tions of this kind not only impress the student with such characteristics of the mammalian ovum as its diminutive size, for example, or with the image of its fresh state, which differs so effectively from the visions of the fixed and colored tissue that dominate the morphological imagination, but also bring him more concretely into contact with the physiological process of ovulation. True, the technical difficulties involved in the mastery of the exercise will register many failures in a large class, but the interest which it arouses, the ingenuity it calls into play and the competition which it engenders, all combine to make it a stimulating introduction to the embryological course.

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EASY SAMPLING OF PLANT TISSUE

THE usual procedure in preparing green plant tissue for sampling for chemical analysis has been to cut the material into one half to one inch segments with a razor or sharp knife. In some instances scissors have been used when the material has not been too bulky or tough. Obviously the preparation of material by this procedure has been a laborious task when the material has been very hard and fibrous or the amount of tissue was very large. In fact, the labor involved is so great that it has been practically impossible to secure samples for analysis when the bulk of material has been large.

Recently in this laboratory some samples of one hundred plants each of hubam clover were taken for carbohydrate studies, but because of the woodiness of the stems it was practically impossible to secure samples for analyses by the procedure mentioned above. The stems were so woody that they were chopped with difficulty with a sharp corn knife.

A paper-cutter having a ten-inch blade was tried and found to work very successfully. The samples of one hundred plants were cut into one half to three quarter inch segments in from three to five minutes. The paper-cutter has been tried on other material and has been used almost exclusively in preparation of green plant tissue for analyses. Samples of cowpeas weighing ten pounds have been prepared for sampling in ten minutes. Fibrous stems like those from large tomato plants have been prepared for sampling in a few minutes.

While the use of a paper-cutter for preparing samples may not be new to a number of laboratories, there are so many places in which the razor method is used that a suggestion to use a paper-cutter in the preparation of samples may be very helpful.

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SPECIAL ARTICLES

THE LEAKAGE OF HELIUM THROUGH PYREX GLASS AT ROOM TEMPERATURE

(Contribution from the T. Jefferson Coolidge, Jr., Memorial Laboratory, Harvard University.)

IN experiments upon the change in PV with pressure for helium at 0° C. in a container of Pyrex glass it was noted that even in so short a time as twenty-four hours the alteration in PV at atmospheric pressure through leakage of helium was perceptible. In Table I are given the products of the pressures in millimeters by the volumes in milliliters as determined on different dates. Since the pressure was considerably below atmospheric in the second series of experiments, in which the gas was expanded from 319 ml. to 392 ml., there can be no question of mechanical leakage. Furthermore the apparatus had been used previously for argon and showed no similar effect.

TABLE I

Date	P	PV	Time	dPV	Change per day
	mm.		days		Per cent.
Oct. 15, 1927	770	245513			
Oct. 18	"	245485	3	28	0.0038
Oct. 20	"	245470	5	43	0.0035
Oct. 23	"	245444	8	69	0.0035
Oct. 25	627	245418			
Oct. 29	"	245388	4	30	0.0031
Nov. 2	"	245373	8	45	0.0023

The capacity of the container in the first series of experiments was 319 ml., the interior surface about 257 cm^2, and the thickness of the walls, which were not very uniform, between 1.5 and 2.0 mm. Apparently the leakage per day per cm^2 was 0.04 mm^3.

Although the leakage of helium through Pyrex glass at elevated temperatures has been noted by various observers, we have been unable to find any reference to this effect at ordinary temperatures.[1] In order to make sure that what we observed was really diffusion through and not merely into glass we have made a roughly quantitative determination of the rate at room temperature in the following way: A spherical Pyrex glass globe of 1044 ml. capacity was filled with fairly pure helium to a pressure of 75 cm. at 20°, and then was sealed by fusion of the glass. A counterpoise of 1.4 ml. greater exterior volume than that of the globe was filled with argon at 79 cm. and also carefully sealed. Since the coun-

[1] Paneth, Peters and Günther state that glass dissolves more helium than neon at ordinary temperatures. *Ber.*, 60B, 808, 1927.

terpoise was heavier than the globe by 8 g. (brass), the effective volume of the globe and weights was 0.4 ml. less than that of the counterpoise.

The difference in weight between the two was then very carefully determined at intervals over a period of twelve months. In making the comparisons the globe and counterpoise were similarly treated preparatory to weighing and were suspended on opposite sides of a sensitive balance in a room maintained at nearly constant temperature throughout this time. The observations follow:

Date	Excess in weight of counterpoise over globe	Time	Loss in weight	Loss in weight per day
	g.	days	mg.	mg.
Nov. 11, 1927	8.08873			
Nov. 12	8.08875	1	0.02	0.02
Nov. 15	8.08876	4	0.03	0.007
Nov. 21	8.08882	10	0.09	0.009
Nov. 29	8.08886	18	0.13	0.007
Dec. 6	8.08890	25	0.17	0.007
Dec. 15	8.08893	34	0.20	0.006
Dec. 21	8.08896	40	0.23	0.006
Jan. 21, 1928	8.08916	71	0.43	0.0059
Feb. 8	8.08925	89	0.52	0.0059
Mar. 1	8.08939	111	0.66	0.0059
May 7	8.08958	178	0.85	0.0048
May 30	8.08965	201	0.92	0.0046
June 26	8.08975	228	1.02	0.0045
July 25	8.08996	257	1.23	0.0048
Oct. 23	8.09036	347	1.63	0.0047
Nov. 2	8.09040	357	1.67	0.0047
Nov. 11	8.09046	366	1.73	0.0047

Although the loss in weight per day at first shows a gradual diminution with the time, it is possible that a part or even most of this diminution is due to the difficulty in determining the loss in weight with sufficient accuracy. A diminution with the pressure certainly is to be expected. The total loss in weight of the globe filled with helium is 1.73 mg., or one per cent. of the total weight of helium contained in the globe (0.168 g.). That is, apparently 10.7 ml. of helium leaked through the glass in the course of one year. Since the globe weighs 151 g. and has an interior surface of 500 cm^2., this is at the rate of 0.059 mm^3. per day per cm^2. of Pyrex glass of average thickness 1.34 mm. This corroborates the result of the experiments described first.

One possible source of error in the experiment lies in the well-known difficulty of making perfect seals with Pyrex glass. Naturally this point received especial attention. Since the pressure in the globe was sometimes greater, but usually less, than that of the atmosphere, and since the loss of helium was so slow and so regular, mechanical leakage seems unlikely. Furthermore the globe held a high vacuum for a long period before it was filled with helium.

These observations raise the question as to the effect of leakage upon the recent determinations of the density of helium by Baxter and Starkweather,[2] which were carried out in Pyrex globes. The globes used in the earlier density determinations were practically identical with the one used in the foregoing leakage experiment, and may be assumed to have behaved in the same way. Those used in the later density determinations had capacities of a trifle over two liters, and an average thickness of 1.11 mm. Since the surfaces of these globes were 1.6 times as large and the thickness 0.8 that of the globe used in the leakage experiment, the leakage may reasonably be estimated to be twice as great, *i.e.*, 0.01 mg. helium per day. Because the weight of helium in each density experiment was in every case the average of several weights obtained ordinarily during the 24 to 48 hours following the filling, the error from this source can hardly exceed 0.005 mg. in the weight of one liter and 0.01 mg. in the weight of 2 liters of helium. This quantity lies outside the accuracy of the density determinations.

The leakage experiment is being continued.

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DIFFERENCES OBSERVED IN THE CONDITION OF THE SEA WATER AT THE MARGINS OF TWO OPPOSING TIDAL CURRENTS

IN bays and estuaries where the range of the tides is considerable, it is a familiar sight to observe the meeting of flood and ebb currents along a sharply defined line, rendered visible either by the agitation of the water, or by a narrow zone of flotsam, or by differences in the color of the water, as when one current is turbid and the other clear. When the currents thus meeting are of considerable velocity (in Puget Sound they may attain a velocity at times of five or six miles an hour), the water is agitated and thrown into eddies, producing a dull roar. A "tiderip" of this description may be seen and heard for a distance of several miles.

On July 23, 1927, the authors, in conjunction with Messrs. George H. Hitchings and Seldon P. Todd,

[2] Baxter and Starkweather, *Proc. Nat. Acad.*, 11: 231 (1925); 12: 20 (1926).