the concentrated sperm poured over the eggs and a minute or two allowed to elapse before the addition of water. The watch-glasses are then kept in a covered crystallization dish filled with water to a depth just greater than the height of the syracuse watch-glasses which contain the eggs. Water changes can be made in the main dish leaving the eggs undisturbed. When examination is necessary the watch-glasses may be lifted out of the water and placed on the stand of the microscope.

The eggs are about a millimeter and a half in diameter and are perfectly clear and transparent. Cleavage and development is rapid. The first cleavage furrow appears in about an hour at the temperature of the water during spawning. The pulsating heart can be observed on the second day and the circulation is very distinct on the third day. At a general temperature of about 22° C. the eggs hatch on the seventh day. For two or three days after hatching the larvae remain inactive and lie on their sides on the bottom of the dish. In this position the heart action and the course of circulation can be easily studied. Pigment cells are practically wanting at this stage and the blood corpuscles can be seen passing through the finest of the capillaries.

The abundant straw-colored minnow (*Notropis deliciosus*) is found from Michigan, Ohio, Ontario, and New York to Tennessee, westward to the Dakotas, and southwestward to Kansas and Texas. An excellent colored plate of this species is contained in Forbes and Richardson's "Fishes of Illinois," opposite page 137. For a key for the identification of the Great Lakes minnows and a discussion of nomenclature see Hubbs' "List of the Fishes of the Great Lakes, etc."[4]

The straw-colored minnows are found in spawning condition along sandy shores and are usually taken best at night. Little is known of their natural spawning. Working with a seine at night they can be taken in numbers sufficient for experimentation. The fishes can be stripped and the eggs fertilized in the same manner as *Percina*. The spawning season extends a little later than *Percina*, lasting until August 1st at Douglas Lake. The eggs are about a millimeter in diameter and are transparent. Development is very rapid. The first cleavage furrow appears within an hour after fertilization, followed by the second about fifteen minutes later. The eggs hatch about 72 hours after fertilization at temperature 22°–24° C.

The eggs of the common shiner, *Notropis cornutus*, are also excellent material for research. The development is not so rapid, however, as in the straw-colored minnow. They are best taken at night with seine or fine-meshed fyke.

Eggs of the common yellow perch (*Perca flavescens*) are quite satisfactory but the females can not be stripped with any degree of success and the eggs must be secured after they have been naturally spawned and hence the exact time of fertilization can not readily be ascertained. These eggs can frequently be secured from fish hatcheries in April and May in Michigan, and thus are available at an early date.

Reighard[5] worked with a related species wall-eyed pike (*S. vitreum*) which should be satisfactory for physiological purposes.

This list is very incomplete, and no doubt more study will add other species producing suitable eggs for work throughout the spring and summer months.

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[4] Hubbs, Univ. of Mich. Museum, Miscellaneous Publications No. 15, 1926.

[5] Reighard, "Development of the Wall-eyed Pike (*S. vitreum*)," Mich. Fish Comm. *Bull.*, 1: 66, pl. 1–10, 1890, Lansing, Mich.

BOOKS RECEIVED

ALLEN, FRANK. *The Universe from Crystal Spheres to Relativity.* Pp. xiv + 145. 31 figures. Harcourt, Brace. $2.00.

BABOR, JOSEPH A., WILLIAM L. ESTABROOKE and ALEXANDER LEHRMAN. *Elements of General Chemistry.* Pp. x + 601. 135 figures. Thomas Y. Crowell. $3.75.

BOLDYREFF, TATIANA W. *By Word of Mouth.* Pp. 144. Badger.

DAVIS, MICHAEL M. *Paying Your Sickness Bills.* Pp. xi + 276. University of Chicago Press. $2.50.

FISCHER, F. and H. LICHTE. *Tonfilm Aufnahme und Wiedergabe nach dem Klangfilm-Verfahren.* Pp. xi + 455. 378 illustrations. S. Hirzel, Leipzig.

FLETCHER, HARVEY. *Physical Characteristics of Speech and Music.* Pp. 25. 21 figures. Bell Telephone Laboratories, New York.

HAN-SENG, CHEN. *Notes on Migration of Nan Min to the Northeast.* Pp. 31. China Council of the Institute of Pacific Relations, Shanghai.

MANLEY, R. M. *Synthetic Philosophy.* Pp. 66. Author.

NOBLE, G. KINGSLEY. *The Biology of the Amphibia.* Pp. xiii + 577. 174 figures. McGraw-Hill. $5.00.

PARTINGTON, J. R. *A Text-Book of Inorganic Chemistry.* Third edition. Pp. viii + 1083. 390 figures. Macmillan. $4.75.

PLANCK, MAX. *The Universe in the Light of Modern Physics.* Translated by W. H. Johnston. Pp. 114. Norton. $2.00.

RUSSELL, BERTRAND. *The Scientific Outlook.* Pp. x + 277. Norton. $3.00.

TEXAS AGRICULTURAL EXPERIMENT STATION. *Forty-third Annual Report, 1930.* Pp. 167. Agricultural and Mechanical College of Texas.

TÔHOKU IMPERIAL UNIVERSITY. *The Science Reports.* First Series: *Mathematics, Physics, Chemistry.* Volume XX, No. 3. Pp. 323–488. Illustrated. Maruzen Company, Tokyo.

WEIDLEIN, EDWARD R. and WILLIAM A. HAMOR. *Science in Action.* Pp. xiii + 310. 32 illustrations. McGraw-Hill. $3.00.