Mr. Worthington speaks as if we were anxious to do away with a student's familiarity with force as a push or a pull. This shows that he does not appreciate our position.

I even venture to assert that in what he says concerning mass and inertia he is not so absolutely clear in his own mind as it is desirable for a reformer to be. May I suggest to him that the "inertia" or "inertia-reaction" of a lump or mass of matter—that which is measured in an experiment, and the only thing that can be measured in an inertia experiment—is $m\frac{dv}{dt}$; and that the coefficient of the otherwise measurable kinematic factor in this quantity is properly called "the coefficient of inertia," but is, for brevity, styled "mass," and is taken as a measure of the quantity of matter in the body, because, experimentally, it is found to be absolutely unalterable by every physical and chemical process except those which change the amount of matter in the lump. Fancy making our standard of quantity of matter depend upon the approximately determined gravitative attraction of some arbitrarily selected planet at some arbitrarily selected spot near its present surface!

Sometimes, indeed, m is briefly called merely "inertia," just as the coefficient $\frac{V-V^1}{C}$ in Ohm's law is for brevity styled "resistance"; but the full names of these quantities are "coefficient of inertia" and "coefficient of resistance," respectively. In the case of friction the full name is usually given. With junior students it is clearest to give the full names in every case; just as it is much clearer with them to avoid the misleading abbreviation specific heat, and to use the full phrase specific capacity for heat. OLIVER J. LODGE.

Liverpool, January 14.

A Hare at Sea.

AMONG the notes published in NATURE for December 27, 1888, is an account of a hare swimming across a river; perhaps the following account of a hare taking to the sea may be of interest. In October 1887, I was a member of a shooting party staying near Auchencairn on the Kirkcudbrightshire coast, where for miles the waves of the Solway beat on red sandstone cliffs, broken here and there by small bays, where the burns run down to the sea through little glens. One day I had left the others and was standing among the seaweed-covered boulders of such a bay, when the sounds of a course reached me from a hill-side a quarter of a mile or more away, and presently I saw hare and greyhounds coming down to the shore; they ran close past where I was standing, and then to my astonishment the hare deliberately entered the water and swam out to sea.

I could not persuade the greyhounds to follow, though one was so close that, if she had done so at once, she could have caught the hare without swimming, as the latter was out of her depth directly and swam very slowly. The sun was shining very bright on the water, and it soon became very difficult to keep the hare in sight, as her head only showed now and then on the top of a wave, and about a hundred yards from shore I saw her for the last time, though I stayed about the place a long while.

This hare was perhaps hard pressed, still I could see no reason why she should not have run along the shore to the march dyke, which was close to, and where she would probably have made good her escape. W. J. BEAUMONT.

Sandiway, Northwich, January 13.

THE ARTIFICIAL REPRODUCTION OF VOLCANIC ROCKS.[1]

ORIGINALLY, the study of the crust of the earth was purely utilitarian: it seems to have been at first forced upon man by the necessity of exploring the strata in order to extract metallic ores, constructive materials, and combustible minerals.

To anyone who glances at the history of the sciences, it becomes evident that they all owe their origin to some useful and practical aim, and that from this initial phase they have passed through a regular development: this progress, so far as geology is concerned, I shall proceed to sketch.

Man, then, commences to explore the depths of the earth in order to extract the materials which may minister to his wants. At first he works without rule; but as the miner's art is developed, method is introduced into the search for mineral wealth, and he observes the conditions under which useful minerals and rocks occur in the bosom of the earth. These observations, at first merely empirical and local, gradually become generalized, and thus lead to a recognition of some of the leading features in the architecture of our planet. On digging into the earth, it soon becomes evident that the world was not made at a single stroke, but owes its formation to a succession of epochs.

It follows, therefore, that, in order to interpret the history of the earth, and the operation of the agencies which have taken part in its formation, it is necessary to study the living world, and to investigate the present condition of our planet. In comparing the various strata of the earth with the deposits which are in course of formation under our own eyes, we realize the conditions which have presided at the formation of the stratified rocks of ancient geological periods. It is thus that, by the analysis of facts, and by induction which generalizes the observations, our knowledge of the crust of the earth enters on a new and truly scientific phase. We start by attempting to discover practical rules for the guidance of the miner, and we are gradually led to decipher the history of the earth.

In this reconstruction of the past history of our planet we are guided by a fundamental principle—namely, that the essence of the forces which have acted upon the earth has never changed. We ought, then, to seek in geological epochs for traces of only such phenomena as are of the same nature as those which we can witness to-day, and submit to direct observation.

Since geologists commenced, towards the close of the last century, to apply the inductive method to the study of the mineral masses which form the crust of the earth, to their architecture, and to the organic remains embedded in the rocks, a vast collection of documents has accumulated, bearing upon the history of our planet. During this period, Geology has made such immense progress that she need not envy the older branches of natural science.

Let us see how, in applying this analytical method and relying on induction, geology interprets the formation of the rocks. Rocks, we know, are the solid mineral masses which constitute the earth's crust. Observation teaches us to recognize two groups. The first are characterized by an arrangement in beds or strata: these are the sedimentary rocks. The second group, which does not present this stratified arrangement, comprises rocks of volcanic character, with a massive structure. These differences in the structure and composition of the two great lithological groups lead us to regard them as having been formed under special conditions, which have left their imprint upon each group.

We see the sedimentary rocks in the course of formation when we observe how detrital matter is rolled about by stream and wave, and how such waters deposit pebbles, sand, and mud upon their beds. After the death of the organisms which inhabit these waters, their skeletons or their shells become mingled with the mineral deposits, and with them build up sedimentary masses. The minerals so deposited assume, by successive accumulation, a stratified arrangement. All their constituent particles were originally isolated grains, and still retain traces of their origin: they are either the *débris* of pre-existing rocks or organic exuviæ, which, by physical and chemical processes, may become subsequently consolidated.

Let us now compare these modern sedimentary deposits, characterized by a stratified arrangement, and

[1] A Lecture delivered in French at the Royal Institution, on Friday, May 18, 1888, by M. Alphonse Renard, LL.D., Hon.M.R.S.E., Corr.G.S., Curator of the Royal Museum, Brussels. Translated by F. W. Rudler.