distance from the sea and a sufficient altitude are reached, another region of cloud is encountered, so that there are two cloudy zones, separated by a zone over which the sky is prevailingly clear. This contrast was well seen by the writer at the beginning of the cloudy season in December, on trips between Mollendo, on the coast, and Arequipa, 80 miles inland in a direct line, 7,550 feet above sea-level. The same three zones were passed through on a trip up the Oroya Railway, from Callao, at sea-level, to Oroya, 12,178 feet above the sea.

As to the cause of the coastal cloud, that would seem to be found in the prevalence of cool southerly and southwesterly winds—the spiral outflow on the eastern side of the South Pacific anticyclone—blowing along shore or obliquely on shore along the whole desert strip of the Pacific coast of South America. These northward blowing and hence warming winds flow from a cool ocean surface on to a warmer land. They, therefore, becoming warmed, are increasing their capacity for water vapor, and instead of being rain-bearing, as might be expected in the case of on-shore winds which are forced to ascend by the topographic conditions, they are hostile to the production of rain. It is true, to be sure, that the adiabatic cooling due to their enforced ascent over the low coastal hills is sufficient to produce cloudiness, but it does not seem sufficient, in most cases, to produce precipitation. North of Paita, where the cold ocean current and the southerly winds turn off to the westward, the barren strip comes to a sudden end, and the coastal cloud, so far as could be determined by the observations of only one voyage, comes to an end also.

That the range of hills along the coast plays an important part in the production of the coastal cloud was shown by the fact that where the immediate seacoast is low, as, *e. g.*, at and for a short distance north of Pisco, there the coastal cloud was absent.

R. DeC. Ward.

Colon, Colombia, January 12, 1898.

NEWCOMB'S PHILOSOPHY OF HYPER-SPACE.

There is in Professor Newcomb's beautiful address (Science, January 7, 1898) a marked naïveté. He says: "Certain fundamental axioms are derived from experience, not alone individual experience, perhaps, but the experience of the race." On the contrary, the hereditary geometry, the Euclidean, is underivable from real experience alone and cannot be even proved by experience. Its adequacy as a subjective form for experience has not yet been disproved, but might in future be disproved. It can never be proved.

The realities which with the aid of our subjective space form we understand under motion and position, may, with the coming of more accurate experience, refuse to fit in that form. Our mathematical reason may decide that they would be fitted better by a non-Euclidean space form. But we are, and shall be, helpless to get such a space form from any experience whatever.

Space is presupposed in all human notions of motion or position. We may drop out such specifications from our space form as render it specifically Euclidean, but we cannot replace them by non-Euclidean. Euclidean space is a creation of that part of mind which has worked and works yet unconsciously.

It is not the shape of the straight lines which makes the angle-sum of a rectilineal triangle a straight angle. With straight lines of precisely such shape, but in a non-Euclidean space, this sum may be greater or less. In non-Euclidean spaces, if one edge of a flat ruler is a straight line the other edge is a curve, if the ruler be everywhere equally broad. In any sense in which it can be properly said that we live in space, it is probable that we really live in such a space. What becomes of the dogma that fundamental axioms are derived from experience alone?

George Bruce Halsted.

Austin, Texas.

SCIENTIFIC LITERATURE.

Traité des variations du système musculaire de l'homme, et leur signification au point de vue de l'anthropologie zoologique. Par Le Dr. A.-F. Le Double, Professeur de l'anatomie a l'École de Médecine de Tours, avec une préface de M. E.-J. Marey. En deux volumes. Paris, Schleicher Frères. 1897.

During the last twenty years large numbers of scattered observations on muscular anoma-

lies have been published, together with attempts at explanation of their significance, which for the most part have left a good deal to be desired. Testut's work on this subject, published in 1884, has been the only at all systematic account. The present one, however, supersedes it, both from its greater scope and from its more philosophic spirit. The work of analyzing the variations of each muscle, of grouping together the observations of others and discussing the comparative anatomy, has been most thoroughly done, so that the book is indispensable to all workers in this branch of anatomy.

At the end of the second volume are the general considerations, treating among other things of the classification and significance of anomalies. We should say, in the first place, that, though Le Double occasionally uses the word *anomaly*, he has chosen *variation* as the correct one, holding that the former implies a knowledge of all the laws and of the fixity of species, which last he evidently does not believe in. He rejects unity of plan as any explanation, though he quotes a really eloquent passage from Geoffroy Saint-Hilaire in support of it. On the other hand, he is not only more conservative, but more philosophic than those who would call all anomalies atavistic. As Poirier has written: "Lorsqu'un auteur, pour expliquer le muscle présternnal de l'homme, remonte ou descend jusqu'au serpent, il court grand risque de n'être pas suivi." Le Double points out that in this respect Macalister has done him an injustice by classing him among those of this set.

His system divides variations into three classes: First, regressive, reversive, atavistic and theromorphic; second, progressive ones; third, monstrosities. The last word is not used in quite the ordinary sense, but rather to include such muscles as cannot be made to fit into the other classes. He believes that their number will steadily diminish with the progress of the departments of science bearing on the question.

It is very hard to find two men in accord on the significance of anomalies, but at least the day of those who would call everything atavism and resent criticism is on the wane. On the other hand, a satisfactory explanation of many points is wanting. Without quite agreeing with Dr. Le Double, we wish to call attention to an excellent piece of work that is a true contribution to the facts of anatomy.

THOMAS DWIGHT.

The New Psychology. By E. W. SCRIPTURE. London, Walter Scott; New York, Charles Scribner's Sons. 1897. (Contemporary Science Series.) Pp. xxiv+500. Price, $1.25.

Dr. Scripture here gives us an account of the work which has been carried on in the psychological laboratories. After a general treatment of the methods, he presents, under various heads, the technique and results of a wide range of experiments, and has helped out the narrative by a plentiful use of illustrations. There is also an historical sketch of the rise of experimental research in psychology, together with a chapter on the present state of the work in various lands, to which Professor Binet has contributed some interesting pages on past and present conditions in France. Binet is evidently pleased that the study of hysteria and hypnotism is yielding to an interest in 'aphasia, arithmetical prodigies, memory, the superior intellectual functions, and also the organic and motor functions connected with intellectual states.' He believes 'that French psychology will long continue in this path, on which he entered about 1890.' The book closes with an appendix containing a number of mathematical tables and formulæ.

In the general grouping of experiments Dr. Scripture has taken new and, on the whole doubtful ground. He has attempted to make psychology speak the language of physics by dividing experiments into those involving Time, Energy and Space. The division entitled 'Energy' is the rag-bag into which everything is thrown that doesn't readily fall under 'Time' or 'Space.' The scheme is an awkward one, and if it gives some borrowed feeling of scientific exactness it can only be at the expense of clear thinking in the purely psychological field. Classification is, at best, a thankless task; but since it has to be done it would seem best to group experiments more according to the mental process we are really investigating than according to the object on which this process plays. For instance, from a psychological stand-