plement had been finished. The general views on *Protoplasm* are given under *Cells*, *Amaba*, and so far as it is identical with *Sarcodæ* under *Actinophrys*, *Sarcodæ*, and other headings in E.C.S. *Rhizocirrus* is referred to under *London Clay*, and its occurrence in the living state mentioned. *Aerolites*: The latest reference is said to be 1861, implying, as it seems, that none of the information is of later date. Falls subsequent to 1861 are mentioned, and many of the facts are of later date; as, for example, those relating to the Alais and Orgeuil aerolites; Sorby's conclusions published in 1865; and Daubrée's experiments, of which accounts were given in 1866 and 1868. The article itself appeared early in 1869. As to the bibliography, the principal authors are mentioned, and a list of the works consulted was written, but was inadvertently omitted. It is also said that the latest reference under *Alca* is 1861, but this again is not correct. The writer of the article *Annelida* was not aware of Claparède's strictures at the time he wrote it; but, after all, they do not seem to affect materially the general statements given in the supplementary volume. Prof. Huxley's views respecting the systematic position of *Archæopteryx* are given under *Birds*, E.C.S. No reference is made to *Protagon* under *Blood*, E.C.S., nor is mention made of Day's colour tests, nor Dr. Richardson's renunciation. Of the last, all that was found in the Reports of the British Association is the title of his paper, which runs thus, "On Coagulation of the Blood; a correction of the Ammonia theory," and of which nothing more is said. Hence it was thought best to say nothing about the matter. Of the long string of terms which "Nemo" has culled from Prof. Huxley's last address to the Geological Society, and which are said to be omitted, the majority are given in the Supplement. For instance, to cite one or two cases: *Anthracosaurus* occurs under *Carboniferous system*, E.C.S.; *Evolution* under *Palæontology*; *Microlestes* under *Rhetic Beds*; and so on. As to the other remarks which have not been specially alluded to, it may be admitted that some of the articles might have been improved. *Foraminifera* would have been all the better if Haeckel's volume had been consulted, only Haeckel's work could not be got. It would have been very desirable if subjects which have been omitted had been inserted, and if cross references had been more numerous; but there were restrictions as to space which rendered it necessary to make a selection. Thus, *Melœ* was inserted and *Sphegida* rejected, because there was no room for both. What a Cyclopædia ought or ought not to contain is an open question. It cannot give information upon everything; and probably very few persons not specially interested in the subject want to know about *Hyenictis* or *Ictitherium*. If regard was had to the theoretical view of the matter, and not to the cost and other practical drawbacks, a full account of all that has been done in the last sixteen years would fill several volumes as large as the Supplement to the "Natural History Division of the English Cyclopædia." I beg to sign myself

THE EDITOR

Cuckows' Eggs

WHAT is the drift of this discussion on the eggs of the cuckow? Is it "natural selection," "mimetic analogy," or what? Are we to understand that by some process of "natural selection" the European cuckow can change the appearance of her egg to that of the selected foster parent? or that one set of cuckows lays eggs like titlarks, let us say, another like hedge-sparrows, and so on; and always select each its particular nest in which to deposit its particular coloured egg?

If this is it, *cui bono*? Of course to deceive the foster parent. Is this needed? I doubt it. I do not think the foster parent cares what coloured eggs she sits on, so long as they are about the size of her own, so as not to inconvenience her.

Let us see what cuckows do in other countries, and let me select Africa as my field. If deception is necessary in one country, why not in another? Le Vaillant is so inaccurate that one must take all his statements *cum grano*, but he is right in some things, where, I suppose, he had no temptation to go wrong. He says of *Cuculus gularis* "that its egg is olive grey, dotted with red" (gris olivacé, piqué de rouge), and that it is laid in the nests of—1, the Jean Frédéric (*Bessonornis phanicurus*); 2, Coryphæ (*Bradypterus coriphæus*); 3, Traquet-patre (*Pratincola pastor*); 4, Pie-grièche fiscal (*Lanius collaris*); and 5, Bachakiri (*Telophonus bachakiri*). Now the eggs of No. 1 are of a dirty white or buff ground,

more or less spotted with pale rufous; 2, a lovely verditer, irregularly blotched with brown; 3, also verditer, indistinctly clouded with brown; 4, pale grey, blotched at the obtuse end with greenish and reddish spots; 5, light blue, profusely spotted with brown.

Cuculus solitarius, he says, lays its pink egg, dotted with clear brown spots, in the nests of—1, *Bessonornis phanicurus*; 2, *Bradypterus coriphæus*; 3, Le Capocier (*Drymoica capensis*); 4, Le Reclameur (*Bessonornis vociferans*); and 5, Le fauvette à tête rousse. The eggs of the last two I do not know; those of the first two are described above; those of No. 3 are blue, with brown blotches.

Oxylophus edolius and *O. melanoleucus* he confounds together, but it matters little, as the eggs are alike—pure white—and deposited in nests of—1, Bergeronette brun (*Motacilla capensis*); 2, *B. coryphæus*; 3, Gobemouche mantelé (*Tchitra cyanomelas*); and others, whose eggs I do not know. Of 1, the eggs are greyish white, or rather nankin, minutely freckled with brown; of 3, they are cream-coloured, profusely spotted with red, brown, and purple spots, in a band at the obtuse end. One of my correspondents finds eggs of *O. edolius* in the nests of *Pycnonotus capensis*, whose eggs are rather deep lake, profusely spotted with dark markings! They also, I know, lay in the nests of *Pycnonotus nigricans*—eggs as of the last. I found Mud-birds (*Malacircus bengalensis*) in Ceylon, feeding a young *O. melanoleucus*, and their eggs are of a uniform deep verditer.

Chalcites auratus lays white eggs also, and some of my correspondents have sent what I believe to be their eggs taken from the nests of *Hyphantornis capitalis*, whose eggs are green, profusely speckled with brown, and dark salmon-colour profusely speckled and spotted with dark brown and black.

Now, will any one say, after comparing these different cuckows' eggs with those of the nests in which they have been found, that there is any attempt at imitation, and if not in so many cases, why in that of *C. canorus*?

I used to think and so I wrote ("Birds of South Africa," p. 252) that the eggs of parasitic birds "usually resembled those of the foster parent." This was my idea founded on statements concerning the European cuckow taken from books; but a valued correspondent, taking exception to my position, set me to investigate the subject for myself, and to collect together and analyse my own observations and those of my collectors in this country. She writes as follows:—"The eggs of all the cuckows that I have met with in this country (South Africa) are white, and moreover they are nearly always larger than the eggs of the bird in whose nest they are deposited. With regard to distinguishing eggs, birds of all kinds are exceedingly short-sighted. We used to amuse ourselves by changing the eggs in all the birds' nests we knew of. The owners seldom left them, but took to the strange eggs; and unless their habits were remarkably different, they would blindly rear each other's young, just as they do the young cuckows. It is not necessary, therefore, for nature to make this provision. My second son once filled a Cape canary's nest with so many eggs that when the young were hatched they were more than the poor birds could manage to provide for, and having repented of his mischief, he was obliged to help them bring up their young." (Cf. *Ibis*, 1868, p. 247.)

Since this was written, I have had the advantage of visiting my correspondent, who is well known throughout this colony for her talents, love of natural history, and powers of observation. We often discussed this subject. She and her sons assured me they never cared to select eggs like those of the foster-parent, but simply eggs of those whose food they knew to be similar. They said the confusion they caused was most amusing, but only after the young were hatched. The eggs were incubated without any demur on the part of the foster-mother. After this, surely I may ask *cui bono* the *C. canorus* imitation?

E. L. LAYARD

Cape Town, Cape of Good Hope, May 3

The Chromatic Octave

I HAVE to thank "M. A." for his letter in NATURE of June 9th, suggesting that the wave-frequency to which the complementary of any tint is due, may be, not the geometric mean between that tint and its octave, as I suggested in a letter in NATURE of 28th April, but the harmonic mean. I can scarcely doubt that there must be some simple arithmetical relation between the wave frequencies of any tint and its complementary,

but I see no *à priori* reason for expecting to find one such law rather than another; we must try which assumed law will most nearly coincide with fact, and the hypothesis of a harmonic mean does so coincide pretty nearly. The following table (see my previous letter) gives the ratios of the wave-frequencies of red, orange, and yellow as observed, of their complementaries as observed, and of the same as calculated on the hypothesis of the harmonic mean:—

	Observed.	Calculated.
Red . . . 36°4c	Bluish Green 48°30	48°53
Orange . 39°80	Blue 51°80	53°07
Yellow . 41°40	Indigo 54°70	55°20

The discrepancies between the observed and the calculated outlines are much less on this hypothesis than in that of the geometric mean; but they are on the same side, and, as I explained in my former letter, I think it likely they may be due to the solar spectrum not being of a truly white colour, owing to the absorption lines toward the violet end. They are on the side which this way of accounting for the fact requires. It would be desirable to make a set of comparative experiments with solar light and the electric light, as I suggested before, in order to clear up this question.

Old Forge, Dunmurry,
Co. Antrim, June 13

JOSEPH JOHN MURPHY

On the reported Current in the Suez Canal

IT is stated on excellent authority that a constant current runs through the central portion of the Suez Canal, from the side of the Mediterranean to that of the Red Sea, and a good deal of surprise has been excited by this apparently anomalous phenomenon. A little consideration will, however, suffice to establish a theory, that constant currents are almost necessary conditions of inter-oceanic canals, and that their absence, not their presence, would be contrary to just expectation. My reason is based on the improbability that a long canal, A B, could be constructed across strata that are almost necessarily inclined in one direction more than another, which should not resist the flow of tidal water from, say, A towards B, more than from B towards A. Wherever this differential aspect is established, a quasi-valvular action is called into existence, and a current along the middle of the canal, in a constant direction, is the necessary consequence.

Let A B be the canal, and *a b* the extreme limits of tidal influence. After each successive rise and fall of the tide on either side, more water will have passed from A towards *a*, than

A — *a* — *b* — B

will have returned from the side of *a* to A, and more water will be able to travel from the side of *b* to B, than can get up the canal from B towards *b*. Consequently there will be a constant current in the ultra-tidal portion, *a b*, of the canal, from the side of A to that of B.

I have made some inquiries, but am unable to learn what notchings, indentations, or sweeps of the sides of a canal, would exercise the greatest differential effect, at low velocities, of the kind of which I am speaking. However, I hear it is a fact well known to sailors, that a spar cannot be towed behind a boat, unless with the greatest difficulty, if its small end be foremost, whereas, it is moved easily enough if its thick end be in front. I argue from this that if a number of spars were moored against the sides of the canal, with their large ends towards A, much less strain would be exerted on the ropes by which they were secured when the current ran from A to B, than when it ran from B to A, and consequently that the current itself would be much less resisted in the former than in the latter case. A succession of very long notches in the sides of the canal would produce identically the same effect, and might call into existence a considerable aggregate of differential resistances. I constructed a model for the purpose of experiment, but found it much too small to give satisfactory results; nevertheless, I will describe it, in hopes it may save trouble to others in designing a suitable arrangement, for the same purpose, on a larger scale. A notched trough was cut, running up and down in long zig-zags, and its two ends were brought together into the same reservoir. By alternately allowing water to run into the reservoir, and then drawing it off, the effect of the rise and fall of the tide was simulated. I scattered lycopodium on

the water, in the middle part of the channel, to show the direction of the current.

I venture to suggest to those engineers who are connected with inter-oceanic canals, the importance of making experiments on this problem, because it may prove to be quite within their means to produce and to regulate a current within such canals, in the direction and of a velocity most convenient to keep its bed clean and serviceable.

FRANCIS GALTON

Birds' Nests

BIRDS, though almost always adapting themselves to circumstances in the use of materials, are frequently, even in the country, very eccentric in their choice of a place for their nests. I have seen a blackcap's nest built of the ordinary materials, in an open flower-pot standing on the top of a garden wall. Apparently there was no possible reason for this, there being plenty of hedges and banks hard by. But in the neighbourhood of London birds may be allowed an excuse for their eccentricities.

In a quiet street in one of the southern suburbs there is now a pair of tom-tits who have taken possession of a cast-iron lamp pillar, wherein they have built their nest and reared their young for two or three years past. It is curious to think what business they could have had there, to have found out that it was a suitable residence. The nest is placed in the bulb or swelling out of the column, just below the lamp, and the birds creep through

the space between the gas-pipe and the iron rim at the top of the column. This space is not three-quarters of an inch in width. The nest is on one side of the pipe, and cannot be more than two inches across. The lamp is lighted every evening, and on one occasion the pillar was actually taken down for some repairs with the nest inside, containing seven or eight eggs, which were, I believe, destroyed; but the birds, concluding I suppose that this was not done with *malice prepense*, but that it was only a necessary domestic difficulty, wisely returned to their home, and continued to occupy the lamp pillar for the remainder of the season, rearing another brood that same year. The accompanying sketch shows the position of the nest. Under the eaves of the adjacent house, two pairs of house martins have built this year. They came flitting about on the 1st June, and the weather being very dry, and no mud to be got at, the "gudeman" of the house kept a little spot in the road well watered, from whence the birds obtained all their necessary mud. The sparrows would plump down after the martins, thinking there was food there, and stand watching the martins at this little wet spot, and wondering apparently why they kept on flying down here, where there was no grub to be got. They tried hard to obtain possession of the martin's nests when half built, but were constantly driven away by the gentleman of the house, and now the nests are finished, and the entrance too small for the sparrows to get in; so that they dwell in comparative security. Two of these martins seem to be the sole occupants of their nest, but the other nest appears to be visited, at least, if not owned by, more than one pair of birds, three or four birds being often seen there at one time. I have often noticed this in the country, but never saw any remarks about it recorded by any one.

C. W. W.