Physics at Amherst College. It was presented to the college many years ago by Thatcher Thayer, D.D., of the class of 1831, Amherst, a descendant of the Thayer to whom it was originally written.

The post-card was written with a lead pencil, and is fairly legible except for a stain in one corner. The inscription is as follows:

From the Balloon above the Clouds.
Let this afford one proof, my dear Mr. Thayer, that *no separation shall make me unmindful of you*,—have confidence,—hopeful that happier days are in store for you, my dear Mr. T. I wish you much pleasure,—believe me as I ever have been,
faithfully yours,
J. JEFFRIES.

This little bit of post-card was prophetic of the days when the Wright brothers' "Strange Contraption" should rise at Kitty Hawk in 1903, when Louis Blériot, 1909, should drive an aeroplane from France to the white cliffs at Dover, when aeroplanes and dirigibles should become the speedy carriers of our mails and when we should see

. . . the heavens fill with commerce,
argosies of magic sails,
Pilots of the purple twilight,
dropping down with costly bales.

S. R. WILLIAMS
AMHERST COLLEGE

SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE ABDOMINAL WINDOW

SIMPLIFICATION of methods and apparatus in experimental procedures is a goal that is earnestly sought after in teaching. Too frequently, however, when the goal is attained, the results are disappointing. In our laboratory we have devised a piece of apparatus in our teaching courses which has several attractive features that are of interest to teachers, especially those who must combine economy with success. The abdominal window is simple in construction, the results are gratifying, and the expense is almost nothing. There have been many methods devised for observing the movements of stomach and intestines in anesthetized animals; *e.g.*, submerging the intestines under saline solution with the abdominal wall open and making direct observations; feeding a meal mixed with material opaque to x-ray and observing the contractions of the intestines on the opaque material; opening the abdomen in the midline and inserting a watch-glass under the abdominal muscles but over the intestines; opening the abdomen and without further preparation observing the movements as long as they last. Those who have used the above methods will recall readily certain vital objections to each method especially for use in class work.

The abdominal window which we have been using since 1922 in our laboratory is not a new principle but a modification which has proved very successful here. The method was demonstrated at the meeting of the Federation of American Societies for Experimental Biology at Chicago in March, 1930. The window is a modification of the old watch-glass method. One of the most annoying features with that method was the tendency for a loop of intestine to move out of the field of observation, especially after normal observations had been obtained and a procedure inaugurated whose effect one wished to observe. The watch glass was easily placed, but the results were too frequently disappointing. We felt that a larger field of observation should be provided in order to obviate the disappearance of a particular loop of intestine in which we had become interested.

The abdominal window which we have developed is shown in Fig. 1. It consists of a piece of old x-ray film (A) which has had the coating removed and which was cut in the shape shown. It is 7″ long, 4½″ wide. This has been found to be a satisfactory size for both cats and rabbits. We have used it mostly in rabbits. In the upper third is cut a hole 1¼″ in diameter and centered laterally. A lid or door (B) is then cut from another piece of film of such size and shape that it may effectually close this opening or expose it when swung on the hinge (C). This hinge is made with an ordinary office combination punch and eyelet machine. Near the outer margin of the lid (about ½″) a slit is cut just wide enough to permit the insertion of one jaw of a No. 46 Dennison card holder (E). This clip insures the lid being fastened shut. Release of the clip permits the opening of the hole in the window. Woven back and forth through the lid is a wire (D) which is bent slightly with its concavity downward. We used the wire of a No. 1 paper clip straightened out. The object of this wire is to prevent the lid from curling up laterally when it becomes warm. The Dennison clip and the hinge prevent curling in its long diameter. The object of the lid is to permit the making of injections directly into the loop of an intestine or to make applications of agents directly on the outside of the intestinal tract.

The placing of the abdominal window requires a little more operative procedure than the watch glass,

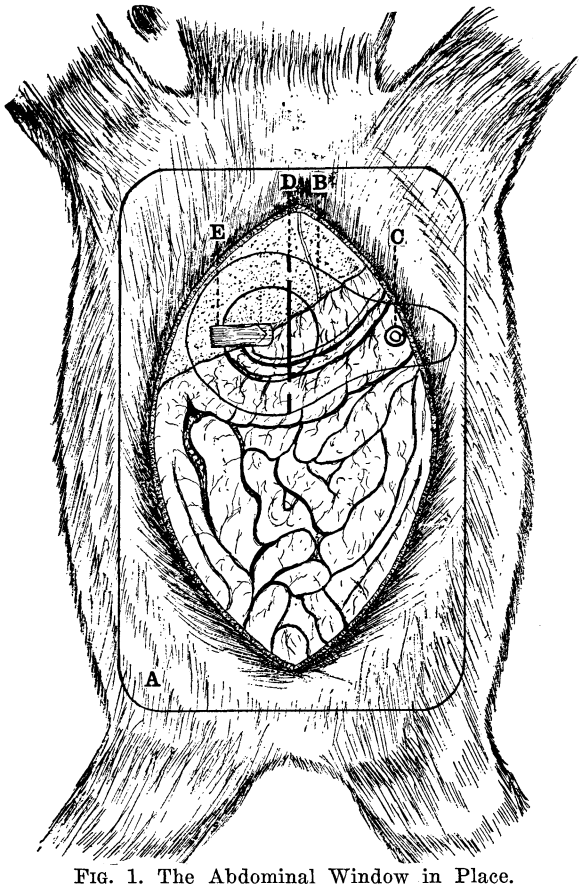

FIG. 1. The Abdominal Window in Place. (Semi-diagrammatic.)

but the returns in successful observations more than counterbalance the extra work. We have used the following technique. After thorough anesthetization with urethane or other anesthetics, a median abdominal skin incision is made two inches less in length than the abdominal window. The skin is then separated from the underlying muscles, the *separation* extending one inch *beyond each end* of the lineal incision in the skin and laterally almost to the spinal column. This is fairly easily accomplished in the rabbit, not so easily in the cat, and more difficult and bloody in either animal if it is a female, because of the mammary glands.

The skin having been thus thoroughly separated, a double row of ligatures is laid through the muscles of the upper abdomen in a line at right angles to the long axis of the animal's body, and the muscles cut across between the ligatures. A similar double line of ligatures is laid across the lower abdomen and the muscles cut between them. Care should be taken of course that the underlying intestines or bladder are not included in the ligatures or injured. We use eight ligatures in the upper abdomen and four in the lower abdomen. Each ligature extends over an inch or one and one half inches, and includes a fairly large mass of muscle tissue. Technique of preparation, however, may be varied to suit one's personal inclinations. The muscles then are separated longitudinally by an incision made in the median line. Then they are rolled back on either side from the median line, thereby exposing a large field to view. A loose ligature may be laid under one of the loops which will be under the opening in the window.

The abdominal window is then placed *under* the skin, but *on* the abdominal muscles which have been rolled back. With the lid of the window open, the loose ligature, previously placed under a loop of intestine, may be drawn up through the opening and left outside. The lid is then closed and fastened by means of the Dennison clip. If the large intestine occupies too much space in the center of the field (especially in rabbits), it may be moved to one side before the window is placed.

In a few minutes after placing the window, it becomes sealed from the skin oozing and so is practically air-tight. The small amount of air that may enter through the lid is of no consequence, as movements continue uninterruptedly. No fluid is required to be placed in the abdomen. Fog may collect on the under surface of the window and is due to the unequal temperature of the room and the inside of the abdomen. This may be obviated by keeping hot moist towels laid over the window between observations. Whether fogging occurs or not, it is a good plan to keep hot towels laid over the window especially in a cool laboratory for, unless the animal is on a heating pad, its temperature tends to drop rapidly because of the thin window, and therefore the intestinal movements may be much retarded or stopped altogether.

The advantage of this method is the large field for investigation and the ease of making the observations. A loop of intestine does not depart from the field of observation at the most inopportune moment. Furthermore, it is an easy procedure to secure a loop of intestine and bring it up where a hypodermic needle may be inserted into the lumen and injections made in that manner. The loop is then returned inside the abdomen and the lid closed. In the same manner applications directly to the outside of the gut may be made. Properly insulated wires may be introduced through this opening and stimulations of nerves or muscles made directly. The method is admirably adapted not only to the observation of intestinal movements, but also for the observation of the condition of the blood vessels, *i.e.*, whether dilated or contracted; and for observations of other abdominal organs, such as bladder, uterus, kidneys, etc.

While the method was devised primarily for teaching and demonstration purposes, it may be used in research, and in the physiological laboratory of this school Dr. Leland C. Wyman has carried on an investigation in which he made use of the window to observe vascular changes in the intestines of a rat.

The abdominal window herein described is simple, efficient, inexpensive, and has the added advantage that it maintains the interest of students because they are able to carry on their experiments easily and successfully.

WALTER L. MENDENHALL
BOSTON UNIVERSITY SCHOOL
OF MEDICINE AND THE
EVANS MEMORIAL

A METHOD FOR RIPENING HAEMATOXYLIN SOLUTIONS RAPIDLY

THE writers are calling the attention of biological workers to the ease in preparation of various haematoxylin solutions which ordinarily require a rather long ripening process. Within our knowledge, this method has not been reported heretofore. Ehrlich's or Delafield's haematoxylin solutions are prepared in the usual way. When ripening is to be brought about, the solution is placed in a very wide and somewhat shallow evaporating dish and exposed at a distance of approximately two feet, to any rather powerful quartz mercury vapor light. The rapidly darkening solution should be stirred frequently. Delafield's solution will be ready for use after an exposure of about two hours, and some three or four hours are necessary for ripening Ehrlich's solution. A very vigorous staining solution results. This method can also be applied to the ripening of a one half per cent. haematoxylin solution for use in Haidenhain's iron-alum stain except that the exposure to the quartz mercury arc is very much shorter.

E. J. KOHL
C. M. JAMES

DEPARTMENT OF BIOLOGY,
PURDUE UNIVERSITY

SPECIAL ARTICLES

SEXUAL RHYTHM IN THE CALIFORNIA OYSTER (OSTREA LURIDA)

IT has been known for many years[1] that the common edible oyster of our Pacific coast is hermaphroditic and viviparous but no definite information has been hitherto available as to the sequence of the sexual phases in this species. With the cooperation of Professor W. E. Allen, of the Scripps Institution of Oceanography, cement and wooden experimental blocks have been placed in the water at frequent intervals and at all seasons during the past five years. From these blocks, which were suspended from the Institution's pier at La Jolla, California, a fairly complete series of oysters of approximately known ages has been obtained.

Weekly or biweekly collections were made, at which time one face of a block was scraped free from attached organisms, including oysters. The block was then returned to the water to gather a new crop of the free-swimming stages of such organisms as were at that time ready for attachment.

Examination of such blocks shows that the oyster in that locality is in process of reproduction during at least seven months of the year,[2] or for a longer period in those years in which the water remains unusually long above the critical temperature of about 16° C. in the autumn or reaches this temperature earlier than usual in the late winter or spring. For it is found that spawning is inhibited when the water falls below this temperature, to be resumed when the critical point is again reached.

Microscopic sections of the gonads show that some members of the oyster population in that locality have ripe sexual products at all seasons of the year and that all possible combinations of sexual phases are represented. Immature individuals in the male phase, young hermaphrodites, inter-sexual forms predominantly of one sex or of the other, with all conceivable transition stages, are always to be found, as Stafford has long since reported.[1] Some of these are evidently young, others are mature and still others are obviously old, but they offer only vague testimony as to the sexual conditions appertaining to any one individual during its lifetime. By taking a series of oysters of definitely known ages, on the other hand, such as has become available from these experimental blocks, the sequence of sexual phases can be followed with little chance of error.

In the young animal the first trace of the gonad appears at the age of about eight weeks. The few cells composing this gonad show no distinguishing characteristics of sexual differentiation, but at the age of twelve to sixteen weeks each gonad in every animal studied shows that both primitive ovogonia and spermatogonia are present.

The spermatogonia, however, proliferate more rapidly than do the ovogonia and the gonad soon

[1] Jos. Stafford, The Canadian oyster. *Comm. of Conservation*, Canada, pp. 1–159, 1913.
[2] W. R. Coe, *Anat. Rec.*, 47: 359, 1930.