publication, Dr. Johnston-Lavis has added one more to the long list of valuable services which he has rendered to geological science.

Les Sciences Naturelles et l'Éducation. Par T. H. Huxley. Édition Française. (Paris: Baillière et Fils, 1891.)

THIS is a translation of various essays with which all English students of Prof. Huxley's writings have long been familiar. Most of them deal with various aspects of the question as to the true place of science in a proper system of education; and no one who has read them in their original form is likely to have forgotten the philosophical power with which the subject is discussed, or the admirable lucidity, strength, and grace of the writer's style. With his educational papers Prof. Huxley has associated his well-known essays on Descartes and Auguste Comte, which cannot fail to be of interest to French readers. He contributes to the volume a short preface, in which he refers with satisfaction to the astonishing advance that has been made in the recognition of science as an instrument of education. He warns men of the younger generation, however, that the battle has only been half won, and that much serious work will have to be done to secure the triumph of the principles for which he has contended. Of the translation it may be enough to say that Prof. Huxley cordially commends it as a faithful rendering of his thought.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

W. E. Weber.

IN the article on Wilhelm Weber (NATURE, July 9, p. 229) no mention is made of the fact that Weber and Gauss in 1833 invented and constructed a telegraph connecting the Physical Laboratory of the University in Göttingen with the Observatory. In Germany they are for this reason said to be the inventors of telegraphy. This is, to say the least, a somewhat sweeping statement, as the possibility of communicating by electricity was known long before that time. However, there is no doubt that Weber and Gauss played some part in introducing telegraphy into practice. For my part I consider the purely scientific work of either of the two men more glorious. For the enormous practical consequences of telegraphy have nothing to do with the scientific merit of the invention. Nevertheless I think that an article on Wilhelm Weber would not be complete without entering into this subject.

C. RUNGE.

Hanover, Technische Hochschule, July 13.

[Conducting wires were erected between the Göttingen Observatory and the Physical Cabinet of the University, distant about three-quarters of an English mile, in order to obtain accurate comparisons of the clocks. But, in addition to systematic daily transmission of time, the wires were from the first frequently used for telegraphic purposes, though, with the first arrangements, only two letters could be sent in a minute.—G. C. F.]

Earthquake Shocks in Italy and Australia.

BY a telegram from London, which appeared in the newspapers here on the 12th and 13th inst., information is given of a severe earthquake in Italy (about Vesuvius) on June 7 (Sunday). On that day, several distinct and well-marked shocks were felt over parts of the south of Australia, and as there may be some connection between these seismic disturbances in both hemispheres, I give below the times and other information of the disturbances experienced here.

None of the disturbances reported in Australia seem to have been more than a "shake" or *sharp tremor* sufficient to shake windows and rattle crockery, &c., but they were enough, in some instances, to produce feelings of nausea.

June 7, at 2.5 p.m., the first disturbance occurred, and was felt all around Melbourne and over a surrounding area of 360 square miles.

June 7, at 2.45, another shake (not so great as the first) was also felt; in this case it was felt most severely to the east of Melbourne.

June 7, at 7.20, smart shock felt at Kapunda, South Australia. June 7, at 6.45, slight shock felt at Stockport, South Australia. The direction of motion is variously given as from north-west to south-east, south-east to north-west, and south-west to north-east, north to south, south to north, &c. The conclusion arrived at is that the wave was from south to north nearly. The approximate geographical positions of the several localities where these disturbances occurred are as follows:—

	Lat.	Long.
Stockport	34 21 S.	138 57 E.
Kapunda	34 21 S.	138 46 E.
Melbourne	37 50 S.	144 58 E.

Melbourne, June 15.

R. L. J. ELLERY.

P.S.—It is quite probable the shocks felt at Kapunda and Stockport were one and the same, as time is not very strictly kept in districts distant from large towns in Australia.

Force and Determinism.

I SEE nothing to criticize in Mr. Dixon's middle paragraph, wherein he accurately summarizes some of the definitions of mechanics, except that I should prefer to express the meaning of his last sentence by saying that, if in any department something simulated the functions of, say, energy, without obeying its precise mechanical laws, then the distinction between energy and that something should be clearly recognized, and another name be given to it.

I find it rather common for "life" to be thought of and classed under the head energy, either by the use of a phrase such as "vital energy," or in a more direct way; the reason being apparently that organisms while living simulate some of the functions of energy, and cease to do so when dead. It was against this confusion that I wrote on p. 491 (vol. xliii.).

Life has not yet been included in the domain of physics, neither has it, so far as I am aware, been much studied under the head biology.

And yet the disturbing action of live animals will have to be formulated and attended to some day, even in physics; for, though they generate no energy nor affect its amount in the slightest degree, they certainly control it and direct it in channels it would not otherwise have taken. The question is, How do they manage this? And one answer that may be given is, By exerting directive or guiding forces on matter.

Of course they are not limited to this, but in so far as they do work their action is fairly understood: the energy displayed by a gang of navvies is known to be derived from the little tin cans they bring with them: the energy is not theirs but their victuals', they simply direct it. But how comes it that they can direct the energy of victuals and atmosphere into the erection of the precise bridge or other structure which has been planned? What determines the direction of the transfer of energy?

The same question may doubtless be asked in connection with inanimate activity: I would not be understood as assuming for certain any clear or essential difference between the two cases; but in neither case do I know the answer.

The action of force in doing work, *i.e.* transferring and transforming quantities of energy, has been thoroughly attended to.

The action of force in directing and guiding the transfer of matter and energy does not seem to me to have been seriously contemplated.

In his most recent book ("The Philosophical Basis of Evolution") Dr. Croll attacks the problem, and says that guidance is effected by "determinism" not by force. But that cannot be admitted; for without force the motion of matter cannot be changed in direction any more than in speed. Force is certainly necessary to direct the motion of matter, it is energy only which is unnecessary; for any transfer of energy that may occur is an accidental, not an essential, concomitant.

I determine to move an object: it may be only my finger, or it may be a wheelbarrow. In so far as I do any work in the action I do so at the expense of my food, and there is nothing but a chemical difficulty about that. The mystery begins when one