Proportionally they suffer from the ravages of the birds equally; the percentage of losses is the same; they are on equal terms. No matter how long they continue the association, neither gains nor loses on the other; though through one being more numerous it loses more individuals, yet equally in proportion with the other. So that, if one is twice as numerous as the other at the time of assimilation, it must always—other conditions being equal—remain twice as numerous.

We now give the mathematical reduction:—

Designation of species	A		B
(1) Original number	a	$>$	b
(2) No. lost without imitation	e	$=$	e
(3) Remains without imitation	$(a - e)$		$(b - e)$
(4) No. lost with imitation	$\dfrac{a}{a+b} e$		$\dfrac{b}{a+b} e$
(5) Remains with imitation	$a\left(1 - \dfrac{e}{a+b}\right)$		$b\left(1 - \dfrac{e}{a+b}\right)$
(6) Excess of remains due to imitation, or *absolute advantage* (3)-(5)	$\dfrac{be}{a+b}$		$\dfrac{ae}{a+b}$
(8) Ratio of excess to remains without imitation (6) : (3), or *proportional advantage*	$\dfrac{e}{a+b} \cdot \dfrac{b}{a-e}$		$\dfrac{e}{a+b} \cdot \dfrac{a}{b-e}$

(9) Ratio of proportional advantage of B to proportional advantage of A ... ... $\dfrac{a\,(a-e)}{b\,(b-e)}$ or $\dfrac{a^2}{b^2} \dfrac{1 - \dfrac{e}{a}}{1 - \dfrac{e}{b}}$.

From (8) we see that, if $e < b < a$, there is a proportional advantage to both, the mimicry "is twice blessed," but the proportional advantage to B is greater. If e is zero, there is no advantage to either. If $e = b < a$, the prop. advantage to B is infinite, while that to A is still finite; this is as it ought to be, seeing that to B it is a case of "to be or not to be," of existence with mimicry or extinction without. And in this extreme case it must be evident to every one that the ratio of $a^2 : b^2$, both terms finite, cannot be the ratio of the infinite advantage of B to the finite advantage of A. The greater e the greater are both advantages.

From (9) we see that, if e is small compared to b and a, the ratio is nearly $a^2 : b^2$ (Müller's law), but the larger e is the further it deviates from that law, the ratio becoming rapidly greater than $a^2 : b^2$, and approaching infinity as e approaches b.

To conclude, we may point out that Müller's law, as given in his own words and quoted above, is incompletely enunciated, and but for the numerical examples, it might lead any one astray as to what the law is. It ought to have *the ratio of* interpolated between "and" and "the *proportional*"; then "*advantage*" and "*square*" ought both to be plural; "relative" ought to be respective; and, lastly, the fact that the ratio is inverse should be explicitly stated.

Finally we enunciate our law. Let there be two species of insects equally distasteful to young birds, and let it be supposed that the birds would destroy the same number of individuals of each before they were educated to avoid them. Then if these insects are thoroughly mixed and become undistinguishable to the birds, a *proportionate advantage* accrues to each over its former state of existence. These *proportionate advantages* are inversely in the duplicate ratio of their respective original numbers compounded with the ratio of the respective percentages that would have survived without the mimicry.

This last "ratio compounded" correct. Müller's law, but we still think with Mr. Wallace that the law, even when corrected, has not much bearing on the question that the individual absolute advantages (6) above, together with the probable value of e and the ratio $a : b$ indicated by relative frequency of capture, solve the whole question. In our first paper above mentioned we established formulæ for calculating these last-named items, although in a different manner from and quite independent of Müller's law, which we had not then seen.

THOMAS BLAKISTON
THOMAS ALEXANDER
Tokio, Japan, November, 1883

Christian Conrad Sprengel

I BECAME acquainted with Christian Conrad Sprengel's work, "Das entdeckte Geheimniss der Natur im Bau und in der Befruchtung der Blumen" (Berlin, 1793) in 1850 at the University of Berlin through Prof. C. H. Schultz-Schulzenstein, who brought it forward in one of his lectures on botany, praising Sprengel's good observations and illustrations, but making his teleological views appear so irksome as to dispose his hearers rather to depreciate and reject the book than be attracted to it by respect. The value of Sprengel's treatise in its bearing on the theory of selection was first recognised by Charles Darwin, whose writings recalled the remarkable book to my mind, and induced me to buy it, which I did at a very cheap rate at an old book-shop. K. MÖBIUS

Kiel, February 18

Circular Cloud Bows

I FANCY that the phenomenon described by Mr. Fleming in your issue of January 31 (p. 310) is not a very uncommon one. It has twice fallen to my lot, when in Switzerland, to be a witness of these spectral shadows.

On the first occasion I was with a party of three on the mountains to the north-east of Montreux, almost opposite the Cape de Moine. It was midwinter, and the day was very cloudy, even in the valleys, while the high ground on which we stood, and all the surrounding peaks, were completely swathed in mist. Suddenly, and under the impulse apparently of a blast of wind from below, the mists around us were almost entirely dissipated, and a few sickly gleams of sunshine filtered through the fog. At that moment we saw gigantic images of ourselves projected on to the wall of vapour enshrouding the Cape de Moine, immediately opposite the point where the sunbeams had permeated. The effect was very transitory, and, so far as I remember, there were no prismatic colours.

The circumstances under which I saw the second appearance were as follows:—

In August last I was standing, just before sunset, on the summit of the Niesen, in company with a friend. The day had been very hot, and we were just remarking on the extraordinary difference in temperature between our elevated position there and our situation a few hours before on the Lake of Thun, when we saw some scattered wisps of cloud rising out of the depths below. These increased rapidly, both in size and number, uniting as they rose, till the whole abyss presented the appearance of a seething cauldron, from which was escaping a dense cloud of steam. The prospect towards the east was quickly blotted out, while the sky in the opposite quarter remained as clear as before.

We then saw dim and fragmentary signs of prismatic colours in the curtain of cloud, and these became more defined and vivid as the thickness of the cloud increased. Finally there appeared a very distinct circle of rainbow hues, with our own figures looming, weird and awful, in its centre. Both images were visible to myself and my companion, though each could see the other's reflection more distinctly than his own.

Mr. Whymper, in his "Ascent of the Matterhorn," mentions an instance in which the prismatic colours assumed the shape of crosses. This effect, occurring as it did soon after the fatal accident which marked the conquest of the mountain, filled the minds of the guides with superstitious horror. From my own experience on the Niesen I can well imagine that, as Mr. Whymper suggests, this form could be accounted for by the supposition that there were several circles interlaced, and that only segments of them were visible from the point at which he and his companions stood.

Perhaps some of your readers may be able to explain the exact atmospheric conditions under which these appearances become possible. E. H. L. FIRMSTONE

Bewdley, February 21

On the Absence of Earthworms from the Prairies of the Canadian North-West

In NATURE of Jan. 3 (p. 213) Mr. Robert M. Christy writes on the absence of earthworms from the prairies of the North-West. I can confirm his statements, and extend them to cover the prairies of Kansas, the Indian Territory, Idaho, and Washington Territory. In all the above-mentioned territory of the United States the soil is more or less alkaline, and it seems to