

PROFESSOR R. M. BARTON, of the University of New Mexico, has been appointed professor of mathematics in Lombard College.

#### DISCUSSION AND CORRESPONDENCE

##### THE RATE OF CONTINENTAL DENUDATION<sup>1</sup>

IN an article bearing the above title, published in *SCIENCE*, December 25, 1914, Charles Keyes contends that determinations of mineral matter carried by such streams as the Mississippi are of little or no value, particularly as a basis for estimates of "the rate of lowering of the continental surface through stream corrasion" (and transportation?). To the present writer it seems that the article as a whole and most of the individual statements in it are likely to give many readers a wrong impression, and that some of the statements, for example that "The elaborate stream measurements thus go for naught" are altogether and demonstrably untrue.

The great practical value of the water analyses is too obvious to need elucidation. They are essential in water-supply problems almost innumerable, especially in connection with providing water for industrial and municipal use, and for irrigation; in fact they were made primarily for use in solving just such problems, not "with the express purpose of determining the rate of lowering" of the land surface. The measurements of stream discharge that have been utilized in calculating the rates of denudation furnish the basic data for many of the greatest public and private hydraulic developments in the United States.

The educational value of the data afforded by these determinations is equally obvious. That the Mississippi is gathering from the surface, mostly from the soil, of its own basin several hundred million tons of earthy material every year and is dumping this material into the Gulf of Mexico; that practically none of this material is being returned; that some parts of the basin are losing by stream action more rapidly than others; that the earth's surface everywhere is being continually modified by such action—valleys carved, hills razed, and

so on—these are not facts that it is worthless to ascertain.

Apparently Mr. Keyes wishes to convince his readers that the stream observations that he assails are futile because the effects of stream action are modified by internal earth movements and by the introduction of wind-blown materials.

That parts of the Mississippi basin have been uplifted in past geologic time is a matter of common knowledge, but the writer does not see that it affects the precision of conclusions regarding the amount of material now being removed by the streams. The statement that "Since Glacial times—perhaps 10,000 years ago—a very considerable part of the upper Mississippi Valley appears to have been elevated not less than 500 or 600 feet" must have reference to the remarkable work of late years on raised Pleistocene beaches of the Great Lakes, but the published reports on this work indicate that only a small part of the Mississippi Valley has been affected by the uplift, and none of it so much as 500 or 600 feet. The 500- and 600-foot isobases lie entirely outside of the Mississippi basin in the vicinities of Lake Superior and Quebec.

As to wind deposits, it should be remembered that strata of other than wind origin lie at or near the surface throughout the Mississippi basin, whereas if dust had been accumulating "over the entire Mississippi Valley faster than the river and its tributaries are carrying rock waste to the sea," water-laid and ice-laid materials would not outcrop but would be deeply buried under eolian dust instead of under products of their own decomposition. That large quantities of material have been and are being shifted by the wind no one doubts. The literature on the subject is voluminous, as is shown by the excellent bibliography compiled by Stuntz and Free, and many precise data have been recorded. For example, J. A. Udden calculated in 1894 that the capacity of the atmosphere over the Mississippi basin to transport dust may be a thousand times that of the river, but he did not fail to observe that the actual load carried by the air is "an insignificant fraction" of its capacity load. Dust, however, is shifted back

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and forth in the basin by the wind, whereas stream sediment and dissolved matter travel in one direction only. It is well known that in drawing conclusions regarding the rate of denudation account should be taken of the material transported by wind. Attention was called to this factor of the problem by E. E. Free in an article published in *SCIENCE*, March 12, 1909, but it is difficult to comprehend how conclusions as to the "rate of lowering of the continental surface through stream corrasion" are affected by aerial transportation. (Erosion rather than corrasion is probably here meant, for corrasion does not include transportation.)

In the fourth paragraph of his article Mr. Keyes speaks of wind-blown dust and then says:

In recent geologic times also, the western half of the basin has actually had deposits laid down upon its surface to a thickness of not less than 1,000 feet.

Now if "recent geologic times" means most of the Tertiary and Quaternary periods (of which *Recent* time is but a small part); if the "western half of the basin" means a part of the western half of the basin; and if "deposits" means not only wind deposits (loess and sand) but also and predominantly aqueous deposits, the statement would appear to be in accord with the facts. Nevertheless it might still be characterized as trite and irrelevant, for the existence of Tertiary and Quaternary strata in the western part of the basin is well known and the commonly accepted conclusion that the great western tributary, Missouri River, carries 150 to 200 million tons of mineral matter out of its drainage basin every year is on just as firm a basis as before.

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#### ALBINISM IN THE ENGLISH SPARROW

TO THE EDITOR OF *SCIENCE*: The note in *SCIENCE* of January 1, concerning albinism in the English sparrow recalls several observations made by the present writer at various times. Semi-albinism, or spotting, or mottling with white in the plumage of these birds is not at all rare, though of course not particularly conspicuous unless one is especially

used to the study of birds in the open. I have seen this feature among these sparrows both in this country and in Europe at several times and places. But complete albinism is less common, though not so rare as the note referred to above might imply. A number of years ago in Oxford, Ohio, I found in a brood of sparrows just in flight from the nest three specimens which were perfectly white, and with the characteristic pink eyes of the pure albino. Two of these birds I was able to capture, the other escaped. Two of the same brood were quite normal in plumage. Neither of the parent birds was an albino, and so far as one could know the phenomenon was quite spontaneous in this brood. Another case which came to my knowledge quite recently was in Syracuse. In this case a single specimen was observed by school children of one of the grammar schools of the city who at once ran to the teacher with the news, and the teacher having seen it communicated with me as to the significance of a feature quite new to her. While I did not see this specimen myself, the validity of the case is beyond doubt and may be accepted as another example of the phenomenon.

In this connection it may be well to call attention to several cases of partial albinism which I have noted in the common robin. Several years ago I found such a female robin brooding a nest near my house and I took pains to watch the outcome. None of the young gave any indication of white plumage. Another case has come under observation in a park adjoining my present home in Syracuse. Here again, the robin was a female, and had a conspicuous patch of white feathers on the back and shoulder. The specimen has been noted now for three successive summers, and though careful attention has been directed to the young no evidence of similar markings has been noted. Albinism being a recessive character tends to disappear under ordinary conditions of mating, hence its comparative rarity in a state of nature.

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