easily made directly on the films. Film slides may be stored and filed away in a small space and are therefore more accessible for reference. They are easier to make than glass slides and the cost is much less. Larger lantern slides, such as are used in Europe, can be conveniently cut to the size which is used in this country, if films are used.

It is probable that the idea of using films for lantern slides is not new, and yet the advantages are so many that it is difficult to understand why the principle is not in general use to-day.

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SPECIAL ARTICLES

ON REFLEX-HYPERLIPAEMIA

PRELIMINARY PAPER[1]

THAT stimulation of an afferent nerve results in a rise of the sugar content of the blood is a well-known fact; nothing, so far as we are aware, is known concerning changes in blood fat under this condition, although perhaps the "emotional" hyperlipaemia, found by Himwich and Fulton, is a related phenomenon.

We have, therefore, investigated the changes in blood fat in the cat under stimulation of an afferent nerve. The animals in this series were anesthetized by intraperitoneal injection of chloralose. At least two hours after the onset of the anesthesia the fat content of the arterial blood was determined (by the method of Stewart and White) before and after periodic faradic stimulation (periods of 5 seconds alternating with periods of rest of 5 seconds) for 2 to 5 minutes at various strengths.

In the great majority of the experiments a marked "reflex-hyperlipaemia" occurred; the increase in blood fat is very abrupt, as it was found to be present in the blood drawn immediately after cessation of afferent stimulation.

In several instances the rise in fat was greater with stronger stimulation.

The following protocol is typical for the experiments of this series:

Oct. 7, 1931.
Cat, female, 3.00 kg., starved for 16 hours.
11:00 p. m. 27 cc 1% (warm) chloralose intraperitoneally.
11:10. Animal in side position. Rectal temperature 39.0°.
Oct. 8.
8:00 a. m. Respiration regular. Temperature 40.3°. Heating off.
8:30. Temperature 40.0°.
9:00. Animal on board. Temperature 39.8°. Both femoral arteries and left sciatic exposed.
9:02. First blood drawn (about 9 cc). Respiration 15–16 per minute. Hyperreflexia on tapping on board.
9:08–9:10. Periodic faradic stimulation of left sciatic (5″–5″) for 2 minutes; coil distance 10 cm. Peripheral end of nerve not ligated. Moderate general responses during stimulation periods. Dilation of pupils. Rectal temperature 39.2°. Respiration 15 per minute.
9:10. Second blood drawn, about 9 cc.
11:30. Temperature 38.6°. Hyperreflexia.
11:50. Temperature 40.0°.
1:20. Temperature 39.5°.
2:04. Third blood drawn (about 9 cc).
2:11–2:13. Stimulation of left sciatic as per 9:08–9:10 (5″–5″, 2 min. 10 cm).
2:14. Fourth blood drawn.
Animal sacrificed.

FIGURES

	Hematocrit Per cent.	Sugar mg Per cent.	Fat mg Per cent.	Rise in fat Per cent.
1st blood	30	85	396	
2nd blood	34	98	538	35.9
3d blood	34	109	412	
4th blood	32	119	543	31.8

Investigations are in progress to determine whether or not a "center" exists for this reflex-hyperlipaemia, as well as the nature of the fats mobilized.

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[1] The experiments were started by one of us (Y. D. K.) during this summer. His thanks are due to Mr. H. Henstell, candidate in medicine of Yale University, for his cooperation during this part of the work.

VARIATIONS IN HOLOPEDIUM SPECIES

Holopedium gibberum is a cladoceran species well known to biologists as one of the very few members of the fresh-water plankton which possess a special adaptation to the floating habit in the form of a spherical "test" of a jelly-like substance which encloses the whole body of this small Entomostracan—a feature which is also found in the planktonic Rotifer *Mastigocerca setifera*. To ecologists and to students of animal geography, *H. gibberum* has a still stronger claim to interest in virtue of its characteristic habitat, namely, the slightly acid waters of stenothermous lakes and pools in North America and in northern Europe, and many authorities regard it as a glacial relict. The genus *Holopedium* is no less interesting to the systematist, since its peculiar structural characters oblige him to place it alone in the family Holopedidae of the cladoceran tribe Ctenopoda, while of this genus itself but two species are known: these are the familiar *Holopedium gibberum* and the little known *H. amazonicum,* described by Stingelin from material collected at the mouth of the Amazon[1] and recorded since then from only one additional locality, namely, Lake Charles, Louisiana.[2] Stingelin himself remarked upon the peculiarity of the fact that this characteristically boreal cold-stenothermous form should have its nearest relative in tropical waters: the circumstance is the more singular from the very close relationship which exists between the two species, and which induced Stingelin to construct a carefully tabulated key to their diagnostic features.[1]

Recently, in examining material collected in certain small lakes near St. Andrew's (New Brunswick), I have found the typical form of the species *H. gibberum* accompanied by forms which show all degrees of variation in respect of these very diagnostic characters used by Stingelin in the separation of the two species.[3] It looks very much as if we have here the beginning of a gradation towards the *amazonicum* type, and it is highly desirable to examine material from as many freshwater lakes and ponds as possible, especially along the eastern fringe of the United States, in order to see whether anything like a true connecting series between the two species can be established. Should this be possible, we should have a case among the Cladocera exactly parallel with that of the two waterbeetles *Deronectes depressus* and *D. elegans,* recently elucidated by Balfour Browne[4] and with that of *Gyrinus natator* and *G. substriatus,* on which another British entomologist is now working.[5] Such north-to-south gradations are of the highest interest in relation to the study of species-evolution and distribution, and it is, therefore, with confidence that I appeal to American biologists for collections of freshwater plankton containing *Holopedium,* especially from the eastern Atlantic States. Such collections can easily be made by towing a plankton-net of bolting cloth from a boat, or even with a hand-net: the catch should be diluted with 4 per cent. formalin containing a few drops of glycerin for efficient preservation. Any specimens sent to me will be gratefully acknowledged and expenses of mailing defrayed.

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[1] Th. Stingelin, *Revue Suisse de Zoologie,* 12: 53–64, 1904.

[2] E. A. Birge, Chapter on "Cladocera" in Ward & Whipple's "Freshwater Biology," 693, 1918.

[3] An account of these variations is included in a paper on "The Cladoceran Plankton of the Chamcook Lakes," shortly to be published in *Contributions to Canadian Biology.*

[4] F. Balfour Browne, *Scottish Naturalist,* November–December, pp. 172–188, 1930.

[5] J. Omer-Cooper, *Nature,* February 14, 1931.

MANGANESE AND THE GROWTH OF LEMNA MINOR[1]

IT has recently been shown by the author[2] that the unicellular alga Chlorella will not grow without manganese although this organism makes apparently normal growth when only a minute amount of this element is added to the manganese-free culture solution. It has further been demonstrated[3] that a number of other "rare" elements for plant growth are unable to replace manganese in the nutrition of this organism. The results reported on the necessity of manganese for Chlorella are based on determination of the dry weight of cells produced. Since then counts of the numbers of cells in plus and minus manganese cultures have been made. These counts show as high as 64,000,000 cells per culture in some cases in two weeks' time in cultures containing manganese in a concentration of 1:5,000,000. While in minus manganese cultures there is a decrease in the number of cells used for inoculation. This furnishes a striking confirmation of the data already reported. Manganese is therefore not a "stimulant" but an essential element for the growth of Chlorella. Other experiments not yet published using another unicellular green alga (species undetermined) have also shown the same clear cut results as with Chlorella. The investigation was then extended to the common duckweed, *Lemna minor,* and here again it has been found that manganese is indispensable for growth.

Clark and Fly[4] have studied the relation of manganese to Lemna and come to the conclusion that "there is no indication that manganese is an essential element in the nutrition of the plant." Since, however, my work has shown it to be absolutely essential for certain unicellular green algae and others have demonstrated it to be necessary for the normal development of a large number of seed plants it seems plausible that the duckweeds should require it also.

The experiments on *Lemna minor* were all carried out in pure culture. After many trials with various disinfectants the following procedure was successfully used in freeing the fronds from microorganisms: A

[1] The investigation upon which this article is based was supported by a grant from the Heckscher Foundation for the Advancement of Research established by August Heckscher at Cornell University.

[2] SCIENCE, 72: 609–610, 1930.

[3] E. F. Hopkins, "Manganese an Essential Element for a Green Alga," *Am. Jour. Bot.,* 17: 1047, 1930.

[4] N. A. Clark and C. L. Fly, "The Rôle of Manganese in the Nutrition of Lemna," *Plant Physiology* 5: 241–247, 1930.