(Page 136) "All known Devonian vertebrates were aquatic."

(Page 321) "During the Pliocene and Quaternary, *Equus,* or the modern Horse, has one toe only on front and hind feet with the two side toes of *Protohippus* reduced to splints (the fetlock of the present day Horse)."

(Page 305) "In this vastly expanded interior sea true marine deposition took place, the most characteristic formation being a Nummulitic limestone, so called because it is chiefly made up of shells of a certain species (*Nummulites*) of unusually large Foraminifers. Perhaps no other single formation in the crust of the earth built up essentially of the remains of but one species of organism is so widespread and thick, its thickness at times reaching several thousand feet."

(Page 334) "At no time did the Labradorian ice sheet spread enough eastward or the Kewatin sheet far enough westward, to cover this driftless area."

Typographical errors in this book are rare. We now recall having noted but two, one in the caption of page 193, the other in the spelling of the specific name *choctavensis,* page 315.

The illustrations upon the whole are good. The printing of whole-page half-tone engravings on the class of paper used in the text (though very good) is scarcely to be recommended, as the plate on 129 clearly shows. The routing on the line engraving, Fig. 69, page 126, was carelessly done. Slight stains, perhaps from the paste used in securing the illustrations appear about their borders, in Fig. 52, page 95.

The printing is of uniformly good grade, the body type approaching very closely the 10-point modern Lining Roman No. 510 opened up by two point leading, giving always a clear, pleasing appearance. The paper, very slightly reddish tinted, is about 70 lb. book, scarcely shiny, but sufficiently calendered to take small half-tone engravings to advantage.

To sum up: Professor Miller has carefully compiled from recognized authorities facts and figures illustrative of historical geology as now generally understood. He is no iconoclast. He has apparently felt the need of a systematic tabulation of topics, serving as a ground-work for a series of lectures in historic geology. This with minor expansions and articulations forms the text-book before us. What were his needs are likewise the needs of other teachers of the same subject; and, since he has done his work well and his publishers have cooperated with good judgment and artistic ability, there would seem to be no reason why the book should not meet with deserved success.

G. D. Harris

Paleontological Laboratory,
Cornell University

SPECIAL ARTICLES

BOILING BUFFALO CLOVER SEED

The discovery that the process of boiling the seed of spotted bur clover (*Medicago arabica*) one minute insures good germination has resulted in the adoption of the practise by the farmers of the south. The kindred discovery recently made by the writer that the seed of buffalo clover (*Trifolium reflexum*) can be readily germinated in the same manner, opens the way for experiment station men to investigate the economic merits of this little-known clover. Experiments heretofore attempted have been nipped in the bud, as far as is known, by failure to obtain a stand. With the practise of soaking and boiling, however, stands can be obtained and the merits and demerits of this legume can be found out.

In 1914, after successfully germinating spotted bur clover seed by the boiling process, the same method was tried by the writer on red clover, white clover, sweet clover and alfalfa, but with negative results. A single experiment with buffalo clover at that time increased the germination from four to thirty per cent. by boiling one minute, but this was considered too small a per cent. and the matter was dropped. Recently, however, the experiment was tried again in a slightly modified form and with excellent results.

The details of the experiment were as follows:

Treatment	Per Cent. Germination
None	0
Boiled 5 seconds	53
Boiled 30 seconds	60
Boiled 60 seconds	60
Soaked in cold water 12 hours	0
Soaked in cold water 12 hours and boiled 5 seconds	47
Soaked in cold water 12 hours and boiled 30 seconds	87
Soaked in cold water 12 hours and boiled 60 seconds	93

Buffalo clover is scattered over many states as a wild plant, but is cultivated nowhere. It somewhat resembles red clover in general appearance and habit of growth, but is smaller. Its leaves are narrower and more sharply pointed and its head, when dead ripe, turns over and hangs down like the heads of white clover. It is large enough to have value if it has other desirable qualities.

The writer obtained the idea of soaking the seed before boiling from similar experiments with bur clover by the Alabama Experiment Station. The fundamental experiment of boiling the seed of both species was original, however, with the writer. A. D. MCNAIR

GOLDFISH AS EMBRYOLOGICAL MATERIAL

FEW laboratories have at their disposal a constant supply of material for the study of living embryology. Frog and snail eggs are used occasionally, but the supply is uncertain and sometimes difficult to obtain in the right stages, and furthermore, these ova are not particularly favorable for study. While engaged in an investigation on the genetics of goldfish the availability of the eggs of this animal for studies on the living embryo became evident and led to this note.

Goldfish are readily obtained in almost every locality and are thoroughly normal in environments in which few wild fish could exist. They breed in tanks containing not more than fifteen or twenty gallons of water and consequently require no elaborate or extensive equipment. Cypress boxes a foot or more square and three feet long make excellent breeding tanks.

A half dozen pairs or less will supply ample material for class use. It is not necessary to have as many males as females. It is well to obtain fish at least four or more inches long, as the larger fish are more certain to mate and are much more prolific. It is impossible to distinguish the sexes except as the breeding season approaches, when the sides of the female become distended through the growth of the ovaries and small spiny projections appear on the operculum and the anterior edge of the pectoral fins of the male.

One or two months before the breeding season begins it is advisable to feed the adults small quantities of beef, liver, mosquito larvæ or worms several times a week, which strengthens the fish and often advances the mating season. If the fish have been properly fed in the fall, spawning may begin as early as January or February if the aquarium is in a fairly warm place, although I have seldom obtained eggs before March or April.

During the season goldfish spawn at intervals of two weeks or longer and experienced breeders say that large vigorous females may breed as frequently as eight times during the spring, though in my work four or five matings have been more usual. The number of eggs spawned ranges from a few hundred to several thousand at a period, depending on the size of the female, and consequently the season's production, even allowing for unfertilized ova, is very great.

Goldfish spawn in the morning for periods varying from two to eight hours. The female discharges a small quantity of eggs against some water plant and the male, who is at her side at the time, fertilizes the eggs in the water. The feathery roots of the water hyacinth seem to be preferred, although the water plants, myriophyllum and cobomba are very satisfactory. The eggs adhere to the plants and may be removed on them. When it is desirable to time the fertilization accurately the plants may be removed as fast as the ova are discharged against them and others substituted. Though the eggs may be removed from the thread-like leaves or roots of the water plants generally these threads do not interfere and make a convenient handle for moving and