SCIENCE

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DUST FROM THE KRAKATOA ERUPTION OF 1883.

[THE following article is a condensation of some earlier publications by Joseph Wharton, of Philadelphia, and formed a contribution by him to the papers read at the one hundred and fiftieth anniversary of the American Philosophical Society. The work of proving the origin and cause of the beautiful glowing skies that are so well remembered seems to have been assumed by this first American metallurgist as a recreation for his leisure hours. If Mr. Wharton would write of his long, laborious and successful efforts in introducing into America the manufacture of zinc and nickel and of his metallurgic work at his great Bethlehem steel furnaces, he would add a series of most valuable chapters to the history of the great industries upon which the prosperity of our country is based.—ED.]

The splendid roseate glows which in the winter of 1883–4 were visible in the western sky after sunset and in the eastern sky before sunrise gave rise to many conjectures, but apparently to almost no experiments. A few persons believed those glows to be sunlight reflected from the under surface of a stratum of fine solid particles suspended at a great height in the atmosphere; some thought with me that those particles might be volcanic dust which had floated to us from the eruption at Krakatoa, but, as no one offered any proof of this, I attempted on the morning of Jan. 20, 1884, to demonstrate it. Six miles northward from the centre of Philadelphia, where I reside, a light and fine snow was then gently falling in an almost calm atmosphere, presumably from a high altitude. Of that snow, while it was yet falling, I collected about a gallon by skimming it carefully with my hands from a considerable surface in a field a hundred yards to windward of my house and a quarter-mile from the nearest windward building.

This very clean new-fallen snow I melted under cover in the porcelain bowl it was gathered in, and was at first unable to detect any sediment; after maintaining for several minutes a gentle rotary movement of the bowl in order to bring into its deepest part any solid matter which might be present, I poured off the water and evaporated the remainder. A minute quantity of fine dust was then discerned by the tiny vitreous reflections which it gave in the sunlight; my practice in chemical analysis, and therefore in weighing small quantities, affords some justification for the estimate that the total weight of this dust was less than one-hundredth of a grain.

Under the microscope, where it was immediately placed, this dust showed the characteristics of volcanic glass; it consisted in part of irregular, flattish, blobby fragments, mostly transparent and showing no trace of crystalline structure, in part of transparent filaments more or less contorted, sometimes attached together in wisps and mostly sprinkled with minute glass particles. The filaments of glass had about the same diameter as single filaments of silk placed on the microscope slide for comparison with them.

Having microscopically examined the dust again and again, I ignited it upon platinum to destroy any organic matter which might be present, and thereafter found the filaments, the flat plates, and the amorphous accretions of glass quite unchanged.

No pyroxene, augite, or magnetite, such as have elsewhere been observed in volcanic dust, was present; it may be assumed that, if at first mingled with the glass, those heavier minerals had been dropped during the long voyage of more than ten thousand miles of space and more than four months of time.

The capacity of fine volcanic glass to float in the air to considerable distances being a well-established phenomenon, my examination claims no greater novelty or interest than what may be due to the actual finding of such glass at so great distance from the point of its ejection.

In this case two separate ejections seem to be indicated, for on several evenings I observed a second and fainter glow after the original and stronger glow had entirely disappeared. A higher stratum of finer particles doubtless reflected the sunlight from the greater altitude after the sun had set at the lower elevation of the principal dust stratum.

Early in February, 1884, the ship J. E. Ridgeway arrived at Philadelphia from Manila by the Strait of Sunda. On Feb. 12 I visited that ship, and read on her log-book that at 10 p.m., Oct. 27, 1883, in south latitude 7° 57′ and east longitude 100° 54′ (about five hundred miles W.S.W. from Krakatoa), she encountered a vast field of floating pumice, through which she sailed until 7 a.m., Oct. 29. So abundant was this pumice that the ship's speed was reduced from nine knots when she entered it to two knots at 6 p.m., Oct. 28; several hours after that time her speed gradually increased, as the pumice became less dense, from two knots to eight, and finally, when she cleared it, to her normal nine knots. No volcanic ash had fallen upon the ship, as she arrived too late upon the scene.

Some of this pumice I took directly from the hands of the mate and steward, who had collected it from the sea and had kept it in their private lockers. It can scarcely be doubted that this pumice was ejected from Krakatoa.

Now, on placing under the microscope small crumbs of that pumice and filaments picked out from its cavities, I recognized just such transparent flattish scraps and ragged accretions as were among the dust found in the snow-fall of Jan. 20, while the filaments, though less varied and interesting than those then collected, where quite similar in character, even to the tiny glass particles sprinkled on them. A minor point of resemblence was that the yellow color of one little vesicular mass in the dust caught Jan. 20 was fairly matched by a slight streak of similar color in the pumice.

In March, 1884, I collected dust from the steel works at South Bethlehem, Pa., and also dust from a blast furnace there, in order to compare them with the dust

found in the snow and with the filaments and crumbs of pumice from the ship J. E. Ridgeway.

After separating from these dusts the large proportion which was attracted by the magnet, the remnant showed in each case many vitreous particles ; that from the iron furnace largely spheroidal or globular, with a few filaments ; that from the steel works partly minute rounded particles, but containing many filaments of great tenuity. Neither contained such clear vitreous plates and aggregations as abounded in the snow-dust, while the filaments in both cases were of dark color, and smooth, straight form, distinctly different from the colorless and frequently contorted filaments of the snow-dust.

It is difficult to resist the conclusions (1) that the vitreous dust found in the snow-fall of Jan. 20, 1884, was not derived from iron or steel furnaces, (2) that it was of similar origin to the floating pumice found by the ship J. E. Ridgeway, (3) that it was ejected by the huge volcanic explosions of Krakatoa.

To meet the objection which might be urged, that this account cannot be regarded as accurate because written so long after the occurrences, I add that it is simply condensed from three successive articles contributed at the time to the *Public Ledger*, of Philadelphia, describing respectively the finding of the vitreous dust in the snow-fall, the examination of pumice from the ship Ridgeway, and the scrutiny of furnace dusts.

FAMILIARITY OF CERTAIN WOOD BIRDS.

BY MARY HYATT, STANFORDVILLE, N. Y.

SOME of our wood birds depart occasionally from the prescribed course laid down for them by ornithologists, and come to our orchards and lawns, instead of haunting deepest woods and distant solitudes, as the authorities say they should.

A certain lawn surrounding a dwelling in Dutchess County is often favored with the presence of various wood birds—not transient visitors only, but birds that make themselves thoroughly at home in the garden and yard, sometimes building nests quite near the house. Beyond the garden there is a ledge of rocks, around and over which bushes and trees are allowed to grow, forming an attractive spot to these fugitives from the forest.

One summer a pair of wood pewees (*Contopus virens*) nested in a towering honey locust that stood five feet from the piazza. The trunk of the tree was crusted with gray lichens, with which the pewee coats the outside of its nest, the inside being usually composed of scraps of wool and inner fibres of decaying bark. The domicile of these sociable pewees was saddled upon a horizontal limb of the honey locust about thirty feet from the ground. By looking from the top-floor windows, one could just see the heads of the young projecting from the top of the nest. Now and then a parent bird appeared with a moth or some such delicacy for the little ones. The old birds spent much time on a wire fence between the garden and meadow. From there they made frequent dashes after insects, returning to their wire perch, where they remained for hours each day, quietly indifferent to all passers. The pewees seemed to have great confidence in their human neighbors. One day, as an occupant of the dwelling was walking leisurely along near the fence, one of the pewees darted down and snatched a little insect from the shoe of the passer, then flew serenely back to the wire again.

The redstart is another frequenter of this yard and orchard. Its nest has not been found, but it is more than probable that it has nested somewhere about the yard, which is well supplied with trees and shrubbery. The redstarts have been seen feeding young birds near the door, but they dart about so swiftly that it is no easy matter to find their nesting places. They often came about the door, sometimes hopping tamely on the ground, and once a redstart flew in the open doorway, picking up a crumb from the floor and departing as suddenly as he came.

A pair of wood thrushes started house-keeping one summer in a plum-tree by the driveway. The nest was built, and the eggs were laid when Madam Thrush met with untimely death. She was found gasping on the door-stone one morning, and in a few moments the bird was dead. It was supposed that she had dashed against a window, thinking to fly through. The mate of the dead bird lingered a couple of days in the vicinity of the nest, and then departed from the premises, returning no more to his favorite lawn, where he had explored the flower-beds for many a day, sometimes singing on the very door-stones.

The crested flycatcher (*Myiarchus crinitus*) occasionally makes himself quite prominent about the grounds. One year there were several of these saucy fellows calling so constantly and noisily through the yard for two or three weeks in May that they attracted much attention.

The oven bird is one who delights in parading the flower-beds or walking the garden wall when he thinks no one is looking. Upon one occasion we caught him promenading the piazza, walking briskly up and down until his curiosity was satisfied, when he darted away, sounding a lively crescendo from behind the trees.

—The latest number of the *American Journal of Psychology* (edited by G. Stanley Hall, Clark University, Worcester, Mass.) opens with an extensive article (pp. 145–238) by T. L. Bolton, on "Rhythm," in which the author discusses interestingly the almost untouched field of the psychology of rhythmic phenomena,—treating of physiological rhythms, attention and periodicity, rhythmic speech, time relations, intensity of sounds, qualities of sounds, emotional effects of rhythm upon savages and children, rhythmic, music and poetry. The main bulk of Mr. Bolton's paper is taken up, however, with the tabulation and explanation of the results of many valuable experiments on rhythm carried out in the Psychological Laboratory of Clark University. "Minor Studies from the Psychological Laboratory of Cornell University," "Mediate Association," by H. E. Howe, and "Sensorial and Muscular Reactions," by A. R. Hill and R. Watanabe, are communicated by Prof. E. B. Titchener. Mr. Howe's experiments seem to controvert Scripture's "Mediate Association." Mr. J. A. Bergström contributes a careful "Experimental Study of Some of the Conditions of Mental Activity." The experimental work upon which the paper is based was done in the laboratory of Clark University in the last two years. The questions treated of are chiefly "Natural Rhythm of Mental Activity" and physiological memory. Mr. F. B. Dresslar publishes "A New Illusion for Touch, and an Explanation for the Illusion Displacement of Certain Cross Lines in Vision," besides a "New and Simple Method for Comparing the Perception of Rate of Movements in the Direct and Indirect Field of Vision," two interesting additions to the stock of laboratory experiments. Mr. J. S. Lemon has a brief paper on the "Psychical Effects of the Weather," a subject with which he promises to deal more in detail on a future occasion. The number concludes with the usual extensive review of the literature of anthropological psychology, nemology, morbid psychology, instinct and experimental psychology.