3. A waving line, which denotes *nasal* emission.

4. A line closing the curve, which denotes *stoppage* of the breath.

The letter thus says to the reader: —

Stop the breath by means of the lips, and sound the voice through the nose.

It must be obvious that such directions, conveyed without words, will be uniformly interpreted by readers of any nationality who have simply learned the meaning of the radical symbols. All the Visible-speech letters are formed in this way, by synthesis of two or more out of a total number of nine elements. Such letters, consequently, make up an alphabet adapted for universality, because independent of explanatory language; also because its symbols are physiological pictures, and because the writing, even of unheard foreign tongues, is self-explanatory to the reader's eye.

Visible speech was first published sixteen years ago (August, 1867); and it has been very generally studied by philologists, and adopted in theoretical works as a necessary exponent of linguistic phonetics. It has also been widely utilized in America for the teaching of articulation to the deaf. But its popular uses for the teaching of vernacular languages to children and illiterates, and of foreign languages in schools and colleges, as well as for the literation of hitherto unwritten Indian and other tongues, have not yet been correspondingly developed. People generally do not take the trouble to investigate the nature of the characters, but suffer themselves to be repelled by fancied difficulty, — as if what is strange must needs be difficult. But the difficulty is only to eyes unacquainted with the principles of the symbolization. When these are known, there is no comparison, in point of simplicity, between Roman letters and Visible-speech letters. To children and illiterates, all letters are equally strange. To one who can already read, the eye is simply prejudiced in favor of established letters. In the present exposition the *letters* of Visible speech have not been made the basis of illustration, but only the rudimentary symbols from which all the letters are derived. This mode of treatment will, it is hoped, leave no room for prejudice to act.

In this stage of the world's history we do not need to concern ourselves about a universal language: that will develop itself in due time. But a universal medium for the communication of languages is a practical necessity, which every day renders of more and higher importance. Without a universal alphabet there never could be a universal language; with a universal alphabet the progress of the fittest language towards universality will be enormously accelerated. At present, English seems the most likely to achieve this distinction; but its natural fitness is antagonized by its defective and irregular system of letters. Give English the advantage of an alphabet simple and phonetically perfect, and, whereas it is now the most difficult of all tongues for foreigners to learn, it will become by far the easiest.

In the system of Visible speech a universal alphabet is for the first time attained: the system is of English birth. Let its native language have the benefit of this instrument of diffusion, and the world-wide predominance of the speech of Britain and America will be assured. A. MELVILLE BELL.

LETTERS TO THE EDITOR.

Variations in butterflies.

BETWEEN the 20th of June and the 10th of July, I obtained three hundred and eighty Vanessa Antiopa from caterpillars fed on swamp willow. Twenty-five of these were varieties, and the balance were of the usual form. Two of the varieties were Lintneri, from which all the blue had disappeared. The third had the primaries Lintneri, while the secondaries had the usual blue spots. The fourth had the secondaries Lintneri, while the primaries bore the blue spots. In the remaining twenty-one, the whole upper surface of the wings had a mottled appearance, showing that the colors had been disturbed. They retained the blue spots, but the spots were much smaller than usual.

The veins in the twenty-five varieties remained soft for several days; not becoming firm and hard, like the veins in the others, although treated in the same manner. I have also found this softness of the veins in the varieties of Turnus, where the red is suffused, and in the rust-colored specimens.

All the Vanessa Antiopa which I have seen this season have the yellow of a much deeper shade than I have ever before noticed.

Colias Philodice is also remarkable this season in this respect. S. LOWELL ELLIOT.

New York City, 3d August, 1883.

Function of the colorless blood-corpuscles.

The interesting abstract of Zawarykin's important investigations into the function of the leucocytes in the absorption of fats from the intestinal canal (SCIENCE, ii. **192**) calls to mind an investigation by Franz Hofmeister, into the absorption and assimilation of the peptones, which will be of interest in connection with the abstract referred to.

In a series of papers published in 1881, Hofmeister[1] comes to the interesting conclusion, that "absorption of peptones in the intestinal canal is, accordingly, no simple mechanical process of diffusion or filtration, but is rather a function of particular living cells, the colorless blood-corpuscles; and these play, in the nutrition of the organism, a similar rôle to that of the red corpuscles in respiration."

In his discussion he calls attention to the presence

[1] Zeitschr. phys. chem., v. 151.

of the leucocytes, in great numbers, in the adenoid tissue during digestion; and, also, to certain proofs of the ability of the leucocytes to combine with peptones in a loose form of combination.

The similarity of these two functions of the colorless corpuscles, as determined by Hofmeister for peptones, and by Zawarykin for fats, cannot fail to suggest the probability of a very definite and important function of these corpuscles in general nutrition. Possibly, also, the anomalies observed in the absorption of saccharine food, and in the glycogenic functions of liver and muscles, may in time receive some explanation through the functions of the colorless corpuscles.

It seems as if we were, at last, beginning to obtain an idea of the functions performed by these important cells, whose close connection with the life of the organization has been generally recognized, though but vaguely understood. J. M. S.

HUMAN PROPORTION.

Human proportion in art and anthropometry: a lecture delivered at the National museum, Washington, D.C. By Robert Fletcher, M. R. C. S. E. Cambridge, *King*, 1883. 37 p. illustr. 8°.

From the earliest ages, man has found his standards of measurement most conveniently in some bodily measure, like the digit, the palm, the span, the foot, or the cubit. As these measures necessarily vary with the size of the individual, the attempt to ascertain their average led to the first systematic measurements of the human body: hence have sprung the innumerable schemes of human proportion devised by artists and anatomists, all founded on the belief that some one part of the body was a standard of measurement for all its other dimensions. The Egyptians first developed a canon of proportion as early as the thirty-fifth century B.C., which was twice subsequently changed. Their last canon adopted the length of the middle finger as the standard, reckoning it precisely one-nineteenth of the entire stature. But in the 'canon of Polykleitos,' the famous sculptor who flourished about 450 B.C., was embodied the highest rule of Greek art in its most flourishing period. This has fortunately been preserved in a well-known passage of Vitruvius, and is illustrated by a recently discovered drawing by Lionardo da Vinci. The restless spirit of modern life has not remained content with this, as more than a hundred different attempts bear witness by men of all nations, including the celebrated English sculptor Gibson and our own Story. All these methods have been based upon the theory that there is a fixed relation between some one portion of the body and all its other dimensions; and their number proves the fallacy of the idea. Anthropometry, on the other hand, measures with the strictest scientific accuracy the living man, and from an immense mass of measurements obtains the mean of the human form, and thus arrives at the perfect human type. The father of this science is the Belgian Quetelet, and the enormous number of measurements rendered necessary by the draft during our civil war have greatly advanced it. By its tests many a time-honored dogma bearing upon human proportion has been exploded. Thus it has been proved that the length of the outstretched arms is somewhat greater than, and not exactly equal to, the height of the body; that not eight, but seven and a half heads make up the entire stature; and that only in the negro skeleton can be found the length of humerus bestowed upon the Apollo Belvedere.

All these matters the author has illustrated with great learning and in a clear and animated style. We have noticed, however, that his knowledge of archeology is sometimes at fault, — as where he calls the '*crux ansata*' in the hand of the Egyptian standard figure 'a key,' which is really a cross with a loop or handle attached to it, and is the symbol of eternity; or suggests that the 'golden fleece' was in reality 'the secret of Egyptian art;' or states that the Doryphoros of Polykleitos was 'a beautiful youth in the act of throwing a spear,' instead of its being one of the 'spear-bearers,' the body-guard of the Persian king. The most marvellous statement, however, is, that "prior to the time of Phidias, the face, hands, feet, or other exposed parts of the body were carved in marble, and fastened to a wooden block, which was covered with real drapery." This is a complete misunderstanding of the nature of the archaic ξόανα, or wooden statues, which in Greece preceded those made of stone or metal.

WARE'S MODERN PERSPECTIVE.

Modern perspective: a treatise upon the principles and practice of plane and cylindrical perspective. By William R. Ware, Professor of architecture in the School of mines, Columbia college. Boston, *James R. Osgood & Co.*, 1883. 321 p. 12°.

Professor Ware's Modern perspective is in substance a series of papers printed two or three years ago in the *American architect*, but with additions which extend its range, and give it more the scope of a scientific treatise. Scientific it is, both in its idea and its methods; though its treatment is naturally freer than would be given it for scientific uses alone, — freer, perhaps, than the author would have given if it had originally been written as a formal