and the varnish poured on until the surface is covered, then the excess is drained off one corner and the glass is placed in a negative rack to dry. For a varnish, any good, transparent varnish may be used. It should be diluted to about one tenth the usual thickness. For the diluting substance xylene, toluene, turpentine, etc., may be used. Varnish diluted with xylene will dry on the glass in about half an hour if the room is dry and warm. If turpentine is the diluent it is better to let the varnish dry over night.

If the slide is to be used for a single exhibition it need not be covered and bound, but if it is to be permanent it is better to protect the surface by covering and binding as with photographic lantern slides.

If the slides are coated with 10 per cent. gelatin and dried one can also use the pen and brush well, but the varnish has proved a better coating.

These varnished glasses for hand-made lantern slides have been in use in different departments of Cornell University for the last six years and have proved very satisfactory.

It may be well to call attention to the fact that nearly all forms of celluloid are inflammable, and slides made of it might bring disaster.

Simon H. Gage

Cornell University,
July 30, 1918

THE HOUSE FLY

To the Editor of Science: The accompanying paper was written by one of my students in elementary biology within one month of the opening of the course. It happened that the house fly was providing the material for laboratory work at that time. And it also happened that several students were attracted by the inconclusive statements in several textboks regarding the function of the so-called *balancers*—which they had already recognized as probably representing the second pair of wings. Experiments were thereupon encouraged to clear up the situation. At first results were conflicting, owing to excusable defects in operative technic. Mr. Whealdon, however, succeeded in reaching unequivocal results, which he embodied in the report that is printed below just as he wrote it.

My purpose in bringing this report to your attention is primarily pedagogical. The facts established by Mr. Wealdon can not lay claim to novelty, as he later discovered. But the method of permitting a student in an elementary course at the very beginning of his work to occupy himself in laboratory hours with a problem he himself had raised and frankly to regard such work as a research—which indeed it is in every essential—to be carried to a real conclusion, quite regardless of the activities of the other students in the laboratory; this method, which subordinates prearranged plans by the instructor to the encouragement of student initiative, may be still sufficiently uncommon in American schools and colleges to justify submitting the accompanying evidence of its efficiency.

Harry Beal Torrey

THE BALANCERS OF THE HOUSE FLY

Report of Some Experiments to Determine their Use

Experiment 1.—I put two flies of apparently equal vigor, but differing slightly in size and coloring of the abdomen, under the influence of ether. From one of them I removed the balancers by means of very sharp pointed scissors. The other I left untouched, using him merely as a check, by which I could compare the actions of the two as they came out from the influence of the anesthetic. This process I repeated with two more flies, then placed them in pairs, one clipped fly with one unclipped, under bell jars, and observed their behavior.

Through the difference in size and marking I was able to identify the unclipped flies and noted that they appear to recover from the influence of the anesthetic sooner than the clipped flies in both cases. As soon as the flies with the balancers removed recovered from the effects of the ether they commenced to rub themselves with their hind legs, stroking their abdomen and wings almost continuously, even lifting their legs quite above the wings and

pressing them down to the table with a stroking movement. The unclipped flies did not do this, and since they appeared entirely normal I allowed them to escape.

The clipped flies continued stroking their bodies and would not attempt flight except when provoked by being touched with a piece of paper which I pushed under the jar. Then their flight was extremely erratic. They seemed to have largely, if not wholly, lost their power of equilibrium. They would fall upside down, and could pursue no direct flight at all.

As a further test I left them under the jar until the following day and repeated observations with the same results. I again put some normal flies in a jar besides the clipped ones to compare action in flight. The unclipped flies had no difficulty in maintaining an upright position while flying about the jar even though they were striking the sides continuously. The unclipped flies stayed in flight much more, and without provocation.

As a final test I took the clipped flies out of the jars and let them go. Although the movements of the wings appeared entirely normal they could not fly, but fell to the floor with an erratic zigzag movement.

Experiment 2.—The procedure in this case was the same as in the first experiment, except that I used five flies instead of two. For each fly that I clipped I imprisoned another, unclipped, that had been subjected to ether for the same period, to use, as in the first experiment, for comparative study. The five from which I removed the balancers I put under one jar. The other five I placed in a second jar beside the first.

These flies I allowed to remain under the jars overnight in order to recover completely from the effects of the ether. On the following morning I found that one of the flies that had been clipped had died; two of the unclipped had succumbed. Probably the dose of ether had been too great.

Upon testing their powers of flight I found that the clipped flies, just as in the first experiment, were altogether unable to maintain equilibrium. Not one of them when released could fly at all, but dropped to the floor with a zigzag darting movement. The unclipped flies flew off in normal flight.

Experiment 3.—Having acquired considerable skill at removing the balancers I put a large number of flies under the anesthetic at once. Then from nine flies I removed both balancers and placed them all under one jar. From eight flies I removed *one* balancer and put them under a second jar; and finally I put seven flies under a third jar. These seven had been subjected to the same dose of ether, but I left them untouched and confined them for comparative study as in the other experiments.

The results accorded exactly with those of the other tests.

(*a*) Flies seemed to notice the removal of the balancers, and kept stroking themselves with their legs about the wings and abdomen.

(*b*) In no case was a fly with both balancers removed able to fly. They could use their wings, but had no power of equilibrium.

But in contrast to this, the flies with only one balancer removed could fly without difficulty, in a manner to all appearances perfectly normal, although sometimes I thought they had slight difficulty in gaining balance at the commencement of a flight.

From these experiments I concluded that the balancers of the fly are intimately connected with his nervous system, and by a distinct and essential function enable him to maintain equilibrium in flight. But just as a man is not deaf who has one ear injured, nor blind though one eye is destroyed, so this power of equilibrium is not essentially impaired without the removal of *both* balancers.

Submitted November 8, 1917.

ROWAN WHEALDON

QUOTATIONS

THE PROPOSED BRITISH MINISTRY OF HEALTH

THE Ministry of Health Bill, which has been under the consideration of Sir George Cave's Home Cabinet, will not, we imagine, prove to be a measure as comprehensive and revolutionary as recent debates and discussions might lead the public to suppose. In this connection