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GENERAL REVIEWS AND SUMMARIES

THE PSYCHOLOGY OF SEX

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During the four years since my last review of the literature of the psychology of sex (PSYCHOL. BULL., October, 1910) the number of experimental investigations in the field has increased to such an extent that whereas it was difficult at that time to find anything to review, it is now impossible to review all I could find. The number of books and essays devoted to general discussions of the subject has also increased and their quality has improved very markedly. The emphasis placed on sex by the Freudian school and the interest in sex education, to say nothing of the whole feminist and woman's suffrage movement, have swelled the dimensions of the literature aside from experimental contributions to such an extent that no brief review could pretend to deal with it. Confronted by such a dilemma I have chosen the course of attempting a summary in the field of experimental psychology as complete as time and library facilities would allow, and a very brief mention of what seem to me the most important contributions to the other phases of the subject.[1]

I. EXPERIMENTAL AND STATISTICAL STUDIES

There have been two extended series of tests applied for the purpose of measuring sex differences, one by Burt and Moore (19),

[1] I am indebted to Mr. Charles A. Reed, librarian of the University of Cincinnati, for special library privileges and for assistance in borrowing books and periodicals from libraries at a distance, without which it would have been impossible to prepare this review in Cincinnati.

in England, summarized by Jones (46), and one by Cohn and Dieffenbacher (22) in Germany. A third one by Pyle (69) in the United States, less comprehensive in scope, but representing a larger number of individuals, has sex as one basis of formulation. Other experimental papers either deal with only a few phases of the sex problem, or are formulated primarily from some other point of view. I will make the summary by topics, referring to the parts of the special investigations under the various headings.

(*a*) *Heredity.*—The present status of the theory of sex inheritance is very clearly and concisely summed up by Morgan (59). So far as a layman can see, there is little if anything in the theory which applies to the psychological problem. The ancient idea that the female is essentially an undeveloped male seems to be finally disproved by the fact that it requires more determiners—usually one more chromosome, or a larger sex chromosome—to produce a female than a male. When the additional sex chromosome was first discovered the assumption was that it determined maleness, doubtless because of the idea that the male was a more highly developed type. If there were any sense at all in such a formulation—which there probably is not—it would now have to be reversed. It seems certain that sex is determined at the moment of fertilization, and its determination is quite independent of environmental factors. Morgan believes that both the primary and the secondary characters of sex follow the laws of Mendelian inheritance, though not all biologists agree with him (Meijere, 55).

Secondary sexual characters are in some instances—chiefly in insects—determined independently of the sex glands. In the higher animals they are to a great extent dependent on the action of the sex glands, so much so that successful transplantation of the sex glands in the guinea pig carries with it a development of the secondary sexual characters of the opposite sex, even to the extent of producing secretion of milk in the milk glands of the male. The mechanism by which this is brought about is that of hormones given off to the body fluids by the sex glands.

The part played by sexual selection in evolution Morgan considers very small. There is little evidence that it takes place at all in animals. Even when consciously practised it is incapable of originating modifications of species, or producing steady change in any direction. It merely serves to develop in pure strain traits which have become mixed. Modifications of species always arise as mutations, for the appearance of which no explanation can at

present be offered. Mutations when they arise may be inherited as sex-linked traits of the type of color-blindness, which are found predominating in one sex, though in certain combinations they may be inherited by the other.

Both Morgan and Tandler and Gross (77), point out that it is impossible to find any single secondary character which belongs exclusively to either sex throughout the animal kingdom. For instance, superior size and brilliant plumage in some species belong to the female, while even the instinct for incubating eggs is assigned in some species to the male. Tandler and Gross interpret all secondary sexual characters as modifications of characters belonging to the species as such. They believe that the reason the sexes resemble one another after castration is merely that under those circumstances both sexes tend to revert to the original species type, an assumption which makes it unnecessary to assume the presence in each sex of the determiners of the other sex.

The theory of heredity, then, seems incapable of throwing light on the question as to what systems of the body carry sex-linked factors. Conceivably any of them, including the nervous system, might. It merely describes the machinery by means of which any mutation which arises may be inherited as a sex-linked trait.

(*b*) *Physical Development.*—Under this head I shall report a few papers which are of interest from a psychological point of view. Beik (9), instead of measuring children in absolute amounts, as most previous observers have done, measured a series of 6½-year old children in terms of the proportion to adult standards for each sex. On this basis, he found girls more advanced than boys in height, weight, dentition, brain weight, and probably in the development of the skeleton. Measured in absolute terms boys are ahead in most of these respects. Hertz, in the report of the Danish Anthropological Society (26) gives a series of measurements kept for the last 27 years which show that during that time girls have gained considerably in height and weight, while boys have been at a standstill. Burgerstein (17) in reporting European statistics, states that girls show a much greater susceptibility to disease than boys.

(*c*) *Motor Ability.*—Beik (9) found that at 6½ years, girls, measured in terms of proportion to adult attainment, were ahead of boys in motor control. In simple reaction time and in rate of tapping, boys and men—as in previous tests—have shown them-

selves superior (Burt and Moore 19). In card dealing, Burt and Moore found the boys quicker, while Calfee (20) found girls quicker. In card sorting and in alphabet sorting, girls were found decidedly superior by Calfee and by Burt and Moore. Culler (25) also found women faster on first trials of card sorting, though his group was small (17 of each sex) and he was not primarily interested in that point. In mirror drawing Calfee found the girls—college freshmen—faster than the boys throughout six successive trials. This agrees with previous work. Burt and Moore found the boys superior, but they do not consider their own test very reliable because of a change of method.

Mead (54) gives a small but reliable set of statistics supporting the popular opinion that girls learn to walk and talk earlier than boys. Starch (72) measured the handwriting of the entire school system of Madison, Wisconsin, and found the girls superior to the boys in speed, legibility, and form. The sex difference was greatest in form. Burt and Moore found the same difference with regard to speed. Cohn and Dieffenbacher (22) found that girls read faster than boys, a result also obtained by Burt and Moore in reading and in counting for speed.

Ballard (7) found a relation between left-handedness and stammering, both of which are more prevalent among males. He tries to show that while the greater frequency of left-handedness is characteristic of the male sex, the greater frequency of stammering among boys is an artificial condition brought about by attempting to force left-handed individuals to write with the right hand. Statistics show that stammering is far more frequent among the left-handed who have been forced to write with the right hand than among those who were allowed to write with the left hand. He offers no explanation of how the result is brought about.

The tentative generalizations which may be drawn from this series of facts are (1) that girls develop faster than boys from infancy; (2) that boys are superior to girls in rapidity of movement under conditions in which the direction of attention remains fixed, as in reaction time and tapping; and (3) that girls are superior to boys in rapidity of motion in types of activity in which the direction of attention is constantly shifting—activities which involve rapid adaptations—such as card sorting, mirror drawing, reading and writing.

(*d*) *Sensation and Perception.*—(1) *Skin and Muscle Sense.* Bobertag (11) found that boys of 8, 9, and 10 years are more accu-

rate in the Binet-Simon test for discrimination of weights than girls. Burt and Moore (19) confirm this result for both children and adults. They also found the space threshold of females, child and adult, very much finer than that of males. These sex differences are in accord with previous investigations. (2) *Hearing.* Hentschel (38), who tested 250 children of each sex in Germany, found that boys discriminate pitch better than girls both when a musical interval is employed, and when much smaller differences of vibration rate are made the basis of comparison. The boys are from 2 to 7 per cent. ahead in the several series. Burt and Moore, like previous investigators, found females a little better in pitch discrimination than males. (3) *Vision.* Burt and Moore found females superior in fineness of color discrimination. Monroe (58) in giving the Binet-Simon tests to 300 boys and 300 girls, of from three to six years, found that the girls excel the boys in color perception and in color naming. Burt and Moore found the boys superior in judging visual space. These results also agree with previous work. (4) *Perception.* The group of tests which belong most distinctly under this head are tests of the cancellation type, which involve both perception and motor reaction. In these tests females of all ages are uniformly better than males (Haggerty and Kempf (36), Woodworth and Wells (86), Pyle (68, 69)).

The possible generalizations in this field are (1) females have a finer spatial threshold on the skin, better color vision, and more rapid motor responses to changing perceptions than males; and (2) males are superior to females in the discrimination of weights and visual areas. The results with regard to pitch discrimination are contradictory.

(*e*) *Memory.*—There have been two sorts of experiments which may be included under this head, the rote memory experiments and those in "Aussage" or report. Under the first head there have been tests by Aall (1) using objects, by Burt and Moore (19) material not stated, by Myers (64) using words and letters in testing incidental memory, by Vertes (79) using words, by Cohn and Dieffenbacher (22) using digits, by Pyle (69) using words, and by Winch (85) using consonants. All of these workers found females superior except Cohn and Dieffenbacher, and Pyle, who found no difference of sex. These results are in accord with most previous investigations.

The experiments in the psychology of report have been carried on chiefly in Germany, Holland and Norway, and are published in

German. The term *Bericht* refers to the spontaneous account given by the subject of the picture, story, or series of events presented to him, while *Verhor* refers to the results of an examination which he subsequently undergoes on the subject matter. These words I shall translate *report* and *examination*. The trustworthiness (*Treue*) is estimated by finding the proportion of correct statements to the total number of statements made, both correct and false. Spontaneity is measured by finding the proportion of correct statements in the report to the total number of correct statements in both report and examination. Some of the questions used in the examination are distinctly suggestive, which gives an opportunity to measure suggestibility. Finally it is possible to classify the kind of items reported by each sex, for qualitative differences of memory.

With regard to the extent of memory displayed by the sexes in these experiments, the results are somewhat contradictory. In view of the small number of individuals represented in many of the series (from 15, or even less of each sex, to 30) contradictions are not surprising. Aall reports two tests, one with adults (2) and one with school children (1). In both cases he followed the plan of asking for a second reproduction of the story without warning. In some groups a mental attitude of expecting an immediate reproduction had been induced, while in others the expectation was that the reproduction would be deferred. In all variations of the experiment he found the extent of immediate memory greater in the female. With adults the same difference held for the second reproduction, but the school boys were better in the second reproduction than the girls. Aall is inclined to lay great stress on the latter result. The same type of test was tried by Lem (49) with school children with exactly the reverse result. His boys displayed a greater extent of memory in the immediate reproduction than the girls, while in subsequent ones, asked for without warning, the girls caught up with and at last a bit surpassed the boys. Breukink (15) and Schramm (71) both compared groups of university students. Breukink used pictures and Schramm a story. Breukink found the extent of memory a bit greater in men, while Schramm found it greater in women. Cohn and Dieffenbacher (22), and Pyle (69), whose test of logical memory belongs here, both found school girls superior to boys at all ages. With regard to trustworthiness, Breukink, Schramm, and if I understand him correctly, Aall, found women superior, Lem found boys superior, and Cohn and Dieffenbacher found no difference of sex. The latter authors report that girls have a decidedly greater degree of spontaneity.

Aall lays great stress on the qualitative differences in the reports as distinctive of sex. These analyses have been carried to too great length to be reported here. The chief point of agreement among them is that females report visual elements and particularly colors more frequently than men. Several of them also find that males report space relations more accurately than females, a fact corroborated by Myers (64) in his study of incidental memory.

Memory of dreams can be considered a special case of the psychology of report. In an Italian kindergarten in which the children take a nap every day, they were questioned immediately on waking with regard to what they had dreamed. Doglia and Banchieri (27) made records for 100 children at three years of age. The girls remembered more dreams and remembered them more fully than the boys. Two years later Banchieri (8) reexamined a large portion of the same group, and found that the same sex difference persisted.

To sum up then, females are superior to males in memory at all ages. The difference is clear and very uniform with regard to rote memory. In experiments in report sometimes one sex and sometimes the other has shown itself quantitatively superior, but on the whole the advantage is with the females.

(*f*) *The Effect of Drill.*—Closely allied to memory are the investigations on the effect of drill. Brown (16) and F. M. Phillips (67) both tested elementary school children with respect to the efficacy of drill work in arithmetic. Brown found no difference in this respect between the sexes, while Phillips found that the boys gained more than the girls. Wells has two papers which touch on the subject, but in both instances the sex groups are too small to be significant. In one (83) he found a progressive improvement of endurance with practice which was greater in women than in men. In the other (82) he found no difference in the gains made by practising addition and number checking. Yoakum and Calfee (88) report that their freshmen boys gained more in practising mirror drawing than the girls, though they did not catch up with them. Culler (25) observed that the men of his comparable group (only 7 of each sex) gained with practice in card sorting enough faster than the women to surpass them, particularly after an interference due to a rearrangement of the system of sorting. These investigations have been very different in type, and most of them represent small groups, so that generalizations are not safe, but there have been more of them which report a faster rate of improve-

ment with drill in boys than in girls. It is interesting to notice that these tests have been carried out with processes in which females are at the start faster.

(*g*) *Association.*—Huber (45) carried out, with soldiers in training, the same series of free associations that Reinhold had previously tried with the girls of an advanced school. Though he states that differences of sex exist, the specific differences which he finds, such as greater uniformity in the associations of the girls, and more predicate, adjective and definition reactions on the part of the soldiers, he explains as due not to sex, but to the amount of education in the two groups Free association tests consisting in recording the number of words which could be written in a given length of time are reported by Burt and Moore (19) as showing boys faster, and by Pyle (69) and Lobsien (51) as showing girls faster. The latter found the difference marked from 9 to 11 years, but insignificant in older children. Since girls write faster than boys, such a test cannot throw much light on the rapidity of the thought process. Free associations in which the reaction time for each word has been measured, have been very uniformly found faster in men than in women. Haggerty and Kempf (36) and Wells (81) confirmed this result. Controlled association of the type represented by fundamentals in arithmetic (addition, etc.) is usually faster in females. Burt and Moore found boys faster, but Courtis (24) with his enormous series of New York school children, Phillips with a smaller number of school children, and Haggerty and Kempf with university students found girls and women faster. In controlled association of the opposite type girls are also apt to be superior (Burt and Moore, Pyle, Bonser, (15)), though in this case correctness of idea is a larger factor in estimating results than time of association. Haggerty and Kempf, considering speed alone, found men faster. The Ebbinghaus completion test has been used as a measure of sex difference by Cohn and Dieffenbacher (22), Burt and Moore, and Bonser. Burt and Moore, who call the test "completion of argument" because of the nature of the text used, found no sex difference, while the other two found boys superior. In a substitution test, Pyle found the girls faster at all ages, while in the number of associations suggested by an ink blot (called a test in imagination) boys were superior.

The generalization which is suggested by these results is that males are faster in free associations, while females are faster in practised systems of associations.

Both Wells and Haggerty and Kempf discuss the reasons for the more rapid free associations of men. Both papers take the view that the lengthened time of the women is due to a greater tendency to interference and suppression of ideas. This means, as Wells points out, that the associations of women are really controlled associations—controlled by the self for various reasons—to a greater extent than those of men. He thinks it possible that this result may be due merely to the fact that men have tested women, and that a woman testing men might obtain reverse results. Haggerty and Kempf are inclined to think that this tendency to be "on guard" against embarrassment is characteristic of the female sex. Apparently the Freudian school would find this interpretation in harmony with their theory of hysteria, which they explain exclusively on the basis of the suppression and substitution of sex impulses and ideas, and which is so much more prevalent among women.

With regard to types of reproduction within the associative process, Wells (81) and Lobsien (51) give results. The only decided difference of sex observed by Wells was the greater frequency of predicate associations in women, and of coordinate associations in men, a difference which had been previously noted. Among children Lobsien found the vast majority of associations belonging to the type in which no connection was evident. He calls them "springende" reproductions. The next largest class was the coordinates, while verbal and predicate associations were very few. The sex differences were small. Taking the entire group from 7 to 15 years, he found a few more "springende" associations for girls, and a few more of each of the other three types for boys. He also, then finds coordinate associations a bit more frequent for boys, though he fails to find predicate associations more frequent for girls. However differences of method make a comparison of results of doubtful value.

(*h*) *Attention.*—Cohn and Dieffenbacher (22) measured attention in terms of the distraction involved in simultaneous reading and writing, in which the girls suffered less from distraction than the boys. Burt and Moore (19) used two tests, one a test of the scope of attention called the spot pattern test, a tachistoscopic test in which a pattern composed of spots is reproduced, and one called irregular dotting which consists in tapping as rapidly as possible when each tap must hit one of an irregular series of dots. In both tests they found the boys superior, though in the second one the

girls were better if the time interval was short. Heymans (39) lays stress on the narrower range of consciousness of the female, which he thinks can be deduced from her greater emotionality, and which is corroborated by the greater prevalence of hysteria in women. These two tests of the scope of attention give contradictory results.

(*i*) *Judgment and Reasoning.*—Breukink (15) tested judgments of time and space in men and women, and found men more accurate with regard to time, but no sex difference with regard to space. In judging space from memory, Myers (64) found males more accurate. Cohn and Dieffenbacher (22) thought the boys showed better judgment in their series of tests in several respects. They judged better the additional time required to learn the long series of digits than did the girls, though they came out with no better result in the end. He found that the boys had more questioned judgments in their tests of report, and that they were more trustworthy than the girls on the most essential points of the picture, though not in the report as a whole. In the logical arrangement of themes of the two sexes they found no difference. Burt and Moore (19) found boys better than girls in solving mechanical puzzles, but observed no difference in the sexes in respect to reasoning power tested by a group of tests consisting of the completion of an argument, the completion of analogies, constructing sentences, opposites, and the correction of syllogisms. Bonser (14) who made a particularly careful and many-sided investigation of a large group of children in the fourth, fifth, and sixth grades, found the boys a little ahead in the median for the series, seven tests in all. In details there were more marked differences. The boys were ahead in reasoning out problems, in selecting correct reasons for statements, and a bit so in a completion test. The girls were ahead in opposites, in selecting correct definitions, and particularly in the interpretation of literature. With regard to age, he found the boys ahead up to twelve years, and the girls ahead above twelve years.

The other tests which I have been able to find deal with reasoning as displayed in the solution of problems in arithmetic. F. M. Phillips (67) using the Stone tests, and Courtis (24) using his own tests found the boys better than the girls in tests of correct reasoning. Fox and Thorndike (31) report that in their group of high school pupils, girls surpassed boys in arithmetical ability, but they believe that the girls in that community were a more selected set than the boys.

On the whole, then, males have stood better than females in tests of judgment and reasoning.

(*j*) *General Intelligence.*—Under this head there have been (1) several investigations of school marks in the United States and Europe, and statistics with regard to the number of advanced and retarded children in school systems, (2) Binet-Simon tests, (3) groups of selected tests, and (4) some single tests which can be more conveniently classified here than elsewhere.

(1) The instability of school marks as a measure of ability has been strikingly brought out by Starch and Elliot, who sent an examination paper to 180 head mathematics teachers to be marked, and received grades all the way from 25 to 90! However, taken in the mass they doubtless have some significance. Baldwin (5) studied school marks in the fourth and fifths grades of a city school. He found that the girls maintained a higher standard of scholarship than the boys. In accord with this was the fact that there were more repeaters among the boys and more girls who skipped grades. Miles (57) made a study of the marks in both elementary school and high school for a group of 106 children for whom he had continuous records. The girls were consistently ahead in every grade, and in every subject except arithmetic, where there was no sex difference. Klinkenberg (47) studied school marks in a school system in Holland which was partly coeducational and partly segregated. Boys were ahead in mathematics, physical sciences, history, and geography, subjects, he remarks, in which an analytic process of thought is uppermost. Girls were ahead in literary studies and languages. He states that girls do not stand examinations as well as boys, but do better in class work than one would expect from their examinations. Girls were further behind boys in geometry than in algebra, which is due, he says, to their well-known disinclination to constructive thought. Cohn (see Bobertag, 13), in the "Dritter deutscher Kongress für Jugendbildung und Jugendkunde" gave a report on school marks in a coeducational school in Baden. Taken as a whole, he found no sex difference, but in grouping the subjects he also found boys better in science and mathematics, and girls in the language group. Forsyth (30) reports that the mean college grade of women in the University of Illinois is a little higher than that of the men. Heymans (39) collected statistics on this point from the universities of Holland, and found that the women rank higher than the men. The fact is so well established in this country that it has given rise to the

witticism that university professors who used to object to admitting women to their classes on the ground that it would lower the standards of scholarship, now object because the women do so much better class work that the men become discouraged and refuse to compete in the game.

The number of advanced and retarded children in large school systems in the United States have been tabulated by Bevard (10) in Washington, D. C., by Hill (41) in New Orleans, by B. A. Phillips (66) in Philadelphia, and by Lurton (52) for fifty-five towns in Minnesota. In every instance there were more retarded boys than girls, and more accelerated girls than boys.

(2) The Binet-Simon tests have been made the basis of sex comparison in the United States by Goddard (35), A. C. Strong (75), and Monroe (58), and in Europe by Bobertag (11) and Wiersma (84). Monroe dealt only with children from three to six years of age. He tested 300 of each sex, and found no sex difference on the whole, though there were small differences in the various years. Goddard's results represent the largest number of children tested by the Binet-Simon scale under one director, 2,000 children. His table shows no clear difference of sex. Reduced to percents on the basis of the proportion of each sex who are two years or more retarded, or two years or more advanced—a procedure which he did not himself carry out—it appears that there is no sex difference in retardation (boys 18.4 per cent., girls 18.6 per cent.), but the girls have a slightly greater proportion of accelerated individuals (boys 3.7 per cent., girls 4.8 per cent.). Strong in tests of 225 white children found on the same basis a similar state of affairs, though the differences were larger—retarded, boys 9.6 per cent., girls 10.7 per cent.; accelerated, boys 3.2 per cent., girls 6.9 per cent. The European results rest on much smaller numbers. Wiersma, who tested 68 boys and 73 girls, found the girls ahead on the whole, while the boys had larger groups both of retarded and of accelerated individuals. Bobertag alone found boys superior to girls. His results are stated in terms of years and fractions of years for each sex at each age. The boys were superior at each age by amounts varying from 0.06 to 0.20 of a year. Bobertag is quite too scientific to regard this result as conclusive, since it rests on about fifteen of each sex at each age, but he remarks that if it is substantiated it would be in accord with other experimental findings. That it does not agree with the general trend of Binet-Simon tests so far is evident. It is quite possible, however, that results in the co-

educational school systems of Holland and the United States may prove to be different from those in the segregated schools of Germany.

(3) Cohn and Dieffenbacher (22), Burt and Moore (19), and Pyle (69) carried out series of tests on comparable groups of the two sexes. The subjects of Cohn and Dieffenbacher varied in age from 7 to 19 years. They were selected as representatives of the better and the poorer sections of their school classes. There were about 100 of them in all. Burt and Moore tested about 140 children of 12½ to 13½ years, and about 100 university students. These two series agree in finding no sex differences as a whole. Specific differences which they report have been mentioned under the appropriate headings. Pyle, testing school children in this country, found the girls superior, but his tests were not as varied in type as the other series.

(4) Two investigations, those of Libby and his coworkers (50) and that of Franken (32), were made by means of questions on general information. Franken, though he had a considerable number of subjects, had only small comparable sex groups. The younger girls were superior to the boys, but there were no differences among the older children. Libby and his associates tested grade children from the fourth to the eighth grade, and first year high school students. They report boys superior in all age groups. The girls were more cautious in their replies, and not so likely to guess if they did not know. Ash (4) tried giving school children the choice of two kinds of tasks, one of which required original observations, and the other compilations from books. He found no sex difference on the whole, but the boys were most numerous in the group who selected all their tasks from one type, while the girls were more likely to divide the choice. With regard to mental fatigue, which should, I suppose, be regarded as an element in general intelligence, Offner (65) reports that no sex difference has been observed.

On the whole, then girls have stood better than boys in measures of general intelligence. So far as I know, no one has drawn the conclusion that girls have greater native ability than boys. One is tempted to indulge in idle speculation as to whether this admirable restraint from hasty generalization would have been equally marked had the sex findings been reversed! The usual explanation of the result offered is that girls are more docile and industrious than boys. The greater industry of girls has been turned to account by Lipmann

in a novel argument for the inherent superiority of the boys. In his summary of the evidence on variability (see Bobertag, 13) he states that there are a larger number of series of measures in which the boys proved to be the more variable sex in the sense that there were more boys in the extreme quartiles of the range of values, and more girls in the two middle quartiles. He argues that the greater industry of the girls would be capable of raising them from the lowest quartile to a higher one, but would not suffice to overcome their lesser native ability to the extent of raising them from a lower to the highest quartile. To limit the effects of industry so much as to make it inoperative through a whole quarter of the range of a measure seems a bit extreme.

The writers who explain the results just quoted on the ground of the greater industry of girls are also those who emphasize their greater emotionality and rapid changes of mood. They seem to find no contradiction in the fact that the sex which is most dominated by emotions and moods is also the one which has the greatest capacity for plugging away at a task whether it is interesting or not. Another explanation quite as reasonable as that of the greater industry of girls might be sought in the fact that girls develop somewhat faster than boys. In the case of university students it may be, as Thorndike points out, that the sexes are selected on a different basis.

(*k*) *Affective Processes, Tastes and Ideals.*—The only direct experimental investigation of affective processes is that of Burt and Moore (19) in which they measured the psychogalvanic reflex in adults under stimulation of various sorts, and found the deflection in response to emotional disturbances greater in women than in men. It would be interesting to find out whether the same difference obtains when a woman instead of a man does the testing of the two groups. Under those conditions the plethysmograph and respirator—which to be sure are not very safe measures—gave opposite results in my own tests. Burt and Moore believe that an analysis of the content of association reactions revealed a difference of sex in emotionality at an early age, and that the difference increases with years.

Heymans (39) attacked the question of the relative emotionality of the sexes by the questionnaire method. A large number of intelligent people in Holland filled out the blanks, and a tabulation of results showed that a larger number of women than men were classed as emotional. Moreover the traits that were assigned

predominantly to women were also those assigned to emotional men. (For a discussion of the scientific value of this method see Thorndike, 78.)

There have been a few bits of experimental evidence bearing on other phases of affective life than degree of affectability. E. K. Strong (76) found that women have more and greater dislikes than men and are better able to classify them. H. L. Hollingworth (42) suggests the generalization, which he says needs further confirmation, that men resemble one another more clearly in their preferences, while women are more alike in their aversions. Kuper (48) confirmed for children Strong's statement that women have more dislikes than men. Her method was to ask 200 children, evenly divided as to sex and varying in age from 6½ to 16½ years, to arrange three series of pictures in the order of preference. All three series represented the same nine subjects. It is interesting to notice how nearly alike the order was for the two sexes. For girls it was religion, patriotism, children, pathos, animals, sentiment, landscape, heroism, and action. The only change in the order for boys was that the positions of children and of heroism and action together were reversed, bringing children last and heroism and action third and fourth in the boys' lists.

Ballard (6) classified preferences in the themes of free drawings made by London school children. The themes of boys in order of preference were ships, miscellaneous drawings, plant life, houses, human beings, vehicles, animals, weapons, and landscapes, while for girls the order was plant life, houses, miscellaneous drawings, human beings, animals, ships, vehicles, weapons, and landscapes. Here again the order is very similar. The chief difference is that boys show a much greater liking for ships and girls for plant life. Stockton (74) tried to measure preference by means of the choice of one of a pair of words. He found far more resemblance than difference. Both boys and girls choose time words a bit more frequently than space words, words for food rather than words for dress, and adjectives rather than verbs. For words of activity boys showed a small preference, while girls choose words of passivity a little more frequently. He found that preference based on the idea of the word increased with age, and more markedly so in the case of boys than in that of girls, but neither sex based the choice on meaning to as great an extent as upon mere position.

There have been three investigations which consisted in asking each of a large number of children to state what person, whether

acquaintance, historical character, or character of fiction he would most like to resemble. Brandall, reported by Gilbertson (34) worked with Swedish children, Hill (40) with American children, and Hoesch-Ernst (see Bobertag, 13) also with American children. They all agree that girls choose personal acquaintances oftener than boys, and that boys choose more public and historical characters. Brandall and Hill found that girls choose ideals from the opposite sex many times as often as boys. In the Swedish study boys choose characters from fiction more frequently than girls, while in this country the reverse was true. Brandall recorded also the reasons assigned by the children for their choices. He found that girls name moral, intellectual and artistic qualities more frequently than boys, while boys name material advantages, honor, and social position more frequently.

Anderson (3) gives the result of a questionnaire on the kind and amount of reading done by school children. She found no difference of sex with regard to amount, though girls read more books and boys more magazine articles. The girls used libraries more than boys. The preferences for kinds of literature were for boys, (1) stories of adventure, (2) detective stories, (3) and (4) war and love stories; for girls (1) love stories, (2) stories of adventure, (3) detective stories, and (4) travel and biography. Anderson also found that girls displayed a greater range in their reading, received more advice about it, and talked more about what they read than boys. The boys were more independent and original in choice.

Scheifler (70) has a paper on the tastes of boys and girls in games, based on a questionnaire given to 5,000 children. He divided plays into four classes, imitation plays (dolls, soldier, etc.), plays of bodily movement and contest (ball, tag, etc.), plays of intellectual activity and contest (building, checkers, chess, etc.), and occupation plays (sewing, reading, collecting, etc.). His general result is that girls give a greater preference to imitation plays, and boys to plays of bodily movement and contest, while there is no sex difference in the other two groups of plays. However when he picked out a set of plays which he designates as constructive—such as drawing, building and chess—the boys predominate. Scheifler is much relieved to note that coeducation shows no tendency to make the plays of boys and girls alike. If it did he thinks it would be a sufficient reason for doing away with coeducation. "Freuen wir uns vielmehr der schönen Eigenart der Geschlechter

und pflegen wir sie! Unser Volk braucht immer noch beides: Männer die da wägen und wagen, Frauen die im kleinsten Kreise unendlich Grosses wirken."

Melville (56) asked each member of the four high school classes to write down all the slang phrases he knew. He then selected 100 papers, evenly divided between the sexes, from each class. The boys were ahead of the girls in the number of expressions by amounts increasing from 18.7 per cent. to 40.0 per cent. in the four classes.

(*l*) *Creative Ability in Art and Letters.*—There have been several studies of children's drawings published. Cohn and Dieffenbacher (22) and Wagner (80) both followed the method of asking large groups of children to draw, under experimental conditions, illustrations for Hans Sach's poem "Schlaraffenland." They both classified the drawings as Kerschensteiner had done, on the basis of representations of space, from the entire spacelessness of primitive drawings through linear and group arrangements to well-developed perspective. They agree that the primitive spacelessness is more characteristic of girls' drawings than of boys', and that girls take more pains than boys with decorative details. Cohn and Dieffenbacher found that girls treated a greater number of themes than boys, while Wagner found the reverse. Wagner noticed more elaboration of details in the drawings of the boys, and found them superior in inventiveness, in the representations of humor, and of motion. On the whole Wagner considers the boys very superior. The girls in his group excelled only in details which had to do with feminine interests. Cohn and Dieffenbacher noticed that the drawings of the boys were larger than those of the girls, and more characterized by heavy lines and strong colors, whereas the girls preferred delicate lines and soft colors. This difference in color preference had been previously noted in Kirkpatrick's monograph on "Studies in Development and Learning."

Muth (63) asked children from the first to the seventh years in school to decorate the outline of a plate and of a shield. She agrees with the two reports just quoted that girls prefer fine lines and a smaller more delicate type of drawing. She found that the sense of rhythm is earlier developed in girls and is stronger than in boys. The girls showed a better sense of proportion between the filled and the blank spaces of the surfaces. From the point of view of mere decorative effect, then, girls were superior, though she found the boys excelling in the expression of humor and in the originality of their drawings.

The generalization suggested by these pieces of work is that boys excel in perspective drawing and girls in decorative drawing.

Within the years with which I am dealing, I have found but one attempt to measure the relative merits of literary productions in the sexes. Cohn and Dieffenbacher (22) asked their group of children to write a theme on experiences at the local railroad station. They found the themes of the girls superior in most of the measures which they applied. Their themes were longer, both in words and in statements, their sentences were longer, they used more figures of speech, and a greater number of unusual expressions. Their themes were richer in content, and better in literary style. Analyzed for content they found that the boys mentioned more objects, more definite numbers and spaces than the girls. The girls' themes were richer in feeling, and more subjective. The sexes differed in the kind of feeling expressed. With girls sentimental and comic moods predominated, and with the boys the loyal and ethical sentiments. Though it does not belong in my period, it seems worth while to mention the fact that Giese (33) arrives at generalizations opposed to most of those just quoted! His monograph is an extended study of the free literary productions of boys and girls from the ages of five to twenty. The material he collected from all sorts of sources, chiefly from the public press. He criticizes Cohn and Dieffenbacher for passing judgment on a question of personal opinion like literary style, but does not seem to feel that his own work is open to the same criticism with reference to his selection of material, and his judgments of originality and value. He finds that boys write more poetry than girls, and do it much better, that their compositions are longer, more philosophic, and of higher artistic quality. The monograph contains very detailed comparisons of a large number of factors, and is half devoted to a collection of literary productions representative of the various ages.

(*m*) *Suggestibility.*—Two of the papers on the psychology of report (Aussage) contain measures of suggestibility. Breukink (15) in his group of adults found the women more suggestible than the men. They answered more of the suggestive questions both wrongly and correctly than the men did. Cohn and Dieffenbacher (22) in their group of school children found no sex difference in suggestibility, measured in the same way.

(*n*) *Variability.*—Several of the experimental series to which we have referred have been formulated in terms of variability, but most of the groups have been too small to be significant unless there

was wide agreement, which there has not been. The results dealing with the largest number of individuals, those of Goddard (35) on Binet-Simon tests and of Courtis (24) on tests in arithmetic fail to show any sex difference in variability. There have been two papers which sum up experimental evidence on the subject, one by L. S. Hollingworth (44) and one by Lipmann (see Bobertag, 13). Hollingworth sums up her review by saying, "If the evidence can be said to point in one direction rather than another, a greater female variability seems actually to be indicated in experiments so far made on the higher mental processes." Unfortunately I have not seen Lipmann's original paper, but only the abstract of it in the report of the congress at which it was delivered. He says that he worked over all the available statistics on variability in the sexes, and found that in 53 per cent. of the series of measures males were more variable, in 37 per cent. females were more variable, and in 10 per cent. there was no difference. Thorndike (78) selected a set of measures of various traits which he thinks most reliable as a basis for estimating variability, and concludes that they indicate somewhat greater variability of the male. He is convinced that greater variability of the male must be the explanation of the great preponderance of male geniuses. The amount of the sex difference in genius is most vividly brought out by comparing Cattell's former study of eminent men with that of Castle (21) on eminent women, and is of course not brought into question by sketches of the contributions to science made by women, such as those by Mozans (60), interesting as they may be.

Hollingworth questions the genuineness both of the greater number of male geniuses and of the greater number of male deficients, facts which have usually been thought to be proofs of male variability. She points out (43) that most of the evidence for the greater number of male deficients rests on statistics from institutions for the feeble-minded, which she and others consider unreliable because it is easier for feeble-minded women to maintain themselves outside of institutions than for feeble-minded men, since the former may earn their way either as household drudges or as prostitutes. As evidence of the truth of this assumption she reports a series of 1,000 consecutive cases passing through the New York clearing house for mental defectives, in which she found the females much more numerous than the males in the older group, showing that they had been able to maintain themselves longer in society than the corresponding males. The Binet-Simon tests confirmed this

by showing that of those individuals who tested at a given mental age, the women were older than the men. She concludes that if social pressure bore equally on the sexes, there would be as many females as males in institutions for the feeble-minded. The statistics from a social survey of the number of the feeble-minded outside of institutions, which gives more males than females, Hollingworth considers unreliable, though Thorndike apparently accepts them. With regard to genius (44) she makes the very pertinent suggestion that no one who has discussed the question has given sufficient weight to the fact that most women have devoted the greater portion of their time to occupations connected with bearing and rearing children, and in maintaining a home—occupations in which eminence is impossible though genius is not. No one can tell, she says, how much genius of a high order may have gone into these tasks where recognition in terms of fame is out of the question. She concludes that there is little ground for explaining the lesser scientific and artistic achievements of women on the ground of greater male variability. Finot (28, 29) makes much the same point in stating that in proportion to the number of women devoting themselves to scientific and artistic pursuits, the number of persons of eminence has compared favorably with males.

II. General Discussions

The general discussions of the psychology of sex, whether by psychologists or by sociologists show such a wide diversity of points of view that one feels that the truest thing to be said at present is that scientific evidence plays very little part in producing convictions. As Coolidge puts it: "In our present stage, the conclusions as to the permanence or significance of any feminine peculiarity at which any observer will arrive are in accordance usually with his anti- or pro-feminine bias." Hartley expresses the same idea. Among psychologists Burt and Moore (19), Stern (73), Heymans (39), Wreschner (87), and Thorndike (78) have expressed opinions with regard to the facts of the psychology of sex, based on the experimental evidence. The generalization at which Burt and Moore arrive is that sex differences are most marked in the simpler functions of sensation and motion and decrease as one rises to the higher levels of mental activity, until in the most complicated functions no difference is to be observed. Stern arrives at exactly the opposite generalization! The simpler and more easily measured functions show no significant differ-

ence of sex, he says, while we may be certain that as we penetrate further with experimental methods into the more complex mental functions, the significant differences will appear. Heymans, basing his opinion largely on the returns from the questionnaires which he and Wiersma sent out, though he considers experimental results also, derives a differential psychology of sex from two fundamental factors, first the greater emotionality of women, and second their greater activity, in the sense of readiness to act. The differences in intellectual capacity he explains in terms of interest and attention, which are ultimately determined by emotionality. Heymans's book is exceedingly readable, but not altogether convincing. His principle fails to work at a very vital point. The fact that women are in many respects poorer observers than men, he explains on the ground that their emotionality limits their interests, so that they observe well only that which has emotional value for them. When it comes to accounting for the better rank of women in academic work, he finds that while men put effort chiefly on that which interests them, women are industrious and conscientious in all tasks, whether they find them interesting or not. This contradiction he attempts to resolve on the ground that women are more readily spurred to action than men. Wreschner's book is in the nature of a popular lecture summarizing experimental studies of sex. He gives no references, and no indication of the strength of the evidence underlying his generalizations. The source of his material is easily recognized by any one familiar with the field. As a matter of fact some of his statements rest on evidence so contradictory or so meagre that they are worth no more than a personal opinion. In his conclusions he agrees with Heymans in assigning to women a stronger emotional nature, and a smaller participation in abstract intellectual processes, but takes the opposite point of view with regard to activity, which he regards as distinctly greater in men. Thorndike (78) regards the differences between the sexes of the type revealed by experimental psychology as too small, in view of the large variations within each sex, to be considered significant except with regard to the greater variability of the male. So far as central tendencies in various abilities are concerned, he assumes no difference of sex. He is inclined to agree with the others that women are more emotional than men, and thinks it probable that the chief difference of sex aside from variability is to be found in the fighting instinct of the male and the nursing instinct of the female, instincts which affect lines of conduct.

One element in the success of men in scientific, artistic or social fields is their love of getting ahead of the other fellow, while women have less of a desire to win, and a more pronounced humanitarian tendency.

All of this group of men, in spite of their wide differences of opinion as to the nature of the psychological characteristics of sex, are convinced that they are inherent and are not to be explained by environmental influences during the life of the individual. Burt and Moore base their conviction on the fact that the sex differences which they found in English children and adults were similar in kind and amount to those of my series of American university students. Differences which remain constant at different ages and in different countries must, they think, be inherent in sex itself. They do not seem to have considered whether or not there are factors in the social environment of sex which remain constant in all modern civilized countries. Stern believes that sex differences have been found in processes which are not influenced by social environment, such as spontaneous drawings. Wreschner holds that some of the traits most characteristic of women, notably emotionality, are of a nature to be repressed rather than fostered by the social environment of women. Heymans points out with much justice that much of the argumentation with regard to what effect the social milieu would have on given traits is very inconclusive. It is no difficult matter to get up fairly plausible arguments to prove either that social conditions tend to foster emotionality in women (Finot) or that they tend to repress it (Wreschner). Heymans thinks it quite as reasonable to suppose that differences in traits determined the differences in environment as vice-versa. Finally Wreschner inquires somewhat peevishly how in the world we are to know what is inherited and what socially acquired, and calls upon all good citizens to help along the course of evolution, whose direction he is confident he perceives, by cherishing our present valuable distinctions of sex instead of subversively trying to overthrow them. However none of these men, except perhaps Stern, believes that the nature or amount of the psychological difference of sex is a sufficient ground for separate systems of education for the two.

There are a few points in the literature of experimental psychology which point to the importance of social influences. The sex difference in size, whose hereditary origin has seldom been questioned, is decreasing with the change in the educational regime of

girls. The Danish Anthropological Society (26) has found that within the last generation girls have made large gains in height and weight, while boys have not changed. It is interesting to notice, too, that in Germany, where the tradition of the mental inferiority of women is still strong, and the girls' schools are even yet inferior (Münsterberg, 62) experimental results are more likely than in other countries to show differences of sex, and to find them in the direction of male superiority. In the tests conducted by Cohn and Dieffenbacher in one of the few coeducational schools of high school rank in Germany, they found the girls superior not only to the segregated girls, but to the boys in the same school. They were a small group, and German psychologists explain their high rank on the ground that they were to a greater extent than the boys selected on a basis of ability. It is also significant that differences between the cultured and the uncultured in experimental results are usually far larger than those between the sexes (Breukink, 15).

When one turns to the books written more largely from the historical and sociological point of view, the trend of opinion is that mental differences of sex are of social origin. There are four scholarly and exceedingly interesting books of this type, Coolidge (23), Hartley (37), Finot (28, 29), and Muller-Lyer (61), coming respectively from the United States, England, France, and Germany. The last three all contain historical sketches of the position of women from primitive times to modern. Hartley and Finot also discuss the question of sex in animals, and its bearing on human problems. Coolidge's book is particularly interesting to American readers because it is written with immediate reference to the social position of women in the United States during the last few generations. They all lay stress on the view that social conditions account for most of the traits ordinarily considered feminine, and particularly for the limited accomplishment of women in art and science. Coolidge gives a vivid sketch of the way traditional domesticity limited and determined the intellectual life of women. The same point is effectively brought out from the German standpoint by Maurenbrecher (53).

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THE HEREDITY OF MENTAL ABILITIES

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The recent work upon the heredity of mental traits is strongly influenced by the findings of the biologists, and especially the Mendelian formula. The newer point of view and the data collected by numerous field workers have given a new aim and character to this branch of research.

Several important investigations in the transmission of *feeble-mindedness* have appeared. Goddard's (9) work, *The Kallikak Family*, has received widespread attention. He traced two lines of descent from a soldier of the Revolutionary army. One line began with a feebleminded girl whose illegitimate son was the forbear of 480 individuals, the other line with a normal woman, his legitimate wife, and numbers 496 persons in direct descent. In the former line 143 were feebleminded, 46 normal, and the others unknown, or doubtful cases; in the latter line all were normal persons. In the defective line there were 41 matings, in which both parents were feebleminded. They had 222 feebleminded children and only 2 who were considered normal. Goddard believes his results "show the possibility that the Mendelian formula applies to human