utmost importance in the debated question of discontinuous *versus* blended inheritance. Although, as has just been said, the rough coat dominates in the first generation of hybrids (rough × smooth), yet sometimes it shows a weakened condition; and what is even more interesting is that certain smooth individuals which may be said to be prepotent show a stronger tendency to weaken the rough coat than do other individuals. Such partially rough individuals may later transmit the rough character to their offspring in its full intensity. Again, repeated crossing of rough animals with prepotent smooth ones leads to a further weakening of the rough coat until it may be almost eliminated. Here are some nuts to crack for those who believe the Mendelian purity of the germ cells depends on the elimination of maternal or paternal chromosomes *which have never mixed* during their sojourn in the same nucleus!

Another apparent Mendelian inconsistency is found in the ratio of inheritance of the long coat, which is dominated by the short, or ordinary coat. In the second generation of inbred hybrids the proportion of long coated individuals exceeds the expected number.

An interesting point in regard to heredity in rabbits is shown when pure white and Himalayan rabbits are crossed. The Himalayan character dominates in the first generation only *imperfectly,* yet complete segregation of the characters takes place in the germ-cells, so that the two pure parent types reappear in some of the offspring.

For other important facts the paper itself must be consulted. That some of the conclusions are only tentative the author himself fully realizes. The constant attention and great labor involved in an extended experiment of this sort will be appreciated by those who have had experience in such matters, and we can confidently expect the future to bring forth many important results from these pedigree animals. Already enough 'problems' are indicated to engage many other workers who have the opportunity, the patience and the skill to give to investigation of this sort. Carefully recorded histories, such as is given for these hybrids, are invaluable to science. Professor Castle is to be much congratulated upon his admirable work.

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The Stone Reefs of Brazil, their Geological and Geographical Relations, with a Chapter on the Coral Reefs. By John Casper Branner. Bulletin of the Museum of Comparative Zoology, Vol. XLIV. (Geological series, Vol. VII.). Cambridge, Mass. May, 1904.

This important memoir treats of a geological phenomenon that has not hitherto received the attention that its importance and interest, both commercial and scientific, deserve. A port formed by a stone reef harbored in 1500 the fleet of the first Portuguese discoverers of Brazil and the impression produced by it on their minds is strikingly shown by the fact that they applied to it a descriptive title, 'Porto Seguro,' instead of a name taken from the Saint's Calendar, as was the almost universal custom of the early Iberian explorers. From this point as a center a considerable section of the Brazilian coast region was explored and peopled, while two other stone-reef-protected ports, Recife (Pernambuco) and Rio Grande do Norte, became equally or even more important in the history of the early development of the country. The first of these has retained its commercial importance to the present day, and, being situated on a great line of travel, has attracted the attention and excited the wonder of all mariners and travelers who have visited the Brazilian coast. The former very naturally confounded the reefs formed by sandstone with those, still more frequent along this coast, composed of coral rock, and the latter have repeated the sailors' statements to the effect that a large section of the coast is bordered by a reef of the same nature as that of Pernambuco.

The first to accurately describe the Pernambuco reef as a consolidated bar of sand was Darwin, who touched there in the celebrated voyage of the *Beagle.* Hartt, in 1870, showed that the reputed great barrier reef of Brazil was a myth, though detached reefs, both of coral and of sandstone rock, occurred at numerous points; the latter being due to a superficial consolidation of beach sands which

is substantially limited by the planes of high and low tide. The examples of these curious structures hitherto described were in the immediate vicinity of Pernambuco and along the section of coast to the southward of Bahia. The present memoir besides beautifully illustrating those already known with nearly 100 maps and photographs, gives full details of a large number of others between the points above mentioned and to the northward of Pernambuco as far as Rio Grande do Norte. The most southerly one known is at Guarapary in the state of Espirito Santo and from this point to Rio Grande do Norte, a distance of about a thousand nautical miles, the sandstone reefs can now be considered as definitely known. To the southward it is tolerably certain that no more exist, but in the nearly equally long stretch of coast from Rio Grande do Norte to the Amazonas they may be presumed to be about as abundant and characteristic as in the section above mentioned, and it is much to be desired that this northern section should be examined in the same careful manner.

Dr. Branner, after fully describing and illustrating the reefs examined to the number of over twenty, sums up their characteristics as follows:

> The stone reefs are nearly but not quite straight. The bedding of the material dips seaward at the same angle as ordinary beach sands. The hard rock of the reef is only three or four meters thick. The underlying materials are sands, shells and clays without regular sequence. The process of formation, the character and the structure of the reefs show that they are ancient beaches hardened by lime carbonate, while their straightness shows that they are forms of a mature beach line fixed and made permanent by the process of consolidation pointed out in Part VI.

The most puzzling problem presented by these reefs is that of their consolidation through the deposition of lime carbonate, and one of the most interesting chapters of the memoir is devoted to its discussion. The hypothesis of the hardening of beach sands through the action of rain water and through the escape of carbon dioxide contained in sea water is admitted as possible, but put aside as insufficient to account for all the phases of the phenomenon. The coincidence of the distribution of the stone reefs with an area of greater density of the oceanic waters is noted as a possible concurrent cause. (Another coincidence worthy of note is that of the distribution of the sandstone and coral reefs.) A more efficient cause is thought to be the seeping of fresh water charged with organic acids from the decay of vegetable matter accumulated in the lagoons and repressed streams behind beach ridges. The reefs occur along a section of coast swept by tolerably constant winds and currents, and with such geologic and climatic conditions that many streams are temporarily or permanently closed by the formation of beach ridges, so that their waters, becoming charged with organic acids, have to find their way to the sea by percolation through the barriers of beach sands. In conclusion the author remarks: "It seems probable that the consolidation of the reef sands would not take place if the rainfall were large enough and constant enough to keep the mouths of the streams open and the waters of the streams fresh" [pure].

In a chapter on coast changes evidences of both elevation and depression in late geological times are presented and discussed. A depression of considerable importance is presumed to have taken place in early Pliocene times, followed by a smaller elevation. The sandstone reefs were formed and hardened subsequent to the depression, but there is no evidence that they have suffered any appreciable movement since their formation. The reefs, both sandstone and coral, have protected the land and helped build out the shores.

In an introductory chapter a brief sketch of what is known of the geology of the coast along which the reefs occur is given. In this Dr. Branner takes issue with his predecessors, and with his own previous writings, by referring to the Tertiary a considerable portion of what has been considered as Cretaceous. The evidence for this change of view is, however, confessedly inconclusive, and to the reviewer it seems that some contrary evidence of importance has been overlooked or unduly minimized.

The chapter on coral reefs is also a valuable

contribution to our knowledge of the physical and geological conditions of the same section of the coast, as hitherto the only scientific studies of the Brazilian coral reefs were those of Hartt on the reefs near the Abrolhos and of Rathbun on that of Itaparica in the bay of Bahia. The coral reef-fringed section of the Brazilian coast extends from near the equator to 18° south latitude, but for nearly half of this long line, from Rio Grande do Norte northward, the various types of reef—sandstone, coral and underlying rock—can not at present be discriminated. The coral reefs are broken by many and large gaps, for some of which no apparent reason can be given. With the exception of the Rocas, which seems to be a true atoll rising from deep water, all the reefs are built up on the submerged continental shelf and are fringing and barrier reefs. They are usually narrow, ten to fifty meters in width, but in the case of the large barrier reefs may attain a width of thirty kilometers. The near-shore reefs are quite thin, probably not exceeding a thickness of ten meters, and a hundred meters is presumed to be the maximum thickness of the outlying barrier reefs.

For the most part the reefs have reached the upper limit of growth and are now dead on top, though still growing laterally. None, however, are known that have been elevated above tide level. In age they are presumed to date back to Tertiary times, since they rise from a shelf due to a great depression presumed to be of early Pliocene date. Coral rock has been observed both beneath and on top of sandstone reef rock and possibly some coral reefs rise from a base furnished by submerged examples of sandstone reefs. The coral polyp fauna found on the reefs contains twenty-eight species and is more closely related to that of the West Indies than to any other known coral fauna.

One of the points of greatest geological interest brought out by this study of the coral reefs is that a process of dolomitization of the reef rock is going on in the open sea, thus rendering unnecessary the 'salt-pan' hypothesis that has been appealed to in the cases hitherto noted of a higher proportion of magnesia in rocks of coral origin than in the skeletons of the corals themselves.

Dr. Branner states that the opportunity for completing his reef studies, commenced many years ago, was provided by Professor Alexander Agassiz. Both these gentlemen are, therefore, to be congratulated on the importance of the results achieved and presented in this splendid memoir, and it is greatly to be desired that these results will stimulate them to promote a similar study of that biologic and geologic *terra incognita,* the northern section of the reef-bound Brazilian coast, which, on account of the peculiar conditions of winds and currents, can only be explored by the use of steam vessels.

Orville A. Derby.
Commissao Geographica e Geologica de São Paulo, Brazil,
December 26, 1904.

SCIENTIFIC JOURNALS AND ARTICLES.

The April number (volume 11, number 7) of the *Bulletin of the American Mathematical Society* contains the following articles: Report of the February Meeting of the American Mathematical Society, by F. N. Cole; Report of the December Meeting of the Chicago Section, by T. F. Holgate; 'Mathematics at the St. Louis Congress, September 20, 22 and 24, 1904,' by H. S. White; 'The Use of Hypercomplex Numbers in Certain Problems of the Modular Group,' by J. W. Young; 'Extension of a Theorem due to Sylow,' by G. A. Miller; 'Note on Isothermal Curves and One-Parameter Groups of Conformal Transformations in the Plane,' by C. L. Bouton; Review of Arendt's Dirichlet's Definite Integrals, by Virgil Snyder; 'The Theta Functions' (Review of Krazer's Thetafunktionen and Rost's Riemann'sche Thetafunktionen), by J. I. Hutchinson; Review of Hilton's Mathematical Crystallography, by R. P. Baker; 'The Theory of Electricity' (Review of Abraham and Föpple's Theorie der Elektricität), by E. B. Wilson; Notes; New Publications.

The April number (volume 6, number 2) of the *Transactions of the American Mathematical Society* contains the following papers:

E. J. Wilczynski: 'General projective theory of space curves.'