rooted, and now needs only to be judiciously tended and watered.—*Boston Evening Transcript.*

CURRENT NOTES ON LAND FORMS

DRAINAGE CHANGES IN CALIFORNIA

J. C. Branner describes 'A Drainage Peculiarity of the Santa Clara Valley [Cal.] affecting Fresh-water Faunas' (*Journ. Geol.*, XV., 1907, 1–10), in essence as follows: A stream flows westward from the Mt. Hamilton group into the middle of the longitudinal (N.W.–S.E.) Santa Clara Valley of the Coast range, and there builds up a great alluvial fan which forms a divide on the valley floor. The stream at present flows northwest from the fan by Coyote Creek to the southern end of the Bay of San Francisco. Another creek heads in the longitudinal valley near the fan and flows southeast to join Pajaro River, which runs westward into the Bay of Monterey. A slight radial shifting of the stream on the fan would transfer it to the Pajaro system. There is good evidence that such shifting has occurred in the past, probably repeatedly, so that the waters from Mt. Hamilton have found their way alternately into the two bays. Such stream changes would permit a mingling of the faunas of the Coyote and Pajaro basins. Should a long time then elapse without further changes in drainage, the unified faunas might spontaneously and gradually diverge. At present the fishes of the two rivers are remarkably alike in most respects; some points of difference are taken to indicate the beginning of spontaneous divergence.

It appears, however, that the faunal peculiarities common to these two rivers are noted also in other rivers flowing into the two bays. As the mouths of the rivers are now separated by salt water and as their heads are far apart, a second hypothesis must be advanced to account for the community of forms, which Branner believes to require direct fresh-water connection at some former time. A former elevation of the coast, permitting the rivers of each bay to unite in a main river system, is believed to afford a satisfactory explanation for the phenomena observed. Each of the two main river systems would then have had its own fauna, until changes on the alluvial fan, as above described, had mingled them in a single fauna common to both basins. Submergence would then dismember or betrunk the two systems, yet the isolated rivers would still have similar faunas.

Independent evidence is given of the elevation and submergence here postulated. The amount of elevation is believed to have been great. In view of this it would be interesting to know whether the possibility has been considered that, during such uplift, the two main river systems might have united in one, permitting a mingling of faunas independent of the stream changes on the fan at the divide.

D. W. J.

THE PENEPLAIN OF BRITTANY

E. de Martonne, lately professor of geography in the University of Rennes and now in that of Lyons, gives an effective description of the peninsula of Brittany, illustrated with expressive block diagrams and photoplates ('La pénéplaine et les côtes bretonnes,' *Ann. de Géogr.*, XV., 1906, 213–236, 299–328). Brittany is a district of greatly deformed ancient rocks, worn down for the most part to a peneplain, but retaining here and there certain residual reliefs of moderate altitude; the whole gently up-warped in Tertiary time, and now more or less dissected in a second cycle of erosion. The chief residual reliefs or linear monadnocks follow the east-west structural trend somewhat north of the middle of the peninsula. In spite of their moderate altitude (250 meters), they are sparsely inhabited; some of the peasants there are still ignorant of the French language and speak only Breton. The peneplain, admirably developed and preserved north of the residual hills, is sharply dissected by young valleys towards the bold coast; but when the valleys are followed southward towards their heads they open out on the upland. The peneplain on the southern side of the peninsula is more destroyed by revived erosion, because larger areas are here occupied by relatively weak rocks, some of which have been almost re-

duced to local peneplains of a second generation. The southern coast is less bold than the northern, because the peneplain slopes gently southward under the sea. A recent gain of the sea on the land has drowned the distal parts of all the streams, and carried vigorous tidal currents into the incised meandering valleys. Along the southern part of the shore line thus determined, the sea has already formed numerous smooth-beached sand reefs; but little advance to such maturity is seen on the ragged western promontories and bold northern coast, where marine action is still chiefly destructive.

It is gratifying to see so systematic a treatment of a physiographic province on the basis of structure of rock masses, process of sculpture and stage of development, stated in the compact terms of the cycle of erosion and illustrated with typical block diagrams which combine structure and form in so simple and suggestive a manner. It is at the same time indicative of the stage of physiographic development of the readers of the *Annales de Géographie*—the most scholarly geographical periodical in France—to note that the transformation of valleys into arms of the sea by drowning is here presented in a more or less argumentative manner, as if it still needed discussion and demonstration before it could gain acceptance. It is also significant that Brittany is here described as having an Appalachian structure and development, as if this new world example of a corrugated structure, peneplained, elevated and redissected, were so well established that it served as a type for the description of a somewhat similar example in the old world.

There are two points on which supplement may be made to de Martonne's very readable article. First, that although the sea works furiously, with heavy storms and strong tidal currents, on the western and northern coast, the outer shore line there is still in a young stage of development, marked by an increase of irregularity and raggedness over that of the initial shore line; hence a recent date must be given to the depression by which the valleys were drowned and the initial shore line of the present cycle was formed. Second, when the recent depression of the region occurred, it presumably caused the submergence of an extensive lowland, worn down on a large area of weak rocks north of Brittany in the second cycle of erosion. Submergence thus formed the western part of the English channel, and brought the sea against the northern marginal slope of the hard-rock upland of the earlier peneplain, a little outside of the present cliff line. When explained in this way, the northern cliffs of the peninsula do not, in spite of their height, indicate a great consumption of the land by the sea, as has been supposed by some authors. W. M. D.

PHYSIOGRAPHIC TYPES

THE address delivered by the late Professor Israel C. Russell on 'Physiographic Problems of To-day' at the Congress of Arts and Science, Universal Exposition, St. Louis, in 1904, is brought again to mind by its recent publication in the proceedings of the Congress (Vol. IV., Boston, Houghton, Mifflin & Co., 1906, 627–649). One of its most suggestive passages is concerned with 'ideal physiographic types,' by which the author meant "complete synthetic examples of * * * physiographic forms, which will serve the rôle of well-defined species in the study of the surface features of the earth. Ideal types may be likened to composite photographs. They should combine critical studies of many actual forms, within a chosen range, and in addition be ideally perfect representations of the results reached by specific agencies operating under the most favorable conditions. * * * A well-arranged catalogue of ideal types would be an analytical table of contents to the history of the evolution of the features of the earth's surface, and constitute a scheme of physiographic classification. * * * The selection of idealized physiographic types * * * has for its chief purpose the reduction of endless complexities and intergradations to practicable limits. It is a method of artificial selection so governed that, while no line in the chain of evolution may be lost to view, certain links are chosen to represent their nearest of

kind and serve as types." When this suggestion is well carried into practise, geography will have made a great advance.

W. M. D.

SYSTEMATIC PHYSIOGRAPHY

A SERVICEABLE article by Hettner, professor of geography at Heidelberg, on 'Das Wesen und die Methode der Geographie' (*Geogr. Zft.*, XI., 1905, 545–564, 615–629, 671–686), revives Ritter's conception of geography as the science that is concerned with the material filling of terrestrial spaces—'die dingliche Erfüllung der Erdräume'—and emphasizes the importance of the causal notion which has been coming into greater and greater prominence in the last half century, as fuller explanation has been found for the earth's physical features, and as fuller meaning has been given to the distribution and behavior of plants, animals and man by the philosophy of evolution. He recognizes also the advantage that comes from a scientific terminology in making short and clear descriptions possible; yet he expresses a doubt as to the possibility of describing various geographical features such as valleys and towns, in generic terms, because such features possess so many details which can be portrayed only by individual description. The Neckar Valley is taken as an example to illustrate this conclusion; it is briefly described as 'a *Durchbruchstal* formed in a climate without the cooperation of ice action; we can perhaps still find even a few more generic features, but everything else is individual.' This is hardly more than begging the question, for the possibility of giving an adequate account of the Neckar Valley in terms of generic features can not be so lightly tested. The study of the development of generic features in the class of incised meandering valleys, to which the Neckar Valley belongs, has already proved the repeated or systematic occurrence of various minor elements whose recognition greatly increases the power of description. (See an article by the undersigned on 'Incised Meandering Valleys,' *Bull. Geogr. Soc. Phila.*, July, 1906.) In view of the notable progress of this kind in recent years there is every reason to expect a still greater progress in the years to come: there is indeed no direction in which a physiographer may labor more profitably than in contributing to this progress. Instead of practically giving up the problem, and abandoning the method of systematic or generic description of geographical features as impracticable because insufficient, as Hettner suggests, it is our plain duty to make every effort to develop it farther than its present stage, in the manner suggested by Russell in the preceding note; and there is good ground for hope that systematic description may yet be so far advanced, especially if carefully chosen adjectives are consistently used to modify the generic nouns which represent standardized type forms, that whatever local supplement is needed will be not so well given by an unsystematic verbal account of individual features as by reference to a good map, where many items that are fatiguingly represented in words are very easily shown graphically.

W. M. D.

THE NEW GEOLOGICAL SURVEY OF BRAZIL

The Diario Official, the official organ of the federal government of Brazil published at Rio de Janeiro, in its issue of January 22, 1907, prints the text of the decree establishing the Brazilian Geological Survey or, as it is called officially, the 'Serviço Geologico e Mineralogico do Brazil' (the geological and mineralogical service of Brazil). This decree was approved January 10, 1907, by the president of the republic, Affonso Augusto Moreira Penna, and by the minister of industry and public works, Miguel Calmon du Pin e Almeida, and has already gone into effect.

The following instructions are translated from the same issue of the *Diario Official:*

Instructions for the Operations of the Serviço Geologico e Mineralogico do Brazil

Article I.—The following are the principal objects of the geological service:

1. To carry on a scientific study of the geological structure, mineralogy and mineral resources of the territory of the republic, having