

Reymond is not infallible, and most prophecies as to the limits of human knowledge have turned out to be only limits to the ingenuity of the prophet. It is very much more likely that Du Bois Reymond's apparently resistless logic has a flaw, than that the path of progress of science for three hundred years has been along the wrong route. There are plenty of philosophical speculations, which no doubt Du Bois Reymond brushes aside as hardly worth consideration, which would entirely invalidate the greater part of his arguments. Even though they do not, it is certainly quite unscientific to leave a road that has led to great discoveries merely because you imagine that there is some curious spectre in the distance to which you think it is leading you.

Prof. Ostwald's fourth attack is based on the fact that seeds grow into trees, but that trees do not grow back again into seeds. He thinks that if the universe were a mechanical system, there is no more reason for one than the other, and that they should occur equally often. As he says, "the tree could return again to the sapling, &c." But that is not the question. The question is, *must* it, if this is a mechanical universe. The order of events depends entirely, in a mechanical universe, upon the *initial conditions*, and all we can say is that the initial conditions of this earth were such that trees generally grow from seeds, and that the reverse operation has never been known to occur. That it *has* never occurred has nothing on earth to say to the question of whether this is a mechanical universe. As a matter of fact, I believe that this and other much simpler cases, such as are usually classed under irreversible actions in thermodynamics, can be shown to be not only, as I have here argued, *possible* mechanical processes, but to be *the most probable* mechanical processes. Hence it is quite possible that the actual sequence of events which Prof. Ostwald cites as disproving the mechanical theory of the universe may be the very best proof extant, not only that the mechanical theory is the most probable

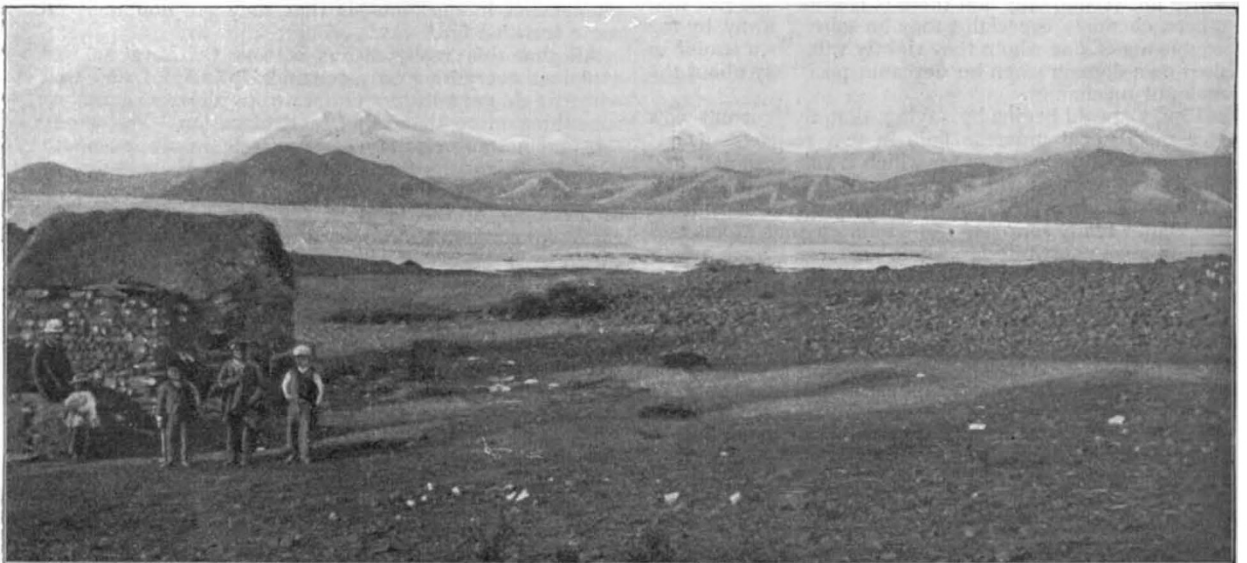
from those dreadful hypotheses. He prefers volume energy to the molecular theory of gases. He criticises this latter by neglecting to see that the quantity often quoted as energy per cubic centimetre of the gas is really momentum per second carried across a plane, and has consequently that very element of direction which he accuses it of not possessing, and the absence of which in volume energy one might possibly expect him to explain. Prof. Ostwald's idea of science as free from hypothesis is the most advanced form of pure positivism. If he were consistent, he should deny the existence of thought in the moving coloured, soft, objects he sees and feels around him, and calls men. That other men think is a hypothesis; and if he rejects all hypotheses, why not this?

In conclusion, Prof. Ostwald seems to have some dim doubt whether energetics will explain everything. As the doctrine of the conservation of energy will not determine by itself the motion of even a single planet round the sun, it is somewhat curious to see the doubt that seems to haunt him in answering this question. The doctrine of the conservation of energy is most valuable, but it goes only a very little way in explaining phenomena. More than energetics is certainly required unless we are prepared to endow energy with all sorts of curious properties after the manner of our predecessors, who used to invent a new subtle fluid with convenient properties in order to explain every new difficulty. Prof. Ostwald's energy seems more like one of these subtle fluids than any product of modern thought.

GEO. FRAS. FITZGERALD.

THE HIGHLANDS OF PERU.¹

THE two first volumes of this work were noticed in NATURE, vol. li. p. 388, and the general remarks made there apply in great measure to the new volume also. We must, however, observe that the highlands of



The Andes from Chililaya, Lake Titicaca

theory, but it may even lead us to conclude that it is the only possible theory.

Finally, Prof. Ostwald tries to build up something instead of what he thinks he has demolished. A vague energetics is what he presents instead of the mechanics of the past. He advocates the deadly view that science should be a catalogue, well arranged, no doubt, but free

Peru afford material for a much more interesting description than the coast and the capital, which were dealt with in somewhat wearisome detail. Here the narrative form is not unwelcome, for there is always a charm in the

¹ "Beobachtungen und Studien über das Land und seine Bewohner während eines 25-jährigen Aufenthalts." III. Band. Das Hochland von Peru. Von E. W. Middendorf. Pp. 604. (Berlin: Robert Oppenheim [Gustav Schmidt], 1895.)

record of travel in the Cordillera, even upon the beaten tracks.

A short general introduction gives some account of the Andes as a whole, with remarks on the characteristic scenery, on the roads, the methods of travelling, and a few pages on the vegetation. Then follows the description of a series of four journeys through different parts of highland Peru, with observations drawn from official sources regarding some places not personally visited, such as the Amazon territories and the Bolivian coasts of Lake Titicaca. The first journey led over the Cordillera Negra and the Cordillera Blanca in Central Peru to Huanuco and the famous mining town of Cerro de Pasco, 4350 metres in elevation, with great silver-mines tunnelled into the mountains. The best room of the best hotel in this loftiest town in the world was found in such a condition that Dr. Middendorf could not say whether its floor was of tiles, mud, or boards, and he hailed the invitation of the Scotch engineer in charge of the mines as a happy deliverance.

The second journey was in the northern part of the republic, from the seaport of Pacasmayo by Cajamarca to the Marañon valley and Chachapoyas, returning across the Cordillera by Huanachucho to Trujilla. A short account of the Amazon province of Loreto is added, and an historical narrative of the discovery and exploration of the Amazon.

The third journey was a visit to the great plateau-lake of Titicaca, with many particulars regarding the ancient ruins of the Inca time. The concluding section, on the mountains of Southern Peru, describes the return journey down the long valley to Cuzco, and thence over the Cordillera past Ayacucho to Lima.

Throughout the work there are happy descriptions of the native peoples, the scenery, and the incidents of the journey. Dr. Middendorf seems to have paid considerable attention to linguistic studies, and also to the architecture of the ancient ruins. He especially remarks the contrast between the mud-huts, or dwellings built of sun-dried bricks, which characterise the arid coast-strip, and the megalithic masonry of the lofty plateaus and high mountain valleys.

The illustrations throughout are extremely well chosen, really illustrative of the natural features of the great Cordillera, and they are numerous enough to satisfy the most exacting. An index to all three volumes completes the work.

SEKIYA SEIKEI.

ALL students of seismology and vulcanology will learn with regret that Prof. Sekiya has passed from amongst us. He was born towards the end of 1855, a year well remembered by the inhabitants of Yedo as that of the great earthquake. In 1876, whilst on a visit to England to complete his studies as a mechanical engineer, he fell a victim to consumption, the symptoms of which gradually grew more and more severe until January 9 of this year, when they culminated in his death.

After acting as assistant to Prof. J. A. Ewing, in 1886 he was appointed to the newly-created chair of Seismology at the Imperial University of Japan.

A lasting testimony to his ingenuity and perseverance, which is to be seen in many museums, is a model illustrating the path followed by an earth particle at the time of an earthquake. Although he wrote much in Japanese, he contributed many valuable papers and memoirs in English or French to the journal issued by his own college, to the *Transactions* of the Seismological Society, and to other periodicals.

The impetus he gave to seismology by the enlargement of the University Laboratory, the establishment of

instruments throughout Japan, and to the extension of the seismic survey of that country, which now boasts of 968 stations, is well known to his colleagues and acquaintances. Sekiya was a kind and sincere friend, and his honesty and unflinching straightforwardness of speech were a by-word amongst all who knew him. J. M.

NOTES.

PROF. J. J. SYLVESTER, F.R.S., has, with the approval of his Majesty the King of Italy, been elected a Foreign Member of the Royal Academy of Sciences of Turin.

A NUMBER of admirers of Prof. Mittag-Leffler, the founder of the *Acta Mathematica*, will shortly present him with a congratulatory address, written in four languages—German, French, Italian, and English—and expressing the appreciation of mathematicians of the services he has rendered to their science. It is proposed to present him at the same time with his portrait in oils, and a subscription list has been opened to obtain funds for that purpose. Prof. Appell, 6 rue Le Verrier, Paris, will be glad to receive subscriptions.

SIR J. RUSSELL REYNOLDS has expressed his intention to retire shortly from the Presidency of the Royal College of Physicians.

THE Chairman of the Local Committee for the Toronto meeting of the British Association for the Advancement of Science is Dr. A. B. Macallum.

AT the ordinary meeting of the Royal Meteorological Society, on Wednesday next, a lecture will be given by Mr. Frederic Gaster, on "Weather Forecasts and Storm Warnings, how they are prepared and made known."

A LIVE gorilla, said to be the largest ever imported into this country, has just been received at the Zoological Gardens, Regent's Park. The animal comes from near Ngove or Iquela, on the French Congo, and is in excellent health.

THE De Morgan medal, which is given triennially by the London Mathematical Society, will be awarded in June next, and nominations may be made at either the March or April meetings of the Society. Prof. Klein, of Göttingen, editor of the *Mathematische Annalen*, was the last recipient.

THE Paris correspondent of the *Times* states that a tablet commemorating Franklin's residence at Passy, then a village outside Paris, was unveiled on Sunday in the wall of the Christian Brothers' School, Rue Raynouard. M. Faye, of the Academy of Sciences, and M. Guillois, a local antiquary, delivered addresses.

SIR W. M. CONWAY proposes to take a party to Spitzbergen next summer, for the purpose of exploring the interior. He expects to be accompanied by Mr. Trevor-Battye, and by four others, all of them scientific experts in different branches, so that the journey may result in valuable increase to scientific knowledge.

WE regret to announce the deaths of Mr. James Abernethy, past-President of the Institution of Civil Engineers, and a Fellow of the Royal Society of Edinburgh; Dr. Alfred D. Kennedy, a distinguished chemist and toxicologist, of Philadelphia; Dr. H. Ernest Goodman, Professor of Surgery in the Medico-Chirurgical College, Philadelphia; Dr. R. M. Hodges, Professor of Surgery at Harvard; and Christophe Negri, the Italian economist and geographer.

THE second International Horticultural Exhibition will be held at Dresden, from May 2 to 10 next, under the patronage of