

might be expected, as Nos. 2 and 3 are obviously descended from the hermaphrodite No. 1. I have never, however, found a single individual in any sense intermediate between Nos. 2 and 3, which appear to be two distinct female forms developed from No. 1 along different lines.

These two forms, it will be observed, differ remarkably from each other in the following points, viz. size of capitulum, size of florets and arrangement on the receptacle, colour of corolla, stoutness, colour and general form of style, and in the absence or presence of stellate hairs.

The stellate hairs are utilized to catch stray pollen-grains detached from the bodies of insect-visitors coming from neighbouring hermaphrodites, most of which would otherwise be wasted. As it is, they are retained by the hairs until the arrival of other insects, which in depressing the already bent and twisted styles bring their viscid stigmas into contact with the pollen-grains collected by the hairs of adjacent florets—a result facilitated by the manner in which the stigma is set on the style. By this arrangement the chances of fertilization are much increased, as each stigma generally receives a full share of pollen.

With regard to the relative size of the three forms it is remarkable that while one of the female forms is so much smaller than the hermaphrodite (as is the case, according to Darwin, in all gynodioecious species known to him), the other even exceeds it in size. It is also noteworthy that the capitulum of the second female form, although larger than that of the hermaphrodite, contains a much smaller number of florets, and these are very large.

I can discover no rule as to the distribution of the different forms. In one station near here (a large common) all the plants are hermaphrodites. In a certain wood where the species abounds, the "bent-styled" females appear to be nearly as common as the hermaphrodites, while no "straight-styled" females can be found. In another wood, not half a mile distant from the first, the "bent-styled" form is almost entirely supplanted by the "straight-styled," which is plentiful. Lastly, in a fourth station (a barren strip of ground by the roadside), all three forms are found growing together. ARTHUR TURNER.

Box Hill, September.

On the Aquatic Habits of Certain Land Tortoises.

It has always proved of more or less interest to me to observe the method of aquatic locomotion adopted on the part of any of our strictly terrestrial vertebrates, and never is this more keen than when the opportunity has been afforded to study the swimming propensities of certain of our Reptilia. Most snakes swim well, but who of us has not been surprised upon first observing the violent wriggling, forward-propelling motions of some of the smaller lizards when they are thrown out into the water some little distance from the shore? The American chameleon (*Anolis principalis*) well illustrates this last; and this lizard, in common with others, seems to possess an actual dread of getting into deep water. For a long time it has been known that most species of the so-considered stricter types of land tortoises soon drown when placed in water of any considerable depth, and it would be but natural to suppose that such species would avoid that element as far as possible, but I have found this by no means always to be the case. Take the ordinary land turtle of the United States (*Cistudo carolina*, for example: it will voluntarily enter the water under certain circumstances. Not long ago the writer noticed one of these hunting for food in three or four inches of water along the edge of a pond that had rising banks; and the first time I discovered the nest of this variety the eggs were deposited in the water in a depression at the miry margin of a marsh. But this is not all, for if we place one of these reptiles upon a little island of land, well removed from the shore, and surrounded by water several feet in depth, and withdraw to watch its movements, we note that as soon as it satisfies itself as to its position, it will, without further ado, take at once to the water and swim to the nearest shore. It does not, however, sink beneath the surface, but, holding its head high out of that element, and filling its lungs with air, strikes out vigorously, with alternate pairs of feet, until it accomplishes its purpose, and regains the mainland. How far one could swim in this manner I am unable to state, but that it would not exceed a few yards I am quite certain. Nevertheless, even the power to accomplish the feat to the extent indicated

might, under a variety of circumstances, have its influence upon the distribution of the species, or of any species of typical land tortoise, and it would be interesting to know how far this power may be enjoyed by this class of reptiles generally.

Smithsonian Institution,

Washington, D.C., September 13.

R. W. SHUFELDT.

Delambre's Analogies.

FOUR of the most important formulæ in spherical trigonometry were given by Gauss, without proof, in his "Theoria Motus Corporum Cælestium" (1809), and were therefore called Gauss's theorems or analogies.

They were, however, given by Mollweide in Zach's *Monatliche Correspondenz* for November 1808, and before that by Delambre in the *Connaissance des Temps*, issued in April 1807, so that they are now justly ascribed to the latter.

They may be deduced in the most simple manner from Napier's analogies, and thus easily remembered.

Napier's analogies are—

$$\tan \frac{1}{2}(A + B) = \frac{\cos \frac{1}{2}(a - b)}{\cos \frac{1}{2}(a + b)} \cdot \cot \frac{1}{2}C \quad (\alpha)$$

$$\tan \frac{1}{2}(A - B) = \frac{\sin \frac{1}{2}(a - b)}{\sin \frac{1}{2}(a + b)} \cdot \cot \frac{1}{2}C \quad (\beta)$$

$$\tan \frac{1}{2}(a + b) = \frac{\cos \frac{1}{2}(A - B)}{\cos \frac{1}{2}(A + B)} \cdot \tan \frac{1}{2}c \quad (\gamma)$$

$$\tan \frac{1}{2}(a - b) = \frac{\sin \frac{1}{2}(A - B)}{\sin \frac{1}{2}(A + B)} \cdot \tan \frac{1}{2}c \quad (\delta)$$

$$\text{Let } m \cdot \sin \frac{1}{2}(A + B) = \cos \frac{1}{2}(a - b) \cos \frac{1}{2}C. \quad (1)$$

$$\therefore m \cdot \cos \frac{1}{2}(A + B) = \cos \frac{1}{2}(a + b) \sin \frac{1}{2}C. \quad (2)$$

These are numerator and denominator of (α).

$$\text{Let } n \cdot \sin \frac{1}{2}(A - B) = \sin \frac{1}{2}(a - b) \cos \frac{1}{2}C. \quad (3)$$

$$\therefore n \cdot \cos \frac{1}{2}(A - B) = \sin \frac{1}{2}(a + b) \sin \frac{1}{2}C. \quad (4)$$

Numerator and denominator of (β).

Square, and add—

$$\therefore m^2 + n^2 = 1.$$

Divide (4) by (2), and it follows by (γ) that—

$$\frac{n}{m} = \tan \frac{1}{2}c;$$

$$\therefore m = \cos \frac{1}{2}c, \quad n = \sin \frac{1}{2}c.$$

Substitute these values, and (1), (2), (3), (4), are Delambre's analogies. R. CHARTRES.

Classified Cataloguing.

THE principle suggested by Mr. Petrie, on "Classified Cataloguing" (NATURE, August 22, p. 392), is already successfully used in many of the chief libraries of the United States, having been originated by Mr. Melville Dewey, while Librarian at Amherst College. It is equally applicable to collections of all kinds, and the classification has already been extended to a considerable extent in certain departments, particularly in botany, and is capable of unlimited extension. It possesses all the advantages mentioned by Mr. Petrie, but is broader, inasmuch as it includes all subjects.

In the "Decimal Classification" of Mr. Dewey (Boston, 1885, second edition), we find, for illustration, under 500, General Science; 580, Botany; 583, Dicotyledonæ; 583.9, Apetalæ; 583.95, Unisexuales, 583.951, Euphorbiaceæ; 590, Zoology; 598, Reptiles; 598.13, Chelonia, &c.

If an extension of this system, which would, I have the means of knowing, be most acceptable to Mr. Dewey, were to be adopted for general museum use, the advantages would be incalculable.

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Valuable Specimens of Vertebrates for Biological Laboratories.

WHAT specimens of Vertebrates are the best to be used by the student in the biological laboratory? This is certainly a very important question. In Europe, the following animals are generally dissected: some fish, the common frog, the pigeon,