may be a difference as great as that between the work of the sculptor and of the stonemason. Analytical skill is not to be expected of the physicist, whose field of research with the development of electrolysis begins to encroach more and more upon the domain of inorganic chemistry; but even without this he can make great attainments in his own province. But physical chemistry is by no means identical with inorganic chemistry; for inorganic chemistry, so far from being a secluded science, presents an unlimited number of problems, whose solution must be sought along quite other lines than those indicated by the theory of ions. The really successful carrying out of inorganic chemical research is only possible for the man who is not merely a theoretical chemist but also an expert analyst, not only a practically trained, mechanical workman, but a thoughtful educated artist; the theory of every operation he carries out must be very clearly in his mind, stoichiometry must be transformed for him into living flesh and blood, and in all that he does, he must be inspired by an esthetic spirit, by a sense of order and neatness, and above all by a desire for the truth."

J. L. H.

NOTES ON OCEANOGRAPHY.

THE NOMENCLATURE OF SUBMARINE RELIEF.

At the Berlin International Geographical Congress a committee was appointed to discuss methods of naming the forms of submarine relief. That some common system should be adopted is plain, yet a vigorous paper by Dr. A. Supan sustains the thesis that the existing nomenclature is both insufficient and ill-advised. He proposes an almost wholly new scheme intended to remedy these shortcomings (*Petermann's Geog. Mittheilungen*, vol. 45, p. 177, 1899, with map). In several important respects his system stands in contrast with the usage which has gradually grown up and has crystallized in the maps published by Sir John Murray in the Summary Report of the *Challenger* Expedition and in Murray's supplementary chart recently printed in the *Geographical Journal* (Vol. XIV., p. 426, 1899).

The depressions are, by Murray, in the main generically differentiated and named on a purely bathymetric basis, forty-three of them over three thousand fathoms in depth being called 'deeps,' and each of fourteen shallower depressions receiving the name 'basin.' Supan objects to this method and emphasizes the expedience of so naming these forms that their orographic relationships may appear. Thus his 'Atakama-Graben' is so distinct an orographic unit that it does not seem well to refer to this great trench only under the names of the five 'deeps' which Murray has mapped off the coast of Chili. Throwing out the term 'deep' entirely, Supan has used 'Becken' (basin), 'Graben' (trough), 'Mulde' and 'Bucht' (for which satisfactory translations into English are desired). These are intended to describe all the types of depression yet discovered outside of the continental shelf. They are distinguished by form, not by absolute depth. The principle is a good one; yet it does not follow that the bathymetric element in our charts should be entirely restricted to what the isobaths tell us. Murray's 'deeps' are far too interesting and important not to deserve special names, and his system might well be combined with that of Supan. We think it would be to their mutual benefit.

The chief difference in the naming of elevations appears in Supan's 'Schwelle' (Swell) for Murray's 'Plateau'; the German term certainly seems the more fitting.

But a still greater contrast between the two systems subsists in the names given to individual elevations and depressions. Here again it is a matter of the principle involved. Murray has watched the growth of the older nomenclature, and, with the traditon of the naturalist in his support, has given preference to names having the priority. These names were given at various times and but slowly. Exploring vessels, commanders and naturalists were commonly honored in the application of their names to the newly discovered basins, deeps, ridges and plateaus. Supan properly dwells upon the fact that these names give no clue to the location of the corresponding forms. He, on the other hand, employs the one principle of giving submarine forms names which will relate them at once to well-known parts of the continents or to the grand ocean basins. His 'Fidschi-

Becken' is Murray's 'Gazelle Basin,' his 'Japanischer Graben,' the famous 'Tuscarora Deep,' and his 'Atlantische Schwelle' include the 'Dolphin,' 'Connecting' and 'Challenger plateaus of Murrays maps. One consequence of the difference in method is that but six of Supan's names are identical with those of Murray, although thirty-nine of the former and fifty-six of the latter relate to the same portion of the sea-bed. Such a state of affairs needs immediate attention if confusion is to be avoided in the future. Some of Supan's terms, *e. g.*, 'Chilenisch-Peruanisches Becken,' are, at the least, inconvenient; the 'Nordmeer Becken' 'Murray's Arctic Basin') is to the Anglo-Saxon ear possibly ambiguous. Yet, on the whole, Supan's names are well chosen.

In the two systems sharper definitions of the terms 'plateau,' 'swell,' 'ridge,' 'bank,' 'rise,' 'trough,' and 'basin' are necessary. As yet we have no clear statement as to the characteristic features of any one of them. Size, shape, depth and slopes should have some sort of limitations for each type, and, difficult as it may be to set bounds where one type passes into another, yet, for purposes of presentation and of understanding the subject of submarine topography, we believe that the attempt should be made. In any case, it is manifest that we have not, at the present time, secured a complete list of even the larger forms of the sea-bottom. The recent discoveries of the 'Moser Deep,' the 'Nero Deep' and the 'Reykjanaës Ridge,' the last-mentioned is the best known of all the great basins, show this conclusively. When, in addition, we reflect that the lesser details of suboceanic relief are yet to be determined, we may well ask if the future more or less complex system of nomenclature should be definitively impaired by too close adherence to the doctrine of priority, or, on the other hand, by a too hasty acceptance of new views. What is needed is a classification of forms which will include not only those already discovered but also the many expected in future exploration. It is to be hoped that the committee will succeed in finding out the right way. In one respect their task is comparatively light; if changes in the existing nomenclature are necessary, they will now meet with a minimum of prejudice either academic or of other sort. The habit of but one generation, and, indeed, of but a few of the world's broadest and best trained scientific men needs to be affected in order to secure a firm foundation upon which may be based a classification suitable for needed expansion.

THE LITHOLOGY OF ANCIENT MARINE SEDIMENTS.

ATTENTION should be called to the elaborate 'Contribution à l'étude micrographique des terrains sédimentaires' by Cayeux (Mémoire de la Soc. Géol. du Nord, t. iv, Mém. No. 2, Lille, 1897). He concludes, after a painstaking study of the Cretaceous sediments of France and of England, that the chalk must be regarded as having been deposited in comparatively shallow water. It is thus important to note that the doctrine of Continental permanence is not invalidated by this latest and most detailed examination of the London and Paris Basin beds. Cayeux proposes to add to our classification of oceanic sediments by recognizing, with the terrigenous and pelagic deposits, a third class, the 'benthogenic,' which are composed principally of the remains of bottom organisms. Examples are cited in the bryozoal beds of Senonian limestones and in the Cretaceous strata made up essentially of sponge spicules, his 'spongolith.' He discusses at length the problem of glauconite, and finds conclusive evidence that it may be found either by the intervention of decaying animal matter or by simple secondary crystallization in the absence of organic substance. He lays stress on a new class of ancient marine sediments distinguished from the more usual sandstones by the presence of a high proportion of silica soluble in alkalies (allied to opal). While the rock may consist of from 76 to 92 per cent. of silica, no more than 50 per cent. is clastic quartz, the rest of the silica being accounted for by this soluble diagenetic form. This type of sandstone, the 'gaize' of French geologists, Cayeux would have permanently introduced into our classification of sediments.

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