of "Interesting Animal Surgery" is noted an operation for cataract performed on the Indian rhinoceros, "Mogul." A Census of American Bison gives a total of only 2,047 on January 1, of which 969 were in captivity in the United States and 41 in Canada: these figures are now different owing to the sale to Canada of the Pablo herd. As a supplement to the bulletin F. A. Lucas has an article on "The Passing of the Whale," noting that the number of whales are being rapidly lessened and that unless protective measures are taken one or two species are in danger of actual extermination.

Bird-Lore for July–August contains articles on "The Fish Hawks of Gardiner's Island," by Frank M. Chapman; "The Return of the Snowy Heron," by Herbert R. Sass; "A Little Blue Heron Rookery," by M. Harry Moore, and the fifth paper on "The Migration of Flycatchers," by W. W. Cooke. The Educational Leaflet is by Mabel Osgood Wright and devoted to the tree swallow. The report on The Audubon Societies notes steady progress, but as the result of continuous work, and the vast numbers of birds sold for "plumes" shows the necessity of further hard work.

THE LIQUEFACTION OF HELIUM[1]

In his communication to the Amsterdam Academy concerning the liquefaction of helium Professor Onnes describes in considerable detail the steps that led up to that achievement, the complicated apparatus employed, and the difficulties that had to be surmounted. The narrative conveys a vivid impression of the obstacles that have to be overcome in order to lower temperature a very few degrees in the neighborhood of the zero of absolute temperature. In spite of the most elaborate and comprehensive preparation and ample supplies of liquid hydrogen, not only was the whole apparatus, with its subsidiary arrangements, tested to its utmost capacity, but the physical energies of the professor and his assistants were well-nigh exhausted by the prolonged struggle.

The constants of helium, while showing some important points of difference, are found to agree very remarkably with the predictions made by Dewar on theoretical grounds in his presidential address to the British Association in 1902. After a correction of two tenths of a degree the boiling point of the liquid is found to be 4.5 degrees Centigrade. By exhaustion to below one centimeter, and probably below seven millimeters of pressure, the professor considers that the temperature was reduced to about 3 degrees without, however, affecting the mobility of the liquid.

The density of the liquid helium is 0.15, or about double that of liquid hydrogen; and the proportion between the density of the vapor and that of the liquid is as 1 to 11. The critical pressure is in the neighborhood of two or three atmospheres, which is relatively low in comparison with the figures for other gases.

Professor Onnes deduces a critical temperature not much higher than 5 degrees Centigrade. But with regard to this and all the other figures he says that more careful measurements and calculations must be made before any certain and final conclusion can be reached. At temperatures so near to the absolute zero there is always room for doubt in the application of laws deduced from the behavior of bodies in more normal conditions, and for the present we must apparently be content to accept the values of the helium constants as provisional.

[1] From the London *Times*.

SPECIAL ARTICLES

A NEW GROUP OF PERMIAN AMPHIBIANS

More than thirty years ago the late Professor Cope described from the reputed Permian, of Illinois, three small vertebræ which he considered reptilian and which he made the type of the genus and species *Lysorophus tricarinatus*. Six years ago Professor Case recognized in certain material—a considerable series of connected and more or less intertwined vertebræ—which he had collected from the Permian of Texas, the same genus, and, possibly, the same species. He reached the conclusion that the animal was

legless and serpentiform in shape. In the absence of the skull, he referred the form, as Cope had done, to the Reptilia. Two years later F. Broili thought that he recognized in some imperfect skull material of the same species a pair of flat bones below the palatal region, which he believed to be gular plates. As such plates are characteristic of fishes and unknown in reptiles, with which he also classed the genus, he reached the rather startling conclusion that the reptiles were, in part at least, derived directly from the fishes—a conclusion, it is needless to say, which was received with doubt and incredulity by naturalists. Because of this extraordinary character he proposed for the form the family name Paterosauridæ.

Recently, in the examination of the Texas Permian material in the Chicago University collection, I was so fortunate to find a skull of *Lysorophus* in connection with vertebræ, which, upon preparation proves to be wonderfully perfect and complete. The so-called "gular plates" of Broili are merely and clearly four pairs of epibranchials, all nearly of the same size, the first pair only with a stout pair of ceratobranchials connected with them. Upon the whole the branchial apparatus resembles not a little that of *Necturus* or *Proteus;* and indeed there are certain other resemblances to these salamanders in the skull that can not be overlooked—the small, pointed snout, the very small size and anterior position of the orbits and nares, especially. The temporal region is unossified; the basioccipital is ossified and there are two occipital condyles. There is no pineal eye; and there is a pair of large plates, apparently proatlantal, back of the small, unpaired supraoccipital.

Lysorophus was a slender, well-ribbed, serpentiform, legless, probably blind, mud-burrowing amphibian, with long, one-headed ribs attached neurocentrally, and with notochordal vertebræ, strangely resembling, though genetically very distinct from, the modern Cæcilia. In skull structure it is not unlike modern amphibians, but will doubtless require the erection of a new group for its reception, a group equivalent to the modern Cæcilia. In length the creature may have reached a foot or fifteen inches, though the skull measures but a trifle more than half an inch.

S. W. WILLISTON
UNIVERSITY OF CHICAGO

COMBINATIONS OF ALTERNATIVE AND BLENDING INHERITANCE

WHETHER blending and alternative inheritance are fundamentally the same thing or not, they are usually sharply to be distinguished in their end results. Mendelian work has been almost wholly concerned with alternative inheritance. However, usually each member of the Mendelian pair exhibits fluctuating variation. Tallness of peas is dominant in a Mendelian sense over dwarfness, but each sort varies as to height. When either condition is pure (homozygous) only blending inheritance is concerned. When the two conditions are crossed we have to consider a combination of both alternative and blending inheritance.

When the ranges of variation of the two conditions do not overlap no confusion would occur. However, when they do, although Mendelian segregation and purity of germ may be as perfect as ever, confusion would arise. In the beetle *Crioceris asparagi* there are three pigmentless areas on each elytron. These areas may be distinct or they may be united in various degrees. Usually it is the anterior and middle area which unite. They may be well united, or only faintly so, or not united at all but extra large, or they may not be united and small. It seems[1] that the condition of areas-distinct-and-small is a Mendelian dominant over areas-united. However, the recessive character is subject to the fluctuation just mentioned and the inheritance of these fluctuations is a problem of blending inheritance as contrasted with the problem of areas-distinct *vs.* areas-united.

I have been carrying on a study of the inheritance of abnormal venation in *Drosophila ampelophila* for about forty generations of the fly. As was pointed out in a preliminary report of the work before the Boston meeting

[1] Lutz, *Psyche*, June, 1908.