*nearness*, and I propose to take as the law of repulsive force, the *cube of the nearness*. I think I am justified in taking this as the true law of repulsion of atoms of matter, because I find from the researches of eminent chemists that all free gases do so expand as to double their bulk by an increase of the distance of the particles, in the ratio of the cube of their nearness, or as 111 cube to 367." Then the theory of heat that is put forward appears to be a kind of material theory: "We may therefore define heat as *the effort of ether to resist crowding*. . . . Ether existing all around us in a normal state may be called *free ether*. Ether enclosed by force in limited space surrounded by material atoms is imprisoned or stored ether; its greater or less degree of crowding or storing means degrees of heat, and the quantity of crowding among the atoms indicates the specific heat of these atoms, and sometimes the specific heat of that kind of matter."

One more extract and we have done:—"Even Sir Isaac Newton's calculations of the speed of sound fell 100 feet short of the truth, and therefore corresponded to an error of a mile in the height of the atmosphere, and he could invent nothing better to account for the error than this sudden inflammation of the atmosphere. To this the reply is that the existence of the solitary wave of translation was not known to Newton, that the nature of its genesis and propagation could not therefore be calculated; but that present knowledge of the nature and laws of this wave completely explain and accurately measure its phenomena without the introduction of any hypothesis contradicted by fact."

We have said enough to show the character of this treatise, and we will conclude by repeating that we are sorry to see a posthumous work by so eminent a man as the late Mr. Scott Russell, containing nothing more to justify its publication than a reprint of his well-known, and imperfect, views in 1843, upon wave motion, and a fanciful interpretation of great physical laws. It is a pity that greater skill and discretion were not brought to bear upon the production of this volume.

## OUR BOOK SHELF

*Publication of the Norwegian Commission of the Measurement of Degrees in Europe.* (1) Geodetical Operations, Part IV. (2) Tidal Observations, Part III.

THE first of these publications contains an account of the northern portion of the trigonometrical work undertaken to connect the side Stokvola-Haarskallen with the side Spaatind-Næverfjeld. The former side is directly connected to the base measured in 1864 near Levanger, as described in Parts I. and III. of the "Geodetical Operations."

A trigonometrical survey of this part of the country had already been made in 1835-6 by Gen. Broch, and it was at first hoped that this survey could be utilised, but on closer investigation it was found that the observations were not of sufficient precision to meet the requirements of the Commission for the Measurement of degrees in Europe, for which this work was to a great extent undertaken. The old stations were, however, utilised in the northern part of the triangulation; there the signals were well-built masonry cylinders. In the southern portion, however, the stations had in many cases entirely disappeared and had to be reconstructed. A careful description of each station is given, and in every case, with one or two exceptions, the signal could not be placed at the centre of the station; the usual measurements for reduction were therefore made, and apparently with more than usual care. The observations were taken with a 10-inch universal instrument made by Olsen and with a 12-inch theodolite made by Reichenbach. It would appear that the graduation of these instruments is not of a very high order; at any rate, the differences in the readings are rather large, frequently exceeding 10″: but in extenuation it must be said that the instruments were too small for the work and that the observations were made under considerable difficulties, owing to sea-fog and snow. There is nothing special to remark in the method adopted to adjust the observations, it being the usual method founded on the principle of least squares. It is shown that the mean error of the finally-adjusted angles is

$$0''{\cdot}547 \pm 0'{\cdot}029.$$

A diagram of the triangulation is given, from which it is seen that most of the triangles are well-conditioned; a few, however, are more elongated than they should be for good work, the triangle Munken, Stokvola, Haarskallen, especially so; for instance, the angle at Munken is 5° 12′ 57″·416. It should also be observed that several of the stations are determined by only two intersections. The longest side measures about sixty miles.

The second publication is the third report of the Norwegian tidal observations, and contains the results of the work done at Oscarsborg in 1880-1 and at Stavanger, Bergen, Kabelvaag, and Vardö in 1883. This report is simply a continuation of Reports I. and II., already noticed in NATURE; it contains nothing but tables, and there is nothing in it that calls for special notice.

## 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. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

### On the Influence of Wave-Currents on the Fauna of Shallow Seas

FOR many years past I have endeavoured, without much success, to call attention to the widely-spread influence of waves on the bottoms of shallow seas. To the geologist this action signifies denudation, and accounts, among other things, for the wholesale destruction of marine fauna so often exemplified in the rocks. To the zoologist it signifies a factor in evolution of immeasurable magnitude.

On seeing the abstract of Prof. Moseley's lecture on the fauna of the sea-shore in NATURE, I troubled you with my letter of July 6; now that the full report has appeared, equally reticent as to the significance of wave-currents, I ask leave to add somewhat to my former letter.

The difficulty in arousing interest in this subject arises from the fact that, though the phenomena of wave-disturbance are well known to mathematicians, natural history text-books commonly agree in asserting either the non-existence, or unimportance, of such disturbance. Thus the question has remained unheeded.

My own experience in the matter is as follows:—Holding the orthodox view of the peaceful repose existing on the sea-bottom, I commenced cruising, some twenty years ago, on that excellent natural experimental tank, Torbay. I soon found, to my surprise, that the local fishermen and dredgers were as confident that the waves greatly disturbed the bottom as naturalists were of the reverse. Having kept my eyes open in this direction, I submitted a paper to the Devonshire Association in 1878, descriptive of the levelling action of the waves on the six-fathom area of Torbay (*Trans. Dev. Assoc.*, vol. x. p. 182).

With the kind assistance of Lord Rayleigh I was enabled to show that theory and observation were in complete accords a