

combination of genetic characters which living forms exhibit; the palæontologist shows that these varying degrees of similarity and dissimilarity have been brought about by progressive differentiation in both time and place; but, as Dr. Bather rightly insists, succession (progressive differentiation) does not of necessity imply descent. The final step in the argument for evolution (*i.e.* the theory that progressive differentiation has been effected through the agency of the process of reproduction) is that organisms are known to be derived only from pre-existing organisms, and that new genetic characters are from time to time differentiated in the actual course of normal generation; hence to interpret the diversity of genetic characters in living forms *in terms of experience* it can only be inferred that such diversity has been brought about in the course of descent.

It appears to me that the paramount necessity for clear statement on the logical position of the evolution theory is: (1) To recognise that much of the reasoning employed in the past originated in the emotional atmosphere created by popular prejudice and hostility; and (2) while appreciating the fact of specificity (genetic stability), to dispense entirely with the arbitrary notions connected with the term "species" as employed by systematists. It is interesting to note in conclusion that Darwin himself regarded the facts of ontogeny as an extension of the law of unity of type rather than a contention *sui generis* in favour of the theory of evolution.

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South Kensington, S.W.7, October 2.

I AM much obliged to you for letting me see Mr. Hogben's most interesting letter, and I thank him for emphasising the fact that the mutants of the experimental breeder do not show such recapitulatory phenomena as do the mutations of the palæontologist. Since this point was dealt with, however imperfectly, in the address, I surmise that Mr. Hogben has considered only the extract published in NATURE. His statement of "the final step in the argument for evolution" appears to me consequent, but I am not yet prepared to admit that my statement was inconsequent. Neither, I fear, is absolutely conclusive. Consequent or inconsequent, I did my best to view the problem without prejudice or emotion, but I plead guilty to some attempt at humour.

F. A. BATHER.

A Fracture-surface in Igneous Rock.

THE accompanying photograph (Fig. 1) was taken by me some years ago during the construction of the Shirawta Dam, Bombay Hydro-Electric Works, India. It shows a curious fracture surface due to a heavy gelignite detonation in finely crystalline "trap" rock. So far as I can remember, I had seen other examples of this phenomenon, but photographed this as it was a particularly good one, and I thought it would be of special interest to "elasticians."

B shows the "splash effect," having its origin at the bottom of the 1½-in. diameter vertical drill-hole A. C is a two-foot rule used to fix the scale. E is the vertical edge of a fault (or possibly a dyke) in the "trap" rock. D points to one of the faint radial "splash" lines that form a sort of aurora about the explosion centre A.

It will be noticed that the "splash" at B looks like the fluting of a large fossil. The Deccan "trap," however, is an igneous rock, and, of course, has no

fossils in it. Tentative explanations that may be advanced are (a) that the pressure at A was so enormous at the moment of detonation that an actual flow of the rock took place; (b) that the fluted surface is the result of unequal stress distribution due to "interference" between waves reflected from the three reflecting surfaces. These surfaces are: (1) The rock surface some 10 ft. to 20 ft. above and parallel to the foot-rule C. (2) The face of the fault E. (3) The original face of the cutting lying in a plane parallel to the plane of the paper and, at the most, 2 ft. in a line normal to the paper from the points A and B.

The distance to the original face before the blast would not be more than 6 in. to 1 ft. from the top of the drill-hole shown. The hole was drilled in the side of the rock cutting having a "batter" of about one in five, at the stage when the photograph was taken. The drill-hole A would probably be about 3½ ft. deep, and the point A about 5 ft. above the floor of the cutting.

It should also be mentioned that the site of this explosion was the side of a rock cutting about half a mile long, with level bottom leading to the Shirawta-Walwhan tunnel. The rock cut at the shallow end would be about 3 ft. deep, and at the tunnel end about 40 ft.; its top width was 20 ft.,

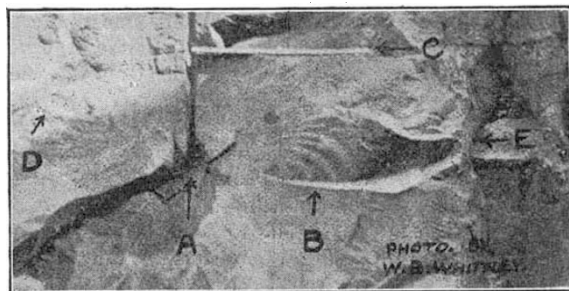


FIG. 1.—Splash-like fracture-surface due to gelignite explosion in rock. A, base of 1½" diameter drill-hole and origin of explosion; B, fluted "splash effect"; C, 2-ft. rule, to fix scale; D, one of a number of radial "splash" lines.

and its width at the bottom was, at that date, from 5 ft. to 10 ft.

Samples of rock similar to that blown away from A were weighed, and their specific gravity worked out at between 2.720 and 2.752 (taking the weight of a cubic foot of water as 62.5 lb.).

(Prof. B. Hopkinson calculated that the maximum pressure at the face of an explosion of 1 oz. of gun-cotton is of the order 100 tons per sq. in., and that this maximum is attained in 1/400,000th of a second.)

Since writing the above, it has been suggested that the phenomenon is a large example of conchoidal fracture. In any case, I think the photograph will be of interest to readers of NATURE.

W. BEVAN WHITNEY.

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Gerrards Cross, Bucks, September 19.

A Visual Illusion.

THE visual illusion described by Mr. Turner in NATURE of October 7, p. 180, may be seen very well by looking steadfastly at a long luggage train as in, for example, counting the trucks at about 100 yards distance. Immediately after the train has passed, the embankment appears to slide along in the opposite direction.

A. E. BOYCOTT.

17 Loom Lane, Radlett, October 10.