was enormously stimulated and became even tumultuous; this was seen in marked degree in old individuals which were decrepit and motionless. Such a moth, for example, injected in the morning, immediately was thrown into a state of intense activity which continued during the rest of the day, followed by death a few hours later.

In conclusion Bataillon says:

> The entire life of *Bombyx* from the spinning to death presents constant physiological characteristics: lowering of internal pressure; respiratory and circulatory disturbances, and histolysis. . . . The circulatory disturbances . . . are merely the permanent index of more profound disruptive changes.

Both Bataillon in his earlier paper (1893)[4] and Fischer (1918)[5] suggested that periodic reversal may be due to increased acidity of the blood accompanying metamorphosis. This idea is supported by a recent paper in Japanese by Yokoyama[6] who has succeeded in bringing about periodic reversal prematurely in the larva by blocking the abdominal spiracles with enamel paint or by injecting into the hemolymph of the abdomen (at the eighth abdominal segment) weak solutions of lactic or acetic acid.

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THE CHEMICAL CONSTITUTION OF PECTINATELLA

IN searching for material in order to study the synthesis of protein, Pectinatella was examined. The thought was that here was a source of rapidly formed gelatin, or its precursor collagen. A mass weighing from 2 to 5 kilos is formed within a few weeks, comparable to the growth of certain tumors. The fact that investigation reveals that the jelly-like secretion is not of the nature of collagen but of true protein of a fairly high order does not rob the study of its interest or importance, for the organism stands as a readily available source of study of extremely rapid synthesis of protein.

The material was supplied by Professor Raymond C. Osburn, director of the Stone Laboratory, Put-in-Bay, Ohio. Pectinatella is available in large quantities during the summer and autumn. It may be preserved in fresh water, and sampling is possible from the growth, the remainder proceeding with its growth without detriment.

The water content is high. A specimen weighing 1,200 grams gave, on drying, 5.0 grams dry weight. Protein, etc., therefore make up about 0.5 per cent. of the normal body.

The protein reactions were typical of such proteins as ovalbumin, serum albumin, etc. The biuret reaction was positive and typical, that is, like that of white of egg and not like that of gelatin or peptone.

The following amino-acids were demonstrated: tyrosin, tryptophane, cystin. In a cold extract of the dried material all three were positive, but the reactions were intensified after acid hydrolysis. This was especially true of cystin. The protein was heat coagulable.

Of the inorganic substances, sodium chloride was demonstrable. Phosphorus was negative before hydrolysis, and after boiling with equal volumes of sulphuric and nitric acids, none was demonstrable. Calcium is present in copious amounts, as one would suspect from the calcareous nature of the body and statoblasts.

Characteristic of these organisms is the supporting structure composed of chitin. In the specimens examined chemically, glucosamine (galactosamine?) was readily demonstrable after hydrolysis. This amino-sugar has extensive distribution through the animal kingdom and in man occurs in cartilage.

WITHROW MORSE

JEFFERSON MEDICAL COLLEGE,
JANUARY 3, 1930

REPORTS

THE TEACHING OF HYDROBIOLOGY AND AQUICULTURE IN AMERICAN UNIVERSITIES

THE committee on aquiculture of the Division of Biology of the National Research Council has had a subcommittee engaged in gathering data on the teaching of hydrobiology and aquiculture in American universities. This committee has consisted of James G. Needham, A. G. Huntsman, Chancey Juday and E. N. Transeau. A report has recently been submitted, embodying the following data.

Sixteen institutions in the United States and Canada give courses in these subjects. These institutions and their undergraduate courses are listed in the accompanying table. These courses are called by various names, as indicated in the footnotes to the table.

[4] E. Bataillon, *Bull. Sci. France et Belgique,* 25: 18–55, 1893.

[5] E. Fischer, "Eine bei Raupen und Puppen beobachtete Umkehrung der peristaltischen Herzbewegung," *Entom. Rundschau. Stuttgart,* 35: 9–10, 1918.

[6] T. Yokoyama, "Notes on the Periodic Reversal of Heart-beat in the Silkworm *Bombyx mori* L.," *Dobutsugaku Zachi* (*Zool. Mag.*), 39, No. 459, Suppl.: 45–51, 1927.

SUMMARY OF INSTRUCTION IN HYDROBIOLOGY AND AQUICULTURE IN NORTH AMERICAN UNIVERSITIES, 1929

Institution	Staff	Limn.*	Aqc.**	Ichthyology	Dis.***
1. Cornell	P P P I	3	3	6	
2. Illinois	P P P	3			v
3. Indiana	P I	5+			
4. Iowa	P				
5. Kansas	P	3			
6. Maryland	P	v		v	
7. Michigan	P P P P I	5+4‡		2‡	4+
8. Montana	P	?			
9. N. Carolina	P	5			
10. Queens	P	4	4		
11. Rutgers	P P P P	3			3
12. Stanford	P P P	3†			
13. Toronto	P P	3			
14. W. Virginia	P P	2†			v
15. Washington	P P P P I	5+5	5-5	5	5
16. Wisconsin	L	2+2			

Under Staff, P = professor, I = instructor, L = lecturer, conducting the course listed. In other columns, numerals indicate credit hours in courses; v = variable.

* Limnology or hydrobiology or fresh-water biology.

** Aquiculture or fish culture.

*** Diseases of fishes or fish parasites.

† Limnology directed toward public health rather than toward aquiculture.

‡ Repeated in summer at the biological field station of the university.

Owing to the newness of the subject of instruction they are very diverse also in content and in emphasis. So great is this diversity that a blank designed to gather data proved to be of little use. It merely developed these facts not shown in the table:

1. That these are upperclass courses.

2. That from one to three courses in zoology are the usual prerequisites; less often, courses in botany, ecology and entomology.

3. That the study of plankton and systematic determinations of invertebrate animals still receive chief emphasis.

4. That a little quantitative work is done in very different subjects.

5. That a rather high proportion of field work during the portion of the year favorable to it is the rule.

6. That emphasis on marine biology goes with proximity to the sea.

Our table seems to show a considerable staff of men engaged in teaching the subjects listed, but as a matter of fact nearly all these men do this work incidentally to other heavier duties. They do it voluntarily in addition to the other teaching or administrative work that is required of them. Aside from the staff of College of Fisheries of the University of Washington (where the emphasis is on marine biology) there appear to be but three men commissioned to devote themselves wholly to fresh-water work: Dr. Juday to limnology at Wisconsin, Dr. Embody to aquiculture at Cornell and Mr. W. J. K. Harkness at Toronto. Dr. Embody's course in aquiculture has been running since 1912.

Courses in ichthyology and parasitology are included in this table only for those institutions that offer also the other subjects; they are here included because they are important contributory training for hydrobiology. There are courses in all universities that provide training in the fundamental sciences.

There are other bits of related work omitted, such as the plankton work that is done at the University of Colorado in a course on bacteriology for civil engineers, and parts of courses in ecology, zoology, parasitology and microbiology given in a number of institutions, notably in Illinois, Ohio and Toronto.

The two Canadian institutions listed have representatives on the Biological Board of Canada and participate in its summer field work. The department of biology of the University of Toronto provides certain offices for the board and maintains a special laboratory for fresh-water investigation, the Ontario Fisheries Research Laboratory.

JAMES G. NEEDHAM, *Chairman*
CORNELL UNIVERSITY

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A MICROCINEMATOGRAPHIC APPARATUS FOR THE OWNER OF A 16-MM MOTION PICTURE CAMERA

THE usefulness of motion pictures for teaching and demonstration of scientific facts has been established long ago; this is especially true in the microscopic field, where phenomena are to be demonstrated before an audience. A microscopic demonstration becomes impractical when the audience is of any size.

It is therefore a great satisfaction to have the experiment "stowed away" in the form of a motion picture film to be ready for projection whenever and wherever needed.