waters. The Echinodermata, described by Grieg, include 2 crinids, 6 starfish, 6 ophiurids, strangely only 1 sea urchin, and 4 holothurians. The rest of the described marine fauna consists of 2 sponges, 4 actinians, 6 sea-squirts, 10 hydrids, 4 medusæ, and 44 kinds of polychæte worms. Clearly Arctic waters do not teem with a variety of animal life, but they make up for this in abundance of individuals.

The geologic results of Per Schei are very rich, not only in the abundance and variety of fossils gathered, but also in the record of the distribution of the various formations. Over the Archeozoic granites of Ellesmere Land lie about 14,000 feet of Paleozoic strata, beginning with Upper Cambrian, followed by basal Ordovician (Beekmantown), middle Ordovician, early and middle Silurian, and an extraordinary development of Devonian, having a thickness of about 6,000 feet (marine Lower and early Middle Devonian and an Upper Devonian fresh-water facies). The Carboniferous is known only in highest Pennsylvanian rocks, followed by marine Upper Triassic. Then there is no sedimentary record of any kind until the deposition of the Miocene fresh-water beds with lignites. As Per Schei died soon after the return of the expedition, the fossils are described by O. Holtedahl in three papers, one of which gives a summary of the geological results attained. The land plants of the Upper Devonian and the very few from the Miocene are described by A. G. Nathorst; the Devonian fishes by J. Kiær; the Devonian invertebrates by O. E. Meyer and S. Loewe; the Upper Carboniferous fauna by T. Tschernyschew and P. Stepanow; and the Triassic marine invertebrates by E. Kittl.

From Per Schei's account and the splendid photographs (the best Arctic pictures anywhere), it is evident that Ellesmere Land is an elevated and dissected table land, rising directly toward Greenland. Elevated strandlines and wave-cut terraces are seen along most shores, and are of various altitudes up to 570 feet. On one at 300 feet lie undecomposed driftwood and logs, attesting the recentness of some of this elevation.

Norsemen are still lovers of heroic work, and the north lands are their special scientific field. From them we are learning the geography, geology, and biology of the lands of the midnight sun on either side of Greenland, the territory of the Danes. We need, however, still more information about these almost inaccessible places, and let us hope that the Norwegians will soon extend their endeavors and modernize our knowledge of Nova Zembla.

Charles Schuchert

SPECIAL ARTICLES

COMPUTING AGES OF ANIMALS

In the various experiments on animals in regard to growth, nutrition, activity, reproduction, etc., it is necessary to determine the age of the individuals at various times in their lives. These computations, involving mere additions and subtractions, take a great deal of the experimenter's time. The task is monotonous and soon becomes a matter of great drudgery.

Having before me the task of making several thousand such computations I sought a means of obtaining this data in a quicker and less tedious manner. The instrument described and used by Minot in his work on the guinea pig appealed to me. It had, however, the objectionable feature that the age of but one animal could be ascertained at a time. As I was dealing with a pair of animals whose weights were made on the same day and whose ages were to be determined when litters were born it was necessary to devise a scheme whereby the ages of two individuals born on different days could be readily determined at various times in their lives.

The device finally hit upon is so simple to make and operate that I have deemed it worthy of a description in order that others who may be wrestling with such tedious computations may be relieved of their drudgery.

The device consists of three meter sticks, *M*, *A*, and *F*, with two guides, *G*, *G*. The middle meter stick and the two guides are fastened securely to a board and the other two meter sticks slide freely. To facilitate

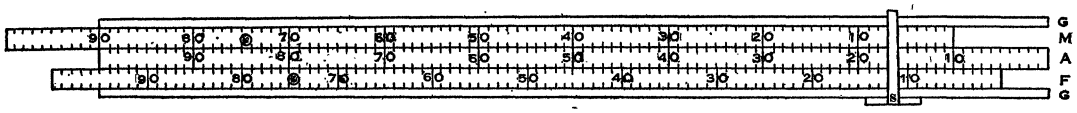

FIG. 1.

movement a small knob, *K*, is screwed to each of the movable sticks. A slider, *S* is made like a small T-square. It crosses the sticks at a right angle and can be moved freely along them. The two guides are slightly thicker than the meter sticks so that the movement of the slider does not change the position of the movable meter sticks. *M* is used in determining the age of the male and *F* that of the female. For the sake of simplicity the millimeters are not shown in the figure.

The method of using this device is best illustrated by an example. Suppose the male of a pair was born on April 10, 1919, and the female on February 19, 1919. The first date is the 100th day of the year, and the second date is the 50th day. A calendar having all the months of the year on one page and also having each day in the year numbered consecutively from both the beginning and the end of the year is used for determining what day in the year a certain date represents. Stick *M* is moved until its right end is even with the 100-millimeter mark on *A* and *F* is similarly moved to the 50-millimeter mark. If a weighing were made on June 9, 1919, which is the 160th day of the year, the slider is moved to the 160-millimeter mark on *A*. The age in days of each animal is now indicated on their respective sticks by the number of millimeters to the right of the slider. That is, the male is 60 days old and the female 110. If the age is to be computed on November 27, 1919, the 331st day of the year, the slider is moved to 331 on *A* and the age of each at once read off, which is 231 and 281 days respectively. The ages at any date in 1919 can thus be computed without moving anything but the slider.

If a date occurs in the succeeding year, 1920, then the sticks would require resetting. This is done in the following manner. The slider is moved to the 365 mark on *A*, which represents the last day of 1919, and the readings taken on *M* and *F*. These are 265 and 315 respectively, that is, the ages on December 31. These two numbers may also be found on the calendar since they are the days in the year when numbered consecutively from December 31 to January 1 corresponding to the two dates of birth. *M* is now moved to the right until its 265 millimeter mark is even with the end of *A* and *F* is moved in a similar manner until its 315 mark is even. This arranges the instrument for any date in 1920. If the ages are desired on March 28, 1920, the 87th day of the year, the slider is moved to 87 on *A* and the ages of the two animals are at once indicated as 352 and 402 days respectively. In this manner the ages may be rapidly determined for any date desired. It is obvious also that the device can be arranged to give the ages when the two animals are born in different years.

The limit of capacity of this device is 1,000 days. But in dealing with animals with a longer span of life each millimeter can represent a week, a month, or a year and the ages computed in these periods of time.

The excuse for this article is the hope that it may help some one who is confronted with a series of tedious computations similar to the ones with which I have had to contend.

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THE CLASSIFICATION OF THE OPALINIDÆ

I HAVE completed a study of one hundred and thirty-four species and twenty subspecies which according to the prevalent usage would be included in the genus *Opalina*. Twenty-four species were known before. My material, obtained mostly from the United States Na-