In placing major and minor genes on an equal footing, Mr. Dufton has failed to realise the modest rôle played by modifiers in a genetical formula. Had he worked out the formula, he would have discovered that the 729 genotypes produce only seven different kinds of effective gametes, so that the formula is not so complex as he imagines and is thus more effective in predicting the inheritance of intelligence than he realises.

The statement that the special non-segregating families have parents of any grades is obviously incorrect. Reference to Tables II, IV, VII and IX of my paper shows that each non-segregating family has a Grade 5 parent, since it is these that are being tested.

It is suggested that the non-segregating families are merely a product of the system of grading and that if mediocrity had been divided into six grades instead of one, there would have been no non-segregating families. An examination of the tables of data shows that this inference has no foundation in fact. So far as the non-segregating families are concerned, it is immaterial whether mediocrity is graded in six grades or one; the fact remains that they produce mediocrity only and no higher or lower grades of intelligence. So far as the segregating families are concerned, the grading of mediocrity in six grades would produce in Tables III, V, VI, VIII, X and XI an aberrant and abnormal frequency curve making the results unintelligible both statistically and genetically.

After many years' trials and tests in my investigations of the Leicestershire families, I found it impossible to divide mediocrity into grades with any certainty. On the other hand, it was usually easy to distinguish the adjacent higher and lower grades from mediocrity since they differed in kind rather than in degree. The intelligence quotient (*I.Q.*) tests of children carried out also confirmed this discontinuity of mediocrity. For these reasons, Woods's ten grades were adopted and his data utilised, the eleventh, grade 0, being added as a necessary sequence of the formula.

It is realised that, like other scientific formulæ, the present formula is only tentative, representing as it does the present state of knowledge. But it is basic and it is clear that no simpler formula would cover the present data. Human intelligence is not so simple a matter as Mr. Dufton would have us believe, and it is now too late to attempt to account for its inheritance on the basis of a single Mendelian difference.

The alternative suggestion that forty grades would be quite as useful, may be nearer the truth than Mr. Dufton imagines, although the facts available do not warrant such a conclusion. Further research with more refined and precise methods of grading will no doubt increase the number of grades and the number of minor genes concerned. It is doubtful, however, whether any subdivisions of the present grades would affect the basic discontinuity between stable *NN* mediocrity and *nn* higher unstable and lower grades.

Recent research indicates that more important developments may be expected from a comparative study of the modifying genes for general intelligence (Spearman's *g*) and those for the special faculties (Spearman's *s*). There is evidence, for example, that the modifiers of general intelligence (*nn*) also act as modifiers of musical ability (*mm*), and the question arises whether these same modifiers also act as modifiers of other special faculties.

Cambridge. C. C. HURST.
April 6.

A Possible Property of the Positive Electron

THE detection of the positive electron (called positron) by Blackett and Occhialini[1] and by Anderson[2] makes it very probable that the positron has a great importance in the building up of nuclei. Anderson[2] suggests that the proton may consist of a neutron and a positron. In favour of this hypothesis we may mention the experiments of Stern (still unpublished), who found that the magnetic momentum of the proton is three times greater than it should be if the proton were to behave like an elementary particle in Dirac's theory. Following Heisenberg[3], both the proton and the neutron obey Fermi statistics and have a half integral spin momentum. This leads at once to the conclusion that, if the hypothesis of Anderson is true, the positron should obey Bose statistics and have an integral spin momentum (0 or 1). If this view should be confirmed by other experimental evidence we should understand better why the positrons can only be found in nuclei; for, since positrons have symmetrical wave functions, they can always be placed in the deepest energy levels. It seems to be an advantage of the proposed hypothesis, that contrary to Dirac's theory of 'holes'[4] an essential asymmetry between positive and negative electricity is introduced into the laws describing the behaviour of elementary particles. Since the light-quanta also have whole number momenta, it seems that it may be a general rule, that symmetrical wave functions are combined with integral momenta and anti-symmetrical wave functions with half integral momenta.

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Zürich. April 25.

[1] *Proc. Roy. Soc.*, **139**, 699; 1933.
[2] *Phys. Rev.*, March, 1933.
[3] *Z. Phys.*, **77**, 1; 1932.
[4] *Proc. Roy. Soc.*, **126**, 360; 1932.

Recent Magnetic Disturbances

A VERY notable magnetic disturbance—the greatest recorded at Stonyhurst for more than four years—occurred on April 30–May 2, the greatest movements being between noon and midnight on May 1. The 'storm', as it may fairly be called, began with a typical 'sudden commencement' at 16h. 27m. G.M.T. on April 30, when declination suddenly fell 2′ and then rose 6′, whilst horizontal force fell 36γ followed by a rapid rise of 75γ. No important movements followed until about 21h., when a 'bay' formed in both *D* and *H*, lasting about four hours, after which conditions were quiet until about 13h. on May 1, when the greatest movements began to manifest themselves, and the disturbance ended almost as abruptly as it began at about 1h. on May 2. The range in *D* was 60′ and in *HF* 436γ, ranges which have not been exceeded since 1929 Feb. 27–28.

It is noteworthy that there had been no spots on the visible hemisphere of the sun since April 21, when a small but active group, which passed the central meridian on April 20, died out. If this spot group is in any way associated with the magnetic disturbance, on the theory of emission from the sun of particles which reach the earth's atmosphere, the time of transmission of these particles, presumably emitted when the disturbed area was on or near the