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## THE INFLUENCE OF ENVIRONMENT ON IDENTIFICATION OF PERSONS AND THINGS.

GUSTAVE A. FEINGOLD.<sup>1</sup>

The symbolic representation of justice indicates that it is the consummate desire of the judicial body to measure and to proportion the claims of contending parties with mathematical precision. To be sure, it is an ideal eminently becoming our civilization to presume the prisoner at the bar innocent until he has been proved guilty. This is the protection that a maternal state properly throws about her erring children; and she does it willingly, preferring that ten guilty persons should escape punishment rather than a single innocent one should suffer unjustly at her hands. Nevertheless, the state must watch out for her own welfare, and to that end she must use the most efficient methods for the apprehension as well as for the conviction and punishment of evil doers.

The problem of identifying supposed culprits was a real stumbling block to the police before the present anthropological methods of identification were discovered. These methods, however, are only serviceable in the recognition of a person of whom there already exists a police record, *i. e.*, anthropological measurements, finger prints, etc. But what about the first time offender, or even the professional criminal who is not apprehended in the act of crime, but who is observed therein by a lay person, and is subsequently arrested on the basis of a description of him—how is he to be recognized? An individual is seen lurking in a building, let us say. Subsequently it is discovered that a robbery or a murder or what not, took place in that building. Some days or weeks later an arrest is made, and the persons who had seen this lurking individual are summoned to the police court for the purpose of identifying the suspect. Assuming that the individual under arrest is the one who had been seen lurking in the building, what is the probability that he will be recognized in the new surroundings? :

In January, 1914, a man named K. was arrested in Boston charged with the robbery of a local store. For a while the police believed they had the leader of a gang that had made many daring breaks. In order to form a chain of evidence against him, many people who reported seeing suspicious looking individuals near the scenes of crime were

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called upon to make the identification. And so the newspapers printed such items as these:

"The police think that he (K.) had a hand in the spectacular and fatal break in Salisbury last October. \* \* \* Salisbury authorities will come to Boston today with witnesses, who will try to identify K. as one of the robbers."

Needless to say, they failed to identify him. And again with reference to the same individual, we read:

"Special Officer Carey, of the City Hall Avenue Police Station, made an effort to identify K. as the man responsible for the blowing of the safe in Blank's office, one of the jobs that the prisoner denies being connected with. A barber who worked in the building, and who had seen a suspicious character about the time of the break could not identify K. as the man."<sup>2</sup>

Another case where much depended on identification occurred in January in New York. It was District Attorney C. S. Whitman's desire to have a certain individual, X, recognized by another, Y, who had testified to the former's attempt to extort a political contribution of \$150,000 from him. This identification was wanted by the district attorney to complete the case he had presented against X to the grand jury. And so he had the two individuals come to his office, neither of them knowing what he was wanted for. X arrived first. When Y arrived, he was told that X was present. The district attorney introduced the gentlemen to each other, and then asked Y if he had ever met X before.

"I don't think that is the man," said Y. "I cannot be sure. I wouldn't say positively that he is not, but I can't say that he is."<sup>3</sup>

These few instances will suffice to show how indispensable the natural type of recognition, *i. e.*, psychological recognition, still is to the fulfillment of justice. Without going into the question as to whether the persons who escaped identification in the above cases were the actual culprits or not, we may properly ask ourselves: Were the conditions favorable for successful recognition?

No one knows so well as the psychologist how meagre the literature is which deals with this important mental quality. Considerable work has been done on sensory discrimination, but when it comes to recognition of meaningful, conceptualized objects, the field of research is practically untouched. A splendid path of investigation was opened up in 1895 by B. Bourdon, who was the first to use meaningful stimuli

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<sup>2</sup>The Boston Herald, Jan. 26 and 27, 1914.

<sup>3</sup>Boston Herald, Jan. 31, 1914.

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in experiments on recognition;<sup>4</sup> none of the later investigators, however, seem to have followed his suggestion. A good piece of work was recently completed by H. L. Hollingworth,<sup>5</sup> wherein he shows the relation between stimuli of different grades of meaning and recognition; though this is not the primary aim of his paper. And finally, by far the best theoretical treatment of the subject has been rendered by Dimitre Katzaroff,<sup>6</sup> but his work, too, fails to throw any light on the problem before us.

Some three years ago, at the suggestion of Professor Münsterberg, I undertook an investigation on the process of recognition and discrimination with meaningful stimuli of graded similarity, under conditions approximating those of life, namely, with distributed attention.

My material consisted of picture postal cards representing every conceivable object, scene and situation, such as men, women and children in different attitudes and activities, singly or in groups; also all sorts of animals and plants, houses, vehicles and streets—in short, everything that a person may very well observe in life and then be called upon to recognize. These picture postal cards were grouped in pairs on the basis of their similarity. The amount of similarity between any two post cards was determined as follows: Two cards that were totally dissimilar, one representing a red rose, and the other a gray church building were given the arbitrary value of 0%S (S = similarity). Two other cards that were identical were given the value of 100%S, and that of course was their real value. The other cards that were to be measured were hung up on the wall in pairs. I then called into my room, one at a time, fifteen mature and competent persons—instructors and graduate students at Harvard University—and asked them to grade the similarity of the postal cards in terms of percentage, rendering their judgment on the basis of the first impression. They were shown the opposite ends of the scale, of course, *i. e.*, the 0% and 100%S cards, and were told to locate the others between them. Thus each pair of cards were rated by 15 persons. By taking the average of the 15 judgments, I secured what we may call the objective similarity of each pair of postal cards. The reliability of the judgments was determined by the mean variation, and I found that the largest M. V. existing for cards that fell within the middle of the similarity scale, 45%S, was about 15% of the total range of judgment. The possible

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<sup>4</sup>Reconnaissance, Discrimination et Association, Rev. Philos. Vol. 40.

<sup>5</sup>Characteristic Differences Between Recall and Recognition, Amer. Jour. of Psychol., Vol. 24, (1913).

<sup>6</sup>La Reconnaissance, Archives de Psychologie, Vol. 11, (1911).

range in this case varied between the 0 and 90 per cent points, but the actual range was, of course, much smaller.

With my cards thus standardized and properly marked, I turned to the experiment on recognition proper: One of the critical cards, called the normal, N, was exposed for a definite time, say 5 seconds, among a fixed group of other cards. After an interval of 20 seconds, during which time the observer was required to retain in memory as much of the material he had just seen as he possibly could, the group was exposed once more for five seconds with the normal card replaced by the variable, V. The subject was then obliged to say whether the second exposure was identical with the first, or whether one card in it was new, and if so, which one, and how did it differ from the one it had displaced.

The subjects, from four to ten in number, who participated in this experiment were trained psychologists. They had never seen the cards before, of course, nor were the same cards, whether critical or fillers, *i. e.*, those that constituted the milieu, ever used twice with the same observer. The various factors that I could vary in this experiment were: 1, degree of similarity; 2, length of exposure; 3, size of exposure, or the number of items exposed. I could also have varied the interval between any two exposures, but as the primary object of the investigation was to establish a relation between recognibility and degree of similarity, this last factor was allowed to remain constant, while the other three were altered.

I found, after recording many hundreds of judgments, that there is an inverse relation between recognibility and degree of similarity, the one being to the other as  $x:100-x$ . That is to say, where the amount of similarity between the variable and normal cards was 0%, recognibility was 100%; *i. e.*, the substitution was recognized every time. Where the amount of similarity was 50%, recognibility was 50%; *i. e.*, the substitutions were recognized only half the number of times, and so on up to the point where the substitution of an identical card was never recognized as new; and this, of course, is equivalent to saying that it was always identified as the same.<sup>7</sup>

In all the foregoing instances the substitution was made in the same environment in which the normal was originally seen. The question then arose in my mind whether this inverse relation between recognibility and degree of similarity would obtain if the variable card

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<sup>7</sup>This holds true for groups ranging between 3 and 6 cards exposed at the rate of one per second.

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were shown, not in the same, but in a totally new setting, in new surroundings. In short, the problem I set to solve was this: Does the feeling of familiarity or strangeness which is aroused by the general environment so color consciousness with its own particular tone as to make a new item appear familiar in the one case, and a previously experienced item appear strange in the other; or is the influence one of contrast rather than fusion? If it is contrast, then the exposure of a previously experienced item in a new setting ought to yield a larger number of correct recognitions than its exposure in the old setting. If it is fusion, then a previously experienced object exposed in a new environment should be recognized less often than in the old environment.

Table I gives the results of the experiments bearing on this question. The first horizontal line (%S), gives the similarity scale. The second horizontal line shows the per cent correct recognitions (%C), when the variable card was exposed in a new environment (N. E.). The third line contains the per cent correct recognitions when similar kinds of substitutions were made in the old environment (O. E.). The length and size of exposure were the same in each instance, *i. e.*, groups of five cards exposed for seven seconds.

TABLE I.

%S	0	25	35	45	55	65	75	85	100
%C in N. E.....	100	100	100	95	92	80	75	44	71
%C in O. E.....	98	90	85	79	74	61	56	17	95
%C (N.-O.) E.....	2	10	15	16	18	19	19	27	-24

From the foregoing figures it would appear that the new environment facilitates discrimination while it inhibits identification. Because we see that when similar (not identical), picture postal cards are substituted they are *less* often mistaken for their mates in the new than in the old setting, whereas the repetition of one identical card is *more* often mistaken for a different card in the new than in the old setting. As a matter of fact, however, only the last proposition is true, that is, the new environment inhibits recognition in general; it does not facilitate discrimination.

The proof is this: the figures given in the second horizontal line represent the judgments of "all changed," "all new." Now, as a matter of fact, all cards were changed objectively in all instances except those where S=100%. And while my subjects were able to point out the similar card in the new environment, they were not able to state in more than about 50% of the cases how it differed from its analogue. Therefore, inasmuch as the new setting caused my subjects to declare

in 29% of the cases that all cards were new, when an identical card, *i. e.*, a card of 100%S was repeated, it also must have influenced them to make the same kind of a judgment when a card of less than 100%S was substituted, irrespective of whether they perceived the difference between this card and its analogous one or not. Only we must not assume that the tendency was just as great with each diminishing degree of similarity. For certainly when a card of 65%S was substituted, the amount of difference within it would have a tendency of its own to elicit the judgment of change, and likewise when a card of only 25%S was substituted it would have a still greater tendency of its own, apart from the influence of the new setting, to elicit the judgment of difference. And in general, less and less error would be attributable to the environment as the similarity of the critical items diminished.

Since it is our desire to establish the relative influence of new and old environment on recognibility, it is imperative that we separate the errors due to the similarity of the critical cards themselves from the errors due to the different settings. When a critical card of 100%S was substituted in the old environment, *i. e.*, when the entire group of five cards which were shown in the first exposure were presented again in the second exposure, the subjects declared some one of the cards to be new in 5% of the cases. But as this 5% of error was made with reference to any one of the five cards, the probable per cent of error made with respect to a particular card was  $1/5 \times 5\% = 1\%$ . Hence we may say that the conditions of the experiment were such as to contribute one per cent error. Subtracting this amount from the errors made when one identical card was repeated in the new setting, leaves 28% as the actual index of lack of identification due directly to the suggestible influence of newness or strangeness arising from the new or strange environment.

Since our general law of ideational recognition says that recognibility varies inversely as degree of similarity, and since, as we have just seen, the amount of error attributable to the new setting is inversely proportionate to the amount of similarity in the critical card; therefore, if we multiply the above index by any value of S and subtract the product from %C corresponding to that value of S, we shall obtain the per cent correct recognition made for the card itself, apart from the disturbing influences due to the new environment.

Table II contains these corrected results for recognition in new surroundings as compared with the results of recognition in the same setting.

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TABLE II.

Per Cent Correct Recognitions when Cards of Different Degrees of Similarity were Substituted in New and Old Environments.

%S	0	25	35	45	55	65	75	85	100
%C in N. E.....	100	93	90	82	77	62	54	20	71
%C in O. E.....	98	90	85	79	74	61	56	17	99
%C (N.-O.) E.....	2	3	5	3	3	1	-2	3	-28

The figures in the last line give us the per cent of false recognition for each value of  $S < 100\%$  due to the influence of the old environment (O. E.). If we take the average of these figures, we obtain 2.5%.

Hence we may conclude that whereas the observation of a previously experienced object in a new setting will inhibit recognition to the extent of 28%, the observation of a similar object in the same setting will give rise to 2.5% false recognitions. Or in other words, the suggestibility of newness arising from a new situation is more than 11 times as strong as the suggestibility of sameness arising from a previously experienced situation.

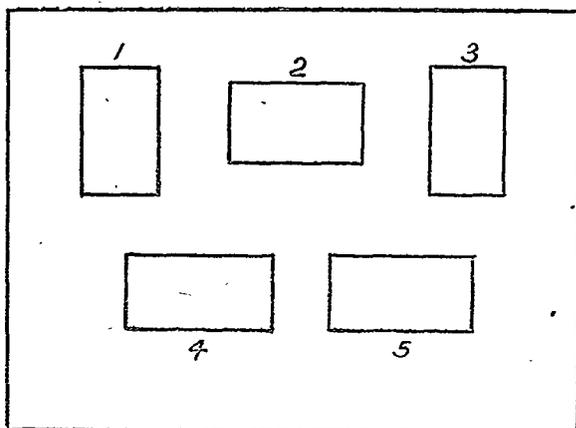
Katzaroff in his work found that the feeling of subjective certitude arising from the recognition of certain parts of an item spreads itself over the rest of the parts and determines the total certainty, *i. e.*, the total recognition of sameness or difference, whatever it may be.<sup>8</sup> To put it in his own language, "The feeling of certainty appears to be more or less contagious." But he does not tell us whether this feeling is more or less contagious according as it springs from the feeling of familiarity or the feeling of strangeness. In view of the absence of a positive statement from him, then, we turn to Meumann, the only other psychologist who, to our knowledge, treats of these two opposite feelings in a way that is pertinent to our discussion. He tells us that the feeling of strangeness produced by acoustic or visual complexes makes a deeper impression on consciousness than the feeling of familiarity.<sup>9</sup> The new items rise into consciousness with much greater definiteness than the half-known ones. The introspection of my own subjects showed not that they perceived or comprehended the contents of the new picture post cards better than the contents of the old, but that they saw at a glance that the new were nothing like the old, and so they slid right over them, to use a phrase that was quite common in the rendition of the introspection. Some of the observers even declared that the feeling of strangeness seemed to gather momentum in proportion as they kept noticing more and more new cards on the sec-

<sup>8</sup>Op. cit. p. 57.

<sup>9</sup>Archiv für die Gesamte Psychologie, Vol. 20, (1911), p. 36.

ond exposure. From the above statements, therefore, and from our own facts, it would seem that the conclusion we have formulated concerning the relative influences of new and old environment on recognition is correct.

Yet in order to test this matter more thoroughly I made one grand experiment, in which 80 college students, divided into groups of 20, participated. I exposed a set of five picture postal cards for five seconds, pasted on a black card board, and arranged and numbered as the following figure shows:



*Fig 1.*

After an interval of 20 seconds the same group was exposed for five seconds once more. I then asked my 80 individuals to state in writing whether all the cards of the second exposure were identical with those of the first, or whether any one of them was different, and if so, which one.

The results showed that 75% of the individuals identified all five cards—and that means each particular card—successfully, while 25% failed to recognize one of the five cards. The probable per cent of error which fell to the lot of any particular card was, therefore,  $1/5 \times 25\% = 5\%$ . Inasmuch as the subjects wrote down the number of the card which they thought was new, I had the data from which to calculate the exact number of times that each particular card escaped identification. The errors were distributed as follows: 4% of the individuals failed to identify card No. 1; 4% failed to identify card No. 2; 2.8% failed on card No. 3; 4%, again, failed on card No. 4; and 10.2% failed on card No. 5. The reason why so many mistook the fifth card for a different one on the second exposure is that it did not stand out

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in sharp relief from its background, being the picture of a lighthouse as seen on a moonlight night. It was rather dark gray, and, being pasted on a black background, many of the subjects could not see it clearly. We are justified in saying, therefore, that other things being equal, the probable error made with respect to any particular card lies between 4 and 5%.

After this I exposed a different group of five picture post cards, arranged and numbered in the same order as the previous one, also for five seconds; and after an interval of 20 seconds I re-exposed *one* of these five, No. 4, among four new ones arranged in precisely the same way. The second exposure was five seconds. I then asked my subjects once more to record in writing whether all the cards of the second exposure were *different* from those of the first, or whether any one of them had been seen in the first exposure, and if so, which one.

Fifty-six per cent of the subjects recognized the card I repeated as having been seen before, 3% were in doubt about one of the new ones (but not the same one), while 41% failed to recognize the repeated card, *i. e.*, declared all five cards to be new. Thus we see that when a single item is re-exposed for the second time in a new environment it will escape identification 44% of the times, whereas if it is re-exposed in the same environment it will escape identification only about 4% of the times. Therefore, the ratio of failure to identify an object in a new environment as against failure of identification in the old environment is as 11:1. This ratio is considerably lower than that obtained with different subjects under more exact conditions of experimentation. But it is sufficiently high to show that the present police method of identifying a person of whom no anthropological records exist as yet, namely, that of bringing the witness to the police court and have him observe the suspect in surroundings totally different from those in which he was originally seen, is wrong, is contrary to the psychology of recognition, and affords the criminal altogether too much opportunity to escape identification, and thereby to foil the ends of justice.

The proper way to obtain successful recognition is not to bring the witness into the police court, but to bring the supposed lawbreaker to the scene of crime and to have the witness look at him precisely in the same surroundings and from the same angle at which he saw him originally.

The reason for this is that recognition is not primarily an ideational process, but is rather an affective process, and like all affective processes depends upon something more than mere volition or men-

tal effort. Recognition does not depend on memory, neither does it depend on imagery; these factors merely serve to strengthen it. It is a primary act of consciousness; it is more like an attitude of the entire organism. The individual had been thrown into a certain attitude on a former occasion, only when the same attitude is aroused once more will recognition take place. But the arousal of the same feeling, the same state of mind is most easily assured when the person is brought into the same situation, into the same environment and subjected as nearly as possible to the same influences that he experienced when he first perceived the object of recognition.

Recognition is not an act like that of recalling a fact or repeating a performance. If I know here and now that Woodrow Wilson is president of the United States I can express that fact in China, Germany or Egypt as readily as in Washington. But if I have seen his private secretary only for a short time in the White House, I do not think I shall recognize him as readily a month or two later in Berlin as I would if I were to see him again, seated at his desk in the same office where I first met him.

Before I undertook this investigation, I thought just the opposite was true. It seemed to me that a new environment should facilitate recognition, because it would act as a contrast to the previously experienced object; just as complementary colors tend to intensify each other by contrast. Indeed, when I made inquiry among some of my friends, I found that nearly half of them believed that new surroundings would aid identification. I fancy this view is quite prevalent with the general public. Do we not, as a matter of fact, often hear the statement made by American tourists that it is very easy to recognize a fellow countryman abroad? Such statement, however, is without significance, because it does not tell us whether it is *easier* to recognize an American abroad than at home. The only reason why we hear it at all is that the feeling of recognition does not flood our consciousness every time we meet an American in his native land, whereas this feeling may readily flood our consciousness when we meet a person in a foreign country, who dresses and talks as an American. But that is nothing strange, for a little reflection will show that we also fail to experience the feeling of recognition every time we look at our household furniture, at our watch or fountain pen? The reason is that these things, like the American at home, are so familiar to us that they have become part of us; our attitude towards them has become fixed. In other words, our reaction towards them is largely a matter of habit, and is directed from a lower level of consciousness.

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And so we may conclude that recognition is more difficult—approximately 20 times more difficult in a new environment than in the old.

It would not be fair, however, to leave our discussion at this point without stating the opposite set of facts. Granting that identification of the same item is easier in the old environment than in the new, what about the discrimination of similar items? We have seen from Table II that if two similar objects, A and A<sup>1</sup>, are exposed successively in the same setting they are mistaken for each other about 2.5% more often than when perceived in different settings. Therefore, to have the suspect observed at the scene of crime for the purpose of identification may result in false recognition, *i. e.*, an innocent person might be identified as the guilty one. Whereas such a thing is less apt to occur under the present method of identification, where the supposed criminal is observed in a new setting.

The only answer we can make to this argument, which must not be dismissed too lightly, is that on the whole the average number of false recognitions resulting from the influence of the environment is not very large. It is true that if a person approaches the same spot where he has been held up, unmercifully beaten and robbed, his mind will be so flooded with recollections of the sad experience, due to association of ideas; hence, if two persons, leading a third one, come up and ask him at that very instant, "Is this the man who robbed you?" he will be very apt to say yes, whether the suspect is the guilty person or not. But it is very improbable that he will blindly connect the suspect with the crime if one of the detectives simply introduces him to the suspect and to another person, say the other detective, and merely asks him if he had ever met either of them before.

We said that 2.5% is the probable amount of false recognition that will result from the influence of the old environment, but this includes the false recognitions made with respect to items of rather high similarity. If we direct our attention at items of 0%S, we find that there was only 2% of false recognition (Table II). But we find also that there were 3% false recognitions with respect to any one of four items of 0%S in a totally new environment. Hence the probable per cent that fell to any particular card was 3/4. Subtracting this from the former value leaves 1 2/5% as the probable amount of false recognition that might result directly from seeing a thing for the first time in a setting where something else had been seen before. Now, this is a very small quantity indeed, as compared with that which rep-

resents the probability of escaping identification with the present methods employed.

But in this connection we must ask ourselves what is the average similarity between any two human faces? Obviously, this question is too broad. The similarity may vary from zero—as between the faces of a negro and a white man—to 95% on our scale—as between identical twins. Apparently the question must be narrowed with respect to race. But also it must be narrowed with respect to sex, for the differences in the external appearances of man and woman are surely as great as differences of racial color. Finally, the question must be narrowed with respect to age. Nobody would mistake a middle-aged man for a child, nor a youth for an old man. Here, then, are three distinct divisions: race, sex, age.

Whenever a description is given of a suspicious person or of a person observed in the act of crime, the first thing mentioned is the sex; the second thing mentioned is whether he or she belonged to the white, yellow, brown, red or black race; and the third is whether the suspect was juvenile or mature. Color, sex and age constitute separate genera, and so are incapable of confusion under any circumstances. Hence our question, what is the average similarity between any two faces, means faces within the same category of color, sex and age.

Now it is well known that, other things being equal, individuals of a given race are distinguishable from each other in proportion to our familiarity, to our contact with the race as a whole. Thus to the uninitiated American, all Asiatics look alike, while to the Asiatic all white men look alike. I admit that the identification of a foreigner in the same environment in which, not he, but a member of his race had been seen before, might result in false recognition. But this is possible under any circumstances, since it is due to incomplete perception of distinctive qualities.

But let us confine ourselves to the physiognomy of the white race. What is the facial similarity of any two such beings? The differences in human features, as Galton tells us, are enormous,<sup>10</sup> as demonstrated by the fact that we are able to distinguish a single face from thousands of others. He believes, however, that fundamentally there is much resemblance, and this he tries to prove by composite portraits. Yet, upon examining his own figures, we are led to conclude that this similarity which he calls great, is not above 5% as measured by our similarity scale.

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<sup>10</sup>Inquiries into Human Faculty.

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The facts are these: Galton made composite portraits of 57 hospital patients (he does not tell us whether of the same sex or not, but they must have been), suffering from tuberculosis. One composite photograph he made of all 57 patients, another of 27 of them, a third of 28, and a fourth of 36. It should be borne in mind that his category of selection had been pretty well shaped and moulded by nature before he came to it. They were either males or females, of approximately the same age, their features similarly modified by the same kind of disease. Yet, in spite of the selectiveness of his group, no two of the four composite photographs were identical. He says that all four composites were closely alike. But what that "closely" means, we do not know. Assuming, however, that it corresponds to 90% on our similarity scale, then taking those two composites that contained the minimum number of components, 27 and 28 respectively, we can compute the similarity between any two components that entered into each composition, by dividing 90 by 27 in the one case, and 90 by 28 in the other. That is, the similarity between any two components is about 3.3%. We believe, however, that it is much less. The exact amount of similarity between the features of individuals belonging to a given class, as fixed by age, sex and color, can easily be determined, however, by finding out the minimum number of components that must be combined in all possible permutations, in order to form two indistinguishable composite portraits. If we then divide 100 by this number, we shall get the similarity in terms of per cent. It is to be regretted that Galton did not do this.

We may conclude, therefore, that even within close natural, but not consanguineous limits, the similarity between any two human faces is so small, that it would fall considerably below 20% on our similarity scale. And we show in our larger work<sup>11</sup> that 20% similarity is practically the same as 0% as far as discriminability is concerned. That is, objects that are 20% similar can be discriminated from each other as easily as objects of 0% S, and this holds true irrespective of the kind of environment in which recognition takes place. Hence, there is no danger of false identification by our method resulting from physiognomical similarity enhanced by identical setting. On the other hand, it has the advantage of yielding between 28 and 40% more successful recognitions than the present method.

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<sup>11</sup>The complete results of this investigation, including those which tend to solve the problem of illegal imitation, will be published under the title of Recognition and Discrimination, in a forthcoming issue of the Psychological Review Monographs.