

A PAIR OF LIMBLESS, SNAKE-LIKE LAMBS.

BY DR. C. R. STOCKARD, COLUMBIA UNIVERSITY.

From the standpoint of the origin of new species or new kinds of animals, a most intensely interesting case is recorded from North Carolina. On the second of last February a lamb without indication of limbs appeared in a flock of sheep on the Tar River Stock Farm in Nash County near Wilson. This lamb is perfect in every other respect, having a well-formed head and body and a long tail, as may be seen by referring to the accompanying photograph of this peculiar sheep.

At first sight one may be led to think that this is merely a case of deformity, or in other words the lamb is a monster, such as occurs every day in one form or another among almost every class of animals. It is well known that young are often born with deformed limbs, and sometimes with their limbs severed from the body, but all such cases are very different from this, for the reasons below.

The first and most important reason is that during the latter part of April a second lamb was born on the same farm which was identically like the first, except that it was white instead of black. This one had the same father as the former legless freak but a different mother, both of its parents being white, while the first lamb had a black mother. Monsters or deformed young are usually weak and rarely live, while these lambs are healthy and very vigorous. The first one was fed on milk from a bottle for the first month or two, but is now able to feed on grass just as a normal lamb would.

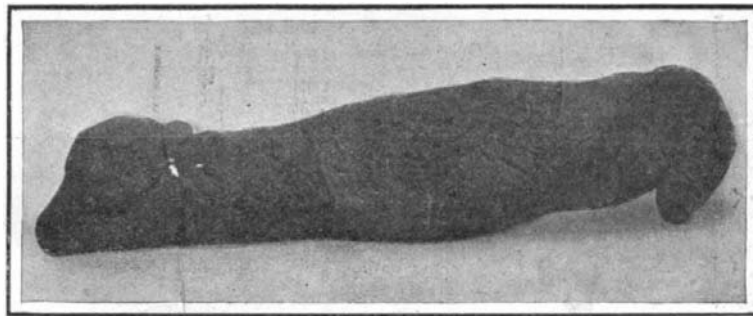
Such cases as these are what have been termed "sports"; they appear suddenly among a given kind of animal, and breed true to their peculiar form. Darwin knew of a few such cases and recognized that they bred true to their peculiarities, and might even form new kinds of animals. The ones that Darwin recorded were the black japed peacock, the turnspit dog, and the Ancon ram. The black japed peacock is a certain peculiarly-marked pea-fowl which sometimes appears in the flocks in England. This "sport" pea-fowl, although smaller and generally whipped in fights with typical males, thrives and will crowd out the common type within a few generations, since it breeds true to its new characters.

The turnspit dog is the often-seen long-bodied and short-legged kind, which has become a race of dogs in such a manner as the black japed peacock tends to establish itself.

The Ancon ram was a peculiar long-bodied sheep with short crooked legs born in Massachusetts about 1791. This sheep on account of its awkward shape was unable to climb the low stone fences which were so extensively used in New England. This was, therefore, a very valuable variety in case it should propagate true to its type, and so it did. When this ram was paired with common sheep, many of the offsprings were of the long-bodied, short-legged kind, and from this original father the Ancon race of sheep was produced. These sheep existed in New England for sixty or seventy years, and were then in some way allowed to "run out" or become extinct. Our legless lambs may be said to have carried this short-legged condition to the last degree and have discarded such appendages entirely, lying flat on the ground and being almost unable to move about except for some twisting motions. To the scientist and experimental breeder these lambs without legs are remarkably interesting. The newest and in many ways the most popular idea of to-day regarding the evolution of animals is based on such cases as this. Prof. Bateson in England and Prof. De Vries in Holland are the chief champions of this "Mutation Theory" of evolution, as it is termed. These prominent scientists believe that the various species in the world to-day have arisen from other existing or pre-existing species by sudden changes in form, or that is to say by "sports" or "mutants," such as this legless lamb. These "mutants" when they once appear breed perfectly true, and so establish new varieties or species of animals and plants. Prof. De Vries in his gardens in Amsterdam has succeeded in getting a number of entirely new plants, which establish themselves and continue to breed true from a single original kind, the evening primrose, which was introduced into Europe from America.

The most common cases of "sports" known to all are the albino forms, which suddenly occur among various animals. Many breeding experiments have been conducted with albino mice, to test the manner in which the albino condition is inherited. Albinos and many of these "sport" variations follow what is known as

Mendel's law of inheritance, a law first discovered by an Austrian monk, Gregor Mendel, about forty years ago and then forgotten until it was rediscovered in 1900 by three different investigators. The manner in which the law acts may be best illustrated by a concrete case. When a gray mouse is paired with an albino white mouse, all of the young born of this pair will be gray in color like the gray parent, not at all lighter. If these gray offsprings from the gray and white parents are paired among themselves, one out of every four of their offsprings will be a pure albino

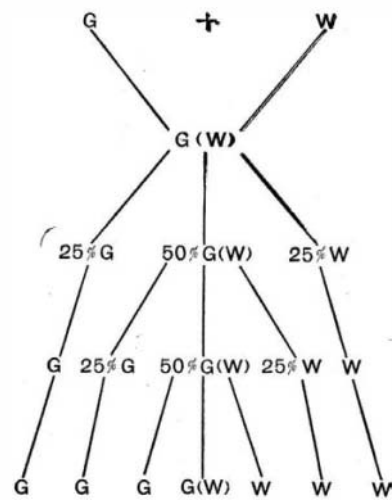


ONE OF A PAIR OF LIMBLESS LAMBS.

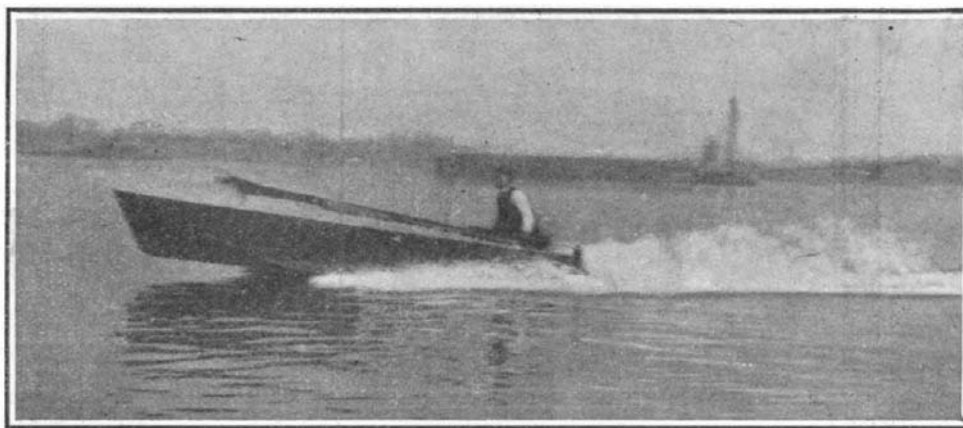
This is not the ordinary case of a monster, but of a new variety or "sport," which may be cited as evidence in favor of the new "mutation" theory of the origin of species.

like one of their grandparents, and the other three will be gray like the other grandparent and their own parents. In such a case the gray character is said to be more prepotent than the albino, or is dominant, while the white is recessive. According to Mendel's law, when an animal with a prepotent or dominant character is paired with one having a corresponding character, such as coat color, recessive or less prepotent, the first generation of the young will all show the dominant character only, though the recessive character is contained within them also, as is shown by what happens in the following generation. If the first generation be paired together, one in four of their offsprings will show the recessive character and the other three the dominant.

The way in which Mendel's law acts is made clearer by the accompanying diagram. If we indicate the



gray mouse by G and the white one by W, then when these two are paired their offsprings will be G(W).



A 15-FOOT HYDROPLANE BOAT WHICH MADE 21.6 MILES AN HOUR WITH 14 HORSE-POWER.

The W in parentheses indicates that this character, although contained in the mouse, does not show itself externally. Its presence is proven, however, when these G(W) mice are interbred. One-fourth of their offsprings will be pure white mice, one-fourth pure grays, and one-half will be G(W) again (see diagram).

If one of these "apodal sheep" be paired with an ordinary sheep, we may predict that all of the lambs will either be legless or else all have legs. Further, when these offsprings are paired together, one in four will be like one grandparent and three like the other.

If the two legless sheep are paired together, all of their lambs will be expected to show the legless condition.

One thus appreciates the practical value of Mendel's law, since by its aid a stock raiser having a breed with two phases of any one character which he wishes to select may know exactly the number of generations required to obtain the pure form he desires, provided the phases of the character are dominant and recessive in their relations.

Zoologists are much interested in these new legless sheep, as they add one more to the very few mutations which are known to be occurring at the present time. A change of one species or form into another is not a common occurrence, and uncounted ages have been necessary to produce the various species of animals and plants that we know to-day. To find such a change when in its beginning gives an opportunity for experimentation along these lines, and may enable the biologist to come nearer the solution of the riddle how the diverse animal population of our planet has come about.

Such a remarkable "apodal sheep" has never before been recorded.

A SUCCESSFUL HYDROPLANE GLIDING BOAT.

We give herewith the design and details of a 15-foot hydroplane gliding boat—"Vida May IV."—which was designed and built by Stearns Brothers, of Bridgeport, Conn., during the fall of 1906, and was intended to be launched during the latter part of February of this year, but which, owing to the heavy ice, was not put overboard until after the middle of March.

This boat has attained a speed of 21.6 miles per hour, which is extremely good, considering her weight and power, for a boat of the gliding type.

Although built on the gliding principle, the boat is considerably heavier than the European gliders, as it was built to stand a good sea, which is shown by the style of the bow and forebody chosen. Its weight is about 500 pounds, while some of the light gliders recently constructed weigh only 100 pounds. The engine used is also of a heavier type, being a 2-cycle, 2-cylinder, 14-horse-power Cushman marine motor which weighs 350 pounds.

As a comparison, this same engine was in use during last season in a displacement boat, "Vida May III," of exceedingly fine lines, this displacement boat attaining a speed of 18 miles per hour.

The gliding boat, being heavier in construction, is quite substantial, which is a very necessary point, as a gliding boat is subjected to the severest stresses that any model can stand. One instance is a gliding boat running into a head sea where it pounds. Unless something is done to resist this pounding, as was the case when the designers adopted the form of bow and forebody which is here shown, such a boat is worthless in a sea.

Another instance is a gliding boat running at an angle to a head sea. The sea then strikes under its weather bow, and unless the hull were designed to resist the impact of the waves, they would wrench or twist it out of shape.

In the design of a gliding boat the weight of the structure has been found to be a very detrimental factor as regards speed, for the resistance varies almost directly as the weight. The angle which the planes make with the water line when running is also of

great importance, as this angle determines the lifting and retarding forces and the resistance. The retarding force is directly proportional to the angle of inclination of the planes with the water line when the area and speed of the planes remain constant.

The lifting force acting on the planes tending to lift the boat at right angles to the water line, has been found to equal

$$(AV^2C \text{ sine of angle}) \times \text{cosine of angle.}$$

In this formula A = area of planes, V = speed in knots, C = a constant of about 4.

In determining the area of the planes, it has been found that the area of plane necessary to give the

right amount of bearing surface at certain speeds is obtained from the formula $A =$

$$W$$

$$V^2C \text{ sine of angle} \times \text{cosine of angle}$$

in which W = weight on plane, V = speed in knots, C = constant as before.

By this formula it can be plainly seen that the area of the plane varies directly as the weight, and inversely as the square of the speed.

A gliding boat when at speed is acting against dif-