pressive in spite of a steady north wind and unusual, close-sticking swarms of flies were bothersome. On the Gulf coast the hurricane tide began to rise about noon on the 13th and the sea became very choppy. During the late afternoon a dark line widening into a band in the eastern sky was to be seen slowly rising. The story of 284 lives lost and $20,000,000 property damage at Corpus Christi and vicinity, as reported soon after the storm does not need to be repeated here. The extremely high tide, "15 feet," covered the low ground and allowed the great waves to demolish 900 houses, and numerous substantial commercial establishments.

A map shows that the heaviest rainfall, September 14–17, in Texas was 12 inches, and in New Mexico, nearly 10 inches. More seems to have fallen in the mountains of northern Mexico, for a great flood rise suddenly on the Rio Grande, at Eagle Pass the rise being 27.2 feet in the 24 hours ending at 7 A.M., the 17th. For about 100 miles above the mouth of the river it is said to have widened to 40 or 50 miles. In connection with the hurricane at least two tornadoes occurred—one at Goulds, Florida, and the other near Hobbs, in southeastern New Mexico.

Mr. R. H. Weightman made a study of the wind conditions over the United States, Central America and the West Indies preceding and during the hurricane, using cloud observations, pilot balloon and kite data for the winds aloft. There was a deep (6 km. or more) circulation of easterly or northeasterly winds throughout the southern states as the center of the cyclone approached and passed several hundred miles to the south.[10]

CHARLES F. BROOKS

WASHINGTON, D. C.

SPECIAL ARTICLES

TECHNIQUE OF OPERATING ON CHICK EMBRYOS

DURING the past five years, a number of workers in the department of anatomy at the University of Missouri have studied problems which involved operations on chick embryos. Since, for many of these studies, it was necessary that the chicks should continue to live and develop to a late stage of embryonic life or to the time of hatching, it was most desirable to develop a satisfactory technique. This has apparently been accomplished and it therefore seems worth while to record these methods briefly for the benefit of other workers in experimental embryology.

Operations are carried out under the binocular microscope, enclosed in a warm box, heated by electric light bulbs. Light is furnished by a desk arc light. A flask containing dilute copper sulphate serves to concentrate, cool, and properly color the light.

The egg is taken from the incubator and candled. By this means the location of the embryo and the extent of the air chamber may be seen and these are marked with pencil on the egg shell. The egg is then placed in a dish containing water, warmed to 38°–40° C., and deep enough so that the air chamber is completely immersed. The egg may be held in place in the water by tucking gauze around it. Mr. E. C. Albritton has devised a simple and ingenious wire frame for this purpose which fits over the edge of the dish, with an inner suspended portion into which the egg fits, the egg being held in the desired position by rubber bands. He also devised a simple steam-heating apparatus for keeping the water warm which obviated the necessity of using a warm box.

The portion of the egg containing the embryo, which is exposed to the air, is swabbed with alcohol and allowed to dry. A small opening is then made in the egg shell by means of a needle or sharp pointed knife. The shell fragments are picked away with forceps, care being taken not to tear the shell membrane beneath. An opening 7 mm. in diameter is sufficiently large for most operations. A drop or two of sterile Ringer's solution is then dropped in the opening, after which the shell membrane may be stripped off with ease.

[10] *Monthly Weather Rev.*, October, 1919, Vol. 47, pp. 717–720, 11 figs.

Simple aseptic precautions are observed for all operations. The forceps, knives, needles, etc., for opening the shell are flamed before using. The more delicate instruments used for the operations proper are simply dipped in alcohol and allowed to dry. The Ringer's solution and other fluids introduced into the shell are boiled for a few minutes and allowed to cool to 38° C.

When the stage of operation is one in which the amnion already surrounds the embryo, the sac may be cut open and, after the desired operation has been performed, it can be "sutured" by pinching the edges together, and will heal rapidly and completely.

Various methods were tried for removing portions of the embryo and the details of these operations can not be given here as they were modified for each particular set of experiments. The electric cautery was tried and abandoned because of the difficulty of localizing the burn when the embryo is surrounded by fluid. The method of cutting and dissecting was the one most frequently employed. For dissecting away somites, spinal cord, etc., steel needles ground down to fine points were used. For removing a more prominent portion, such as the heart, the tail, or a limb bud, iridectomy scissors proved to be the most useful instrument. In removing a blood vessel it was found advisable to inject a small amount of Berlin blue, previously boiled, directly into the vessel. This material clumps on contact with the blood, stopping the circulation and effectively plugging the vessel and at the same time outlining the vessel wall. The vessel can then be dissected away rapidly, without causing hemorrhage.

Mr. E. C. Albritton made use of electrolysis for an extensive series of operations using a needle and a pair of forceps connected by wire to the two poles of a weak dry battery. The needle is placed on the region to be removed, and the forceps a short distance away, in the fluid surrounding the embryo.

After the operation a small window of thin mica is flamed and placed over the opening and sealed down with heated Gerlach's mixture (beeswax 2 parts, lump resin 3 parts). The egg is then returned to the incubator. The egg is turned so as to keep the window at the side or below in order to prevent sticking of the embryo to the jagged edges of the shell. A ring of filter paper placed over the exposed wax prevents its sticking to the floor of the incubator. It is well to rotate the egg slightly several times during the first few hours after its return to the incubator. This may be done automatically by a cradle rocked by an attachment to an ordinary alarm clock. If this is done the yolk remains freely movable and the embryo can be brought around under the window, when desired, for observation.

The method of keeping the air chamber immersed in water at incubator temperature during the operation has only recently been adopted and it has greatly reduced the mortality of chicks operated on at the age of forty-eight hours and over. Formerly, when the shell was opened, without this precaution, the yolk always sagged away from the opening and before the operation could proceed it became necessary to add Ringer's solution, drop by drop, in order to bring the embryo back to the level of the opening. This usually consumed more time than the operation proper. On opening such an egg immediately after the operation it is found that the air chamber has been completely obliterated. Evidently, this sagging away of the yolk from the opening is caused by the gradual forcing out of air from the air chamber. When such an egg with the air chamber obliterated and filled with Ringer's solution is returned to the incubator it forms an inelastic chamber with no room for expansion of the contents. Any slight increase in temperature, in such an egg, would seem to be sufficient, as a result of the increased pressure, to cause embarassment to the heart beat, in embryos in which the circulation has started. Whether this is the correct explanation or not, many chicks died, when this method was used, within a few hours after their return to the incubator.

However, in the embryos in which the air chamber is immersed during the operation, almost no sinking of the yolk takes place

upon opening the shell, and, on candling such eggs after sealing, it is found that the size of the air chamber remains unchanged. With the old method we frequently had a mortality of 50 per cent or higher in the first twenty-four hours. With the new method the deaths during the first twenty-four hours are reduced almost to zero.

Embryos may die three to five days after the operation and for these later deaths we have not yet found the cause or causes.

ELIOT R. CLARK

UNIVERSITY OF MISSOURI

THE AMERICAN CHEMICAL SOCIETY. VIII

The composition of okra seed oil: GEORGE S. JAMIESON AND WALTER F. BAUGHMAN. (By title.) Several lots of the seed of the okra (*Abelmoschus esculentus*) were received at various times from E. A. McIllhenny of Avery Island, Louisiana. The seed were found to contain about 15 per cent. of oil. The oil expressed from the seeds by means of the expeller had a greenish yellow color. The results of the analysis of the four expressed okra seed oils are given in the following table:

Sample No.	1	2	3	4
Iodine No. (Hanus)	93.2	100.3	95.5	95.2
Saponification value	195.5	195.6	195.6	195.2
Polenske No.				0.23
Reichert Meissl No.				0.26
Acetyl value	23.9	16.2	11.5	21.4
Acid value		0.66	0.34	1.42
Specific gravity at 25° C.	0.9187	0.9182	0.9160	0.9172
Refractive index at 25° C.	1.4692	1.4693	1.4695	1.4702
Unsaponifiable matter, per cent.				0.37
Soluble acids		0.12	0.09	0.14
Insoluble acids, per cent.		95.90	96.27	96.20
Unsaturated acids, per cent.				67.33
Saturated acids, per cent.				29.22
Titer insoluble acids				38.5° C.

From the data obtained by a separation of the various fatty acids the percentages of the acid glycerides in the oil were calculated. The composition of the okra seed oil was found to be as follows:

		Per Cent.
Glycerides of	Palmitic acid	27.23
	Stearic acid	2.75
	Arachidic acid	0.05
	Oleic acid	43.74
	Linolic acid	26.62
	Unsaponifiable matter.	.37

The composition of the oil from the seed of the Hubbard squash: WALTER F. BAUGHMAN AND GEORGE S. JAMIESON. (By title.) The oil for this investigation was expressed from the seed of the Hubbard squash (*Curcurbita maxima*) by means of the expeller. A portion of the oil was refined by the well-known alkali process and bleached with fuller's earth. The crude oil had a brownish red color and the refined portion had a yellow color. Both crude and refined oils had a bland fatty taste. The following are the chemical and physical characteristics:

Specific gravity at 25°	.9179
Refractive index at 25°	1.4714
Iodine number (Hanus)	121.0
Saponification value	191.5
Reichert Meissl no.	0.37
Polenske no	0.39
Acetyl value	27.8
Acid value	0.5
Unsaponifiable matter	1.06
Soluble acids %	0.33
Insoluble acids %	94.66
(Solid) saturated acids %	18.37
(Liquid) unsaturated acids %	76.45
Titer (insoluble acids)	29.8° C.

The composition of Hubbard squash seed oil was found to be as follows:

		Per Cent.
Glycerides of	Palmitic acid	12.73
	Stearic acid	6.12
	Arachidic acid	0.04
	Oleic acid	36.58
	Linolic acid	43.34
	Unsaponifiable matter.	1.06

Notes on the composition of the sorghum plant: J. J. WILLAMAN, R. M. WEST, D. O. SPRIESTERSBACH AND G. E. HOLM. (By title.) The juice of sorghum cane contains a high percentage of non-