

rearing their young in the New Zealand forests, to which country they periodically return for the summer season. Such, for example, are the long-tailed cuckoo and the small bronze-cuckoo, known to the Maori as "the bird of Hawaiki"—that is, the bird who returns to the land from whence the Maori ancestors originally came.

Our kingfisher also moves northward in the autumn, and may likewise leave for a warmer country. These latter birds conduct their migrations as we should expect—that is, they reverse the conduct of their flight to those birds which live in northern latitudes, and we feel that their natural instincts are working according to rule. But the kuaka, not satisfied to pass the winter in a warmer country, must actually have two summers—one in New Zealand and a second in Northern Siberia, where it is said to have its breeding-place. Any way, it leaves in countless numbers from the north-east point of New Zealand, from almost the very place where the spirits of the dead Maori are supposed to take their departure to the other world (Reinga). For which reason the bay on the shore of which the birds assemble before flight is named by Europeans "Spirits' Bay."

The Polynesian mariner may in former times have guided his migrations by observation of the place of departure and arrival of birds of passage, also from the particular dates of such occurrence, and from the circumstance that the winds at that time were most favourable for travel in such particular directions. The spirits of their dead may have been supposed to return to the original birthplace of the race; and the nearest point of departure would be that from which the birds also departed.

But do any migratory birds other than the kuaka go further north than Tahiti, Rarotonga, Samoa, and the Fijis?

I always understood that no bird from either the north or the south temperate zones ever voluntarily crossed the tropics, and to me it seems a fable that even the kuaka should do so.

Whence comes the hereditary knowledge that should lead the kuaka half over the world to find a suitable breeding-place? Why does it not go in search of an Antarctic continent, as should be the natural sequence of events? Are not the high lands and alpine valleys of New Zealand where the dotterel, the red-breasted plover, the stilt-plover, oyster-catcher, &c., make their nests, equally suitable for the godwit?

Where does the European godwit (*Limosa lapponica*) breed? and is it not said that the nesting-place of the European knot (*Tringa canutus*) has never been discovered?

That the New Zealand godwit starts in a northerly direction in its migration is assured; but who has traced its course onward, as following the shores of China, it is making its way to lonely steppes in Siberia?

That these birds should winter during a New Zealand summer, and then leaving should pass through both temperate and torrid zones, and still onward to the confines of the north frigid zone to nest and summer, is truly marvellous. Will any reader of NATURE kindly contribute to our knowledge of the nesting-place of the godwit or the knot, or remark on other points at issue?

TAYLOR WHITE.

Wimbledon, Hawkes Bay, N.Z., February 9.

In reference to the above, the British Museum possesses a single egg of the knot, said to be one out of a clutch of four obtained at Disco Island, Greenland. Colonel Feilden has good grounds for believing that this bird nests in the New Siberian Islands.—ED.]

The Indian Musk-Shrew.

THE old yarn about the tainting of wine in bottle by the common Indian shrew (*Crocidura coerulea*) seems to die hard, since "W. T. B." has had to correct it again in your issue of this week. The account of a crucial and deliberate experiment may be another nail in its coffin.

I kept wine in small chambers off my office, in a locked basket, ventilated at the ends, for use at luncheon. One day I opened it, and found a musk-shrew coiled up on a napkin, and did not disturb him, nor he himself. Next day I impanelled an unconscious jury; and we found the wine perfectly good. The musk-rat had been there in the morning, but had received a quiet hint to go. When my guests were gone, I wiped a glass with his napkin, filled it with wine from the same bottle, and found this too musky to swallow.

The wine was a sound Pomard from Treacher and Co., Bombay, with capsuled corks bearing their stamp.

I do not know whether it was bottled in Europe or in India.

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I believe that the commonest cause of the musk-taint in wine is the wiping of the glass with a clout that has been picked up out of a corner, where the musk-shrew has laid on it.

Even in the best houses in India native servants will often use very little care about the cleanliness of "glass-cloths"; and when one that has served to clean a lamp or shelter a shrew is next used upon a wineglass, you have *vera et sufficiens causa* for spoilt wine—and temper.

I have a note on this somewhere in the *Journal* of the Bombay Natural History Society; but it is buried out of sight in some back volume, as my experiment took place about twenty years ago. I may add that the place of it was Ahmadabad, in Gujarat.

W. F. SINCLAIR.

102 Cheyne Walk, Chelsea, London, S.W., May 5.

Mammalian Longevity.

SINCE my letter on this subject in NATURE of March 23, I have noticed that a slight change in the formula—the reduction of the constant from 10.5 to 10.1—gives much better results. The agreement is now very close indeed. The amended statement now runs as follows:—

The full term of life in any mammalian species is equal to 10.1 times its period of maturity divided by the cube root of the period, or 10.1 times the cube root of the square of the period.

We get the following results from its application:—

Animal.	Observations.				Other observations. f. t. l.
	Authority.	p. m.	f. t. l.	f. t. l. by formula.	
Dom. Mouse ..	Dr. Ainslie Hollis.	25 yr	4 yr.	4 (4.01)	
Guinea-pig ...	Flourens.	583	6-7	7 (7.05)	
Lop-Rabbit—					
Buck	R. E. Edwards.	75	8	8 (8.3)	
Doe	R. E. Edwards.	67	8	8 (7.7)	
Goat	Pegler.	125	12	12	
Fox	St. G. Mivart.	150	13-14	13.25	
Cat	Jennings.	2	15	16	
Cattle	Dr. Ainslie Hollis.	2	18	16	14, Gresswell. 15-20, Flourens. 15-20, Flourens; and others.
Large Dogs ...	Dalziel.	2	15	16	
Thor. Horse ...	Dr. Ainslie Hollis.	45	30	28	
Pigs	James Long.	5	30	30	
Hippopotamus	Chamb. Encyc.	5	30	30	
Lion	St. G. Mivart.	6	30-40	33	
Hunter... ..	Blaine.	6.25	33	34	
Arab Horse ...	Dr. Ainslie Hollis.	8	40	40	
Camel	Flourens.	8	40	40	
Man	Buffon.	25	90-100	86	100, Flourens. 75, Farr.
Elephant	Darwin.	30	100	98	
Elephant	(C. F. Corder and Indian hunters.)	35	120	108	100, Darwin.

In this table, p. m. stands, as before, for period of maturity, and f. t. l. for full term of life.

In the first table another statement dealing with the cat was also given, on the authority of Dr. Mivart, which is excluded from this, since the period mentioned—one year—obviously refers to the animal's period of puberty, not its period of maturity, as is indicated by Dr. Mivart's expression: "The domestic cat begins to be ready to reproduce by the end of the first year of her life. . . ."

The age of the hunter, calculated from Blaine, was given in the previous table at thirty-five, and in this it is given at thirty-three. Blaine states that a horse of thirty years is relatively as old as a man of eighty, and a horse of thirty-five as a man of ninety. The first formula gave about ninety for man, and the corresponding age for the horse was therefore thirty-five; but the corrected formula gives eighty-six for man, which corresponds to thirty-three in the horse.

I agree with Dr. Ainslie Hollis that Buffon's 90-100 years for man is too long; but, on the other hand, seventy-five—the period given by Dr. Hollis from Dr. Farr's calculations—seems much too short. The great majority of persons have their lives cut short by disease, the nervous strain of life, &c., and do not live to anything like the full term of life. Were it not for such influences as these, most persons at seventy-five would probably still possess a considerable degree of vitality, and should be able to look forward to many years of life. Furthermore, Farr's cal-