the colourless skin and the vivid scarlet of the exposed gills makes the appearance of this subterranean visitor striking in the extreme. It has four long, slender legs, that are gruesomely human in appearance, and are supplied with feet that are startlingly hand-like. The fore feet bear four fingers or toes and the rear ones have five, and though the legs are extremely slender, they possess a considerable amount of strength. Behind, the body terminates in a flattened tail that bears a fin like that of an eel.

In April 1899, two living specimens of this strange being were shipped by mail from San Marcos to the head office of the Fish Commission in Washington. They bore the journey of nearly 1800 miles, and reached their destination in good condition. They excited great interest, and for some time after their arrival a wondering group of spectators crowded about the aquarium into which they were put. These living specimens corrected several errors that had been made from observations of the dead bodies only. The legs are used for locomotion, and the animals creep along the bottom with a peculiar movement, swinging the legs in irregular circles at each step. They climb easily over the rocks piled in the aquarium, and hide in the crevices between them. All efforts to induce them to eat have been futile, as has also been the case with blind cave fish in captivity and they are either capable of long fasts or live on infusoria in the water.

From whence do these strange creatures come? The well is sunk in limestone, and that renders it likely that there may be some great cavern or subterranean lake communicating with it, but the rock through which the hole is bored is solid, except for a single channel two feet in diameter. The fact that the water rises nearly two hundred feet shows it to be under great pressure, and altogether this well affords material for study to geologists as well as zoologists.

Washington, D.C. CHARLES MINOR BLACKFORD.

Palæolithic Implement of Hertfordshire Conglomerate.

THE rudely-made Palæolithic implement, illustrated to half the actual size in the accompanying engraving, is probably unique in the highly intractable material from which it is made. It was found by me in May last with Palæolithic implements of flint in the Valley of the Ver, Markyate Street, near Dunstable: its weight is 1 lb. $6\frac{1}{4}$ oz.—1677 in my collection. Although rude, there is no doubt whatever as to its true nature; there is a large bulb of percussion on the plain side, as seen in the edge

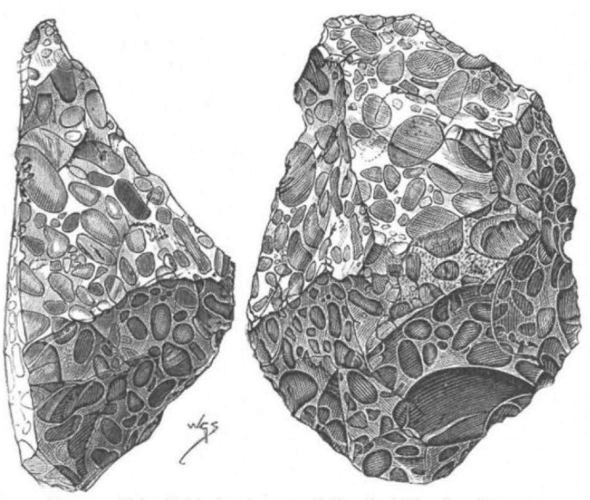

FIG. 1.—Palæolithic implement of Hertfordshire Conglomerate. One-half actual size.

view, and the hump-backed front is chipped to a rough cutting edge all round, each facet going right through the embedded pebbles. Its condition is totally different from a newly-broken block of Conglomerate, and indeed of Conglomerate broken in Roman times by quern-makers. It is faintly ochreous from being long embedded in clay, and sub-lustrous. Newly-broken Conglomerate is in colour a lustreless cold grey. The peculiar nature of the material would not admit of finer work: I have tried hard to flake Conglomerate without the slightest success; it breaks only after the heaviest blows, and then in the most erratic manner, the embedded pebbles often flying from the matrix. Sir John Evans has seen this example, and agrees with my conclusions as above expressed; he also informs me that several years ago he found what appears to be the point of a lanceolate implement of the same material and of Palæolithic character on the surface of a field near Leverstock Green.

Dunstable. WORTHINGTON G. SMITH.

On the Calculation of Differential Coefficients from Tables Involving Differences; with an Interpolation-Formula.

(1) IN NATURE for July 20 (p. 271) Prof. Everett has given formulæ for calculating first and second differential coefficients in terms of differences. The formulæ can be more simply expressed in terms of "central differences." Let the values of a function u_x be given for $x = \ldots, -2, -1, 0, 1, 2, \ldots$; then, with the usual notation,

$$\Delta u_0 = u_1 - u_0$$
$$\Delta^2 u_0 = \Delta u_1 - \Delta u_0 = u_2 - 2u_1 + u_0,$$
&c.

Now write

$$\tfrac{1}{2}(\Delta u_0 + \Delta u_{-1}) = a_0$$
$$\Delta^2 u_{-1} = b_0$$
$$\tfrac{1}{2}(\Delta^3 u_{-1} + \Delta^3 u_{-2}) = c_0$$
$$\Delta^4 u_{-2} = d_0$$
&c.

Then $a_0, b_0, c_0, d_0, \ldots$ are the "central differences" of u_0. Take, for instance, the following table:—

y	e^y	Δ			
4·7	109·947				
		11563			
4·8	121·510		1217		
		12780		126	
4·9	134·290		1343		17
		14123		143	
5·0	148·413		1486		12
		15609		155	
5·1	164·022		1641		19
		17250		174	
5·2	181·272		1815		15
		19065		189	
5·3	200·337		2004		24
		21069		213	
5·4	221·406		2217		18
		23286		231	
5·5	244·692		2448		28
		25734		259	
5·6	270·426		2707		
		28441			
5·7	298·867				

Writing $y = 5{\cdot}2 + {\cdot}1x$, and $u_x = 10^3 e^y$, so as to get rid of decimals, we have the following values corresponding to $y = 5{\cdot}2$ $(x = 0)$:—

u_0	a_0	b_0	c_0	d_0	e_0
181272	$18157\frac{1}{2}$	1815	$181\frac{1}{2}$	15	$2\frac{1}{2}$

With this notation, the value of u_x for values of x between $-\frac{1}{2}$ and $+\frac{1}{2}$ is given by

$$u_x = u_0 + xa_0 + \frac{x^2}{2!}b_0 + \frac{x(x^2-1)}{3!}c_0 + \frac{x^2(x^2-1)}{4!}d_0 + \frac{x(x^2-1)(x^2-4)}{5!}e_0 + \ldots \ldots \text{(i.)}$$

This is a well-known formula. Differentiating with regard to x, and putting $x = 0$, we have (writing u for u_x)

$$\left(\frac{du}{dx}\right)_0 = a_0 - \tfrac{1}{6}c_0 + \tfrac{1}{30}e_0 - \tfrac{1}{140}g_0 + \ldots \ldots \text{(ii.)}$$

Similarly, differentiating twice, and putting $x = 0$,

$$\left(\frac{d^2u}{dx^2}\right)_0 = b_0 - \tfrac{1}{12}d_0 + \tfrac{1}{90}f_0 - \tfrac{1}{560}h_0 + \ldots \ldots \text{(iii.)}$$

Prof. Everett's formula for the "increase-rate" when fifth differences are negligible is obtained by taking the first two terms of (ii.).

(2) The advantage of these formulæ, as Prof. Everett points out, is their greater accuracy. The ordinary formula

$$\Delta - \tfrac{1}{2}\Delta^2 + \tfrac{1}{3}\Delta^3 - \tfrac{1}{4}\Delta^4 + \tfrac{1}{5}\Delta^5,$$

in the above example, would give for $y = 5{\cdot}2$

$$\frac{du}{dx} = 18131\tfrac{1}{2},$$

while, if the differences were taken backwards, we should get

$$\frac{du}{dx} = 18124\tfrac{1}{6}.$$