I trust that the record which will be shown in the census report of cotton production, now in press, will form a convincing illustration of the legitimate uses of soil-analysis. E. W. HILGARD.

University of California, Sept. 1, 1883.

Do humming-birds fly backwards?

The Duke of Argyll, in his Reign of law (p. 145), lays it down in italics, that '*no bird can ever fly backwards.*' He mentions the humming-bird as appearing to do so, but maintains, that, in reality, the bird falls, rather than flies, when, for instance, he comes out of a tubular flower. But this morning, while watching the motions of a humming-bird (Trochilus colubris), it occurred to me to test this *dictum* of the duke; and, unless my eyes were altogether at fault, the bird did actually fly backwards. He was probing one after another the blossoms of a Petunia-bed, and more than once, when the flower happened to be low down, he plainly rose, rather than fell, as he backed out of and away from it. I stood within a yard or two of him, and do not believe that I was deceived.

It may not be amiss to add that the Duke of Argyll's objections seem to be purely theoretical, since the 'Reign of law' was published in 1866, and it was not till 1879 that the author came to America and saw his first living humming-bird.

BRADFORD TORREY.

Boston, Sept. 14, 1883.

Wright's ice-dam at Cincinnati.

I notice on p. 320 of SCIENCE, vol. ii. no. 31, an inaccurate report of what I said at the Minneapolis meeting, which does injustice both to Mr. Wright and to myself, and which I would beg to have corrected.

The reporter makes me speak slightingly of Mr. Wright's discovery of the ice-dam at Cincinnati, as not sufficing to explain our Pennsylvania terraces. On the contrary, I expressed my admiration for the discovery as furnishing precisely the explanation we need for the *local-drift* terraces of the Monongahela, and the *rolled-northern-drift* terraces of the lower Alleghany, Beaver, and upper Ohio rivers.

The reporter probably mixed this up with what I said afterwards respecting the *rolled-drift* terraces of eastern Pennsylvania, which only reach a height of 800′ A. T., in Northumberland county, and require some explanation, perhaps, quite unconnected with that which Mr. Wright certainly furnishes in a most satisfactory manner for the 800′ to 1,100′ A. T. terraces of the Ohio River basin. J. P. LESLEY.

Second geological survey of Pennsylvania,
Philadelphia, Sept. 15, 1883.

Erratic pebbles in the Licking valley.

While engaged in tracing the outcrop of 'Clinton ore' in eastern Kentucky, in the fall of 1882, I became interested in the pebbles, which in certain localities, and up to a certain height, were very abundant in the surface-soil.

Most abundant were rounded quartz pebbles, probably from the millstone grit. Somewhat less abundant were fragments of chert, showing little or no wear derived from the sub-carboniferous limestone. Still less abundant, though by no means rare, were some from the carboniferous, often containing characteristic fossils. They were confined, so far as I could determine, to the valley of the Licking and its larger tributaries. Vertically, they range from the river-bottoms to the top of the table, formed by the upper Silurian rocks, which borders on the Devonian escarpment; so that these tables are quite uniformly covered with the material.

The distribution of the material is such as could only have been made while the valley was temporarily occupied by a lake. I was therefore led, though with some hesitation, to suppose that the glacier must have crossed the Ohio at Cincinnati, damming the river. I was not at the time aware of the labors of Mr. Wright in tracing the glacier across the Ohio.

Having now the certainty that there was a dam at the required point, I think I may have no hesitation in saying, that, during a portion of the glacial period, the valley of the Licking was occupied by a lake which overflowed laterally, and whose bottom became littered with materials brought from the mountains of eastern Kentucky by floating ice. They are most abundant where the ice may be supposed to have had freest access.

Terraces which might have been expected are wanting in the region in which my observations were made. Possibly they may be found in other parts of the valley, especially above; their absence in the region in question being due to the fact that only small portions of the region would have reached above the lake-level, which, by their disintegration, could furnish the material for terraces.

The overflow was probably to southward, but I could not search for it. Could it be traced, the amount of erosion might give some data for an estimate of time. G. H. SQUIER.

Trempealeau, Wis., Sept. 14, 1883.

Depth of ice during the glacial age.

In the issue of SCIENCE for Sept. 7, reporting my paper at Minneapolis, I am made to say, that, during the glacial period, the ice was indeed "600 feet over New England, and very likely of equal depth over the area to the west." I said 6,000 feet over New England. The evidences of glaciation are distinct upon the Green Mountains to a height of nearly 5,000 feet. The lower summits of the White Mountains, like Carrigain (which is 4,300 feet above the sea), are covered with transported bowlders; and there can be little question that some found by Professor Charles Hitchcock, within a few hundred feet of the summit of Mount Washington, were transported thither by glacial agency. Such is the evidence for New England.

For the region north of Pennsylvania and the Ohio River, direct evidence of such a great depth of ice is naturally wanting; but, according to Ramsay, glacial scratches are numerous upon the summit of Catskill Mountains in New York, at an elevation of 2,850 feet above the sea. In southern Ohio there are numerous places where the ice, within a mile or two of its farthest extension, surmounted elevations which are about 500 feet higher than the plains to the north of them. I see no reason why it should not have been as deep over the bed of Lake Erie as over the region to the north of the White Mountains, though there are there no glaciometers like Mount Washington to measure the height of the frozen mass.

G. FREDERICK WRIGHT.

Oberlin, O., Sept. 13, 1883.

The 'stony girdle' of the earth.

In your issue of Sept. 7, just received, you are kind enough to insert a synopsis of the two abstracts of papers which I sent to the Minneapolis meeting. Allow me the space necessary to make a correction and some brief explanations. We are required to furnish these 'abstracts' to suit a printed form of small note size, which is apt to lead to small chirography: hence I suppose the mistake in reading and printing the title.