the conditions of life." Was not this a prophet? Yea, I say unto you and more than a prophet! Of course if the conditions of life are unfavourable, the incipient variations cannot become species. But surely it is obvious that in *variation* is the real *origin* of species. Variations must occur before the selection of some of them in preference to others. To consider the theory of natural selection as a theory of the origin of species, is therefore clearly an error. In his "Origin of Species" Darwin certainly expounded variation, and I might have ventured to think that as the book deals more largely with the subsequent selection of a few varieties to survive as species at the expense of many extinguished, a more exact title for it would have been "The Evolution of Species." But what says the great master? See page 71 :—"Owing to this struggle for life, any *variation*, however slight . . . will tend to the *preservation* of *that individual*, and will generally be inherited by its offspring. . . . I have called this principle by which each slight *variation*, if useful, is *preserved*, by the term natural selection, in order to mark its relation to man's power of selection." And who will not recognize the wisdom of his selection of the term? It has been before observed that the "*Ascent* of Man" would seem a more accurate title than the "*Descent* of Man." But I have no doubt that his reasons for preferring the latter were equally cogent.

But Mr. Romanes proceeds :—"This proof is drawn from three distinct heads of evidence. (1) The inutility to species of a large proportional number of their specific characters. (2) The general fact of sterility between allied species, which admittedly cannot be explained by natural selection, and therefore has hitherto never been explained. (3) The swamping influence of even useful variations of free intercrossing with the parent form." I have advanced, I think, ample reasons why No. 3 may be regarded as imaginary, and which therefore reduce the value of No. 2 to a minimum. No. 1 depends entirely upon the definition of "*utility*." Has this word any real significance outside human interests and considerations? The idea of utility, if extended to Nature's operations, may, it seems to me, apply to the interests of any other variation than the one whose specific characters are in question, which may therefore be, without compunction or regret, sacrificed to the most fit, as we know that innumerable species have been extinguished in the interest of those that supplanted them. But utility to Nature may be the extinction of one variation and the preservation of another. As Mr. Romanes's whole paper is built upon what I have already quoted from it, I need scarcely follow it any further. With your permission, however, I have another remark to make.

Mr. Romanes seems to me to have been much exercised by the consideration of the intercrossing with parent forms, and, not knowing of the simple solution given above, to have cleverly invented his physiological selection to escape from the dilemma. Of course Nature is not clever, but simple in its operations. I was always much impressed with what appeared to me a greater difficulty, which might be thought to have a clearer title to be called "physiological selection." I allude to a general tendency in the (human at least) sexes to prefer a mate with opposite characteristics, with the apparent result of insuring mediocrity in the progeny. Thus, as a general rule, the tall prefer the short; the dark, the fair; the wise, the silly; &c., and *vice versâ*. Variation is, on the other hand, apparently insured to a large extent by the differences between parents, but still it would seem that the tendency should, *cæteris paribus*, be inevitably towards a mean in the progeny. The general migration, however, as above indicated, of young males and females, gives plainly ample opportunity for the preservation of viable variations, besides others which experience and care will doubtless discover.

Melbourne, April 11. H. K. RUSDEN.

Weight, Mass, and Force.

APPLICATIONS of the data previously given, in the extract from the American journal, to the dynamical principles of varied motion are easily provided for Mr. Hayward. Take the following: "Determine the weight of the greatest train the Strong locomotive can take up a 96-feet grade from rest at one station to stop at the next station a mile off in four minutes, taking the brake power as a resistance of 400 lbs. to a ton."

The main points at issue, however, are whether the language of the engineer, and in fact the usage of our own and other languages, is scientifically correct or incorrect in its use of the words *weight* and *weighing*; and whether the mathematician is to be allowed to restrict the word weight to the subsidiary sense of force of attraction by the earth.

It is of great importance that this question of dynamical terminology should be thoroughly thrashed out now, before Mr. Hayward's Committee on Dynamics, of the Association for the Improvement of Geometrical Teaching, prepare their final report on the subject. A. G. GREENHILL.

Woolwich, July 11.

The Sky-coloured Clouds.

ON the evenings of June 14, 18, and 19 there was a feeble reappearance in Sark of the sky-coloured clouds, as I may call them in default of a better name, which were so brilliant in the twilights of the last two summers. Though the display this month has been comparatively faint, it has been unmistakably of the same character. I have seen nothing of these clouds since the 19th in travelling in the Channel Islands and through France.

Geneva, June 29. T. W. BACKHOUSE.

P.S.—*Chamounix, July* 13.—I have seen one more display—a brilliant one seen from this neighbourhood on the 6th inst.—T. W. B.

The Migrations of Pre-Glacial Man.

THE question raised by "Glaciator" has been treated by me in a paper entitled "The Faunas of the Ffynnon Beuno Caves and of the Norfolk Forest Bed" in the *Geological Magazine* for March 1887. I there stated that, "Although man probably reached this country from the east, it seems to me equally clear that he must also have arrived here with the reindeer from some northern source during the advance of glacial conditions." Though the Norfolk Forest Bed fauna contains abundant remains of deer and of other animals suitable as food for man, it is curious that so far no implements or other traces of man have been found there. The Forest Bed contains in the main the fauna of an eastern area, as the river on the banks of which the animals roamed flowed from the south-east. If pre-glacial man arrived in this country from the east or south, we should therefore expect to find evidences of this in the Forest Bed. On the other hand, wherever the remains of northern animals, such as the reindeer, mammoth, and rhinoceros, occur in any abundance, there we almost invariably find traces of man. Now that we know that man arrived in this country before the climax of the Ice age, as proved by the explorations carried on for several years at the Ffynnon Beuno Caves (amply confirmed also by this year's researches), it seems but natural to infer that man arrived in this country with the northern animals as they were compelled to migrate southwards by the gradually advancing glacial conditions, and that he kept mainly with the reindeer near the edge of the advancing ice. HENRY HICKS.

ABSTRACT OF THE RESULTS OF THE INVESTIGATION OF THE CHARLESTON EARTHQUAKE.[1]

I.

THE amount of information now in possession of the United States Geological Survey, relating to the Charleston earthquake, is probably larger than any of similar nature ever before collected relating to any one earthquake. The number of localities reported exceeds 1600. The sources of information are as follow: (1) we are deeply indebted to the U.S. Signal Service for furnishing us the reports of their observers; and (2) equally so to the Lighthouse Board, which has obtained and forwarded to us the reports of keepers of all lighthouses from Massachusetts to Louisiana, and upon the great lakes; (3) to the Western Union Telegraph Company, which instructed its Division superintendents to collate and transmit many valuable reports; (4) to the associated Press, which has given us access to the full despatches (with transcripts thereof) which were sent over the wires

[1] Paper read before the National Academy of Sciences at Washington, on April 19, 1887, by C. E. Dutton, U.S.A., and Everett Hayden, U.S.N., U.S. Geological Survey.