namely, that we have to do with actual ameboid movements of the cells in their entirety. According to this conception, the outlines of the visible pigment masses are nearly or quite coextensive with the outlines of the chromatophores themselves. Not only the contained pigment masses, but the cells which contain them, are believed to actually contract and expand. This view, with various modifications, is still held by a minority of investigators, but little recent evidence appears to support it.

The alternative view asserts that the cell-outlines of the chromatophores are nearly or quite fixed, and that the space thus bounded is at all times occupied by the cell protoplasm or a certain portion of it. This protoplasm does not permit of differential staining, so that it is quite invisible in ordinary histological preparations, and commonly in living material as well. The familiar changes in the apparent form of the chromatophores are due to the movements of the pigment masses in the hyaline protoplasm of the cells. The streaming of these granules is one of the most fascinating as well as one of the most readily observed phenomena available to the microscopist. Successful moving pictures of this process have been obtained by Ballowitz.[1]

This second interpretation of the phenomena of chromatophore reaction is now accepted, with possible qualifications, by probably a large majority of investigators in this field, at least for animals beyond the larval stages. In spite of this fact, it is a curious circumstance that most of these investigators continue to employ the language of the earlier theory, even when they explicitly repudiate it. They speak freely of the "expansion" and "contraction" of the chromatophores, and then promptly proceed to explain, by footnote or otherwise, that they really mean nothing of the sort, but only employ this terminology for the sake of convenience. Any one familiar with recent literature in this field will recognize the truth of my statement.

My suggestion is that we continue to employ the terms "expansion" and "contraction," since something obviously does expand and contract, but that we credit these movements to the things that actually do expand and contract, namely, the pigment-masses within the cells.

For these pigment-masses I propose the following terms:

(1) A *chromatosome* is the aggregate pigment-content of any chromatophore, regardless of color.

(2) A *melanosome* is the pigment mass contained in a melanophore.

(3) A *xanthosome* is the pigment mass contained in a xanthophore.

[1] *Pflüger's Archiv,* Bd. 157: S. 165–210, 1914.

Corresponding terms may be employed for the pigmentary contents of erythrophores and guanophores.

The only objection to this terminology which I can think of is the fact that the term "iridosome" has been employed by Ballowitz[2] to designate the clusters of iridocytes (guanophores) which sometimes surround chromatophores of another type. I do not think that the term proposed by Ballowitz well characterizes these loose clusters of cells, particularly since they frequently form an open reticulum, passing from one melanophore to another. His use, in that connection, of the termination "—some" would hardly seem to render it unavailable for the appropriate, as well as more urgent, application suggested in the foregoing note. No one who has observed the pigment mass of a melanophore, particularly in its contracted phase, would hesitate to call it a "body."

It may be that my suggestions, here offered, are not new. Or it may be that there are serious objections to the proposed terminology which I have overlooked. If so, I shall be glad to be further enlightened.

FRANCIS B. SUMNER
SCRIPPS INSTITUTION OF OCEANOGRAPHY
LA JOLLA, CALIFORNIA

A RECORD OF YOUNG TARPON AT SANIBEL ISLAND, LEE COUNTY, FLORIDA

AVAILABLE records of the spawning habits of *Tarpon atlanticus* contain no reference to observations made north of Puerto Rico and Cuba other than those reported by L. L. Babcock,[1] and but three notes of the taking of young tarpon along the coast of the United States.

Evermann and Marsh[2] state that *"Tarpon atlanticus* is common about Porto Rico, where it evidently breeds." They record four specimens from 7.5 to 11.5 inches long taken at Hucares. At Fajardo very young fish from 2.5 to 3.5 inches were collected. Beebe and Tee-Van[3] give measurements of 78 to 1,060 mm of five arbitrarily chosen specimens collected in Haiti. Eigenmann[4] records tarpon of 20, 119, 182 and 192 mm at Pinar del Rio, Cuba.

Gill,[5] in 1905, wrote that the tarpon "does not appear to breed at any place along the continental

[2] *Arch. für mikr. Anat.,* Bd. 93: S. 404–413, 1920.

[1] L. L. Babcock. "The Tarpon." 3rd ed., 135 pp., 9 text-figs. Privately printed, 1930.

[2] B. W. Evermann and M. C. Marsh. "The Fishes of Porto Rico." *Bull. U. S. Fish. Comm. for 1900,* 20: p. 80, 1902.

[3] Wm. Beebe and John Tee-Van. "The Fishes of Port-au-Prince, Haiti." *Zoologica,* Sci. Contribs. N. Y. Zool. Soc., 10: 33–36, 1928.

[4] C. H. Eigenmann. "The Fresh-water Fishes of Western Cuba." *Bull. U. S. Fish Comm. for 1902,* 22: p. 222, 1903.

[5] Theodore Gill. "The Tarpon and Lady Fishes and Their Relatives." *Smithson. Misc. Colls.,* 48: 31–46, 5 pls., 7 text-figs. 1905.

coast of the United States," but R. E. Coker[6] reports a six-inch specimen taken in 1921 at Dauphin Island, Alabama, and L. L. Babcock[7] notes that J. E. Cotter has taken three-inch tarpon in a cast-net at Aransas Pass, Texas.

A Leptocephalus stage in the development of *Tarpon atlanticus* has not been seen, but is predicated by the 25-mm specimen, transitional between Leptocephalid and adult form, in the Bureau of Fisheries, Washington, which was taken off Beaufort, North Carolina. Such a stage occurs in allied genera, and is probable in this case also.

Meek,[8] in his "Migrations of Fish," suggests as probable that the spawning of tarpon takes place at sea far enough from the coast to demand a denatant drift of the pelagic eggs and larvae to the coast where early life is passed.

There is adequate foundation for the belief that *Tarpon atlanticus* spawns along the Gulf Coast of Florida. For many years past, during March, April and May, tarpon have schooled in considerable numbers in shoal waters from one half to one mile off the southeast shore of Sanibel Island, Lee County. These schooling fish remain in this locality for some time, and when feeding strike freely at live bait. Milt has been seen escaping from fish in play, and when brought to the release-hook quantities exceeding half a pint have been expressed from a single fish. So far as known, female fish have not been taken from these schools.

Local fishermen are familiar with small tarpon in creeks and brackish pools, and occasionally in inland pools which contain water only during the summer rainy season, and have no communication with salt water.

Young tarpon from 12 to 38 cm may be netted at any time from a large brackish pool on Sanibel Island. Seining this pond in April, 1933, yielded specimens 8.46 and 12.70 cm in length, and weighing respectively 10.5 and 12.5 grams. These young fish are probably of a year's growth, as indicated by examination of the scales.

The coincidence of schools of ripe male fish remaining for some time in this definite area, correlated with the abundance of very young tarpon in the pools and bayous of Sanibel Island, strongly suggests this locality as a breeding-ground. Opinion among local fishermen is unanimously affirmative on this point. Efforts to secure specimens in early stages of development are now being made and results will be recorded later.

MARGARET STOREY
LOUISE M. PERRY

SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE MEASUREMENT OF STEADINESS: A NEW APPARATUS AND RESULTS ON MARKSMANSHIP

THE apparatus shown in Fig. 1 is a modification of several previous forms described by Whipple[1] and Dunlap[2] for the measurement of steadiness in fine eye-hand coordinations. All these involve the essential idea of a series of holes, graded from large to small, and a stylus (electrically connected with a buzzer or counter), which is either thrust into or held stationary in the holes, errors or unsteadiness being counted by the number of contacts with the plate or side of the holes and registered electrically by a counter or buzzer. The present apparatus combines the best features found in the earlier models, with additional improvements, namely: (1) Use of a rotating dial so that the movement is always to the same point; (2) use of a fiber cover with a beveled opening to focalize the target hole in the brass disk; (3) use of a back target covered with white paper for visibility and insulation so as to standardize the distance of inserting the stylus in thrusting; (4) adjustability to the most convenient height for each observer; (5) use of a tapering, pencil-shaped stylus to afford clear vision of the point when approaching the hole, and (6) suggested use with a "Cenco" impulse counter,[3]

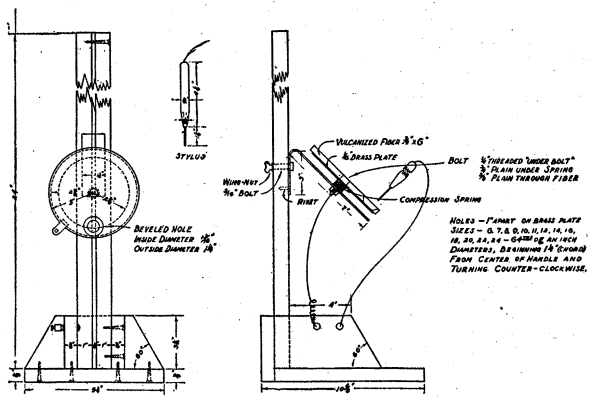

FIG. 1. Apparatus for measurement of steadiness.

[3] Central Scientific Company, Chicago, Illinois.

[6] R. E. Coker. "A Record of Young Tarpon," *Copeia*, No. 93: 25–26, 1921.

[7] *Op. cit.*

[8] Alexander Meek. "The Migrations of Fish," p. 59. London, 1916.

[1] G. M. Whipple, "Manual of Mental and Physical Tests." Vol. 1, "Simpler Processes." Test 13, pp. 155–160. Baltimore, Warwick and York, 1910. Rev. ed. 1914, pp. 130–147.

[2] K. Dunlap, "Improved Forms of Steadiness Tester and Tapping Plate." *Jour. Exper. Psychol.*, 4: 430–3, 1921.