thus permitting the work of natural selection in increasing the numbers to work without interruption.

The recessive character, on the other hand, only occasionally manifests itself, so that natural selection seldom has an opportunity to aid it. This advantage that dominance wins for the characteristic is especially important, because the early generations are the critical period for every new characteristic. Even a favored characteristic may succumb during the early days, when all the eggs are in one basket, so to speak, so numerous are the chance deaths.

Trimorphic heredity, where the heterozygotes constitute a third form different from the parents, also affects the action of natural selection. In this case the *utility of the new characteristic is less important than the utility of the heterozygous characteristic* in the determination of the fate of the characteristic in question. In some cases, the heterozygous characteristic is so different, as in the Andalusian fowl, that it is quite conceivable that the selective value of the heterozygous characteristic might be even opposed to that of the original characteristic. More frequently it would have a decreased value, whether it be negative or positive, which may reduce it to no selective value. A characteristic might have a high utility, but if its heterozygotous condition lacked it, it would probably fail unless some other factor, such as assortative mating or determinate evolution, should come to its rescue. There is a possibility that the heterozygote might be favored by a selective value with the extracted characteristic neutral. It might then be successfully established by natural selection in spite of its own lack of selective value. Again the heterozygous characteristic may be favored and the extracted characteristic opposed. In that case the success of the heterozygote would be jeopardized. Rescue might come for it in the shape of a fixed heterozygous condition, such as that of the Barred Rock poultry.

The method of inheritance plays, then, a large rôle in the action of natural selection.

Roswell H. Johnson

October 11, 1908

The Otter in Massachusetts

It is not commonly known that the North American otter (*Lutra canadensis*) is nowadays anywhere in Massachusetts a frequent victim of the trap or the gun of the hunter. It appears, however, that the otter has escaped extermination in spite of its valuable fur, and in certain sections of the state has apparently gained in numbers. The solitary habits of the animal and its shyness may have conduced to its preservation. It has, nevertheless, always been eagerly sought wherever its presence has become known, on account of the beautiful pelt, which to-day has a substantial market value.

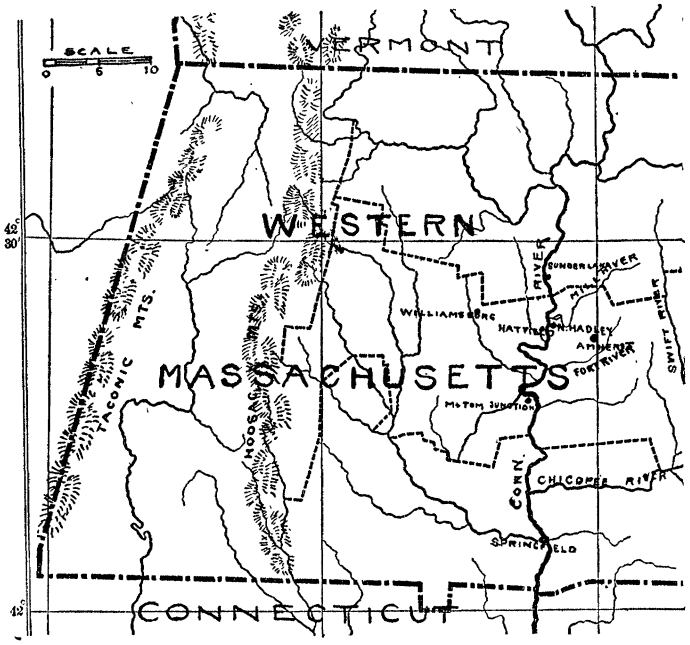
The persecution of these valuable fur-bearing mammals, it would seem, would have led to their extinction. While their shyness and general recluse habits are in their favor, their size and certain other instinctive habits are against them. The otter seems to be a playful creature and apparently enjoys a frolic with a companion or alone. During the rutting season, perhaps at other times as well, it is known to enter into the pastime of sliding on the snow or a muddy river bank into the water of a stream or pond, and to repeat this performance many times. These otter slides are the trappers' "signs." Apparently, too, the creature may have a sort of "playground" or place where it more or less regularly leaves the water for a roll in the snow or mud.

The great traveling capability of the otter is attested by its wide distribution. It is said to be generally distributed over North America, apparently in no great abundance at any one place, but likely to be met with in localities adapted to its habits. The roaming habit, of course, in a way stands between it and destruction. In its new haunts it may live and breed for some time, undiscovered. In the old it would probably have been hunted so relentlessly that it would have been extirpated.

It is to me a matter to occasion some surprise that the otter is as abundant as records seem to show, in certain parts of this state. The otter has always been included in a list of the mammalian fauna of the state. It appears at no time to have become so deci-

mated in numbers as to have been excluded from such a list. In 1835[1] E. Hitchcock included it in his list of Massachusetts mammals, without any reservations, from which fact we may infer that if not abundant it was yet fairly common. In 1840[2] E. Emmons wrote: "The otter is still an inhabitant of our waters, but, from its shyness, watchfulness and aquatic habits, is rarely seen and still more rarely captured." In 1861,[3] however, E. A. Samuels referred to the otter as "once quite common," but "now nearly exterminated, one in two or three years being about the greatest number captured." He reported a specimen killed that season near Marlborough, Middlesex County, and another at Palmer, Hampden County. Eight years later[4] J. A. Allen wrote of the otter as "not rare; still not often captured," and stated that during the ten preceding years some half dozen had been taken near Springfield.

Records are not at hand for later years up to the winter of 1905–6. During that season a party fishing through the ice at an ox-bow of the Connecticut River one half mile north of Hatfield caught an otter. In the confusion following this unexpected catch the creature escaped. In the succeeding autumn another fine specimen, a male, was taken in the town of North Hadley, just across the river from Hatfield, from a mill pond in a creek known locally as "Mill River." A few months later still another specimen, an old male, was taken from this pond. The skeleton and mounted skin of this animal are now in the Massachusetts mammal collection at the Agricultural College. Shortly afterwards a third male was caught from this pond. The trap had been set at the "playground" of the animals. Tracks have frequently been seen near "Fort River," a few miles south of "Mill River," and in a mill pond of this stream, another was trapped in the winter of



[1] Report on Geology, Mineralogy, Botany and Zoology of Massachusetts, 1835, p. 526.

[2] Report on Quadrupeds of Massachusetts, 1840, p. 48.

[3] Agriculture of Massachusetts, 1861, Part I., p. 160.

[4] "Catalogue of the Mammals of Massachusetts, with a Critical Revision of the Species," *Bull. Mus. Comp. Zool.*, Cambridge, 1869, p. 178.

1907–8. In the early spring of 1908 a pair of otters were shot in the "old bed," a large ox-bow of the Connecticut near Mt. Tom Junction. In the preceding winter months a boy shot another on a cake of ice in the Connecticut River near Hatfield. At Sunderland, north of Amherst, in the same season, another specimen was shot in a brook, tributary to the river. In Swift River, a few miles east of the Connecticut, two others were caught in a trap within the last two or three years. Traditions of the presence of the otter, a dozen, twenty and more years ago are common among the residents of the river towns in this neighborhood, but it is generally conceded that these animals appear more abundant at the present time than for many years preceding.

A few weeks ago while searching for microscopic forms near "Mill River" I came upon a large otter feeding in a stagnant pool near the creek. My approach had been along the road. The dust was very deep and muffled every sound. The creature remained feeding—apparently on vegetable matter, possibly frogs—or paddling about for several minutes at a distance of less than one hundred feet from my standing place. At last it evidently saw or scented me and mounted the bank and was lost in the brush. It soon emerged at the bank of the stream a hundred yards away and swam around a bend out of sight.

The surprising abundance of these animals in the Connecticut Valley is thus shown and seems to be a matter deserving of record. The extent of their presence elsewhere in the state can not be stated with any accuracy. Dr. Glover M. Allen[5] reports that they are occasionally seen about the Charles River in the eastern part of the state, he having found unmistakable tracks of the otter near Dedham, Norfolk County, two winters ago.

It is, of course, possible to postulate the persistence of these animals in this state as a logical consequence of their shy habits and tendencies to roam about. At times they might appear to decrease in numbers when eagerly sought for their fur. When the relentlessness of the hunter abated they would multiply and attract attention once more, the streams or ponds where the creatures had been driven serving as centers of dispersion. The younger animals, not having the experience of the older ones, would be less wary and timid; might, indeed, if unmolested for some time, become comparatively bold. The comparatively large size of these animals and their habits, however, would reveal their presence. Even their roaming habit is in a measure against them, as they are essentially stream-loving animals, and in the winter months when searching for the rapids and falls of the streams for open water would leave their tracks in the snow. The otter is a good land traveler and does not always follow the winding courses of the waterway. Their comparative scarcity in the eastern part of the state is noteworthy.

The abundance of these animals in the Connecticut River valley has suggested to me that they have come along this waterway from the north outside the limits of the state to the smaller tributaries of the river in the lowland of the valley. They may have traveled eastward through the valleys of the Ware, the Assabet, and the Blackstone to the seaboard. But one must not overlook the possibility of their having come along another waterway from the north—the Merrimac, along the tributaries of which—the Concord and the Nashua—they might have easily made their way southward.

The emigration from Vermont of terrestrial mammals is a matter of common knowledge. This emigration is along the Hoosac and Taconic ranges in the western part of the state. Early reports record many wild mammals in these districts, but their numbers are fewer, apparently, at present. In the fall of 1907, however, a black bear (*Ursus americanus*), variety not known, was shot near Williamsburg in the eastern foothills of the Berkshires. Some indication of the number of wild cats is had from the treasurer's records in Berkshire County. By the enactment of our general court (Chap. 344, Acts of 1903) provision is made for the payment of a bounty of $5.00 for every wild cat (either

[5] Personal letter.

Lynx rufus or *L. canadensis*) killed in the state. The following bounties have been paid in Berkshire County under the provisions of this act: 1903, $100; 1904, $110; 1905, $115; 1906, $100; 1907, $60.[6] The records are not sufficiently explicit as to the species of *Lynx*, but the loupcervier seems far less common, as in only a few cases was the distinction made on the certificate. These animals (*L. rufus*) are sporadically reported from other sections of the state, but often from localities that lead to the suspicion that they may have immigrated from the western hilly or mountainous parts.

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SOCIETIES AND ACADEMIES

THE PHILOSOPHICAL SOCIETY OF WASHINGTON

THE 652d meeting was held on October 10, 1908, President Bauer presiding. The following papers were presented:

Vertical Temperature Gradients of the Upper Atmosphere: Mr. W. J. HUMPHREYS.

The extensive work that has been done during the past ten years in exploring the air with sounding balloons was reviewed and illustrated with typical curves.

The records obtained with these balloons show that for about 3,000 meters above the surface of the earth the winds are turbulent and the temperature gradient irregular. Above this for some distance the temperature decreases nearly uniformly to a minimum at an altitude of from nine to fifteen kilometers usually. This height and the temperature both are functions of season, of latitude and of type of weather; and the temperature gradient is similarly affected.

Above the minimum the temperature gradient usually changes abruptly and from that point up as far as soundings have been made slowly increases.

All these phenomena were separately discussed and explained as mainly due to the amount and distribution of water vapor in the atmosphere and the consequent location and temperature of the effective radiating surface of the earth.

The results are in accord with the best determinations of the solar constant and with the known laws of radiation and absorption.

[6] Personal letter, Mr. Henry Brewster, treasurer of Berkshire County.

The New Magnetic Survey Yacht "Carnegie": Mr. W. J. PETERS.

A paper on the proposed new vessel designed for a continuation of the magnetic survey of the oceanic areas.

The paper first gave the reasons which made it desirable to purchase a vessel especially built for the requirements of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington. Then followed data concerning the size, sail area and expected performances.

A brief description of the living quarters, accompanied by slides, and also a statement of the methods of observation which are to be on the lines followed in the previous work on the *Galilee* in the Pacific Ocean.

There was also exhibited a graphic representation of the curves of expected maximum ship deviations. A more complete publication will appear elsewhere.

THE 653d meeting was held October 24, 1908. The following papers were read:

The Results of Recent Observations in Atmospheric Electricity: Mr. P. H. DIKE.

The paper gave a summary of some of the recent work in atmospheric electricity and showed the relationship of this work to that done along the same lines on board the Carnegie Institution Magnetic Survey Yacht *Galilee* during the cruise recently finished.

Continuous records made at various observatories of the course of the potential gradient show its extreme variability and slight apparent connection with other atmospheric phenomena. It is of interest as a factor in the determination of the earth-air current.

The discovery of the ionization of gases led to the study of the conductivity of the air, at first by faulty methods through the lack of appreciation of the errors due to saturation currents. J. J. Thomson cleared up the misunderstandings and led the way to more accurate work. For field work the Gerdien conductivity apparatus has been found most useful, and gives fairly consistent results. In conjunction with the record of the potential gradient it gives the earth-air current in absolute measure. Gerdien has found this current at Göttingen to be about 2.5×10^{-16} amperes, with a conductivity for positive electricity of 1.16×10^{-4} electrostatic units and for negative of 1.12×10^{-4} electrostatic units.

The speaker had made use of the same type of