

extension of the spectroscopic field into the ultra-violet and infra-red. In the old tables the limits of the spectra were practically 394 and 670, whereas in the new ones the lines range from 204 to 770. Spectroscopy has also advanced in another direction. It was formerly believed that each substance had its own characteristic spectrum, from which there was no departure; but subsequent researches have shown that the spectrum does not entirely depend upon the substance under examination, but also upon the conditions of temperature and pressure. In the old tables, for example, only one spectrum of oxygen was recorded, but now no less than three are given. Hydrogen, again, has now two spectra recorded, and nitrogen three, including Hasselberg's important observations.

The wave-lengths given in Ångström's "Spectre Normal du Soleil," with a few small corrections, are still taken as the standards for reduction. The tables printed in the Reports of the British Association Committee form the basis of the new edition, but there are also many important additions. One new feature is the addition of a column giving oscillation frequencies, in number of waves per centimetre *in vacuo*, which will no doubt be appreciated most by investigators of the molecular origin of spectra. Tables of the spectra of various compounds, such as ammonia, alumina, and other oxides, chlorides, iodides, &c., and water, are also given. The different substances are arranged alphabetically as in the old edition, and at the head of each there are full references to books and memoirs. The introductory matter has also been considerably expanded, and now forms an excellent guide to spectroscopic scales and methods of mapping. The use of a lens to throw an image of the light source on to the slit, a method which has yielded many valuable results, is, however, unfortunately omitted. The book will be heartily welcomed by all who are engaged in spectroscopic work, and no recommendation of ours is necessary.

A Text-book on Steam and Steam-Engines. By Prof. Andrew Jamieson, M.Inst.C.E. (London: Chas. Griffin and Co., 1889.)

WE welcome with pleasure the fifth edition of this work. Few engineering text-books are intelligible to the average student. Many writers, in dealing with even the simplest engine or mechanical contrivance, completely fog the reader's understanding by the undue use of mathematics and abstruse formulæ. The volume before us is the best yet published for use in the engineering classes at our schools and colleges. Prof. Jamieson has treated the subject in a sensible and useful manner; his examples are worked out as simply as possible; and the descriptions throughout the work are those of a practical man who knows his business.

The new edition contains many extensive and important additions both to the text and illustrations. The chapter on locomotives has been considerably enlarged and improved. An express-engine built by Messrs. Dubs and Co., the eminent Glasgow locomotive builders, is taken as an example, and many well-executed scale-drawings are given as illustrations. Even with these additions the chapter does not do justice to this important branch of engineering, and Prof. Jamieson must not overlook the fact that he has many locomotive engineer apprentices attending his Glasgow classes. The few paragraphs on the compound locomotive are decidedly weak. Mr. Webb's compound locomotive "The Experiment" is excellent ancient history, no doubt; but why not describe the more recent Webb compounds, or, better still, the Worsdell and Von Borries two-cylinder compounds, now doing such good work on the North-Eastern and many foreign railways?

N. J. L.

LETTERS TO THE EDITOR.

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An Unusual Geological Sequence.

IN a late expedition to the north-west coast I have come upon evidence of a fact which was quite new to me—namely, that the well-known Cambrian red sandstones of Ross and Sutherland do not always rest upon the Archæan gneiss, but occasionally on dark blue stratified rocks with which the sandstones are perfectly conformable. For many years I have been familiar with the ordinary sequence, according to which the Cambrian or "Torridon" sandstones rest unconformably on the Archæan gneiss with nothing interposed between them. Nowhere in Sutherland, or in Loch Torridon, so far as I have observed, is there any variation in this order, and I have stood on some hills in Sutherland where the Cambrian sandstones are represented by only a few remaining cakes of conglomerate which lie bedded almost horizontally upon highly unconformable gneissic strata. I was therefore much surprised to see in a little creek on the eastern shore of the Island of Rāāsay, a low precipice of the red sandstone terminating in conformable beds of a rock of very dark colour, and with a texture but little crystalline. The sudden and violent change of colour at once attracted my attention, and on landing and obtaining specimens I found there could be no mistake that the Cambrian sandstones here rest upon some older rock totally different in mineral character from the Archæan gneiss, and equally different from themselves.

Pursuing this (to me) discovery, I examined the eastern face of the same island, where its precipices include fine escarpments both of the Secondary and of the older rocks. There, at one point, I found the same unusual sequence beautifully distinct. The sandstones are represented by a bed of strong conglomerate, and this bed rests conformably upon well stratified rocks of a blue, or dark blackish-blue colour, with a fracture far less crystalline than most of our Silurian slates on the mainland of Argyllshire.

Following up the same clue, I found that on the western shores of the Island of Scalpa, these blue rocks underlie in great thickness the red sandstones which form the bulk of the island, and which are exclusively seen by all who approach it from the eastern and northern sides.

I now understand that this fact has been for some time known to Dr. Geikie, and that the officers of the Survey under him have come across it with equal surprise, in certain parts of Ross-shire. But, so far as I know, it has not been published, and is not generally known.

In one specimen which I obtained on Scalpa there are obscure indications of Annelid borings, together with calcareous cavities, which are very suggestive of an organic origin.

If these rocks really belong to the Cambrian series, as this complete conformability would imply, and if they have been wholly removed in all but a few spots, before the Torridon sandstones were laid down, the fact gives one a good deal to think of both as regards the intervals of time which they represent, and as regards the agencies of change which must have been at work.

To what horizon do these blue rocks belong? The Sutherland fossils from Durness are thought to be among the very oldest Silurian forms. Below these come the great white quartzites of the same county. Below them, again, unconformably, come the Torridon sandstones, and lowest of all come these subsequent blue beds—not at all metamorphosed—less crystalline than many of the secondary rocks. Yet they must be amongst the very oldest sedimentary rocks known to us.

I may add that I found by actual experiment that in a deposit now forming here, of the same blue colour, Annelid burrows develop precisely the same ferruginous stains which I find in the Scalpa specimen before referred to. ARGYLL.

Inveraray, Argyllshire.

Mr. Galton on Natural Inheritance.

MR. GALTON'S recent ingenious book on natural inheritance suggests some remarks on the value of his method and results. In the first place, it is plain that the method of probable error, which he uses, is only applicable with any certainty to cases