enough to ensure that almost every survivor is caught. Towards the end of the seining, it may be necessary to have a third man rile the water thoroughly by stirring up the bottom of the stream in advance of the two seiners. This, in order to prevent the fry from seeing and avoiding the net. Some practice is necessary in seining, otherwise the results will be unreliable.

In one of the brooks seined by the board it was found that the fry ascended the stream about forty rods above and ninety rods below the point of distribution. If it is desired to shorten the distance to be seined and catch all ascending and descending fry, then two fine wire screens should be placed across the stream, one, say twenty to fifty rods above, and the other twenty to fifty rods below the point of distribution. In each of these screens there should be inserted a cylindrical wire fish-trap, funnel-shaped at one end and joined by a smaller cylindrical wire tube or sleeve to an opening in the central part of the screen, so that the trap can be removed and cleaned at pleasure. The screen and the trap should be carefully constructed so as to catch all ascending or descending fry, and thus discover how many fry migrate up or down stream.

The outstanding causes for the high mortality which was found in southwest Ontario seemed (1) warm, stagnant or peaty water; (2) enemy fish eating the fry as shown by finding fry or fingerlings in their stomachs; and (3) lack of sufficient natural food.

The results of the board's experiment thus far are a severe condemnation, not of fish culture as a whole, but of the prevailing method of distributing fry in streams, namely, dumping them at any point most convenient to a highway or traveled road. They should be distributed with fair uniformity along the upper stretches of streams or along the margin of ponds where trout naturally lay their eggs, if they can find suitable spawning beds.

The experiments demonstrate, or at least indicate:

(1) A loss of 98 per cent. of the fry (for the method of planting used and the streams investigated) during the first three months after distribution.

(2) Consequently a greatly increased cost of production per fry.

(3) The necessity of a thorough examination as to the suitability of every stream or pond in which it is proposed to plant fry.

At present we are planting fry in the dark, and in some cases we are feeding them to coarse or useless fish.

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SCIENTIFIC BOOKS

The New England-Acadian Shore Line. By DOUGLAS JOHNSON, professor of physiography, Columbia University. xx + 608 pages. John Wiley and Sons, New York. 1925.

PROFESSOR JOHNSON'S scholarly volume describing the Atlantic shores between the mouth of the Hudson River and the Gulf of St. Lawrence is the most notable American contribution to the science of physiography of the year if not of the decade. It is the first of a series of "Studies of American Physiography" which are designed to treat in systematic fashion the origin and evolution of the surface features of the continent. In this volume is set forth in most readable style a multitude of facts from which the history of this complex shore line may be deduced. The work is largely based on field studies by its author, but Professor Johnson has drawn widely from all available sources so that the book is a complete treatise on the subject.

A part of the expense of the author's field work was met by a grant from the Shaler Memorial Fund of Harvard University and the book is therefore one of the "Shaler Memorial Series." It is peculiarly fitting that the name of the geologist who devoted no small share of his energies to the elucidation of our coastal phenomena should thus be linked with this monographic study of a region which he loved. It is also appropriate that the volume should be dedicated to William Morris Davis, whose creative work in the study of land forms has done so much to make physiography a science.

There is space here merely to call attention to a few of the many outstanding contributions to physiographic knowledge, which the reader will find in this book. The author reaches the general conclusion that the latest movement of the New England-Acadian coast was a gradual submergence of the land which culminated only a few thousand (perhaps between three thousand and five thousand) years ago. So recent was the movement which brought the sea surface against the land at the present level that the salient features of the initial shore line have not been fully destroyed. The shore line to-day clearly displays a remarkable dependence upon geologic structure. It is in an extremely youthful stage of development, befitting the short interval of time since the present relative position of land and sea was fixed. "The rocky cliffs bordering parts of the Maine and Nova Scotia coasts, the picturesque crags towering high above the waves in the Percé region, and the still loftier scarp along the northeastern side of Cape Gaspé, as well as the broad, submerged platforms off the latter cape and along the shores of the St. Lawrence embayment, all seemingly attributable to extended erosion of the lands by the sea, are found to be reasonably interpreted as the result of limited modification by marine agencies of forms earlier produced above sea-level by subaerial forces, and only recently brought within reach of the waves."

The series of baymouth bars which border the lowland shores of New Brunswick and Prince Edward Island, the cuspate foreland and bars of the Bras d'Or and Narragansett lowland shores and a great variety of spits, tombolos and other wave-built features are described. These shores are in a more advanced stage of development than those which margin the crystalline uplands, but they are interpreted as implying similarly a relatively short stand of the sea at the present level. The conclusion that the waves have worked at the present sea-level for only a very short time is further strengthened by a carefully detailed study of submarine topography which indicates that little progress toward the establishment of a profile of equilibrium has been made.

At certain localities there are elevated strands which record a moderate emergence of the land, and along certain parts of the coast a narrow coastal plain of glacial and post-glacial date has been raised above the water. The validity of many of the supposed elevated shore lines is, however, questioned. Elsewhere minor submergence has added slightly to the embayment of the coast and has drowned the lower portions of some of the valleys cut into the narrow coastal plains, but the essential character of the shore line has remained unmodified by these subordinate changes of level. The shore line as a whole may therefore be classified as a shore of submergence. Its critical analysis includes the recognition of its initial form and the changes subsequently introduced by wave erosion and deposition.

Considerable space is given to a consideration of the rectilinear shore lines displayed at several points along this portion of the Atlantic coast. It is shown that the theory of a geometric network of parallel and more or less regularly spaced systems of extended earth fractures does not seem to apply. A number of fault-controlled shore lines are recognized, but the great majority of rectilinear shores are attributed to other causes than faulting.

The conclusion is reached that the New England-Acadian shore line was but little affected by glacial erosion, although profoundly modified by glacial deposition. With the exception of the Mount Desert Island embayments of Maine and the drowned gorge of the Hudson River, true fjord coasts are practically non-existent in this region. On the other hand, the moraines, outwash plains and drumlins of the Pleistocene ice sheets are bordered by characteristic and strikingly different shores.

The problems connected with present changes in the shore line resulting either from changes in level or from the activity of waves and currents are critically reviewed. The conclusion is reached that during the last few thousand years there has been no appreciable change in the relative position of land and sea. Failure to discriminate carefully between fictitious appearance of modern subsidence and the real effects of the more ancient submergence has led to a widespread misapprehension concerning recent changes of level along the Atlantic coast. The great need of more accurate data than are now available for calculating changes in the position of the shore line is emphasized. From the data at hand the present rate of wave erosion is estimated to cause a retreat of shore cliffs amounting to three, five and even ten feet per year. Making due allowance for changing conditions in the future, Professor Johnson calculates that the outer part of the forearm of Cape Cod will disappear within the next four or five thousand years.

Considerable attention is paid to the analysis of the submarine forms bordering the land, an analysis which bespeaks the hand of a master in the study of shore lines. The fishing banks extending from Cape Cod to Newfoundland, and including the Gulf of Maine on the southeast, are identified as the several parts of a typical coastal plain cuesta, now completely submerged, while the gulf itself represents a more deeply submerged inner lowland like that associated with the Atlantic Highland cuesta of the Atlantic plain in New Jersey. Subordinate cuestas parallel to the major "Banks cuesta" are found on the floor of the drowned lowland and a great fault-line scarp, in places double and triple and apparently 350 miles in length, is traced beneath the waters of the gulf from the head of the Bay of Fundy to a point off the Massachusetts coast. This "Fundian fault" appears to be one of the important fracture lines of North America, well deserving of much more detailed study than is possible with the present scanty data concerning ocean depths in the Gulf of Maine. Some years ago Woodworth had suggested from his study of New England earthquakes the probability that a fault existed along or off the coast, which was responsible for several of the quakes, such as those of 1638, 1727 and 1755. Although no definite connection between the "Fundian fault" and such an earthquake as that of January 7, 1925, can at present be established, the recent seismic activity in northeastern North America serves among other things to focus the attention of seismologists and physiographers alike upon this study of submarine geologic structure.

Contrary to the widespread conception that the Atlantic continental shelf extends seaward approximately to the one hundred fathom line, Professor Johnson finds that the margin of the continental platform is only a few fathoms below sea level off Florida, is from twenty-five to thirty-five fathoms deep off Georgia and the Carolinas, forty to forty-eight fathoms opposite Maryland, forty-eight to fifty-five off the New Jersey and Long Island coasts and sixty to seventy fathoms deep at the outer edge of the Banks. The margin of the shelf certainly pays scant attention to the one hundred fathom depth at which it is traditionally supposed to occur and apparently was not developed with respect to the present relative position of land and sea. On the contrary, the author concludes from the depth of the floor of the submerged lowlands in the Gulf of Maine that the depth of submergence for New England is at least as great as twelve hundred feet.

Although primarily of interest to the specialist in geology and geography this book will undoubtedly make an appeal to a wide range of readers. The discussion of the submarine physiography of the Gulf of Maine and the Newfoundland Banks leads to an apt suggestion concerning the route and time of migration of the peculiar coastal plains flora which Professor Fernald has been investigating during recent years in Acadia and Newfoundland. Those interested in coast, protection and marsh reclamation will find much of interest and of value. In fact, all who love the sea and the forms it fashions along the land will find answers to many of the questions they have frequently asked about our coastal scenery.

So far as Professor Johnson's deductions are concerned, it is probable that in the main they will meet with the general approval of those competent to pass judgment upon them. On the other hand, the assertion that this portion of the North American shore line is now stationary with respect to sea-level and has remained so during the few centuries of historic occupation will doubtless meet with opposition. The rather widespread view that this coast is now sinking at the rate of a few inches per century must certainly be looked upon with suspicion on account of this and other of Professor Johnson's publications, but it can not be said as yet to be disproved. More facts are needed before certain conclusions are justified; perhaps these will be forthcoming in the same author's projected volume on "The Coastal Plain Shoreline." In the meantime, geologists and geographers are deeply indebted to Professor Johnson for this stimulating and scholarly publication.

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SPECIAL ARTICLES

A NEW TYPE OF GASEOUS CATALYSIS

IN SCIENCE[1] of November 6 a preliminary account was given of certain organic gas reactions produced at ordinary temperature by the ionizing action of radon. In the last paragraph of that paper announcement was made of the discovery that nitrogen ions (N_2^+) have the same power of causing the polymerization of acetylene of cyanogen and of hydrogen cyanide, as do their own ions $C_2H_2^+$, $C_2N_2^+$ and HCN^+, respectively. Since nitrogen, although exerting this accelerating influence, did not itself in any case enter into permanent combination, we termed the effect *"ionic catalysis."*

It appeared important to find how general this effect of inert gases might be. Therefore *helium, neon* and *argon* were separately mixed with acetylene and a small quantity of radon was introduced as ionizing source. In all three cases the results were the same as for nitrogen; the ratios $\frac{-M_{C_2H_2}}{N_{(C_2H_2+He)}}$, $\frac{-M_{C_2H_2}}{N_{(C_2H_2+Ne)}}$ and $\frac{-M_{C_2H_2}}{N_{(C_2H_2+A)}}$ were all initially equal to about 20, the value for $\frac{-M_{C_2H_2}}{N_{C_2H_2}}$ in the case of pure acetylene. This value is maintained even when the ionization of the inert is as much as 50 per cent. of the total. The specific ionizations relative to air are: $i_{He}=0.211$; $i_A=1.25$; i_{Ne} (estimated by interpolation from He and A) = 0.75. By assuming $\frac{-M_{C_2H_2}}{N_{(C_2H_2+Ne)}}=19.6$, and calculating backward, we predict i_{Ne} = 0.75. No experimental value for i_{Ne} was available.

Having thus shown the effect to be quite general for inert gases, we desired to see if it is confined to polymerization of triple bond compounds like C_2H_2, C_2N_2 and HCN. We, therefore, compared the rates of combination of $2H_2+O_2$ with and without the presence of nitrogen. Again the nitrogen ion contributed just as much to the reaction velocity as the O_2^+, H_2^+ and O_2^- ions do. Since the ionization of N_2 is almost double that of electrolytic gas when they are mixed in equal proportion, $1N_2$ to $1(2H_2+O_2)$, the reaction rate would be expected to be nearly 3 times as fast as if N_2 were absent, which was found experimentally to be the case. Or $\frac{M_{H_2O}}{N_{(O_2+H_2+N_2)}}=4=\frac{M_{H_2O}}{N_{(O_2+H_2)}}$. Incidentally, this indicates that not only the N_2^+ ions are effective but all the free electrons from these N_2^+ ions are trapped by O_2 to form O_2^- ions, which are

[1] SCIENCE, 62, 422 (1925).