of the abrupt turn from the comparatively open course into the gorge; that is, it was concentrated upon the railroad embankment and morainal deposits blocking the preglacial former course of the river. In other words, Mill River set to work to regain its former course now occupied by moraine, state highway and Rutland Railroad. Only the abatement of the storm prevented the river, after washing away the railroad embankment, from cutting through the moraine and down into the village of East Clarendon.

Conditions developed somewhat suggestive of those at the famous Whirlpool in the gorge of the Niagara River, but of course on a very much smaller scale. Niagara River, at the Whirlpool, runs athwart the moraine-filled course of an older, preglacial stream, and has scoured out of the moraine-filling a vast pit about which it whirls in an effort to find the narrow gorge gateway out, at a considerable angle to that by which it entered. So Mill River, flooded to torrent strength, rushed straight for the pass in its moraine-filled former course at East Clarendon, whirled against railway, highway and moraine embankment, and roared out under the old bridge and through the narrow gorge in the gneiss series.

The through train for Boston reached East Clarendon late that afternoon and started through the pass in the moraine and onto the railway embankment against which the whirl of Mill River was directed. Passengers reported that they felt the embankment yield under the weight of the train and the attack of the river, but the train pushed on in safety to Cuttingsville, where it was stalled for several days. The embankment over which it had passed at East Clarendon soon slumped into the river, and a half dozen freight cars and carload upon carload of marble refuse from the yards of the Vermont Marble Company at West Rutland and Proctor were required to fill the gap.

What might have happened to the village of East Clarendon had the storm continued and Mill River cut through the pass in the moraine is suggested by what actually did happen at Proctor about the same distance beyond Rutland. There, Otter Creek, or another branch stream, too swollen to pass through its gorge, overflowed, cut across the Vermont Marble Company yard, submerged a milk train stalled in a railroad cut and washed away a large part of the farmland slope leading to its lower valley.

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THE SPECIES OF PARAMECIUM AND THE THYROID QUESTION

A RECENT article by D. H. Wenrich (*Trans. Am. Mic. Soc.*, 47: 275: 1928) discussing eight well-defined species of Paramecium calls attention to the fact that these species differ not only morphologically but also physiologically, and points out the importance of proper species determination in experimental research. These conclusions are of particular interest to me in view of my contributions (*J. Exp. Zool.*, 17: 297: 1914, and 22: 529: 1917) regarding the effects of a thyroid diet on Paramecium, in which I concluded that this protozoon could ingest thyroid substance with a pronounced acceleration of the division rate. The species studied were then described as *P. aurelia* (1914) and *P. caudatum* (1917). With regard to the second species I reported the effect of thyroid on the structure and activities of the contractile vacuole, and described the appearance of individuals with three contractile vacuoles in the thyroid-treated lines. At about the same time Hance (*J. Exp. Zool.*, 23: 287: 1917) reported the appearance of these multi-vacuoled individuals in a race described as *P. caudatum* after subjection to high temperatures. Subsequently Landis (*J. Morph. and Physiol.*, 40: 111: 1925) demonstrated that the species with which Hance worked was *P. multimicronucleata*, and that this race has a tendency to form three or more contractile vacuoles. I have recently restudied the preserved specimens of the races with which my own experimental work was performed and find that the 1914 race was indeed *P. aurelia* as described at the time, but that the 1917 race was *P. multimicronucleata* and not *P. caudatum*.

In view of these facts I have taken occasion to review the literature on thyroid feeding as applied to Paramecium with particular reference to the species involved and find that the results may be summarized as follows:

Nowikoff (*Arch. Protistenk.*, 11: 309: 1908) reports an increase in the division rate. *P. caudatum.*

Shumway (*l. c.*, 1914), an increase in the division rate. *P. aurelia.*

Budington and Harvey (*Biol. Bull.*, 28: 304: 1915), an increase in the division rate. *P. caudatum.*

Shumway (*l. c.*, 1917), an increase in the division rate. *P. multimicronucleata.*

Abderhalden and Schiffman (*Pfluger's Arch.*, 194: 211: 1922), an increase in the division rate. *P. sp.* (?)

Cori (*Am. J. Physiol.*, 65: 295: 1923), an increase in the division rate. *P. putrinum.*

Woodruff and Swingle (*idem*, 69: 21: 1924), no increase in division rate. *P. aurelia.*

Torrey, Riddle and Brodie (*J. Gen. Physiol.*, 7: 449: 1925), an increase in the division rate. *P. sp.* (?)

The three last contributions also report that thyroxin does not increase the division rate as I can confirm from unpublished researches. It is, however, significant that thyroxin is active only in an alkaline medium, while the normal environment of Paramecium

is slightly acid. So far this particular difficulty has not been overcome, and the effect of thyroxin on the vital activities of Paramecium remains uncertain. It is to be hoped that future workers in the field will identify the species with which they work, and that this note will serve to correct an erroneous identification by the writer.

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THE SMELT IN LAKE MICHIGAN[1]

ATTENTION has been called to the fact that the smelt (*Osmerus mordax*) originally introduced in 1912 into Crystal Lake, Michigan, from Green Lake, Maine, has spread to Lake Michigan.[2] The first specimen came from off Frankfort in 1925, and others have been identified since, coming from Big Bay de Noc, Delta County, and Charlevoix, Michigan. Increase in numbers has been noted each year and unverified reports of its capture have come from other North Michigan ports as far as the Straits of Mackinac.

The first specimen collected from Lake Michigan had a stomach content consisting of a young specimen of the Lake-herring (or of some other species of the whitefish family) and crustaceans (*Mysis oculata*), which caused some apprehension since the smelt in the shallow waters (12–20 ft.) of Crystal Lake eat large numbers of small fishes, mostly *Notropis atherinoides*.

This was enhanced by the writer's discovery that the yearling smelt from Howe Lake (Lake Superior watershed) were at this small size feeding almost entirely upon their own young and the young of perch (*Perca flavescens*).[3]

In the spring of 1928 ten smelt were collected from Lake Michigan from water twenty to twenty-five fathoms deep off Empire, Michigan. They were mouthed in the large-meshed gill nets of the commercial fishermen which were taking nearly all whitefish and a very few lake trout. Their stomachs were entirely filled with *Mysis oculata*. The fact that the smelt can exist upon such a diet when in deep water further emphasizes the fact that this fish can range throughout the Great Lakes and seems destined to become one of the most abundant fishes of these lakes. In the deeper waters of Crystal Lake the smelt likewise feeds mostly upon *Pontoporea affinis* and *Mysis oculata* in contrast to its extensive fish diet in the shallow water. The smelt is therefore an enemy of all smaller fishes, including the young of the commercial species, as well as a competitor for the food of the adults of the larger species. The abundance of food, however, renders this competition less important.

A study of the growth of these smelt as determined from their scales after the standard method[4] and based on an unpublished fish-length, scale-length curve computed from a large series of smelt from Crystal Lake gave these average lengths: 88.7 mm for the first year; 149.3 mm for the second year, and 168 mm for the third year. Crystal Lake smelt averaged 92 mm in length for the first year; 156.9 mm for the second, and 171 mm for the third. Nine of the specimens were three years old and one two years old.

The three-year-old fishes were the most abundant size collected in the spawning run at Crystal Lake in 1923 according to the final determination, rather than the two-year-old size as preliminarily reported.

It is to be regretted that the smelt has become inexorably established in waters where it can not be limited or controlled. There is little chance to utilize it commercially except at the developed spring spawning runs and with ice lines in a few favorable locations. Gill nets of small mesh are impracticable because of their capture of a large number of immature commercial fishes.

This establishment of the smelt is another instance emphasizing the need for very close control of all experiments in the introduction of any kind of animal into a new location. Even with a very thorough knowledge of the life-history of a fish in its native waters little can be predicted as to the place it will assume in the readjustment to the new environment. Careful control, therefore, during such experiments is an imperative matter.

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[1] Contribution from the University of Michigan Biological Station and the College of the City of Detroit.

[2] C. W. Creaser, "The Establishment of the Atlantic Smelt in the Upper Waters of the Great Lakes," Paper Mich. Acad. Sci. V.: 405–424, 1925.

[3] C. W. Creaser, "The Food of Yearling Smelt," Paper Mich. Acad. Sci. VIII, 1928.

[4] C. W. Creaser, "The Structure and Growth of the Scales of Fishes, etc.," Univ. of Mich., Museum Miscellaneous Pub., No. 17, 1926.

QUOTATIONS

HUMPHRY DAVY

SIR HUMPHRY DAVY, who died one hundred years ago, was one of three men—Thomas Young and Michael Faraday being the other two—who by sheer force of native intuition made the Royal Institution, and with it this country, an unsurpassed center of scientific light and leading in the earlier part of last century. He was little more than a boy when he was drawing crowds to hear his lectures and witness his experiments. Before he was thirty he had won a European reputation by investigations which give him