Men who make a business of producing plant novelties, Burbank, for example, are delighted with the slightest indication of sporting, because they consider that, the "stability of the type" having been disturbed, other variations are likely to follow.

Whether there is any basis of fact for this idea cases like that here described may tend to show, if carefully followed up. If the supposed phenomenon is found to be a real one and an initial color variation is frequently followed by others, then it will remain to discover an explanation, since "instability of type" can scarcely be regarded as an explanation, but only a figurative statement, of a phenomenon observed.

Studies of the inheritance of albinism, as already stated, show it to be independent in transmission of the several factors which determine the particular character of the pigmentation, as gray, black, yellow, etc. For in crosses with colored varieties, albinos actually do transmit to their offspring particular qualities of pigmentation, as gray, black, yellow, etc. It is assumed, therefore, that in the albino variation something has been lost from the organism which is indispensable to the production of pigment, though it has nothing to do with controlling the particular sort of pigment which the organism can form. Albinos, therefore, can be produced of as many different sorts as regards their breeding capacity, as are the visibly different pigmented sorts. Each pigmented sort finds its counterpart among albinos, though all these albinos may look alike. A study of the progeny of an albino through two generations will serve to show with what particular colored variety it corresponds. Such a study has not yet been completed for the albino *Peromyscus*.

The albino variation, being a *loss* variation and recessive in nature, must have existed in both the gametes (the egg and the sperm) which produced the individual captured by Mr. Clark. Both the parents of that individual, accordingly, *transmitted* albinism and probably produced other albino young, if they had more than a single litter of offspring. But the survival of albino offspring in the wild state would be exceedingly doubtful because of their conspicuousness and their defective vision. Yet the heterozygous brothers and sisters of the albino sports should themselves be at no disadvantage in the struggle for existence and should produce about 25 per cent. of albino young. Therefore we should not be surprised if the sporadic occurrence of albinism should continue in a locality where it has once made its appearance, as in Clinton County, Michigan. The naturalists of that region would perform a service to science by looking for and reporting future occurrences of albinism in field mice there.

In conclusion I wish to express my gratitude to Professor Barrows (father and son) for entrusting to me the experimental study of this interesting variation.

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Origin of the Sediments and Coloring Matter of the Red Beds of Oklahoma[1]

Since the origin of the sediments and the red coloration of the Oklahoma red beds has long been the object of more than ordinary curiosity, it may not be out of place to briefly outline some of the results of a recent study of these deposits.

Previous workers have made known the fact that the light-colored sediments of the lower Permian rocks of Kansas become red in Oklahoma, and that the similar light-colored Albany beds of Texas redden on approaching Oklahoma. In the Texas reports Cummins hinted that a lateral transition of the Albany beds into the red rocks of the Wichita formation might not be impossible. Later he worked out this transition in detail.[2] Gould and

[1] Published with the permission of the director of the Oklahoma Geological Survey.

[2] The leading recent articles bearing upon this subject are: Cummins, *Trans. Tex. Acad. Sci.*, for 1897, pp. 93–98. Gould, *Kans. Univ. Quart.*, pp. 175–177, 1900; *Amer. Jour. Sci.*, XI., pp. 185–190, 1900; *Trans. Kans. Acad. Sci.*, XVII., pp. 179–181, 1901. Adams, *Amer. Jour. Sci.*, XII., pp.

Adams first described the transition of the light-colored sediments of Kansas into the red deposits of Oklahoma and Adams made a reconnaissance in Texas. Later, Kirk traced the Wreford limestone into a red sandstone in Oklahoma. Beede suggested that the sediments of the red beds were derived from the Arbuckle-Wichita Mountain region, and Gordon made further studies of the Texas region.

During the past summer the attempt was made to take up the study of this transition in somewhat greater detail in order to discover more fully its nature and significance. The horizons of the rocks lying between the Neva limestone and the Wreford limestone, as represented in Kansas, and a part of the way, the Fort Riley limestone were studied. A trip to the Wichita Mountains was made to study the relation of the red beds to the Permian conglomerates. With the exception of a single reference this paper deals with the strata of the beds studied.

In tracing the limestones and shales of the basal Permian beds of Kansas southward into Oklahoma the relationship of the light-colored sediments to the red sandstones, red shales and red limestones of Oklahoma is clearly revealed. It is shown that some of the heavier ledges of limestone first become sandy along their outcrops in patches a few rods across. Farther south the sandstone areas increase in size until the limestone appears only in local areas in the sandstones and is finally wanting. Traced farther southward, the sandstones become deep red or brown with local areas of white. The decimation of the fauna sets in as the limestones diminish and the remains of life are not found far beyond the limits of the limestones. The shales become red very much farther north than do the sandstones, and are frequently more deeply colored. Some of the lower limestones become red before they change into sandstones. The sandstone ledges continue for some distance southward as rather even, uniform beds, but farther on they are found to thicken and thin in a somewhat systematic manner.

Several ledges of sandstone frequently occur in a single section and where one of these ledges is found thickened the others are apt to be thicker than normal. Likewise they are all found to be thin over certain areas. The regions of thickening and thinning were found to be parallel belts lying north and south at right angles to the major drainage lines. Two of these belts together with an intervening region about eight miles across were studied. The sandstones thicken at the expense of the shales, sometimes eliminating them. In one instance a thin limestone was traced southwest into one of these zones. A sandstone twenty feet or more beneath the limestone thickens and rises above the limestone and practically unites with the sandstone some distance above it. The limestone seems to die out a few feet from the sandstone, but farther west the latter shrinks to its normal thickness and the limestone is present in its proper position with its usual characteristics.

In these zones of thickening which are frequently several miles wide, the sandstones are very irregularly cross-bedded and frequently ripple-marked, while the thickening is uneven. It would seem that these zones are opposite the mouths of streams which brought sediment into the sea, where the coarser materials were carried farther from the shore than opposite the inter-stream spaces. The irregular thickening of the individual beds may be due to current work, wave action and heaping into local dunes by the wind, though the action of the last factor is uncertain. The irregular bedding and ripple marks indicate a sort of littoral or very shoal condition for the deposition of the sandstones and shales.

As this interesting transition of sediments is traced still farther southward, we find, before reaching the latitude of Shawnee, that the sandstones become more abundant over the whole area, more lenticular, more irregularly cross-bedded and imperfectly lithified. In a single railroad cutting a thick lens of

383–386, 1901; SCIENCE, XV., pp. 545–546; XVI., p. 1029, 1902; *Bull. Geol. Soc. Amer.*, pp. 191–200, 1903. Beede, *Jour. Geol.*, XVII., pp. 710–729, 1909. Gordon, *Jour. Geol.*, XIX., pp. 110–125. Kirk, Third Bienn. Rep. Okla. (Terr.) Geol. Surv.

sandstone may fade into a soft sandy clay shale with the same bedding and structure as the stone itself and change back into a sandstone a few rods away. Most of the sandstones are so incoherent when freshly quarried that pieces two or three inches in diameter crush readily under foot. In many of the wells of the region the water is obtained in "quicksand." Most of the shales contain much fine sand and offer little resistance to weathering.

At their southern limit these red sandstones and shales are found to dovetail into the Permian conglomerates on the northern side of the Arbuckle mountains, while similar conditions obtain among the higher beds farther west where similar conglomerates occur on the flanks of the Wichita mountains. These conglomerates are largely composed of the fragments of the pre-Carboniferous limestones aggregating 8,000 or 10,000 feet in thickness flanking the mountains and at one time covering them. The solution of these limestones produces a red clay wherever the insoluble residue happens to remain undisturbed below the vegetable mold, and the disintegrating limestone conglomerates produce a more or less sandy red clay indistinguishable from some of the red bed sediments. Thus it seems not improbable that much of the material of the red beds in the region studied was derived from these thick limestones.

Considering all these phenomena, it is apparent that the transition of deposits from the Arbuckle mountains to the Kansas line is such as would be expected in passing from the mountains out into a shallow epicontinental sea.

That the solution of limestone produces red residual clays is well known. It is exhibited in the residual soils and clays of the limestone regions of the unglaciated part of the Mississippi Valley, Cuba, southern Europe and elsewhere. The clays thus derived and their coloring matter—the red oxides of iron—are minutely divided and when in suspension settle slowly, but little movement of the water being sufficient to keep them in suspension. This characteristic adapts them to long transportation. The great thickness of the Arbuckle and associated limestones, and their former extent, over thousands of square miles of country where they are now removed or represented only by their upturned edges surrounding the mountains, seem to furnish an ample source of the coloring matter and a considerable amount of the clays of these lower Oklahoma red beds. The Gabbros, red granites and red porphyries of the Arbuckle-Wichita region also contributed their share of sediment to the red beds.

From these observations it would appear that the sediments of the lower red beds of Oklahoma were derived largely from the Arbuckle-Wichita Permian land mass and the coloring matter mainly from the solution of the limestones known to have been removed from it. It also seems probable that the sediments of the region studied, especially those some distance from the mountains, were deposited in very shallow turbulent water, or vast tidal beaches, inimical to life of all kinds, since they are void of fossils or even carbonaceous matter.

J. W. Beede

THE ENTOMOLOGICAL SOCIETY OF AMERICA

The sixth annual meeting of the Entomological Society of America was held at Washington, D. C., Tuesday and Wednesday, December 26 and 27, in room 376 of the new U. S. National Museum building. The following papers were presented:

Herbert Osborn: *Faunistic Studies in Entomology.*

The need of an extended and accurate record of insect fauna is urged, with statement of instances where such data have been much needed. Attention is called to the possibilities for widely scattered workers to assist in such studies and the desirability of some connected plan by which to encourage and bring together the results of such studies. A suggestion is made that the society appoint a permanent committee on faunistics, the duty of which will be to devise means for the encouragement of faunistic studies and to bring together the correlated results in this line with reports to the society as to methods proposed and the results secured.