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*
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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.

To make motion picture records of microscopic objects, if one has the necessary microcinema equipment, is not difficult at all. An apparatus designed for this purpose has been described in SCIENCE[1] and in the *Transactions* of the Society of Motion Picture Engineers.[2] It is a standard equipment for modern laboratories doing microscopical investigations. This apparatus, however, requires the use of standard motion picture film of 35 mm width (professional size).

In order to enable the owner of a 16-mm motion picture camera (amateur size) to make microscopic film records without difficulties and great expense, an apparatus (Figs. 1 and 2) has been devised whereby

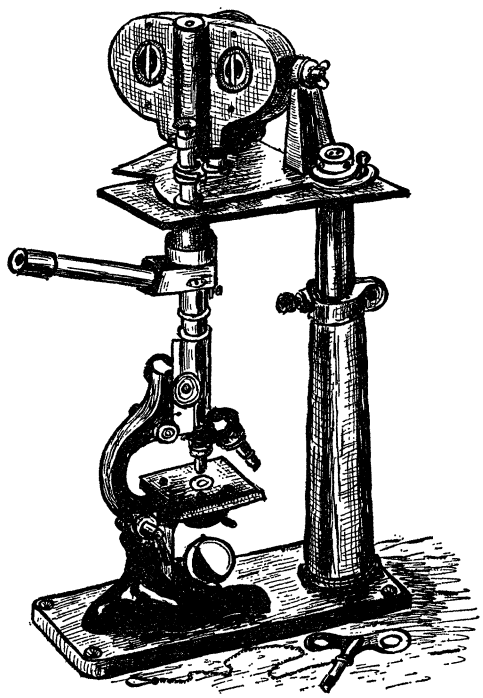

FIG. 1. Microcinema Apparatus with Filmo 70 (Bell and Howell Company), driven by spring motor, adjustable speed up to 128 exposures per second.

any 16-mm camera, be it either Filmo, Ciné Kodak, Victor Ciné Camera, etc., can be used. The apparatus is constructed upon the same principles as the large machine although more simplified and smaller in size, the actual dimensions being 22 x 14 x 9 inches.

The instrument consists of a cast-iron base plate with sleeve, a steel column, a fixed and a swivel plate with focusing and beam centering device. All parts are machined, turned and polished and assembled with great care and precision, so that serious work can be done with it.

The microscope, of any make, is placed on the base

[1] 69: 672, June 28, 1929.
[2] 13: 461–464, 1929.

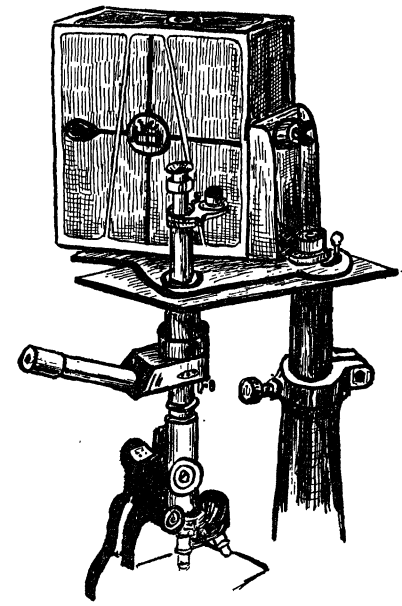

FIG. 2. Microcinema Apparatus with Ciné Kodak Model A, hand driven. Attachments are available for "slow motion" and "time lapse."

plate and brought in line with the focusing device. When the object is sharply in focus it is also automatically in focus on the film in the camera, and the film record can be taken immediately by swinging the camera into position over the microscope and releasing the spring motor or turning the crank of the camera.

A beam splitter with observation tube can be employed when it is desired to observe the specimen while it is being photographed.

As a light source any projection lamp from 50 to 200 watt is more than sufficient when ordinary bright field pictures are to be taken. For taking pictures with dark field illumination (indirect illumination) a small arc lamp of the ordinary type (about 4, 5 ampere) is recommended.

Pictures of small objects, for instance, insects, etc., may be easily taken, by removing the microscope and using a small lens attachment which can be screwed onto the fixed plate.

Another attachment can be substituted whereby single exposures at certain predetermined time intervals can be made. This device consists of an electric timer which controls the camera and also the light source. This arrangement is for the purpose of making accelerated motion pictures for the study of slowly moving objects, for instance, living tissue cells, the growth of bacteria, etc.

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