ZOOLOGY.

PHYSIOLOGICAL SELECTION.—At a recent meeting of the Linnean Society, Mr. G. J. Romanes read a paper "On physiological selection: an additional suggestion on the origin of species." The author contended that the theory of natural selection has been misnamed a theory of the origin of species. It is, in truth, a theory of the origin of adaptive structures, and, if unassisted by any other principle, could not effect the evolution of species. The only other principle that could here assist natural selection would be one that might mitigate the swamping effects of intercrossing. This may be done by geographical barriers shutting off a portion of a species from the rest, and allowing that portion to develop an independent course of varietal history without intercrossing with the parent form. It may also be done by portions of species migrating, changing habital stations, &c. But it may also be done by what the author calls physiological selection, or in virtue of a variation taking place in the reproductive system in the direction of sterility (whether absolute or partial) with the parent form, without impairment of fertility within the varietal form. For instance, the season of flowering or of pairing may be either advanced or retarded in a portion of a species, when all the individuals in that portion (or new variety) would be absolutely sterile towards the rest of the species, while completely fertile among themselves. They would thus start on an independent course of variated history.—*English Mechanic.*

MECHANICS OF SOARING.—Professor Hendricks in the NATURALIST for June, imports into the "mechanics of soaring" a momentary force which I do not think improves it. There is no "momentary" force concerned with any part of the activity that I am aware of. The birds are in the air quite early in the morning, and continue there until nightfall, all the forces concerned in their movements being active every instant of the time.

The air pressures beneath the surface produced by the normal motion are constant, and the expansion of these pressures against the rear curve is constant, and this expansion gives the lateral motion. They are both derived from the gravitating force of the mass of the bird. There is no other force operative upon the bird in the act of soaring.

Mr. Hendricks answers my "crucial" question in the negative; for, "there is an unbalanced force which acts downwards, and parallel with the face of the plane, and therefore towards the rest." But when an equal force acting in the opposite direction is opposed to it, there is no longer an "unbalanced" force acting, for the force is then balanced, and the plane in equilibrium. While the plane is thus in equilibrium a force will move it with equal facility in either direction, for to suppose otherwise is to suppose a force active in one direction which is not active in the other,

which is to deny the equality of the forces producing the balance.

Bear in mind that I have carefully excluded inertia, or in other words, mass acceleration, from the problem. The birds have the power of flapping, or falling from higher to lower levels, to initiate their movements. Soaring has nothing to do with acceleration. It deals with motions of uniformity only. Hence I am justified in holding that one or two pounds of constant pressure is competent to drive the plane edgeways 1000 feet per second against air friction only. As frictional air resistance approaches zero, a small force would move the plane against it with great velocity. No weight is lifted in the upward motion, as the forces producing the weight are already employed to their total value, as fully shown.

As the force producing the lateral motion is derived from the gravity of the mass, I am also justified in holding that a soaring bird is translated at right angles to the gravitating force, or horizontally, solely by the action of that force. It will be noticed that I have *assumed* the force derived from the rear expansion to be sufficient to give the lateral motion. When the wings of birds are examined the details of the lateral motion will be found. My concern in the "mechanism of soaring" was to show that the forces were on hand in quantity sufficient to produce the movement.—*I. Lancaster, Chicago, Ill., June 5th, 1886.*

LIMULUS IN THE PACIFIC.—My friend, Mr. H. W. Turner, of the U. S. Geological Survey, sends me an extract from the San Francisco *Evening Bulletin* of May 29th, which says: "A novelty on this coast was captured off the Farallone islands last Wednesday afternoon by Captain Camilio, who was fishing in his smack in that vicinity. Nothing like the crustacean had ever been seen on this coast before, and the fishermen thought they had made a capture that was valuable. It was found, however, that the prize was only a horseshoe crab, which is very common on the Atlantic coast. It is thought that the crab must have been hatched from eggs brought with the lobsters which were liberated in these waters seven or eight years ago."—*S. L.* [Can this have been the Japanese species?—ED.]

THE SWIM-BLADDER OF FISHES.—Charles Morris has published in the Proceedings of the Philadelphia Academy, a theory of the origins of lungs and swim-bladder, and an explanation of their homologies and the peculiarities of their relative positions. He imagines that the primitive fishes, like the sharks, were without this organ, but that some of them, venturing on land for longer or shorter excursions, took in stomach and throatfuls of air, which procured a certain aëration of the blood. He imagines that the air held in the throat finally produced a distension of its superior wall, which became later a diverticulum and still later a sac with a narrowed opening. The tendency to rise when in the water would ensure that this bag of air should maintain its

position above the œsophagus. In those fishes which continued to use air, as the Dipnoi, the sac became cellular and more complex. Its weight would then cause it to sink below the œsophagus, as we find it in Polypterus. From this stage the lung of air-breathers was derived. In those fishes which became most exclusively aquatic, the bladder underwent degeneration if it had acquired cells, and if not, remained a bladder only. In either case the loss of the connection with the œsophagus (ductus pneumaticus) is the final stage in this degeneracy.

This proposition of Mr. Morris is very plausible, and corresponds with the general course of evolution of the skeleton.

Dr. Paul Albrecht denies the homology of the lungs and swim-bladder in a pamphlet published by Carré, of Paris (1866). His reason is that the swim-bladder is on the dorsal side of the œsophagus, while the lungs are on the ventral side. He therefore regards the swim-bladder of Polypterus as a true lung, while that of Lepidosteus is a swim-bladder. In support of his view that these organs are respectively not homologous, he states that Diodon and Tetrodon possess both swim-bladder and lungs. The latter he recognizes in the diverticula from the lower side of the œsophagus, with which those fishes inflate themselves. He also sees a rudimental swim-bladder in diverticula from the superior side of the œsophagus which occur in some animals, for instance, in the pig.

THE FORMER SOUTHERN LIMITS OF THE WHITE OR POLAR BEAR.—In my remarks on the occurrence of the white bear in Labrador, where it is sometimes called the "water bear," in distinction from the black bear, which is very common on that coast, I then supposed that the polar bear was a straggler from Hudson's and Baffin's bays, rather by accident than otherwise, at rare intervals breeding so far south as Labrador. But on looking over the accounts of the early discoverers and navigators, as well as Cartwright's "Journal," I am led to materially alter my opinion and to suppose that the former limits of this creature extended even possibly as far south as Casco bay, on the coast of Maine.

Whether there are any notices of or references to the white bear in the records and sagas of the Norsemen who visited the coast of Newfoundland and Nova Scotia, we are unable to say. White bears were, however, seen by the first English navigator who discovered our shores, the intrepid Venetian, John Cabot, then sailing under an English flag. The following reference to white bears appears in an extract from an inscription on the map of Sebastian Cabot in Hakluyt's Voyages (III, 27):

"In the yeere of our Lord 1497 Iohn Cabot, a Venetian, and his sonne Sebastian (with an English fleet set out from Bristoll) discouered that which no man before that time had attempted, on the 24th of Iune, about five of the clocke early in the morning.

This land he called Prima vista, that is to say, First seene, because as I suppose it was that point whereof they had the first sight from sea. That Island which lieth out before the land, he called the Island of S. Iohn vpon this occasion, as I thinke, because it was discouered vpon the day of Iohn the Baptist. The inhabitants of this Island vse to weare beast skinnes, and have them in as great estimation as we have our finest garments. In their warres they vse bowes, arrowes, pikes, darts, woodden clubs and slings. The soil is barren in some places, and yieldeth litle fruit, but it is full of white beares, and stagges far greater than ours."

This account shows quite conclusively that John Cabot's Prima vista was some point of land in eastern or northern Newfoundland. The eminent geographer, Dr. J. G. Kohl, in his History of the Discovery of Maine, seems fully persuaded that the landfall of John Cabot was Labrador. But if the inscription and map are genuine, the description of the inhabitants of the island, both men and beasts, would better apply to those of the eastern or southern coast of Newfoundland. The human beings were more probably red Indians than Eskimo. On the Labrador coast the soil is "barren" in all places, while the "stagges far greater than ours" may have been the moose, which does not inhabit the Labrador coast. Whether the "white beares" were the polar bears or a pale variety of the barren-ground bear of Sir John Richardson is somewhat uncertain. We should have unhesitatingly referred the creature to the polar bear, were it not that in Parmenius' account of Newfoundland, published in 1583, it is said: "Bears also appear about the fishers' stages of the countrey, and are sometimes killed, but they seeme to be white, as I coniectured by their skinnes, and somewhat lesse then ours" (Hakluyt).

The next explorer of this coast was Cortereal who, in 1500, landed on the Newfoundland coast, at or probably near Cape Race. In an old Portuguese map of about the year 1520 is a long Latin inscription, thus translated by Kohl, a part of which we copy: "This country was first discovered by Gaspar Cortereal, a Portuguese, and he brought from there wild and barbarous men and white bears. There are to be in it plenty of animals, birds and fish." The land from which Cortereal brought the white bears was evidently the same as that in which he kidnapped fifty-seven of the aborigines. These were Indians and not Eskimo, and must have been the inhabitants either of Newfoundland or of Nova Scotia, for a person who saw them in the streets of Lisbon described them "as tall, well-built and admirably fit for labor." That however they were the aborigines of Newfoundland, perhaps Bethuks, seems proved by the fact that a number of white bears were also captured and sent to Spain with them. From these facts it seems reasonable to infer that the white or polar bear was a resident on the eastern coast of Newfoundland.

The next navigator to explore these seas was Jacques Cartier, who arrived May 10th, 1534, on the eastern coast of Newfoundland. To this observing seaman we owe our first accounts of the home of the great auk or "penguin" on the Island of Birds, now Funk or Fogo island, on the northeastern coast of Newfoundland; also of the Bird rocks of the Gulf of St. Lawrence.

While harboring at what is now Funk island Cartier, after describing the great auks, tells us that he saw a white bear. In his own language, done into quaint English by Hakluyt: "And albeit the sayd Island be 14 leagues from the maineland, notwithstanding beares come swimming thither to eat of the sayd birds: and our men found one there as great as any cow, and as white as any swan, who in their presence leapt into the sea, and upon Whitsun-monday (following our voyage towards the land) we met her by the way, swimming toward land as swiftly as we could saile. So soone as we saw her, we pursued her with our boats, and by maine strength tooke her, whose flesh was as goode to be eaten as the flesh of a calfe two yeres olde."

From this graphic and circumstantial account we feel sure that this was the great white or polar bear (*Ursus maritimus*); that it reached its full size, was not uncommon on the mainland (John Cabot says the land was "full" of them), and that it bred there, as those mentioned by Parmenius in 1583 were probably young ones.

The white bear is still occasionally seen on this coast, as Rev. Mr. Harvey states:[1] "The seal hunters occasionally encounter the white or polar bear on the ice off the coast, and sometimes it has been known to land."

Now, if in these early times of Cabot and Cartier the eastern coast of Newfoundland was the habitat and breeding place of the polar bear, it is not unlikely that it occasionally might have visited, as we know the walrus did, the coast of Nova Scotia and of Maine.

Our supposition is based on the following facts: In an ancient map of "New France," by the Italian Jacomo di Gastaldi, in about the year 1550, republished by Kohl, and which we here present of reduced size, what we should consider as veritable white bears are depicted as swimming in the ocean far from the coast of what must have been Nova Scotia, and near to but west of Sable island or "Isola della rena." In the map the bears are placed to the southward of "Terra de Nvrvmbega," which evidently comprised Nova Scotia and Eastern Maine. Sable island is an enlarged portion of a broad band, intended to represent the banks of Newfoundland and La Have.

That the animals represented are bears admits of little doubt; of the four figures the lowermost one is a seal; it is drawn without ears, while the three other figures have large, drooping ears, like those of a bear. At any rate, if the locality was put in at

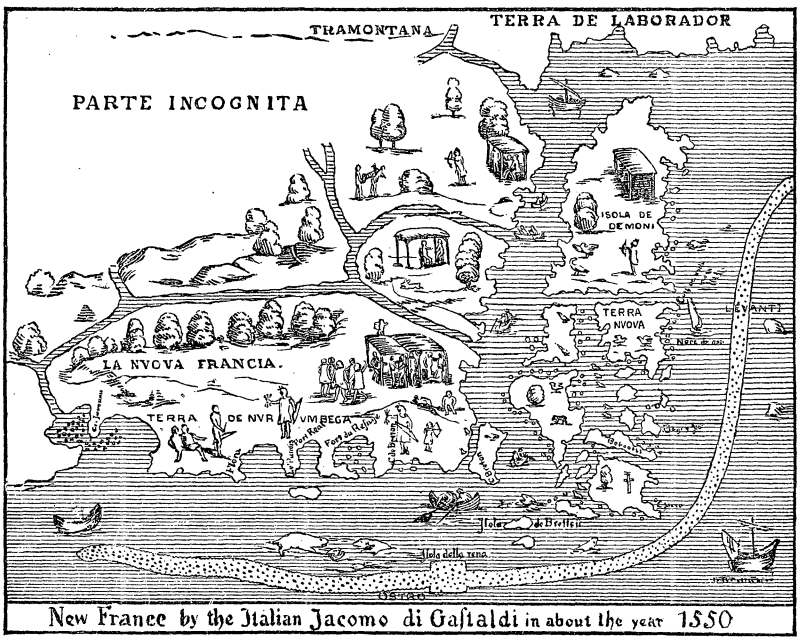
1 Halton and Harvey's Newfoundland, Boston, 1883, p. 193.

haphazard by the map-drawer, why should white bears be also represented, as they seem to be in the ocean off Isola de Demoni. The figures of the black bear, as well as of the rabbit and of the aborigines are well drawn, and it seems not unreasonable to infer that white bears were actually seen and reported to the south and west of Newfoundland.

That the white bear may have visited the coast of Maine, near Portland, is further proved by the probable discovery by Mr. E. S. Morse of a white bear's tooth in the shell heaps of Casco bay.

Speaking of the bones of the bear found in a shell heap on Goose island, Casco bay, Maine, the late Professor Wyman remarked in the AMERICAN NATURALIST, I, 575, January, 1868:

"The bones of the *bear*, though much less numerous, were



New France by the Italian Jacomo di Gastaldi in about the year 1550

similarly broken up, and in two instances had been carbonized by contact with the fire. Among the specimens collected by Mr. Muse in his first visit to Crouch's cove was the last molar from the lower jaw. The crown was somewhat worn, but the ridges were not all effaced; it was of small size, measuring 0.55 inch in length and 0.46 in breadth. The average size of eight specimens of the same molar in the black bear was: Length, 0.60 inch; breadth, 0.47, while that of two specimens from the polar bear was, length, 0.54 inch; breadth, 0.45. The tooth from the shell heaps, therefore, as regards size, more closely resembles

the last-mentioned species, as it does also in the shape of the crown—but it must be unsafe from a single specimen of the molar in question to attempt to identify them. The former existence of the polar bear on the coast of Maine is rendered quite probable by the fact that the tusk of a walrus has actually been found at Gardiner."

That the white bear formerly was an inhabitant of Newfoundland seems probable from the facts we have brought together, and it is to be hoped that the antiquarians and naturalists of Newfoundland will investigate the shell heaps, should such be found, of that island for further facts bearing on this subject.

We will now turn our attention to the former presence of the white bear on the Labrador coast, where the settlers still call it the "water bear." We find only in Cartwright's Journal reference to this creature, but this is sufficient to show that it bred on and permanently inhabited this coast from Belle isle or Chateau bay northward. A white bear was killed in 1769 at Pitt's harbor, Chateau bay. There is a "White Bear Sound" on Cartwright's map just north of Cape Charles, near Battle island. Cartwright's house was to the northward of Cape Charles, in an arm of Sandwich bay. In 1770 Cartwright saw the track of two large white bears, and the Eskimo killed one the same year near his house. In April, 1772, the tracks of three white bears were seen. In April, 1776, a white bear and cubs were seen near Huntington island, and in the following May another was observed. White bears were also seen up the rivers leading into Sandwich bay, and on pp. 410–11 Cartwright describes the habits of the white bear in Labrador, stating that the young are born in March, the parent bringing forth usually one at a time, sometimes two.

While on the coast of Labrador in the summers of 1860 and 1864, we gathered what facts we could as to the occurrence of this animal, publishing them in the Proceedings of the Boston Society of Natural History (Vol. x, 1866, 270), from which we take the following extract:

"At Square island, a locality situated between Belle isle and Domino harbor, two cubs were captured and taken to St. Johns, Newfoundland. At Domino harbor the skin of a bear killed during the preceding spring (1863) was obtained by one of our party. An intelligent hunter told me that the white bear was not unfrequently seen at Stag bay, near Roger's harbor, which is situated a little more than fifty miles south of Hopedale. One was killed there during the preceding winter (1863), and in the autumn their tracks were abundant. They were very shy, and could not be seen in the daytime. Further south they are much rarer. The last polar bear said to have been seen in the Strait of Belle isle was shot fifteen years ago (1849), at the settlement of Salmon bay.—*A. S. Packard.*

Zoological News.—*General.*—A paper by Dr. Hans Gadow,

upon the cloaca and copulatory organs of the Amniota, was read at the Royal Society on March 25th. The derivation of the sphincter and copulatory muscles from skeletal and visceral muscles was followed up in the Sauropsida and Mammalia, and the modifications of the cloaca in the chief groups of the Amniota were described. In the latter respect Hatteria comes nearest to the Amphibia, and Chelonia is intermediate between ostriches and crocodiles on one hand, and the Monotremes on the other. The peritoneal canals are still functional in crocodiles and tortoises, but rudimentary in Hatteria. Muellerian ducts are present in young male crocodiles and wolffian ducts in young females. The conclusion is that the whole cloaca consists originally of (1) the proctodæum, or outermost epiblastic anal chamber; (2) the urodæum, or hypoblastic middle chamber or primitive cloaca; and (3) the coprodæum, or innermost cloacal chamber. The urodæum is oldest, and the ventral urinary bladder, as well as the dorsal anal sacs (tortoises), are differentiations of it. The bursa tabricii of birds, various hedonic glands and the copulatory organs are derived from the proctodæum. The resemblance of these organs favors the phylogenetic connection of the Mammalia with the Reptilia.

Porifera.—The keratose sponges of the Challenger expedition have been described by N. Poléjaeff, of Odessa. Though not deep-sea organisms, thirty-seven species were collected, of which twenty-one are new.

Vermes.—Volume XII of the Challenger reports is on the Annelida Polycheta, and occupies over 550 pages. No less than 220 species are described as new. In many cases the food has been examined, and it throws some light on the food resources of the abyssal depths. A large number of forms occur in the North Atlantic. The remarkable new genus Buskiella is confined to the abysses, 2000 fathoms and more, of the Atlantic, but most of the genera are cosmopolitan. A great number of species were found at Kerguelen, the land-locked bays of which were rich in annelids. Australia and Japan furnished some peculiar and novel forms, while the North Pacific yielded but few species, and the majority of those of the South Pacific came from the Straits of Magellan. The greatest number of species were taken at depths under ten fathoms. Between 100 and 200 fathoms the number of species was less than between ten and 100 fathoms, but there were more new forms, and below these depths most of the fewer species found were new. Between 600 and 1000 fathoms, fourteen species were found, all new except two; depths between 1000 and 1200 fathoms yielded four species, all new; while between 1200 and 1500 fathoms more than twenty species were collected, only five of which were before known, most of them from shallower waters. Below this all the species found were new. The majority of the deep-sea annelids are tube-dwellers.——Only twenty-

eight forms of Gephyrea were collected by the *Challenger*, with ten new species and no new genera. Forms before known as littoral were dredged from great depths. The strange male of *Bonellia viridis* with its curious segmental organs is figured.

Mollusca.—Some 500 species of lamellibranchs were collected by the *Challenger*. The greatest depth was marked by *Semele profundorum* and *Callocardia pacifica*, both found at 2900 fathoms in the North Pacific. The report by Mr. E. A. Smith forms Vol. XIII of the series.

Crustacea.—Mr. W. Faxon, in his revision of the Astacidæ (Mem. Mus. Comp. Anat., Vol. x. No. 4, Part 1), enumerates fifty-two species of Cambarus and fourteen of Astacus. These genera compose the sub-family Potamobiinæ. The Astacidæ of the southern hemisphere form the sub-family Parastacinæ. All the species of Cambarus, with one exception, are American; but the Astaci occupy three well-separated areas. (1) Western North America; (2) Europe; (3) Eastern Asia and Japan.—— The first part of M. F. E. Beddard's "Report on the Isopoda" of the Challenger expedition is occupied by the genus Serolis, of which sixteen species, nine of them new, were collected. Four of the species are deep-sea forms, while the remaining eighteen known kinds occur between five and 150 fathoms.——Fifty-seven species of Schizopoda, representing twenty-one genera, are described and figured by Prof. G. O. Sars in his report on the Schizopoda of the Challenger expedition. Forty-six of these are new. Prof. Sars regards these creatures as a sub-order of Decapoda, and recognizes four families: Lophogastridæ, Eucopiidæ, Euphausiidæ and Mysidæ. Nine species of Gnathophausia are described, one of them six inches in length. Twenty-three new species of Euphausiidæ are described, and post-embryonal stages of several genera are figured, showing that they are hatched as true Nauplii.

Birds.—One would believe that the habits of the European cuckoo are by this time well known, but Mr. Seebohm, in his History of British Birds, throws doubt on this, since he states that the usually received idea that the young cuckoo, soon after it is hatched, ejects the eggs or young of its foster parents, does not rest on a secure foundation. *Nature* puts against this the observations of Mr. J. Hancock, as recorded in the Natural History Transactions of Northumberland (1866). On January 17th, 1884, the nest of a hedge sparrow or hedge accentor, containing four eggs of the species, and one cuckoo's egg, was discovered. On the 27th the cuckoo's egg and two of the accentor's eggs were hatched. On the 28th, at 10.30 A. M., the cuckoo put one of the unhatched eggs out of the nest, and half an hour later it threw out one of the young accentors, the mother looking on quite calmly the while. At 1 it pushed out the second egg, and at

3.30 got rid of the second accentor. In this case poetical retribution was wrought, for while one of the turned-out accentors was placed in a white-throat's nest, and cared for by its foster parents, the young cuckoo was about a week afterwards found dead at the bottom of the nest.

Mammalia.—Dr. C. H. Merriam has reported to *Science* the discovery of an Aplodontia, show'tl or mountain beaver, which he believes to be sufficiently distinct from the ordinary form to take rank as a new species. Eight examples were taken in Placer county, Cal. The skull of this *A. major* is much larger and heavier than that of *A. rufa*, the occipital crest more highly developed, and the zygomatic arches more strongly convex. There are also differences in the color and pelage. A fœtal pigmy sperm whale (*Kogia breviceps*) has been received by the Smithsonian Institution. It is now proved that this species breeds in May.

EMBRYOLOGY.[1]

THE EARLY DEVELOPMENT OF JULUS TERRESTRIS.[2]—The eggs of *J. terrestris* are oval, white and covered by a thick chitinous chorion; the nucleus is embedded in a mass of protoplasm in the center of the egg. This central mass of protoplasm is irregular in shape, but its long axis corresponds with that of the egg. From it anastomosing processes radiate in all directions, forming a network throughout the egg, in the meshes of which the yolk-spherules are contained. The nucleus is not a distinct vesicle, but its position is marked by chromatin granules, and there is no nucleolus.

On the second day the nucleus and central mass divide into two parts, but this division is not complete, the two resulting masses with their nuclei remaining connected by a network of protoplasm. The two segments then again divide in the same incomplete manner, so that there are now four segments connected together. On the third day the formation of the blastoderm begins, some of the segmentation masses making their appearance on the outside of the ovum at different points, so that the development of Julus resembles that of Geophilus as worked out by Sograf. The cells in the interior of the yolk are the direct descendants of the first segmentation masses, and constitute the hypoblast.

The fate of the hypoblast cells is various; some are employed in the formation of the mesoblastic keel, that is, in the formation of the splanchnic and somatic mesoblast. Another part gives rise to the hypoblast of the mesenteron, and a third portion remains in the yolk after the mesenteron is formed, and gives rise to mesoblast cells which are employed in the formation of various muscles and the circulatory system.

[1] Edited by JOHN A. RYDER, Smithsonian Institution, Washington, D. C.

[2] F. G. Heathcote, M.A. Proc. Roy. Soc. London, Vol. XL, No. 242, pp. 73–76. (Read Jan. 21, 1886.)