but was surprised to find that at p. 446 the former figure is repeated with the description, "Fig. 58.—Peruvian Depressed Skull." This is quite correct, for it is not only depressed, but depressed by art; therefore it cannot be an instance of a natural Peruvian dolichocephalic skull. But at p. 451 the latter woodcut is repeated as "Fig. 60.—Peruvian Child's Skull, Normal," and described as such. Indeed it is not necessary to go beyond Dr. Wilson's communication to NATURE. His Fig. 3, p. 48, is the identical woodcut, as "Peruvian Child's Skull Normal." This woodcut is quite conclusive as to what I have asserted, that Dr. Wilson has answered himself. For it is the calvarium of a child which has been artificially distorted and thereby elongated. And in truth it is only necessary to cast the eye on the figures upon the same page in NATURE to see that all the skulls, Figs. 1, 3, and 4, have all been distorted, and distorted in the same manner, viz. by a figure of 8 bandage, which has left its distinct impressions upon the frontal, parietal, and occipital bones. This distortion has necessarily converted them into dolichocephalic or long skulls, in contradistinction to their natural form, which is exhibited in Fig. 2, on the same page of NATURE. This bandage has been the instrument of distortion, and all three have been deformed in what I call the *cylindroidal* manner, resulting in the lengthening out of the calvarium. It may be observed that this mode of distortion is the most generally diffused of any among human races, both of the old world and the new. The figures differ only in the degree of deformation, the "Fig. 3.—Peruvian Child's Skull, Normal," having been less tightly compressed than the other two. I conclude that it is quite unquestionable that this Peruvian skull cannot be looked upon as a natural Peruvian skull, cannot be adduced as evidence that there was a second type of cranium among the ancient Peruvians. The best inspection I am able to give the figures proves this unequivocally, and I am bound to affirm, with the utmost respect to Dr. Daniel Wilson, that he has fully answered himself, and proved that the asserted long Peruvian skulls are simply crania artificially contorted into dolichocephalic ones. After this it may be very safely said that craniologists, beginning with Morton, and going on to that eminent and accurate anatomist, Prof. J. Wyman, are agreed that the ancient Peruvian race was distinguished by having brachycephalic skulls, as is shown in Dr. Wilson's "Fig. 2.—Peruvian Child's Skull, Santa," NATURE, vol. x. p. 48, which is simply an undistorted and natural example.

Having said this, which is a plain statement of what I believe to be the truth, I may add that I regret to find scientific questions are by some even who have acquired a reputation treated as a source of wrangling (I do not at all allude to Dr. Wilson), which I observe with much regret; but such course I most certainly shall not imitate. If a plain statement of facts does not convince, I shall not try any other method. When Dr. D. Wilson shall produce half a score of ancient Peruvian dolichocephalic skulls, the appearance of which totally precludes the possibility of interference by art or other deforming accident, then the question he introduces will be open for discussion, but, until then, I hold that there is no valid reason to doubt that the ancient Peruvians were a decidedly brachycephalic race.

J. BARNARD DAVIS

IN NATURE, (vol. x. p. 46), Prof. Daniel Wilson replies to criticisms by Dr. J. Barnard Davis and myself, of his conclusion that certain skulls, described and figured in "Prehistoric Man," and belonging to the collections of Dr. Warren, of Boston, had natural and not artificial forms. As far as I am concerned, he quotes from a letter of mine to Dr. Davis the following sentence:—

"The upshot of the whole is the crania do not confirm Dr. Wilson's statement. One of Dr. Wilson's chief points—in fact it is his chief point—is, that the skulls are natural because they are symmetrical, and it is next to impossible that a distorted skull should be symmetrical."

In this sentence he says I misrepresent him, and appeals to his published views with regard to asymmetry in skulls in general, about which I had said nothing. I was writing only of those particular ones represented in Figs. 1 and 3 of Prof. Wilson's article in NATURE, and Figs 59 and 60 in "Prehistoric Man." In justification of the paragraph from my letter given above, and to which he objects as unfair, I quote the following sentence from "Prehistoric Man," pp. 449-50:—

"Few who have had extensive opportunities of minutely examining and comparing normal and artificially formed crania will, I think, be prepared to dispute the fact that the latter are rarely if ever symmetrical. The application of pressure on the head of

the living child can easily be made to change its natural contour, but it cannot give to its artificial proportions that harmonious repetition of corresponding developments on opposite sides which may be assumed as the normal condition of the unmodified cranium. But in so extreme a case as the conversion of a brachycephalic head averaging about 6'3 in longitudinal diameter, the retention of anything like normal symmetrical proportions is impossible. Yet the dolichocephalic Peruvian crania present no such abnormal irregularities as could give countenance to the theory of their form being an artificial one."

I will only add, that in several distorted dolichocephalic Peruvian crania in the collections of the Peabody Museum at Cambridge, the symmetry is as complete as in any ordinary undistorted crania.

JEFFRIES WYMAN

Cambridge, Mass., U.S.

Lakes with two Outfalls

FIFTY miles south of Denver, Colorado Territory, on the Denver and Rio Grandé R.R., there is a little lake with two outfalls, which I have myself seen. This lake is on an east and west "divide" and is 8,000 ft. above sea-level; the outfall to the north, Phun Creek, goes to the Platte River, while Monument Creek, to the south, flows into the Arkansas.

EDWARD S. HOLDEN

Naval Observatory, Washington, U.S., June 2

CAPT. J. D. COCHRANE, R.N., in his "Narrative of a Pedestrian Journey through Russia and Siberian Tartary, &c., in the years 1820-23," has the following reference. I quote from the American edition (1824), p. 235:—

"In the evening we reached a fertile spot, and halted on the banks of a lake, from which, it is said, the rivers Okota and Koudousou, running in counter directions, have their source, a circumstance which recalled to my recollection those words in an able work by Mr. Barrow upon rivers, wherein it is said that, although it is not a physical impossibility that two rivers should flow in opposite, or indeed in any direction out of the same lake, yet the contrary approaches so near to an axiom in geography that no instance is perhaps known of such an occurrence."

The rivers named flow respectively into the Sea of Okhotsk and the Arctic Sea. Perhaps a reference to other and later works may settle the question whether this lake has two outlets.

Chicago, U.S., June 2

S. W. BURNHAM

Palæotherium magnum

THE *Palæotherium magnum*, an account of the discovery of which appeared in NATURE, vol. ix. p. 285, differs in so many respects from that which was restored by Cuvier, that it may be well, if possible, to try and reconcile these two accounts.

Cuvier, in his "Ossements fossiles" (1825) after taking the individual bones of the *Palæotherium* one by one, and considering their affinities, places them together, and restores from them as far as possible the animals to which they belonged.

In vol. ii. p. 163, he says: "Hence we see in our environs of Paris, and elsewhere, the genus *Palæotherium*, which resembles the tapirs by its incisor and canine teeth, and in that the nasal bones are so arranged as to carry a trunk, whilst the molars more nearly approximate to those of the rhinoceros and deer."

In vol. iii. p. 53, *et seq.* he commences with a description of the skull, and passes on to the other bones in order.

Having considered separately the various bones of the eight species which he describes, he passes on at p. 243 to the restoration of the whole skeleton, considering first that one of which he had the most perfect remains, viz. *Palæotherium minus*, vide vol. iii., pl. 34. This skeleton is a more perfect specimen in many ways than that which was discovered the other day, though a good part of the lower extremities are wanting.

Speaking of this specimen Cuvier says (vol. iii., p. 244): "If only we could bring this animal to life as easily as we have put together its bones, we should see running about a tapir smaller than a roebuck, with thin and slender legs." And again, "Its height to the withers would be from 16 to 18 in."

This skeleton, it will be seen, resembles to a great extent that of *Palæotherium magnum*, which was figured in NATURE, vol. ix. p. 286. Having completed the smaller animal, *P. minus* is next considered, of which Cuvier says: "We have the head and four extremities of this animal; by supplying it with a body like that of its predecessor, it will be very easy to restore its skeleton. Its head and limbs may be seen at pl. 49, 50, and 60, and its restoration at pl. 66, resembling almost exactly that of

P. minus, though the former is much the larger. Such then are the facts as they appear from Cuvier's writings. The fact that this one skeleton of *P. minus* was found with the neck in the erect position may have been considered by Cuvier as hardly a sufficient reason for placing the neck of his restored specimen, which showed so many tapiroid peculiarities, in the same position. Now, however, that a second skeleton of a *Palaotherium* has been found, with the neck in a similar position, the probability that such a position is the natural one is immensely enhanced.

Two points, however, remain somewhat involved in obscurity; first, how is it that the skeleton of *P. magnum*, as found at Vitry-sur-Seine the other day, differs so much in the length of its leg-bones from the *P. magnum* of Cuvier, which it undoubtedly does if the drawings and descriptions of both are correct? and secondly, how was it that Cuvier, with such a perfect skeleton as that in the accompanying figure, should restore an animal with such short and comparatively stout legs?

Someone perhaps may be able to throw some light upon these points.

W. BRUCE-CLARKE

The Telegraph in Storm-warnings

THE idea of using the electric telegraph to give warning of cyclones approaching from a distance is generally supposed to have first occurred to Prof. Henry of the Smithsonian Institution in 1847 (*NATURE*, vol. iv. p. 390). This however is not the fact, for the same thing had been recommended in India fully five years before by the late Mr. Henry Piddington, in his sixth "Memoir on the Law of Storms," published in the Journal of the Asiatic Society of Bengal in 1842. Referring to a storm which was tracked from Macao to Shih-poo, and its estimated rate of travelling, he says (p. 703):—"If China was a country under European dominion, a telegraph might, when these storms strike the eastern coast, warn those on the southern that they were coming, and in India we might often attain the same advantage. Our children may see this done." In 1849, when he published the first edition of his "Sailor's Horn-Book for the Law of Storms," he had not yet heard of the fulfilment in America of his prophecy, which however he has duly noticed in subsequent editions.

FRED. NORGATE

Corydalis claviculata

A SHORT additional note on *Corydalis claviculata* may be of interest. A sprig placed in a glass of water and out of the way of insects continues to grow and to bear flowers and fruit with nearly as much regularity as if still rooted to its native bank. The flowers do not gape spontaneously; and, as most of the older ones that I have examined in a state of nature have their lips depressed, I think it certain evidence of the agency of insects, though I have not yet been so fortunate as to witness their operations. All the flowers that I have seen are of a greenish white, but dried specimens acquire the yellow tint described in systematic works, a fact which may help to throw light on the somewhat parallel behaviour of *Fumaria pallidiflora*.

Kilderry, co. Donegal

W. E. HART

POLARISATION OF LIGHT*

IX.

THE results of combining two or more colours of the spectrum have been studied by Helmholtz, Clerk Maxwell, Lord Rayleigh, and others. And the combinations have been effected sometimes by causing two spectra at right angles to one another to overlap, and sometimes by bringing images of various parts of a spectrum simultaneously upon the retina. Latterly also W. von Bezold has successfully applied the method of binocular combination to the same problem (*Poggendorff, Jubelband*, p. 585). Some effects, approximating more or less to these, may be produced by chromatic polarisation.

Complementary Colours.—First, as regards complementary colours. If we use a Nicol's prism N as polariser, a plate of quartz Q cut perpendicularly to the axis, and a double-image prism P as analyser, we shall, as is well known, obtain two images whose colours are complementary. If we analyse these images with a prism, we shall find when the quartz is of suitable thickness, that

* Continued from vol. ix. p. 508.

each spectrum contains a dark band indicating the extinction of a certain narrow portion of its length. These bands will simultaneously shift their position when the Nicol N is turned round. Now, since the colours remaining in each spectrum are complementary to those in the other, and the portion of the spectrum extinguished in each is complementary to that which remains, it follows that the portion extinguished in one spectrum is complementary to that extinguished in the other. And in order to determine what portion of the spectrum is complementary to the portion suppressed by a band in any position we please, we have only to turn the Nicol N until the band in one spectrum occupies the position in question, and then to observe the position of the band in the other spectrum. The combinations considered in former experiments are those of simple colours; the present combinations are those of mixed tints, viz. of the parts of the spectrum suppressed in the bands. But the mixture consists of a prevailing colour corresponding to the centre of the band, together with a slight admixture of the spectral colours immediately adjacent to it on each side.

The following results given by Helmholtz, may be approximately verified:—

Complementary Colours	
Red	Green-blue
Orange	Cyanic blue
Yellow	Indigo-blue
Yellow-green	Violet

When in one spectrum the band enters the green, in the other a band will be seen on the outer margin of the red, and a second at the opposite end of the violet; showing that to the green there does not correspond one complementary colour, but a mixture of violet and red, i.e. a reddish purple.

Combination of two Colours.—Next as to the combination of two parts of the spectrum, or of the tints which represent those parts. If, in addition to the apparatus described above, we use a second quartz plate Q_1 and a second double-image prism P_1 , we shall form four images, say O O, O E, E O, E E. And if A, A' be the complementary tints extinguished by the first combination Q P alone, and B, B' those extinguished by the second $Q_1 P_1$ alone, then it will be found that the following pairs of tints are extinguished in the various images.

Image	Tints extinguished
O O	B, A
O E	B', A'
E O	B', A
E E	B, A'

It is to be noticed that in the image O E the combination $Q_1 P_1$ has extinguished the tint B' instead of B, because the vibrations in the image E were perpendicular to those in the image O formed by the combination Q P. A similar remark applies to the image E E.

The total number of tints which can be produced by this double combination Q P, $Q_1 P_1$ is as follows:—

- 4 single images
- 6 overlaps of two
- 4 overlaps of three
- 1 overlap of four

Total, 15

Collateral Combinations.—The tints extinguished in the overlap O O + E O will be B, A, B', A'; but since B and B' are complementary, their suppression will not affect the resulting tint except as to intensity, and the overlap will be effectively deprived of A alone; in other words, it will be of the same tint as the image O would be if the combination $Q_1 P_1$ were removed. Similarly the overlap O E + E E will be deprived effectually of A' alone; in other words, it will be of the same tint as E, if $Q_1 P_1$ were removed. If therefore the Nicol N be turned round, these two overlaps will behave in respect of colour exactly as did the images O and E when Q P was alone used. We may, in fact, form a table thus:—