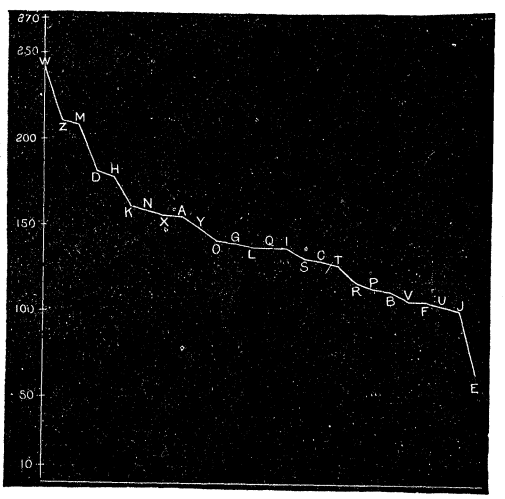
importance to relieve them by using the printed symbols which can be read with the least effort and strain. Experiments are not necessary to show that books (especially school-books) should be printed in large, clear type; but experiments may lead us to determine the most favorable type. It seems probable that the use of two varieties of letters, capital and small, is more of a hurt than help to the eye and brain. All ornaments on the letters hinder: consequently the German type is injurious. The simplest geometrical forms seem the easiest to see. The lines must not be too thin. We seem to judge the letters from the thick lines, and it is doubtful whether it is advantageous to use thin and thick lines in printing. From all these considerations, it seems that our printing-press has not improved on the alphabet used by the Romans. "Our punctuation-marks are hard to see, and, I think,



quite useless. It seems to me far better to replace (or, at all events, supplement) them by spaces between the words, corresponding in length to the pauses in the thought, or, what is the same thing, to the pauses which should be made in reading the passage aloud. Such a method of indicating to the eye the pauses in the sense would not only make reading easier, but would teach us to think more clearly.

"As I have already stated, not only are some types harder to see than others, but the different letters in the same alphabet are not equally legible." It was found that certain letters were usually correctly read, whereas others were usually misread or not seen at all. Fifty-four series were made with the capital Latin letters: consequently each letter was used 270 times. Out of this number of trials, *W* was seen 241 times, *E* only 63 times. The relative legibility of the different letters is clearly shown in the figure, in which the ordinates are taken proportional to the number of times each letter was read correctly out of the 270 trials.

Certain letters, as *S* and *C*, are hard to recognize in themselves; others are mistaken for letters similar in form, as in the case of *O*, *Q*, *G*, and *C*. The great disadvantage of having in our alphabet letters needlessly difficult to see will be evident to every one. "If I should give the probable time wasted each day through a single letter, as *E*, being needlessly illegible, it would seem almost incredible; and, if we could calculate the necessary strain put upon eye and brain, it would be still more appalling." Now that we know which letters are the most illegible, it is to be hoped that some attempt will be made to modify them. Our entire alphabet and orthography need recasting: we have several altogether useless letters (*C*, *Q*, and *X*), and there are numerous sounds for which no letters exist. In modifying the present letters, or introducing new forms, simplicity and distinctness must be sought after, and experiments such as these will be the best test.

"Experiments made on the small letters show a similar difference in their legibility. Out of a hundred trials, *d* was read correctly 87 times, *s* only 28 times. The order of distinctness for the small letters is as follows; *d*, *k*, *m*, *q*, *h*, *b*, *p*, *w*, *u*, *l*, *j*, *t*, *v*, *z*, *r*, *o*, *f*, *n*, *a*, *x*, *y*, *e*, *i*, *g*, *c*, *s*. As in the case of the capital letters, some letters are hard to see (especially *s*, *g*, *c*, and *x*) owing to their form; others are misread, because there are certain pairs and groups in which the letters are similar. A group of this sort is made up of the slim letters *i*, *j*, *l*, *f*, *t*, which are constantly mistaken the one for the other. It would not perhaps be impossible to put λ in the place of *l*, and the dot should be left away from *i* (as in Greek). It seems absurd, that, in printing, ink and lead should be used to wear out the eye and brain. I have made similar determinations for the capital and small German letters, but these should be given up. Scientific works are now generally printed in the Latin type, and it is to be hoped that it will soon be adopted altogether. At present, however, it is impossible to get the books most read (Goethe, for example) in Latin type."

BLONDES AND BRUNETTES IN GERMANY.

WITHIN the last few years the German government has authorized a commission, at the head of which is Professor Virchow, to collect statistics in

the interests of anthropology on the relative proportions and geographical distribution of blondes and brunettes in the German empire. Before the Anthropological congress at Carlsruhe, Professor Virchow gave an account of the results of these observations, illustrating his remarks by diagrams. An account of the study, together with the illustrations, will appear in full in Germany.

The study included all children of school age throughout Germany. Those only were classed as blondes who had light hair, blue eyes, and a fair complexion. The brunettes included those who had black hair and eyes, though the complexion might be more or less fair. All others were classed as mixed, including those with gray eyes. It is to be regretted that the same method was not followed in Belgium, where similar studies had been in progress, so that a direct comparison could be made.

Thirty-two per cent, or almost a third of the German youth, are blondes; 14 per cent are brunettes; while all the rest, 54 per cent, must be classed as mixed. This mixture is not a homogeneous one, but includes all intermediate varieties. One class of the German population forms a decided exception to these averages, viz., the Jews. Jewish children show only 11 per cent of blondes, but 42 per cent of brunettes. Their greater purity of race is shown by the small ratio of the mixed class amongst them. The blond type is particularly prevalent in Oldenburg and the neighboring more northerly communities: it is rarest in eastern Bavaria and in Alsace. A canton (Wildeshausen) in Oldenburg has 56 per cent of its population blondes, while Roding, a town in the second group, has only 9 per cent, a difference of 47 per cent. The former has only 4 brunettes to each 100 inhabitants, while a southern town in Alsace has as many as 31 to 100. The distribution of the blond type is much wider than that of the brunette type, which is only a secondary type. A canton in Wurtemberg shows the largest ratio of the mixed class, 60 per cent, while Pomerania shows the smallest, 40 per cent. The same contrast between the north and the south is shown in Belgium and in Switzerland. In southern Austria the brunette type is especially marked, but here the mixture with the Slavic people adds a complication.

What is the origin of this dark race amongst the Germans? Ancient writers describe them as having fair hair and eyes. One can assume that the immigrating races were of two types,—blondes and brunettes. But this would not account for the present geographical distribution, or perhaps a gradual transformation has taken place: this is improbable, because the climatic and other differences between north and south Germany are not sufficient to bring about such marked differences. The true explanation is suggested by the large proportion of the mixed class. The Germans were blondes, and spread to the east and south as such; but in Switzerland and Alsace they encountered a dark race, which was not expelled, but forced a mixture with the conquering race. The gray eyes are an indication of this great mixture of types, and not a mark of a third type. The questions regarding the brunette type must be resolved into a series of secondary problems connected with the general development of all the types. It must also be remembered that the characteristics by which the Germans have been described are not peculiar to them, but are common to other anthropologically different nations, of which the Finns are an example. Professor Virchow expressed the opinion that a comparative study of this question in different European nations would be of great importance.

DEFORMITIES OF BONES AMONG THE ANCIENT PERUVIANS.

NEARLY fifty years ago Dr. v. Tschudi, in the disinterment of a number of Indian graves in the vicinity of Lima, found one containing the parts of three skeletons, in which the bones showed peculiar deformities, due to disease. The graves were near the famed temple of Pachacamac; and from the position, as well as the associated objects, Tschudi determined them to belong to one of the earlier epochs of the Incas, in the thirteenth century of the Christian era. From the accounts given by the native Indians, Tschudi learned of other graves, farther south, in which numerous skeletons with similar deformities had been found, and from which he concluded that persons thus afflicted had been buried together, as has been more recently done with the bodies of those dying from cholera.

These specimens were studied a few years later by Zschokke, who found the deformations so different from those produced by other known causes, that he pronounced the disease a new one. Very recently, however, the bones have come under the examination of Professor Virchow,[1] who has determined the cause to have been the affection described under the name of 'multiple exostosis.' This disease is one of the rarest known, and has only been recently studied and described. It is due to abnormal development, and appears most frequently near the ends of the long bones, resulting in remarkable growths, sometimes as

[1] Ueber krankhaft veränderte knochen alter Peruaner, von Rud. Virchow, *Sitzungberichte d. k. preussischen akad. d. wissenschaften*, 1885, p. 1129.