foundations of biological knowledge! So it must remain until we develop a wider and deeper consciousness of what constitutes ordered knowledge, and by what cycle of thought it is to be achieved.

Yet to feel some discontent with medicine as we find it does not imply any lack of pride in its achievements, nor any diminished sense of privilege in seeking to serve it. If one is a critic, it is, I trust, in the spirit expressed by Milton when he says, "For he who freely magnifies what hath been nobly done, and fears not to declare as freely what might be done better, gives ye the best covenant of his fidelity."

ON THE DIFFERENCE BETWEEN THE SEXES IN DISPERSION OF INTELLIGENCE

BY

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It is a striking fact, though it is in no way surprising, that in mean performance on intelligence-test scales there should be no difference between boys and girls. On the other hand, and especially in view of this first result, it is one of the oddest facts in the whole field of human biology that boys should be more variable than girls. Furthermore, as will be shown, the difference is not merely a small one, considerable though the academic interest of this would be; it is a large difference with important practical implications. Gifted boys are more numerous than gifted girls, the discrepancy increasing as we pass further away from the average performance of the whole population; till, actually, the performance of the cleverest boy in each 1,000 boys is equalled by only one girl in each 2,000 girls; thus at this level highly intelligent boys are twice as numerous as girls. All this is, however, exactly counter-balanced at the other end of the scale, dull boys being more numerous than dull girls and very dull boys correspondingly much more numerous. In other words, girls tend to be grouped closer to the average for the whole population, while boys tend to spread further over into extremes of brightness or dullness. In the planning, therefore, of such things as the provision of facilities for higher education, a greater percentage allotment should be made for boys than for girls. Similarly, greater provision for boys is needed in special classes and schools for the backward and, to the extent that mental deficiency depends upon intellectual retardation, much more in institutions for mental defectives.

Existence of the Difference

The sex difference in dispersion of intelligence is an empirical observation: so far as I know, nothing analogous has been demonstrated, and it is difficult to think of any convincing biological explanation. In these circumstances it has been naturally and rightly felt that strong evidence should be forthcoming before so curious a finding should be accepted.

From the early days of accurate mental measurement indications of the difference began to appear, though by no means invariably in all studies. It is easy to see why results should have been conflicting. In the first place, relatively large numbers are required in order to detect a difference in variability—considerably larger than those required in order to detect a difference in means; from this point of view most samples were very small. In the second place—and this is much more important—it is very difficult to secure a random sample of intelligence-test results. Bias in the sampling of school-children tends especially to affect the extremes; hence the sex difference in dispersion is particularly liable to be artificially minimized. For example, my colleagues and I (Roberts, Norman, and Griffiths, 1935) have shown that the omission of private-school children from a complete group considerably diminished the difference. For these reasons, Winsor, writing as late as 1927, could still conclude, after a careful review of the literature, that the evidence was insufficient.

Not until the appearance of that magnificent piece of work, the survey carried out by the Scottish Council for Research in Education (1933), was all legitimate doubt at an end. In this survey both the difficulties mentioned above were admirably countered. The numbers tested were vast, being no fewer than 87,000; and every effort was made to secure completeness of sampling, the aim being to test a complete annual age group throughout the whole country. It is true that some unavoidable bias remained, but in excellence of sampling no less than in numbers this group was a great improvement on its predecessors.

A good verbal group-test was applied, the results being as follows:*

Difference in Mean Performance between Boys and Girls

	No.	Mean Score
Boys	44,210	34.506
Girls	43,288	34.411
Difference = 0.095 ± 0.105		

The difference is less than its standard error, so that, even using such large numbers as these, it is impossible to decide whether boys or girls have the higher average performance.

The variances tell a very different story:

Difference in Variance between Boys and Girls

	No.	Variance
Boys	44,210	253.747
Girls	43,288	225.605
Difference = 28.142 ± 1.885		

This very large difference is no less than 14.9 times its standard error.

The existence of the difference is abundantly demonstrated, but two important points must be considered: it is demonstrated using this particular test and for this particular sample; is there any reason to anticipate that using another scale or another sample the same result might not be obtained?

First, as regards the test, good scales designed to measure general intelligence correlate so highly with each other that it is, to say the least, extremely unlikely that the sex difference would not appear whichever was used. Direct proof, however, is not lacking. The Scottish investigators retested a sub-sample of 1,000, using the Stanford-Binet scale. A certain lack of randomness in the sampling complicates interpretation, but it was shown that the difference is clearly apparent on the Binet scale also.

My colleagues and I used a different verbal group-test, the advanced Otis, in our survey of school-children at Bath, as described in a series of papers (Roberts *et al.*, 1935, 1937, 1938a, 1938b; Roberts, 1940). Our results are as follows:

Difference in Mean Performance between Boys and Girls

	No.	Mean
Boys	1,742	100.743
Girls	1,606	99.790
Difference = 0.953 ± 1.187		

Difference in Variance between Boys and Girls

	No.	Variance
Boys	1,742	1296.38
Girls	1,606	1066.26
Difference = 230.12 ± 53.75		

Just as in the Scottish survey, there is no significant difference in mean performance but a very large difference in variability, this being 4.3 times its standard error.

As regards the sampling, it has already been mentioned that the Scottish group was carefully selected; such bias as there was could not affect the magnitude of the difference materially, and in any event would tend to diminish and not to increase it. The Bath group is, of course, much smaller, but even greater care was taken to ensure completeness. The aim was to ascertain and test every child whose time of birth fell between certain dates, and whose home was within the boundaries of the city on a given date. As described in the papers quoted, this aim was very nearly attained.

It can be safely concluded, therefore, that any good test of general intelligence applied to any good sample will show the

* All calculations in this paper on the Scottish survey results are based on the tables given on pages 61 and 62.

difference in dispersion between the sexes; boys and girls do not differ in mean performance, but boys are quite certainly more variable.

Size of the Difference

The reality of the difference between the sexes has been demonstrated, but the available information permits us to take the further step of making a useful estimate of its magnitude. How much more variable are boys than girls? The ratio of the variances in the Scottish survey is (using Sheppard's adjustment for grouping) $245.414/217.272 = 1.130$. Boys are therefore 13% more variable than girls.

The numbers included are large enough to provide a high degree of accuracy of estimation. The odds are 1 in 20 that the true value lies outside the range 11.2 to 14.7%; they are 1 in 100 that the true value lies outside the range 10.7 to 15.2%. These limits are, however, once again subject to the provisos: on this test and in this sample.

In the Bath experiment the ratio of the variances is $1294.30/1064.18 = 1.216$. Boys are thus 21.6% more variable than girls; but as the numbers are smaller than those of the Scottish survey the limits of error are much wider. The odds are 1 in 20 that the true value lies outside the range 11.7 to 31.5%, and 1 in 100 that it lies outside the range 8.6 to 34.6%. The results of the two surveys do not conflict significantly.

There are several factors which point to the conclusion that the Scottish figure is somewhat too low.

1. *Errors of Measurement.*—Verbal intelligence tests have relatively high reliability, and it is unlikely that the elimination from the variances of that part which is due to errors of measurement would raise the figure from 13% to more than about 14.5; nevertheless, such effect as there is must have lowered the difference between the sexes.

2. *The Composition of the Sample.*—Sampling was not quite complete, and a relatively small loss at the extremes would lower the difference appreciably. The Bath survey, in which the sampling was practically complete, does in fact indicate a higher value.

3. *The Nature of the Test.*—Good tests of general intelligence measure something which shows a wider dispersion among boys than among girls. It could reasonably be anticipated that different scales, highly though they all intercorrelate, vary somewhat in their efficiency in measuring that something; it is also to be expected that they contain in varying degree extraneous elements displaying no difference between the sexes. To say more would be pure speculation, but it can fairly be concluded that any given test will be imperfect, and to the extent that this is so the sex difference will be reduced.

Reviewing the available evidence, one might make two estimates of the amount by which the variability of boys exceeds that of girls. The most likely figure is perhaps about 17%. Because of the important practical consequences that follow, however, it seems preferable to select a conservative value—one which we can feel is almost certainly not too high. In view of the factors which must have tended to lower the ratio found in the Scottish survey, the figure of 13% would seem to provide this safe minimum.

Consequences of the Difference

The estimation of the difference has been considered in some detail. It is an important figure because we are unlikely to obtain a better one for a good many years to come. The dislocation of populations in most countries will make the task of sampling too difficult; and even in the United States it will be a long time, in all probability, before investigators can turn their attention to a new survey on an adequate scale. As we have seen, the figure of 13% for the greater variability of boys is conservative; it is extremely unlikely to be too high, though it may well be somewhat too low.

Accepting this figure, we can calculate the ratio of boys to girls in different portions of the range of intelligence. In the middle of the distribution—among, say, the 80% of persons nearest to the mean of the whole population—the disproportion is relatively small; but outside these limits it becomes considerable, and increases as more extreme fractions are considered. Thus the brightest 10% of boys are matched by 8.65% of girls; similarly for the dullest 10%. The brightest (or dullest) 5% are matched by just over 4% of girls. Beyond the level which cuts off the brightest (or dullest) 1% of boys there

are three boys for every two girls. Beyond the extreme limits which cut off at each end of the scale one boy in every 1,000 boys, boys are twice as numerous as girls. Table I shows the percentage (or number per 10,000) of girls who correspond in intelligence to the brightest or dullest 10%, 9%, etc., of boys.

TABLE I

Cleverest (or Dullest) Boys per 10,000 Boys	Number of Girls of Corresponding Mentality per 10,000 Girls	Boys per 100 Girls
1,000	865	116
900	770	117
800	676	118
700	583	120
600	492	122
500	402	124
400	314	127
300	228	132
250	186	134
200	145	138
150	105	143
100	67	149
70	45	156
50	31	161
30	17.4	172
20	11.1	180
10	5.1	196

The comparison can be made in a different way. In a population composed of equal numbers of each sex how many boys and how many girls will be included in the brightest or dullest 10%, 9%, etc., of children of both sexes? These comparisons are given in Table II.

TABLE II

Cleverest (or Dullest) Children (%)	Numbers included per 10,000 (5,000 of Each Sex)		Boys per 100 Girls
	Boys	Girls	
10.0	534	466	115
9.0	483	417	116
8.0	432	368	117
7.0	380	320	119
6.0	328	272	121
5.0	276	224	123
4.0	223	177	126
3.0	169	131	129
2.5	142	108	132
2.0	115	85	135
1.5	87	63	138
1.0	59	41	144
0.7	42.2	27.8	152
0.5	30.6	19.4	158
0.3	18.8	11.2	168
0.2	12.7	7.3	174
0.1	6.5	3.5	186

What will sometimes be of interest is not the relative proportions among all those lying beyond a given limit, but among some section of that group. For example, one might wish to know the proportions of boys and girls in that portion of the range lying between the 90th and 95th percentiles—i.e., the children who are brighter than 90% of the population and duller than 5%. Any such figures can be obtained by difference from Table I or II. Thus from Table II the 500 children out of each 10,000 who lie between the 90th and 95th percentiles will be composed of $(534-276) = 258$ boys and $(466-224) = 242$ girls—a proportion of 107 boys to 100 girls. Table III shows some examples for successive portions of the range.

TABLE III

Successive Portions of Brightest (or Dullest) 10%	Number per 10,000 (5,000 of Each Sex)		Boys per 100 Girls
	Boys	Girls	
90-95	258	242	107
95-98	161	139	116
98-99	56	44	127
99-99.5	28.5	21.5	133
99.5-99.8	17.9	12.1	148
99.8-99.9	6.2	3.8	163
99.9+	6.5	3.5	186

Space does not permit the provision of graphs from which could be read off the proportions in any part of the range. It is hoped, however, that Tables I and II give enough detail to provide immediate answers to most practical questions.

Proportions deduced on the assumption of equal numbers of boys and girls, as in Table II, will be only slightly in error if applied to populations showing the sex ratios commonly encountered.

The consequences of the sex difference in regard to such practical matters as the planning of accommodation are evident. If, for example, it were decided that a particular kind of secondary education was to be provided for the brightest 10% of children, the allocation should be for 10.7% of boys and 9.3% girls. If facilities for a particular type of higher education were to be offered to the cleverest 5%, this should comprise 5.5% of boys and 4.5% of girls; if the figure for another purpose were 2%, the allocations should be 2.3 and 1.7. If university scholarships of some special kind were available for 1% of the population, we should expect, if performance were proportional to mental endowment, to find a ratio of 3 boys to 2 girls among the successful candidates. If, following Galton, we term the one person in a thousand of surpassing intelligence a "genius," we can expect to find that at this level men are nearly twice as numerous as women.

It should be stated, however, that while there is some risk of allocating to girls too high a proportion of special educational facilities, there is no risk at all, certainly not for many years to come, that opportunities for adult achievement will be available for women on too generous a scale. It will be sufficient to quote Terman (1940). More than 20 years ago he initiated the researches embodied in successive volumes of *Genetic Studies of Genius*. An attempt was made to include the most gifted Californian children of their time; the sample of some 1,400 corresponded to about one-half of 1%. A follow-up after 16 years was designed to discover what use had been made of these outstanding gifts. So little chance on the average had the girls had, however, that Terman was forced to confine his analysis to the boys. It would probably be true to say that the greatest reservoir of unused high intelligence in our community is to be found in its female population, and that this loss is not exceeded by that due to any other cause, not even excepting social and economic handicaps.

At the other end of the scale, the dullest section of the population, matters are somewhat more complicated. The first complication is due to the occurrence of idiots and imbeciles: These are not to be regarded as part of the normal distribution of intelligence; they are the pathological dwarfs of mental stature, and have been excluded from the calculations of this paper. Their frequency is about 4 per 1,000 among children of school age. The figures in the tables therefore include only those mental defectives who correspond more or less to the feeble-minded group. To these figures must be added the 40 per 10,000 idiots and imbeciles; among them, too, there is some excess of boys, though for different reasons.

The second complication relates to the concept of mental deficiency, which implies a failure in social adjustment rather than simple intellectual retardation. Of those who on account of mental backwardness are potentially certifiable only a minority are in fact certified or need to be certified. Thus the provision for boys and girls respectively in colonies for mental defectives cannot be deduced simply from the distribution of intelligence levels. To mention two important differences between the sexes which affect certification, there are the illegitimate babies born to the girls and the greater tendency of the boys to come into conflict with the law.

With these reservations, which do not affect the provision of purely educational facilities for the backward, we may consider the effect of the difference between the sexes in dispersion of intelligence. Say, for example, it were decided that special schools (or certification under the Mental Deficiency Acts) should be provided for the dullest 5% of children, and that facilities for special teaching were desirable for the next 5%, then the allocations for this second less-dull group should be 5.2% for boys and 4.8% for girls. Suppose that the next 4% were regarded as suitable for special schools, then these would need to provide accommodation for boys and girls in the ratio of 13 to 11. If the lowest 1% are regarded as equivalent to those feeble-minded children whose backwardness is such that they may require certification (all these figures, of course, are selected simply as hypothetical examples), then there will be included in this fraction 3 boys to 2 girls.

Nature and Origin of the Difference

It is inconceivable that anything in our educational system could be responsible for a big difference in variances combined with an identity of means. It is almost as difficult to imagine that such an effect could be due to any differential influences operating during pre-school life. The source of the difference in variability between the sexes must therefore be inborn; I doubt whether any other possibility would occur to educational psychologists.

It can be concluded that the difference is almost certainly genetic, but beyond that the little that can be said is pure speculation. We know that the heterogametic sex—that characterized by the XY-chromosome pair—diverges more from the common pattern than does the homogametic sex possessing two X-chromosomes. Thus in mammals (the opposite is true in birds), if males are castrated early in life, then development is greatly modified and in bodily characteristics they tend to resemble the female rather than the male. On the other hand, early castration of the female produces much smaller changes. The male is the more highly specialized form, and the higher death rate at practically all ages may be an indication of the cost that this entails. Is a greater dispersion a consequence of the greater specialization? I am not aware of any clear indication of this in regard to physical measurements. For example, Pearl (1940) lists a large number of coefficients of variation. Using this criterion, 60 studies which included both sexes show that males were more variable in 29 instances, females in 31. Of course, in physical measurements interpretation is greatly complicated by the difference in means; it is the identity of the means which makes the analysis so straightforward in the case of general intelligence. Is it to the advantage of the species that in regard to intelligence males should be more and females less variable? It may be so, though it is difficult to see why.

There is little to be said, therefore, except that the difference exists; that a reasonable estimate can be made of its extent; that the practical consequences are of considerable importance; and that the difference, whatever may be the underlying reasons for its existence, is almost certainly genetic. It is to be hoped that future studies will reveal in more detail the mental qualities in which the sexes differ in variability, together with those in which they do not. The study of mental growth may well be facilitated by using our knowledge of this curious phenomenon.

Statistical Appendix

The fitting of the normal curves to the data for the boys and girls of the Scottish and Bath surveys is shown in Table IV.

TABLE IV.—Fitting of the Normal Curves, Scottish and Bath Surveys

	Scottish Survey		Bath Survey	
	Boys	Girls	Boys	Girls
n	44,210	43,288	1,742	1,606
s ₁	176,867	172,767	36,144	33,016
s ₂	819,755	787,189	840,216	747,194
s ₃	4,145,957	3,896,169	21,061,212	18,163,630
s ₄	22,252,871	20,448,001	558,389,232	467,905,502
s ₅	112,179	97,658	90,280	68,454
S ₁	-31,132	-25,110	-118,420	-11,662
S ₂	653,926	531,877	12,173,174	8,426,730
k ₁	4,000.61	3,991.11	20,748.6	20,557.9
±	0.007,576.0	0.007,219.2	0.172.53	0.162.96
k ₂	2.537.5	2.256.0	51.855	42.651
±	0.013,746	0.012,895	1.574.1	1.464.2
k ₂	2.454.1	2.172.7	51.772	42.567
k ₃	-0.704.23	-0.580.11	-68.097	-7.275.1
k ₄	-4.523.9	-2.981.4	-1064.60	-197.46
k ₅	-4.515.5	-2.973.1	-1064.59	-197.45
g ₁	-0.183.18	-0.181.14	-0.182.81	-0.026.20
±	0.011,649	0.011,773	0.058,638	0.061,066
g ₂	-0.749.74	-0.629.80	-0.397.19	-0.108.97
±	0.023,298	0.023,545	0.117.21	0.122.06

Notation: Fisher's *Statistical Methods* (1941).
Units of Grouping: Scottish Survey, 10 points score; Bath Survey, 5 points
Units I.B.

In the published tables of the Scottish survey, the grouping is coarser than is desirable; the effect of this should not be serious, however, and the deductions to be drawn are very unlikely to be materially affected.

A further point about the Scottish figures is that raw scores have been used, uncorrected for age differences. The range of

age was 12 months. Trial shows, however, that the variation due to differences in age is very small indeed compared with the variation between children at fixed age. Furthermore, owing to a (non-significant) difference in the regressions, the ratio of the variances when adjusted for age variation does not differ, up to the number of figures used in this paper, from the ratio calculated using the raw scores. Accordingly it seemed simpler to avoid this complication.

The all-important point is the normality of the distribution of general intelligence, for upon this assumption depend any further deductions. It is well known that the frequency distributions yielded by any good intelligence scale are substantially normal. Group-test results, however, are apt to show departures, especially at the extremes. This is to be expected, for in a group test the same set of questions is used for all children, and even at the optimum age of 11 the test tends to be either too difficult to sort out the very dull at one extreme, or not difficult enough to sort out the very bright at the other; both effects are often seen simultaneously. It will be observed that there is a moderate degree of negative skewness in the frequencies of the Scottish survey—this applying to both sexes. This is also true of the boys in the Bath survey; very poor results on the advanced Otis scale, however, were less numerous among the girls, and the tendency to artificial bunching together is so little marked among them that the skewness is negligible. All the distributions are leptokurtic; this is doubtless to be attributed to a failure to spread out the children efficiently at both ends of the scale. Once again the Bath girls show a smaller departure from normality than do the boys.

There is reason to suppose, however, that these departures from normality are due to the construction of the tests and not to any underlying departure from normality in the distribution of general intelligence—at least, until very extreme limits are reached. Well-designed individual scales, which provide for each child a series of tests adapted to its mental abilities, would probably reveal a closely normal frequency curve. The Bath group provides evidence in regard to the lower end. In this group the duller children on the Otis scale, amounting to about 23% of the whole group, were retested individually on the Stanford-Binet scale, as described in the fourth paper of the series dealing with the Bath experiments (Roberts *et al.*, 1938b). There was no significant departure from normality down to an I.Q. of about 45, which is three and a half standard deviations from the mean—a point outside the range discussed in this paper.

Convincing, even if indirect, evidence regarding the other extreme is provided in Vol. 1 of Terman's *Genetic Studies of Genius* (1925). The figures in Chapter 3 seem to me to give a clear indication that we are taking no undue risk in basing our calculations on the assumption of normality up to the 0.001 point. Terman's whole group of 1,444 included 831 boys and 613 girls, or 136 boys per 100 girls. Terman estimated that his group was about 0.5% of the population sampled. Using the estimate of this paper, the expected number of boys per 100 girls among the brightest 0.5% is 158. Apart from the fact, however, that the brightest 0.5% could not be separated off with complete efficiency, there was undoubtedly bias in the sampling, as is discussed at some length by Terman. In the light of present knowledge it seems clear that this must have minimized the difference considerably. To give one example, private schools were omitted; and if the effect of this is the same in the United States as it is in this country, it would lead to a heavy disproportionate loss of bright boys.

It is the differences within the sample itself, however, which provide the convincing evidence. Stanford-Binet I.Q.s are given for 1,024 children. Dividing them according to I.Q., the results are as follows:

Stanford-Binet I.Q.	Boys	Girls	Boys per 100 Girls
144-...	221	207	107
145-154	206	172	120
155+	132	86	153

Results are also given for 370 children found at high schools. The overall proportion of boys is much higher, but, once again, within the group the disproportion increases with rising score.

Terman Group-test Scores	Boys	Girls	Boys per 100 Girls
194-...	83	53	157
195-204	122	53	230
205+	46	13	354

Whatever the effect of bias in sampling, therefore, upon the composition of the whole group, it is evident that within this highly selected sample of very gifted children the disproportion in numbers of boys and girls increases sharply as intelligence rises, exactly as would be deduced if the consequences of normal dispersion hold up to these extreme limits.

The observed distributions of the group-test results are quite markedly leptokurtic. This has a substantial effect on the variance of the variances; accordingly the estimates of the fourth cumulants have been used in calculating these.

If two series of measurements having the same mean but different variances are added together it is impossible for all three distributions to be strictly normal. Even at the 0.001 point, however, this leads to a discrepancy of only 3%, so that the values of Tables I and II are not appreciably affected.

Summary

It is one of the most curious facts in human biology that in regard to general intelligence boys should be considerably more variable than girls. This is all the more remarkable because there is no difference in average performance. Girls tend to be grouped closer to the mean for the whole population, boys to spread further out into extremes either of brightness or of dullness. Not much can be said as to the nature and origin of the difference except that it is almost certainly inborn. The available data, however, leave no room for doubt as to its reality; furthermore, they are sufficient to yield a tolerably close estimate of its size. Adopting a conservative figure, it is found, for example, that the brightest (or dullest) 1,000 children in every 10,000 will be composed of 534 boys and 466 girls; the brightest (or dullest) 100, of 59 boys and 41 girls. At the extreme limits considered, the brightest (or dullest) boy in every 1,000 boys will be matched by only one girl of similar mentality in every 2,000 girls. The consequences in regard to planning both for the bright and for the dull are of considerable practical importance. Tables are provided from which can be read off the corresponding proportions of boys and girls to be expected in different portions of the 10% at either end of the range of mentality.

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There is not to be any change in the superannuation provisions for nurses and midwives in the service of local authorities, but a separate fund is to be set up for those in the employment of voluntary hospitals and approved organizations where the Rushcliffe and Taylor salary scales have been adopted. This is, briefly, the main recommendation of the joint subcommittee for England and Scotland, which has been considering superannuation for nurses and midwives (Cmd. 6603, H.M. Stationery Office; 9d.). All nurses and midwives to whom the Fund applies must belong, but those who are now contributors to the Federated Superannuation Scheme may elect to remain in it. [This latter scheme, which came into operation for voluntary hospitals in 1928, will remain available for nurses outside the scope of the new Fund, such as those in private practice.] Provision is made for interchangeability with local government schemes, and the benefits recommended under the new fund are on a similar basis: minimum qualification for a pension to be ten years' contributing service; retirement compulsory at age 60, with the option of retiring on or after 55 on completion of thirty years' service; pension to be based on the average salary and emoluments of the last five years of service and to be at the rate of 1/60th for every year of contributing service, subject to a total maximum of 40/60ths of such average service; pensions to be payable on permanent incapacity on the same basis as for age, with a minimum of 20/60ths and subject to the completion of ten years' contributing service; all salaried service since joining the Federated Superannuation Scheme to rank as contributing service.