as by speech to pick it up and give it back. Make him get up, shut the door, send him away, call him back. So much for commands.



Imitation of simple gestures is accomplished by fixing his attention by repeating several times, "Look at me carefully," and when his attention is gained, by saying "Do as I do." The examiner then claps his hands together, puts them in the air, on the shoulders, behind the back; he turns the thumbs one about the other, raises the foot, etc. All this mimicry must be conducted gaily with the air of play. It is sufficient if a single well marked imitation is provoked; the rest is unnecessary. Do not confound the inaptitude for imitation, with bad humor, ill-will, or timidity.

## 7. Verbal Knowledge of Objects

The object of this test is to discover if associations exist between things and their names. Comprehension and the first possibilities of language are here studied. This test is a continuation of the previous one and represents the second degree of communication between individuals; the first degree is made through imitation, the second through words.

Procedure. This test is composed of two parts. In the first place the examiner names a part of the body and asks the child to point to it. The questions may relate to the head, the hair, the eyes, the feet, the hands, the nose, the ears, the mouth. Ask the child with a smile "Where is your head?" If he seems embarrassed or timid, encourage him by aiding him a little. "There is your head," pointing it out and touching it if the child does not seem to understand what is wanted of him. On the other hand if he replies by a correct designation to the first question go no further, because if he knows where his head is he should know equally well where are his ears and his mouth. Give him therefore some more difficult questions, for example, his cheek, his eyebrow, his heart.

The second part of the experiment consists in making him designate familiar objects, a string, a cup, a key. Bring the child to the table and by means of gestures indicate the objects and turn his attention to them. When his attention is fixed upon the objects tell him to give you the one you name. "Give me the cup. Give me the key, etc." The cup, the key, the string are the three objects asked for. It is of little importance that he shows awkwardness in taking and presenting them. The essential is that by the play of the countenance and gestures, he indicates clearly that he distinguishes these objects by their names. It is preferable to keep these three objects, others less familiar should be rejected, as for instance a box of matches, a cork, etc. The test is made with three objects in order to avoid the right designation by simple chance. With backward children the following facts may present themselves. They do not know the name of the object presented to them, but having understood that they are to designate an object, they point to anything that is on the table. This is a manner of reacting very common among idiots and imbeciles. They make mistakes but they do not realize it, being in fact very well satisfied with their achievements. Here is another source of error to be avoided. In consequence of their extreme docility, many backward children may be bewildered by the least contradiction. When they have handed you a cup, if you ask them "Isn't this a key?" some might make a sign of acquiescence. This is a test of suggestibility of which more will be said further on. To a blind child, give objects to be recognized by the sense of touch.

## 8. Verbal Knowledge of Pictures

This exercise is the same as the preceding one with this difference only, that the objects are replaced by pictures which, in consequence of the diminished size and the reduction to a plane surface, are a little more difficult to recognize than in nature, and more than this in a picture the objects must be sought for.

Procedure. We make use of a print borrowed from the picture-book of Inspector Lacabe and Mlle. Goergin. This print in colors represents a complex family scene. We show the print to the child and ask him to designate successively the following objects: the window, mamma, big sister, little sister, little girl, cat, broom, basket, bouquet, duster, coffee-mill. The questions are asked in this way: "Where is the window?" or "Tell me where the window is," or "Show me the window," or "Put your finger on the window."

The last suggestion is generally unnecessary because the child has a tendency to place his forefinger, generally a dirty one, upon the detail which is named for him. If he makes an error in designation be careful not to correct it, but make a note of it. In a psychological examination of this kind, one must never point out to a child the errors which he makes. The examiner is not a pedagogue. It is rare that those who take an interest in the picture can not designate the principal

details named to them. The incapable ones give no attention to the picture and do not seem to comprehend what is wanted of them. It is interesting to study the attitude of a child during this test. There are two acts to be accomplished, one a search for the object, the other the recognition of the object. At once in the search the aptitudes or inaptitudes betray themselves. Many defective persons show an excess of eagerness to designate the object, which in itself is a sign of faulty attention. They point out at once without waiting to comprehend. They sometimes point out before one has finished the sentence. "Where is the ----," said with a suspension in the voice, and already their finger is placed haphazard upon the picture. Such as these do not hunt with care and are incapable of suspending their judgment. This is, it seems to us, a striking characteristic of a weak mind. The child must be closely studied in order to find if, in spite of this special manner, he really knows the names of the objects. A reprimand gently given will sometimes put him on his guard, "No, no, pay attention, you go too fast," and if the question is repeated he will often give a correct answer.

In other cases, errors are sometimes made through suggestibility. The subject seems to imagine that he will commit a fault if he does not designate some object when the question is asked, and out of compliance or of timidity, he makes an erroneous designation for an object whose name he does not know, or which he does not succeed in finding. Notice again, the more reasonable attitude of those who, not knowing the name of the object, refrain from pointing it out but continue the search or reply distinctly, "I do not know." It is rare that an imbecile uses that little phrase. The avowal of ignorance is a proof of judgment and is always a good indication.

### 9. Naming of Designated Objects

This test is the opposite of the preceding one. It shows the passing from the thing to the word. It also is executed by the use of pictures.

Procedure. Here we make use of another colored print borrowed from the same collection as the preceding. We place it before the eyes of the child and designate with a pencil different objects while asking each time, "What is this?" The objects upon which we place the pencil are the little girl, the dog, the boy, the father, the lamp-lighter, the sky, the advertisement. For the lamp-lighter we ask what he does. Here as elsewhere it is unnecessary to exhaust the complete series of questions unless the subject fails. One or two positive replies are sufficient to satisfy the requirements of the test. This test permits us to know the vocabulary and the pronunciation of the child. Defects of pronunciation, so frequent in the young, are a serious source of embarrassment. It often requires a very indulgent ear to recognize the right word in an indistinct and very brief murmur, and in a case of this sort the examiner will do well to use an interrogation point. Added to the difficulties which proceed from faulty pronunciation, are those brought about by a special vocabulary. Many little children though normal use a vocabulary invented or deformed by them, which is understood only by themselves and their parents.

Additional remarks. Tests 7, 8, and 9 do not constitute differing degrees in the rigorous sense of the word, that is to say they are not tests corresponding to different levels of intelligence. We have ascertained that generally with subnormals those who can pass test 7, pass 8 and also 9. These would therefore be tests of equal rank. We have kept them, however, because these tests occupy an important place in our measuring scale of intelligence, as they constitute a borderline test between imbecility and idiocy. It is useful to have this borderline solidly placed and all these tests will serve as buttresses.

Observations, such as one may make every day on those afflicted with general paralysis, aphasia, or simply people very much fatigued, show that it is much more difficult to pass from the object to the word than it is to pass from the word to the object, or we may say, that one recognizes a word more easily than one finds it. It does not seem clear up to the present that this observation is also applicable to inferior states of intelligence.

### 10. Immediate Comparison of Two Lines of Unequal Lengths [5]

As we enter the field of what may properly be called psychological experimentation, we shall find it difficult to define which mental functions are being exercised because they are very numerous. Here the child must understand that it is a question of comparison, that the comparison is between two lines that are shown to him; he must understand the meaning of the words, "Show me the longer."

He must be capable of comparing, that is of bringing together a conception and an image, and of turning his mind in the direction of searching for a difference. We often have illusions as to the simplicity of psychical processes, because we judge them in relation to others, still more complex. In fact here is a test which will seem to show but little mentality in those who are able to execute it; nevertheless when analyzed it reveals a great complexity.

Procedure. The subject is presented successively with three pieces of paper upon each of which two lines, drawn in ink, are to be compared. Each piece of paper measures 15 by 20 cm.; the lines are drawn lengthwise of the paper, on the same level, and separated by a space of 5 mm. The lines are respectively 4 and 3 cm. in length and one-half of a millimeter in width. On the first sheet the longer line is at the right and on the other two at the left. Each sheet is shown to the subject while saying to him, "Which is the longer line?" Note if his reply is correct but do not tell him. In order to eliminate haphazard replies, it is well to repeat the whole series at least twice. The end is not to discover just how far the accuracy of the child's glance may go, but simply to find if he is capable of making a correct comparison between two lines. Many subnormals are incapable of this; but they act as though they were capable; they seem to understand what is said to them and each time put the finger upon one of the lines saying, "This one." It is necessary to recognize those subjects whose errors are not, strictly speaking, faults of comparison but absence of comparison. It often happens that the subject constantly chooses the line on the same side for the longer, for example always the one on the right side. This manner of reacting would be a sign of defect were it not that one encounters the same thing with some normals.

#### 11. Repetition of Three Figures [6]

This is a test of immediate memory and voluntary attention.

Procedure. Looking the subject squarely in the eye to be sure his attention is fixed, one pronounces three figures, after having told him to repeat them. Choose figures that do not follow each other, as for instance 3, 0, 8, or 5, 9, 7. Pronounce the three figures in the same voice without accentuating one more than the others and without rhythm, but with a certain energy. The rapidity to be observed is two figures per second. Listen carefully and record the repetition which is made. Often the first attempt is unsuccessful because the subject has not clearly understood and commences to repeat the first figure the moment he hears it; he must be made to be quiet, renew the explanation and commence the pronunciation of another series of figures. There are certain subjects who can not repeat a single figure; in general these are the ones whose mental condition is such that they have not understood anything at all of what is asked of them. Others repeat only a single figure, the first or the last; others pronounce more than three. Special attention must be given to those whose error consists in pronouncing a greater number of figures than that which is said, or in pronouncing a series of figures in their natural order. An individual who, when asked to repeat 3, 0, 8, replies 2, 3, 4, 5, commits a serious error, which would cause one to suspect mental debility. But on the other hand it is true that all feeble-minded and all imbeciles do not commit this error, and that many young normals may commit it. Be careful to notice also if the subject seems satisfied with his reply when this is obviously and grossly false; this indicates an absence of judgment which constitutes an aggravated condition.

Let us say, apropos of this test, that it is important to make a distinction between errors of attention and of adaptation on the one hand, and errors of judgment on the other. When a failure is produced by distraction it is not very important. Thus it may happen that a subject does not repeat the three figures the first time. Begin again and if he succeeds the second time in retaining them he should be considered as having passed the test. A little farther on we shall have to deal with tests of judgment properly so-called, and three or four difficulties will be presented for solution. In this last case, failure will be much more serious, because it can not be due to inattention and the test cannot be considered as passed unless the solutions are given complete.

#### 12. Comparison of Two Weights [7]

This is a test of attention, of comparison and of the muscular sense.

Procedure. Place side by side on the table before the subject two small cubical boxes having the same dimensions, (23 mm. on a side) and the same color, but of different weights. The boxes, weighted by grains of lead rolled in cotton and not perceptible by shaking, weigh 3 grams and 12

grams respectively. The subject is asked to find out which is the heavier. The operation terminated, two other cubes of 6 and 15 grams respectively are given him to compare, and again 3 grams and 15 grams. If the subject hesitates or seems to be going haphazard, start over again mixing the cubes in order to be sure that he really compares the weights.

At the injunction, "See the two boxes, now tell me which is the heavier," many young subjects designate haphazard one of the two boxes without testing the weights. This error, all the more naive since the two are exactly alike in appearance, does not prove that the subject is incapable of weighing them in his hand and of judging of the weights while exercising muscular sense. One must then order him to take the boxes in his hand and weigh them. Some are very awkward, and put the two boxes into one hand at the same time to weigh them. One must again interfere and teach him how to put a box in each hand and weigh the two simultaneously.

Additional remarks. Following this weighing of two boxes of different weight and equal volume, one can propose to weigh two boxes of equal weight but different volume. The illusion which is produced under these circumstances is well known. With the weights equal, the larger box will appear lighter; and the apparent difference of weight increases with the difference of volume. Investigations have been made to determine whether this illusion takes place with backward children, and it has been observed by Demoor that there are certain ones who are not affected by it, something which we ourselves have recently verified. We put before the defective children long boxes of white wood, of the same weight, the largest one 24 x 4 x 4 cm., the smallest 12 x 2 x 2 cm., the medium one 18 x 3 x 3 cm. Like many normal children our subnormals, when given two for comparison and asked "Which is the heavier," pointed out the larger. The first naive response has but little significance. If one insists, if one tells the subject to weigh them in his hand, it sometimes happens that subnormals either cling to their first designation, or abandon it altogether and find the smaller one the heavier; in the latter case they are sensitive to the illusion. It seems to us that before declaring that a subnormal is not sensitive, one must first find if he can compare two weights, and whether he is able to judge which is the heavier of two weights having the same volume. Having made this preliminary test, one will perceive that very many subnormals are insensible to the illusion because they are incapable of comparing weights. What they lack therefore is a more elementary aptitude.

### 13. Suggestibility

Suggestibility is by no means a test of intelligence, because very many persons of superior intelligence are susceptible to suggestion, through distraction, timidity, fear of doing wrong, or some preconceived idea. Suggestion produces effects which from certain points of view closely resemble the natural manifestations of feeble-mindedness; in fact suggestion disturbs the judgment, paralyzes the critical sense, and forces us to attempt unreasonable or unfitting acts worthy of a defective. It is therefore necessary, when examining a child suspected of retardation, not to give a suggestion unconsciously, for thus artificial debility is produced which might make the diagnosis deceptive. If a person is forced to give an absurd reply by making use of an alternative pronounced in an authoritative voice, it does not in the least prove that he is lacking in judgment. But this source of error being once recognized and set aside, it is none the less interesting to bring into the examination a precise attempt at suggestion, and note what happens. It is a means of testing the force of judgment of a subject and his power of resistance. [8]

Procedure. The proof of suggestibility which we have devised does not give rise to a special experiment: it complicates by a slight addition other exercises which we have already described.

(a) Designation of objects named by the experimenter. When we ask the child (test 7) to show us the thread, the cup, the thimble, we add, "Show me the button." On the empty table there is no button, there are only the three preceding objects and yet by gesture and look we invite the subject to search for the button on the table. It is a suggestion by personal action, developing obedience. Certain ones obey quickly and easily, presenting to us again the cup or no matter what other objects. Their suggestibility is complete. Others resist a little, pout, while feigning to hunt for it on the table, or in the cup; they do not reply, but cover their embarrassment by a search which they continue indefinitely if not interrupted. One should consider this attitude as a sufficient expression of resistance, and go no further. It would be unnecessary as we are not seeking a victory over them. Lastly, those least affected by suggestion, reply clearly, "I do not know," or "There is no button." Some laugh.

(b) Designation of parts of a picture named by the experimenter. When the child has looked at the picture and we have asked him to point out the window, etc., at the very last say, "Where is the patapoum?" and then "Where is the nitchevo?" words that have no sense for him. These demands are made in the same manner as the preceding ones. Here again we find the three types, children who docilely designate any object whatever, others who search indefinitely without finding anything, and again others who declare, "There is none."

(c) Snare of lines. Following the three pairs of unequal lines, which serve to show the correctness of comparison, we place before the subject three other similar sheets each containing two equal lines. We present them saying, "And here?" Led on by the former replies he has a tendency, an acquired force, for again finding one line longer than the other. Some succumb to the snare completely. Others stop at the first pair and declare, "They are equal," but at the second and third they say one of the lines is longer than the other. Others find them all equal but hesitate. Others again fall into the snare without a shadow of hesitation.

#### 14. Verbal Definition of Known Objects

Vocabulary, some general notions, ability to put a simple idea into words, are all brought to light by means of this test.

Procedure. Ask the child what is a house, a horse, a fork, a mamma. This is the conversation that takes place: "Do you know what a ----- is?" If the child answers yes then ask him: "Very well, then tell me what it is." Try to overcome his silence a little and his timidity. Aid him, only when necessary, by giving him an example: "A dog, it barks," and then see if the child understands and approves that definition.

Very young normal children of two or three years, reply to questions of this kind with enthusiasm. They ordinarily reply in terms of use, "A fork is to eat with." This is typical. Record the answer verbatim. Some will keep silent, some give absurd, incomprehensible replies, or again will repeat the word, "A house, it is a house."

#### 15. Repetition of Sentences of Fifteen Words [9]

This is a test of immediate memory, so far as it concerns the recollection of words; a proof of voluntary attention, naturally because voluntary attention must accompany all psychological experiments; lastly it is a test of language.

Procedure. First be sure that the child is listening carefully, then, after having warned him that he will have to repeat what is said to him, pronounce slowly, intelligibly, the following sentence: I get up in the morning, I dine at noon, I go to bed at night. Then make a sign for him to repeat. Often the child, still not very well adapted, has not fully understood. Never repeat a sentence but go on to another. When the subject repeats it write down verbatim what he says. Many even among normals make absurd repetitions, for example: "I go to bed at noon." Often the child replaces the cultured expression "I dine" for a more familiar form, "I eat." The fact of being able to repeat the sentence correctly after the first hearing is a good sign. The second sentence is easier than the first, In the summer the weather is beautiful; in winter snow falls. Here is the third, Germaine has been bad, she has not worked, she will be scolded. Now we give five sentences quite difficult to understand:

The horse-chestnut tree in the garden throws upon the ground the faint shade of its new young leaves

The horse draws the carriage, the road is steep and the carriage is heavy.

It is one o'clock in the afternoon, the house is silent, the cat sleeps in the shade.

One should not say all that he thinks, but he must think all that he says.

The spirit of criticism must not be confounded with the spirit of contradiction.

#### 16. Comparison of Known Objects from Memory

This is an exercise in ideation, in the notion of differences, and somewhat in powers of observation.

Procedure. One asks what difference there is between paper and cardboard, between a fly and a butterfly, between a piece of wood and a piece of glass. First be sure that the subject knows these objects. Ask him, "Have you seen paper?" "Do you know what cardboard is?" Thus ask him about all the objects before drawing his attention to the difference between them. It may happen that little Parisians, even though normal, and eight or nine years old, have never seen a butterfly. These are examples of astounding ignorance, but we have found, what is still more extraordinary, Parisians of ten years who have never seen the Seine.

After being assured that the two objects to be compared are known, demand their difference. If the word is not understood, take notice and afterward choose more familiar language. "In what are they not alike? How are they not alike?" Three classes of replies may be expected. First, that of the children who have no comprehension of what is desired of them. When asked the difference between cardboard and paper, they reply, "The cardboard." When one has provoked replies of this kind, the explanation must be renewed with patience to see if there is not some means of making oneself understood. Second, the absurd replies, such as, "The fly is larger than the butterfly," "The wood is thicker than the glass," or "The butterfly flies and so does the fly." Third, the correct reply.

### 17. Exercise of Memory on Pictures

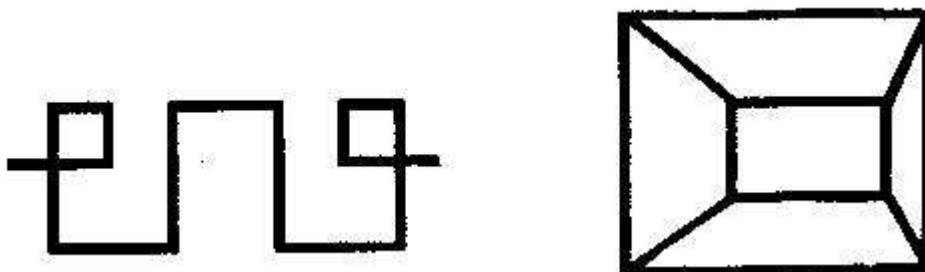
This is a test of attention and visual memory.

Procedure. The subject is told that several pictures will be shown to him, which he will be allowed to look at for thirty seconds, and that he must then repeat the names of the objects seen, from memory. There are thirteen pictures, each 6 by 6 centimeters, representing the following objects: clock, key, nail, omnibus, barrel, bed, cherry, rose, mouth of a beast, nose, head of a child, eggs, landscape. These pictures are pasted on two cardboards and are shown simultaneously. Measure the time of exposure with the second hand of the watch. In order that the subject shall not become absorbed in one picture, say to him, "Make haste. Look at all." The thirty seconds passed, the examiner writes from dictation the names of the pictures the subject recalls.

This test does indeed give an idea of the memory of a person, but two subjects may have very unequal memories of the same picture; one of them may recall only one detail while another recalls the whole. Moreover there is a weak point in this test in that it may be affected by failure of attention. It is sufficient that a fly should alight, a door should open, a cock should crow, or for the subject to have a desire to use his handkerchief during the thirty seconds, to disturb the work of memorizing. If the result is altogether lacking, the test should be repeated with another collection of pictures to find whether the first error was the result of distraction.

### 18. Drawing a Design from Memory

This is a test of attention, visual memory, and a little analysis.



#### DESIGN TO BE DRAWN FROM MEMORY AFTER BEING STUDIED 10 SECONDS

Procedure. The subject is told that two designs will be shown to him, which he will be allowed to look at for ten seconds, and which he must then draw from memory. Excite his emulation. The two designs which we reproduce here, are shown to him and left exposed for ten seconds. (Regulate the time by the second hand of a watch; the time must be exact within one or two seconds.) Then see that the subject commences the reproduction of the design without loss of time.

Marking the results of this test, that is the errors committed, is a delicate operation. Simply note if the reproduction is absolutely correct; or if without being correct it resembles the model; or if, on the contrary, it bears no resemblance whatever to it.

#### 19. Immediate Repetition of Figures

This is a test of immediate memory and immediate attention.

Procedure. This is the same as for the three figures, see above Here the errors noted for the three figures take on greater proportions. One must be on the watch for errors of judgment. A normal may fail but the manner is different.

#### 20. Resemblances of Several Known Objects Given from Memory

This is a test of memory, conscious recognition of resemblances, power of observation.

Procedure. This test closely resembles test 16, except that here resemblances are to be indicated instead of differences. It may be surprising to learn that children have a good deal of trouble noting resemblances; they much more willingly find differences in the objects given them to compare. One must insist a good deal and show them that although unlike two objects may be somewhat similar. Here are the questions to be asked:

In what are a poppy and blood alike?

How are a fly, an ant, a butterfly, a flea alike?

In what way are a newspaper, a label, a picture alike?

Under test 16 we have indicated the precautions that must be taken, notably that of assuring oneself that the child knows the objects to be compared. There are little Parisians who have never seen poppies or ants.

#### 21. Comparison of Lengths

This is a test in exactness of glance in rapid comparison.

Procedure. In this test one presents a series of pairs of lines. One line of each pair is 30 mm. long and the other varies from 31 to 35 mm. These lines are drawn on the pages of a blank book, 15 by 30 cm.; there are only two lines on a page. They extend in the same direction, end to end, separated by 5 mm. The longer occupies first the right then the left of the page. There are fifteen pairs. After placing them in order one begins by showing the pair where the difference is greatest. The subject is asked to point out the longer of the two lines.

We then present, in another blank book, a series of pairs of lines very much more difficult to estimate. The pages of this book are 20 by 30 cm.; the constant line is 100 mm. long, the variable ranging from 101 to 103 mm. The exact comparison of such long lines is beyond the ability of many adults. The number of pairs is twelve.

#### 22. Five Weights to be Placed in Order [10]

This test requires a direct concentration of attention, an appreciation of weight, and the memory of judgment.

Procedure. Five little boxes of the same color and volume are placed in a group on the table. They weigh respectively 3, 6, 9, 12, and 15 grams. They are shown to the subject while saying to him: "Look at these little boxes, they have not the same weight; you are going to arrange them here in their right order. Here to the left first the heaviest weight; next, the one a little less heavy; here one a little less heavy; here one a little less heavy, and here the lightest one." This explanation is difficult to give in childish terms. It must be attempted, however, and repeated if one perceives that it is not understood.

The explanation terminated, one must observe with attention the attitude of the child. One child does not understand, puts nothing in order; another arranges the weights very well but does not compare them; he takes one at random and puts it at the left as the heaviest, without comparing it with the others, and places those remaining without weighing them. A third tries them a little, but noticeably goes at it blindly. The reading of the weights which is inscribed on each, shows us the errors.

There are three classes to distinguish. First, the subject who goes at random without comparing, often committing a serious error, four degrees for example. Second, the subject who compares, but makes a slight error of one or two degrees. Third, the one who has the order exact. We propose to estimate the errors in this test by taking account of the displacement that must be made to re-establish the correct order. Thus in the following example: 12, 9, 6, 3, 15, -- 15 is not in its place, and the error is of four degrees because it must make four moves to find the place where it belongs. All the others must be changed one degree. The sum of the changes indicates the total error which is of eight degrees. It is necessary to make a distinction between those who commit slight errors of inattention, and those who by the enormity of an error of 6 or 8 prove that they act at random.

### 23. Gap in Weights

As soon as the subject has correctly arranged the weights and only then, tell him that one of the weights is to be taken away while he closes his eyes, and that he is to discover which has been taken away by weighing them in his hand. The operation demanded of him is delicate. One must note that he does not cheat by reading the marking on the box. If there is any fear of this, wrap the boxes in paper.

### 24. Exercise upon Rhymes [11]

This exercise requires an ample vocabulary, suppleness of mind, spontaneity, intellectual activity.

Procedure. Begin by asking the subject if he knows what a rhyme is. Then explain by means of examples: "Rhymes are words that end in the same way. Thus 'grenouille' [frog] rhymes with 'citrouille,' [pumpkin] because it is the same sound 'ouille.' 'Compote' [compote] rhymes with 'carotte,' [carrot] they both end with 'ote.' 'Baton' [stick] rhymes with 'macaron,' [macaroon, or a round badge or medal] and with 'citron' [lemon]. Here the rhyme is on 'on.' [12] Do you now understand what a rhyme is? Very well, you must find all the rhymes you can. The word with which you must find rhymes is 'obéissance' [obedience]. [13] Come, begin, find some." In order to accomplish this test, the subject must not only find rhymes, which is partly a matter of imagination, but he must understand the preceding explanation, which is a matter of judgment. There are subjects who remain silent who either have not understood or are unable to find rhymes. Others are more loquacious but the false rhymes they cite prove that they have not comprehended. The minute having elapsed, renew the explanation and try the test again.

### 25. Verbal Gaps to be Filled

This test thought out and proposed by Professor Ebbinghaus of Berlin, varies in significance according to its mode of use. It consists essentially in this: a word of a text is omitted and the subject is asked to replace it. The nature of the intellectual work by which the gap is filled, varies according to the case. This may be a test of memory, a test of style, or a test of judgment. In the sentence: "Louis IX was born in -----" the gap is filled by memory. "The crow ----- his feathers with his beak;" in this the idea of the suppressed word is not at all obscure, and the task consists in finding the proper word. We may say in passing, that according to the opinion of several teachers before whom we have tried it, this kind of exercise furnishes excellent scholastic training. Lastly, in sentences of the nature of those we have chosen, the filling of the gaps requires an attentive examination and an appreciation of the facts set forth by the sentence. It is therefore an exercise of judgment.

Procedure. We have simplified it by suppressing all explanations. The words forming the gap are intentionally placed at the end of the sentence. It is sufficient to read the text with expression, then suspend the voice with the tone of interrogation when one arrives at the gap. The subject naturally fills in the gap. If he does not do so spontaneously, urge him a little by saying, "Finish. What must one say?" Once the operation is set going it continues easily.



The operator knows the true words of the text which have been suppressed. He should not yield to the temptation of considering those the only correct ones. He must examine and weigh with care all the words that are given him. Some are good, others altogether bad, nonsensical or absurd. There will be all degrees.

Here is the text with the gaps. The words to be suppressed are in italics.

The weather is clear, the sky is (1) blue. The sun has quickly dried the linen which the women have spread on the line. The cloth, white as snow, dazzles the (2) eyes.\*] The women gather up the large sheets which are as stiff as though they had been (3) starched. They shake them and hold them by the four (4) corners. Then they snap the sheets with a (5) noise. Meanwhile the housewife irons the fine linen. She takes the irons one after the other and places them on the (6) stove. Little Mary who is dressing her doll would like to do some (7) ironing, but she has not had permission to touch the (8) irons.

#### 26. Synthesis of Three Words in One Sentence [14]

This exercise is a test in spontaneity, facility of invention and combination, aptitude to construct sentences.

Procedure. Three words are proposed: Paris, river, fortune. Ask that a sentence be made using those three words. It is necessary to be very clear, and to explain to those who may not chance to know what a sentence is. Many subjects remain powerless before this difficulty, which is beyond their capacity. Others can make a sentence with a given word but they cannot attain to the putting of three words in a single sentence.

#### 27. Reply to an Abstract Question [15]

This test is one of the most important of all, for the diagnosis of mental debility. It is rapid, easily given, sufficiently precise. It consists in placing the subject in a situation presenting a difficulty of an abstract nature. Any mind which is not apt in abstraction succumbs here.

Procedure. This consists in reading the beginning of a sentence and suspending the voice when one arrives at the point, and repeating, "What ought one to do?" The sentences are constructed in such a manner that the slight difficulty of comprehension which they present, comes from the ideas rather than from the words. The child who does not understand, is hindered less by his ignorance of the language than by his lack of ability to seize an abstract idea. There are twenty-five questions. The first are very easy and tend to put the subject at his ease. We do not reproduce them here as they will be found farther on with the results.

Here are only four of the sentences. They are among those of medium difficulty.

1. When one has need of good advice -- what must one do?
2. Before making a decision about a very important affair -- what must one do?
3. When anyone has offended you and asks you to excuse him -- what ought you to do?
4. When one asks your opinion of someone whom you know only a little -- what ought you to say?

It is often a delicate matter to estimate the value of a reply. Sometimes the subject does not gather all the shades of the question and the reply is too simple, not absolutely adequate to the demand. Nevertheless one must be satisfied if it expresses sense, if it proves that the general bearing of the question has been grasped.

In other cases the reply is equivocal; it would be excellent if it came from a dilettante [sic], or a decadent, because of the double meaning which is ironically evoked. It is of no value in the mouth of a school child. Thus to the first question, "When one has need of good advice --" a child replied, "one says nothing." We suppose he has not understood but if this had been an ironical reply, one might have found in it a curious meaning. As a matter of fact, these uncertainties, which are truly matters of conscience with the examiner, present themselves but rarely. Ordinarily the interpretation

is easy because one knows already about what to expect from his subject.

## 28. Reversal of the Hands of a Clock

This is a test of reasoning, attention, visual imagery.

Procedure. First ask the subject if he knows how to tell time. In case his answer is in the affirmative, put him to the test because it is not best to trust his word. There are imbeciles who say they know how to tell time and give extravagant answers when a watch is given them to read. It is important to note this error in judgment. Having found that the subject knows how to tell time, remind him that the long hand indicates the minutes and the short hand the hours. Then say to him, "Suppose that it is a quarter of three, do you clearly see where the long hand is, and the short hand? Very well, now suppose the long hand is changed to the place where the short hand is, and the short hand to the place of the long, what time is it?" Reverse the hands for the following hours: twenty minutes past six; four minutes of three. The correct solutions are, half past four, and a quarter past eleven.

The subject must not see the face of a watch nor make the design upon paper, or his cuff or his nail to aid his imagination. As the experiment is made individually, supervision is easy.

When the subject gives the two solutions correctly, one can push him a little further, imposing a question much more difficult. Say to him, "For each of the hours that you have indicated, the reversal of the hands brings about the result that you have found; nevertheless this result is not altogether correct. The transposition indicated is not altogether possible. By analyzing the case with care, tell me why."

This test permits of varying degrees of accuracy in the replies. First, certain ones are not able to make any transposition; they give no solution, or else it is absolutely incorrect. Others who come nearer the truth give a solution which is partially correct; for example, only one of the hands is rightly placed, or perhaps an error of symmetry has been committed, one has put to the right what ought to have been at the left or inversely. The third category is that of subjects who give correct solutions. Finally the fourth is composed of those who give a correct solution and are capable of criticizing the slight inaccuracies.

## 29. Paper Cutting [16]

This exercise calls for voluntary attention, reasoning, visual imagery, but not for vocabulary.

Procedure. Take two sheets of white paper of the same dimensions. Call the attention of the subject to their equality. "You see they are alike." Lay the first one on the table, fold the other into two equal parts slowly before the subject, then fold again into two equal parts at right angles to the first fold. The sheet is now folded in four equal divisions. On the edge that presents a single fold, cut out with the scissors, a triangle. Take away the triangular piece of paper without allowing the subject to study it, but show him the folded paper, and say to him: "The sheet of paper is now cut. If I were to open it, it would no longer resemble the first sheet of paper here on the table; there will be a hole in it. Draw on this first sheet of paper what I shall see when I unfold this one." It is important that the experimenter say neither more nor less than our text, and that he compel himself to employ the words chosen by us although scarcely exact and accurate. The subject now draws upon the first sheet the result of the cutting which he has just witnessed. He should not be allowed to handle the perforated sheet. Some subjects look a little at the perforation, others rely upon their imagination and begin at once to draw. The less intelligent simply draw an angle placed no matter where on the white page, or perhaps a triangle whose form and dimensions are not those of the cut. A little closer observation causes some to consider the form and dimensions. Somewhat better is the triangle replaced by a diamond drawn in the center of the page. Although better, it is still not the correct result, for to be correct two diamonds must be drawn, one in the center of each half of the paper. This test interests everybody. It requires no development of style. It has nothing literary, and rests upon entirely different faculties than those required by preceding tests. Moreover the correctness of the result is easy to grade.

## 30. Definitions of Abstract Terms [17]

This test resembles closely those which consist in replying to an abstract question. It differs

especially in that it requires a knowledge of vocabulary.

Procedure. Without preliminaries, one asks of the subject, "What difference is there between esteem and affection? What difference is there between weariness and sadness?" Often the subject does not reply. He sometimes gives an absurd or non-sensical answer.

We conclude here the list of tests we have used. It would have been easy to continue them by rendering them more complicated, if one had wished to form a hierarchy among normal children. One could even extend the scale up to the adult normal, the average intelligent, the very intelligent, the hyper-intelligent and measure, or try to measure, talent and genius. We shall postpone for another time this difficult study.

When a subnormal, or a child suspected of being such, is questioned, it is not necessary to follow the exact order of tests. A little practice enables one to cut short, and put the finger upon the decisive test.

The solutions given by the subjects can be put into four categories:

1. Absence of solution. This is either a case of mutism, or refraining from making an attempt, or an error so great that there is nothing satisfactory in the result. We indicate the absence of result by the algebraic sign minus (-).
2. Partial solutions. A part of the truth has been discovered. The reply is passable. This is indicated by a fraction; the fraction in use is  $\frac{1}{2}$ . When the test permits several degrees one can have  $\frac{1}{4}$ , or  $\frac{3}{4}$  etc.
3. Complete solution. This does not admit of definition. It is indicated by the algebraic sign plus (+).
4. Absurdities. We have cited a great number of examples and insist upon their importance; they are indicated by the exclamation sign (!).

The cause for certain defective replies can sometimes be grasped with sufficient clearness to admit of classification.

Besides the failure to comprehend the tests as a whole, we encounter:

1. Ignorance; the subject does not know the sense of a word or has never seen the object of which one speaks. Thus a child does not know a poppy. We write an I.
2. Resistance to the examination because of bad humor, unwillingness, state of nerves, etc. We write an R.
3. Accentuated timidity. We write a T.
4. The failure of attention, distraction. We write a D. The distraction may be of different kinds. There is an accidental distraction, produced by an exterior excitant [sic] or an occasional cause. For example, the case of a normal who spoils a memory test because he must use his handkerchief. There is constitutional distraction frequent among subnormals. We have ascertained among them the following types: Distraction from scattered perceptions. Distraction from preoccupation. Distraction from inability to fix the attention.

[... Binet then goes on to describe the pedagogical and medical methods - cdg]

Footnotes

[1] One of us (Binet) has elsewhere insisted that a distinction be made between the measure and the classification. See "Suggestibilité," p. 103, Vol. 11, L'Année Psychologique.

[2] Editor's [Kite's] note: Binet's classification of defectives is idiot, imbecile, and "débile." This seems to correspond closely to our American terminology of idiot, imbecile, and moron. We have accordingly translated "débile" as moron and "débilité" as morosity.

[3] One of us (Binet) has been for some years the president of "Société libre pour l'étude de l'enfant," and he has striven to spread among his colleagues, mostly teachers, the taste for scientific research. He has found that the two errors mentioned in the text are those which appear most frequently among beginners.

[4] Editor's [Kite's] note: We have here retained the word used by Binet, because in the English there is no one word exactly synonymous with it. The word literally translated means "the ability to follow with the eyes a moving object."

[5] Cf. p. 196 [of The development of intelligence in Children, E. S. Kite's collection of Binet's papers].

[6] Cf. p. 187 [ditto].

[7] Cf. P. 186 [ditto].

[8] In a book specially devoted to Suggestibility (Paris, Schleicher, 1900) -- one of us (Binet) has described several methods of testing for suggestibility which are valuable for application in the schools.

[9] Editor's [Kite's] note: Binet's sentences vary in length from thirteen to eighteen words. He has corrected this discrepancy in the 1908 edition by counting the number of syllables given in this and kindred tests. A literal translation of his sentences obviously may not contain the same number of words in English as in French.

[10] Cf. p. 220 [of The development of intelligence in Children, E. S. Kite's collection of Binet's papers].

[11] Cf. p. 232.

[12] Editor's [Kite's] note: We have here retained the French words because it is obvious that the English equivalents would not rhyme. In using the test one must of course use suitable English rhymes.

[13] Editor's [Kite's] note: There are many words in the French which rhyme with "obéissance" and which are perfectly familiar to a French child. This is not true of its English equivalent. One would not think of asking a child to make rhymes with "obedience."

[\*]Classics Editor's note: The word "eyes" should probably be italicized here, but is not in the Kite's text. The word "yeux" is in Binet's original French version.

[14] Cf. p. 222.

[15] Cf. p. 224.

[16] Cf. p. 234.

[17] Cf. p. 230.

Commentary on:

"New methods for the diagnosis of the intellectual level of subnormals"

Alfred Binet & Theodore Simon (1905)

"The uses of intelligence tests"

Lewis M. Terman (1916).

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The writing styles of Binet and Terman are notably different. Binet is cautious, adhering to the immediate purpose of mental tests for diagnosing the mentally retarded. Terman offers a broader mandate in which the full range of individual differences in mental ability would be assessed. Terman, using a rhetorical style of exposition, thus is willing to make broad claims about the use of mental testing. Among his claims are the prognostication that testing will reduce crime, reduce prostitution thereby raising morality, preserve the national gene pool (by segregating the mentally defective), and identify the future national leaders (gifted children).

Terman's hyperbole is accompanied by a set of explicitly stated assumptions regarding the nature of intelligence. This contrasts with Binet's more tentative position. Their different approaches are most clearly demonstrated in their views about etiology. Terman assumed that intelligence tests measured innate ability, a point of view shared by the other American testers who revised the Binet-Simon scale. Binet, on the other hand, believed that while there were genetically determined upper limits, intelligence could also be significantly affected by environmental influences. This difference in interpretation had significant implications for how mental tests were to be used. If the tests were measuring innate ability, as Terman contended, then it was possible to make long-range predictions based on test performance. However, if the tests were assessing intellectual functioning that was malleable within limits, as Binet posited, then such functioning could be influenced by environmental intervention. Binet viewed mental tests as diagnostic tools; therefore, in working with retarded children, he developed special training methods, called "mental orthopedics," which were aimed at improving learning skills. Consequently, test performance would also be improved.

The Stanford-Binet was developed to assess the full range of individual differences in intelligence, thus enabling the schools to develop specialized programs. Such programs would allow each child to progress at his or her own rate--whether the rate was rapid or slow. With respect to mental deficiency, Terman pointed out that mental tests were already being effectively used to identify the degree of retardation. It was therefore possible to decide upon the type of instruction suited to the training of the backward child. Mental tests would also make it possible to detect the milder degrees of mental defect. This would correct the tendency of the traditional use of medical diagnosis to overlook the majority of higher-grade defectives, the so-called "feeble-minded." Both Terman and Binet agreed on this point.

In discussing the value of mental testing for identifying mild retardation, however, Binet and Terman held contrasting views. Binet saw the mental tests as diagnostic tools that could target such children for special compensatory education programs that would improve their academic performance and even, in some cases, enable these children to be channeled back to mainstream classrooms. Terman, on the other hand, was concerned with the need to identify the mildly retarded so that they could be segregated in special institutions. In this respect, he reflected the commonly-held view, particularly in Britain and America, about the "menace of the feeble-minded." Reflecting the impact of evolutionary thinking, the problem of feeble-mindedness was perceived to be a symptom of the rising tide of degeneracy. The lower classes with their inferior heredity were reproducing at a faster rate than those of superior breed. At the time, therefore, Galton's eugenics program of selective breeding held great appeal. Terman and the other American exponents of testing believed that mental tests could be utilized to control degeneracy by detecting the higher-grade defective.

The Galtonian paradigm also pointed to the value of mental measurement in identifying those at the upper end of the ability distribution. Just as the feeble-minded might go undetected without the use of mental tests, so might the genius. According to Terman, it was essential to identify genius because this was the potential resource for leadership. Once children of superior intellect were selected by mental tests, they could be prepared through the appropriate education to fulfill their potential. The progress of civilization would be based on the advances made by creative thinkers and leaders in science, politics, art, and, morality.

Terman also believed that through the use of intelligence tests it would be possible to study the effects of heredity and environment on mental development. In the first chapter of his 1916 monograph on the Stanford-Binet (the selection included here), he posed the following question: "Is the place of so-called lower classes in the social and industrial scale the result of their inferior native endowment, or is their apparent inferiority a result of their inferior home and school environment?" (Terman, 1916, p. 19). In a subsequent report, based on a sample of about five hundred schoolchildren who were given IQ tests and classified by their teachers into five social-class groups, Terman concluded that children of higher social classes make a better showing on the test primarily

because of their superiority in original endowment. In line with his belief in biological determinism, the testing data simply confirmed the expectation that the children of higher social-class parents would be better endowed than those children reared in slums and poverty.

Regarding heredity and environment in relation to racial differences in intelligence, Terman in his introductory chapter queried: "Are the inferior races really inferior, or are they merely unfortunate in their lack of opportunity to learn?" (Terman, 1916, p. 20). In a subsequent chapter, he offered the following response, given in the context of discussing the low IQ scores of two boys of Portuguese extraction:

It is interesting to note that. . .[these cases] represent the level of intelligence which is very, very common among Spanish-Indian and Mexican families of the Southwest and also among negroes. Their dullness seems to be racial, or at least inherent in the family stocks from which they come. The fact that one meets this type with such extraordinary frequency among Indians, Mexicans, and negroes suggests quite forcibly that the whole question of racial differences in mental traits will have to be taken up anew and by experimental methods. The writer predicts that when this is done there will be discovered enormously significant racial differences in general intelligence, differences which cannot be wiped out by any scheme of mental culture. (Terman, 1916, pp. 91-92)

Indeed, the massive mental testing data of World War I picked up on Terman's prognostication of racial differences but the hereditarian interpretation of Terman and the army testers would be challenged.

With the publication of the Stanford-Binet, Terman had become a highly visible figure in the mental testing movement. It was therefore not surprising that he was called to serve on a committee that had been assembled at Vineland, New Jersey, in the spring of 1917 to devise mental tests for the army. The United States had entered World War I and Robert M. Yerkes, the president of the American Psychological Association, spearheaded the contribution of psychologists to the war effort. Yerkes, who had developed his own version of the Binet, chaired the testing committee, which was composed of the leading American test developers. Terman brought with him a new group test of intelligence that had been developed by his doctoral student, Arthur S. Otis. The Otis test served as a basis for the construction of the army group tests. While serious questions have been raised about the significance of the psychologists' contributions to the war, there is no doubt that the war provided an enormous boost for the mental testing movement. Approximately 1.75 million men were tested, and on this basis recommendations were made with respect to job placements or immediate discharge from the army.

After the war, Terman seized upon the contribution of the army tests to military efficiency and predicted that they would soon be universally used in the schools. To this end, in collaboration with Yerkes, he was able to secure funding from the Rockefeller Foundation to adapt the army tests for school use. Working with a committee of testers, the "National Intelligence Tests" for grades three to eight were developed and ready for use in 1920. In 1922 Terman, as chairman of a National Education Association committee on the use of intelligence tests in revising elementary education, published a book with the committee that extolled the use of testing for reorganizing schools so that students could be classified into homogeneous ability groups. Terman's earlier call, in 1916, for the widespread use of IQ testing to sort schoolchildren into a hierarchical tracking system had come to fruition with the wide adoption of group testing in the schools during the 1920s and 1930s. His hopes for special recognition and programming for the gifted were also realized, in part through the adoption of the tracking system, but also through his own longitudinal study of a cohort of gifted children in California, which he began in 1923 and was continued after his death in 1956.

The hereditarian interpretation of tested intelligence that Terman and other American mental testers advocated was challenged in the early 1920s when the results of the World War I testing were widely disseminated. In particular, critics raised questions about the assumption that the tests were measuring innate intelligence. These critics pointed to the cultural bias of the tests that placed individuals with little education or immigrants who had recently migrated to the United States at a distinct disadvantage. Thus, it was environmental lack of opportunity rather than innate ability that accounted for the racial and ethnic differences reported in the army testing, differences that demonstrated that Afro-Americans and Americans of Southern and Eastern European origin had relatively low tested intelligence. By 1930, with the rising criticism that the army testers had failed to account for cultural bias, those testers most closely associated with the report of racial-ethnic

differences recanted their views. At least, with respect to racial differences in IQ, the hereditarian argument was put to rest until it was revived in the 1970s with the controversy surrounding Arthur Jensen's hereditarian interpretation of racial differences.

The nature-nurture debate over tested intelligence, however, was not put aside with respect to American schoolchildren. Terman, who was not directly involved with the controversy over the army group differences became the leading advocate for the hereditarian interpretation of IQ differences among schoolchildren. In 1928 and 1940, he took part in published debates on the nature-nurture issue. In these debates, the central issue was whether enriched environmental experiences could significantly raise IQ scores. The 1940 debate was especially contentious and drew considerable attention among psychologists and educators involved in testing. The environmentalist interpretation was championed by a group of researchers at the University of Iowa who had conducted a series of studies reporting marked increases in IQ scores among children who had been exposed to such intellectually stimulating intervention programs as preschool experience and adoptive home placement. George D. Stoddard, the Iowa research director, argued that the evidence from the Iowa studies supported an environmental conceptualization of tested intelligence. To buttress his position, he noted that he was carrying on Binet's legacy of mental testing. Stoddard had spent a postgraduate year of study in 1922 at the University of Paris where he had contact with Simon. According to Stoddard, the Iowa data was consistent with Binet's advocacy of using mental tests as diagnostic tools of present intellectual functioning. As such, they could assess the effects of educational intervention programs. If children were exposed to intellectually stimulating experiences, their tested intelligence would show a notable increase and this is exactly what the Iowa results demonstrated. In reaction, Terman and his fellow hereditarian advocates argued that the Iowa research was inconclusive because of methodological flaws. There was thus nothing to indicate that IQ tests were appreciably affected by environmental effects. The nature-nurture debate had reached another inevitable impasse.

The established practice of mass IQ testing in the schools with the aim of making long-term predictions regarding intellectual potential continued well into the 1960s. The Galton-Terman hereditarian interpretation of tested intelligence thus maintained its dominance over the Binet-Iowa environmentalist point of view. In the 1960s, however, in the context of the civil rights movement and the War on Poverty, the Iowa tradition of studying the effects of environmental enrichment was taken up again. Researchers used tested intelligence as an index of the effectiveness of compensatory educational programs. A decade later, in the conservative climate ushered in by the election of Richard Nixon (who, coincidentally, had been a subject in Terman's longitudinal study), the environmentalist position was challenged. In essence, the contrasting views of intelligence by Binet and Terman continue to be debated and continue to reflect the social and political forces that fuel the debate.

#### Suggestions for Further Reading

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