soured in forty-six hours, the average length of time in which milk not aerated became acid. It was also shown that skim-milk from aerated milk contained .53 per cent of fat against .31 per cent of fat in skim-milk from milk not aerated; this milk was set in Cooley cans.

During April and May of the present year the writer, assisted by Mr. H. C. Beckman, an agricultural student in Purdue University, carried on a series of tests to note the influence of aeration upon the securing of butter-fat in milk, the details of which were presented to the Society for the Promotion of Agricultural Science, at Rochester, N.Y., on Aug. 20. Fifty pounds of fresh, warm, mixed milk was divided into two lots of twenty-five pounds each. Lot one was passed over an Evans and Heuling aerator and reduced in temperature, on an average, from 88.3° to 56.5° F. This milk was then set in cold water, and skimmed in twenty-four hours. Lot two was treated like lot one, excepting that it was not aerated. Twenty-nine lots of cream were secured from each class, which resulted in a total amount of 183 pounds 5½ ounces of cream from aerated milk, and 181 pounds 10½ ounces from that not aerated. Daily tests were made with the Babcock machine, which showed an average of 24.4 per cent fat in cream from aerated, and 24.0 per cent of fat in cream from non-aerated milk. Thirty-two pounds seven ounces of butter were made from the cream from aerated milk, and six ounces less from the non-aerated.

The limited amount of experimental evidence published would indicate that aerated milk kept sweet somewhat longer than that not so treated, other things being equal. Our practical observations seemed to point this way. In order to more carefully investigate this point, a chemical investigation of the subject was carried on under the direction of Professor H. A. Huston, chemist of the Purdue University Agricultural Experiment Station. The milks were treated as noted above, one lot being aerated and the other not. Check samples from each lot were taken every twelve hours. The relative acidity of the milks was determined by means of the quantity of one-half normal caustic potash required to produce a neutral tint. On account of the well-known amphegenic action of milk with litmus paper, it was considered desirable to obtain results with more than one indicator. After repeated trials with a large number of indicators, phenol-phthalein and corralline were selected. The milk was titrated at once after sampling. After the first twelve hours 5 cubic centimeters one-half normal HCl were added to 250 cubic centimeters of the milk; 25 cubic centimeters of this milk were taken for titration. Several methods of setting the lots of milk were tried. A synopsis of these tests, over equal periods of time, shows the following interesting results: In sixteen tests the aerated milk was most acid; in eleven tests the non-aerated milk was most acid; while in seven cases the acidity was equal in both lots. These tests, which represent considerable painstaking work, do not indicate the results from aeration that were to have been expected as based on current opinion.

If cows are properly fed and milked, the writer does not believe that normal milk will be disagreeable if set in clean vessels in sweet surroundings, yet there are those who lay great stress upon the animal odor in milk, and the necessity of removing it. It is claimed that the aerator will accomplish this. In the *Wisconsin Farmer* of Sept. 3, a short article is published on aerating milk, credited to "a Vermont authority." Says the writer, "by aerating milk, odors can be completely driven out that have been absorbed by the milk after being drawn from the cow. Odors that were derived by the milk through the system of the cow are not so easily taken out. They will be somewhat lessened, but can never be wholly removed. Milk should be aerated as soon as possible after it is drawn, and it should, at the same time, be cooled. Aerating alone is an advantage, but its good effects on the keeping of milk are much increased by bringing the milk down to 55° or lower. Milk should keep at least twelve hours longer for the aerating. By using a cooler and aerator faithfully it is possible to dispense with ice in selling milk under the ordinary conditions as they occur in the smaller cities; but where the milk is to be brought by train, and is 24 to 36 hours old before it is put on the milk cart, it would be necessary to use ice even with aerated milk. . . . The man who is raising his cream by shallow setting or cold deep setting has no use for a milk aerator or a milk cooler. Either would be a positive detriment, occasioning the loss of a large amount of butter in the skim-milk."

This subject is one of considerable interest and importance. A person has no business to have milk so contaminated by odors *after being drawn*, as to require the use of aeration to make it palatable. As bearing on the other points in the article quoted, I believe there is but little experimental evidence at hand, though this in a measure substantiates it. Our experiment stations have an opportunity to do some interesting work in this direction.

Purdue University Agricultural Experiment Station, Lafayette, Indiana.

REPORT OF THE SUMMER SCHOOL OF THE BROOKLYN INSTITUTE FOR THE SEASON JUST CLOSED.

BY HERBERT W. CONN, DIRECTOR.

THE Biological Laboratory of the Brooklyn Institute of Arts and Sciences has just closed its third season of biological work. The session has been the most successful one in its history, and as a preliminary report of the summer's work it will be fitting to give a brief account of the history of the Laboratory, together with its purposes and aims, in order that those interested in the matter may gain a better knowledge of the school.

The Biological Laboratory at Cold Spring Harbor was organized in 1890. It owed its inception to the Brooklyn Institute, and has been established as a branch of that institution of popular education. The foundation of the school was made possible through the generosity of Mr. John D. Jones and the New York Fish Commission. Mr. Jones at the outset contributed a considerable sum of money towards purchasing the equipment of the Laboratory, and the New York Fish Commission offered to the school the use of its buildings and appurtenances located at Cold Spring Harbor, L I. Other friends, among whom may be mentioned Mr. Eugene G. Blackford, Professor Franklin W. Hooper, Dr. Oliver L. Jones, Mr. Louis C. Tiffany, Mrs. H. G. DeForrest, and Miss Julia B. DeForrest, have contributed generously toward the equipment and support of the school. By means of these contributions and from students' fees the Laboratory has been thus far supported. Up to the present time the hatchery of the New York Fish Commission has served as a laboratory building, but the school has reached the limit of the accommodations thus offered, and is hoping to erect a special laboratory building during the coming year, which will be especially adapted to biological work. The Laboratory has been supplied with a launch, collecting apparatus, aquaria, and other appliances necessary for the pursuit of biological work. A library of biological literature has been furnished, and microscopes, etc., have been loaned by the Brooklyn Institute and Wesleyan University. During the present year a beautiful lecture-room has been fitted up for the school by the Wauwepec Society, a society organized by Mr. John D. Jones for local improvement at Cold Spring Harbor. The New York Fish Commission has given the use of its boats, aquaria, pumps, and other apparatus, which has been of great value to the school. Thus equipped, the school has been enabled to enjoy three successful seasons, and to demonstrate the need of further support and better equipment. The Wauwepec Society is contemplating the erection of a laboratory building for its use, and its further growth is only a matter of time.

During its three years of existence, over sixty persons have made use of the advantages offered by the Laboratory, either in study or in investigation. Those attending the Laboratory have included college professors, public-school teachers, physicians, and students of various grades of schools.

The Laboratory was, for the first year, under the direction of Bashford Dean, Ph.D., of Columbia College. During the last two years it has been directed by Professor Herbert W. Conn, Ph.D., of Wesleyan University, who has been assisted by Professor Charles W. Hargitt, Ph.D., of Syracuse University, and Professor H. L. Osborn, of Hamline University. In addition to these, there have been at the school leading biologists from various institutions, including Columbia College, Rutgers College, Trinity College,

University of Notre Dame, and others, who have assisted materially, to the advantage of the school, by numerous lectures, given partly to the students alone and partly to public audiences.

The need of a summer school of biology in the vicinity of New York and Brooklyn has been felt for some time. There are many teachers and students who are on the look-out for methods of passing the summer vacation, which will be at the same time pleasant and profitable. To those interested in natural history science, a summer laboratory of biology offers such an opportunity. The success of the Biological Laboratory at Wood's Holl, and the increasing demand upon its space, have demonstrated the need of other schools of similar character. Moreover, the purpose of the Wood's Holl school of attracting biological investigators, has pointed out the need of a special school of instruction. The Biological Laboratory at Cold Spring Harbor has therefore been designed to fill a somewhat different need than that of the Wood's Holl Station. It is designed primarily as a school of instruction in zoölogy and botany, and not as a special laboratory for investigation, or as a technical school, and is also intended for students rather than for investigators.

Students of biology who make use of our marine laboratories, may be divided into three classes: 1. General students, who, having little or no experience with living animals and plants, desire a general course in zoölogy and botany. This class would include medical students, who find biological study of great value as bearing upon the study of medicine, and who find no time for such work during the school year. 2. College students and others, who, having had a general course in zoölogy and botany, desire to do miscellaneous work of a higher character, or to study embryology from the practical side. 3. Those who desire to undertake original research, either independently or with special guidance. Most of the marine laboratories on our coast have been designed primarily for the third class, although other students are welcomed in some of them.

It has been the design of the school at Cold Spring Harbor to plan its course especially for the first two classes. Every year is seeing a growing demand for the teaching of natural history in our public schools, and the teacher who is in especial demand is the one who has had practical knowledge of his subjects rather than simple book-knowledge. The need of summer schools, where our teachers can gain this familiarity with nature, and at the same time pass a pleasant vacation, is becoming more and more felt. The increasing popularity of summer schools voices this demand. The public-school teacher, who wishes to take a prominent part in the better type of teaching which is rapidly forcing its way into our schools, is beginning to feel the need of practical work; and a few years hence those teachers who have made use of summer schools of practical experiment will be found holding the best positions. The school at Cold Spring Harbor has been designed primarily to meet this demand, and it purposes to offer to all wishing to take good positions in our schools a chance to so familiarize themselves with living things as to make their teaching active and vital instead of mere text-book instruction.

For this purpose an elementary course in zoölogy is arranged, lasting six weeks. During the present summer this course has been given by Professors Herbert W. Conn, Charles W. Hargitt, and H. L. Osborn. It has consisted of daily lectures describing animal types and giving information in regard to different zoölogical topics. The lectures have been followed by laboratory work upon the types described, either by microscopic study or with dissecting instruments. The practical laboratory work is personally directed by the instructor in charge. The course of six weeks thus directed gives a survey of all of the chief types of animals, and, when accompanied by collecting and by such other miscellaneous study as is sure to be suggested by the exigencies of collecting excursions, gives the student a practical knowledge of animals and life which he could not get by a much longer course of study away from the sea-shore. The general course thus given is an elementary one, but at the same time many advanced students find it worth while to follow the course partly as a review, but more especially as a means of studying fresh specimens of types which are familiar to them only from text-book descriptions. Either the whole or parts of this course are, therefore, taken by nearly all the students in the Laboratory.

To add to the value of the Laboratory in general instruction, a course of scientific lectures is given during the summer by well-known scientists from various institutions of learning. These are given in a lecture-hall near the Laboratory and are illustrated by lantern views. During the present summer there have been fifteen lectures in this course upon various subjects connected with geology, zoölogy, and botany. The lecturers have been Professor Herbert W. Conn, Ph.D., Professor Charles W. Hargitt, Professor H. L Osborn, Professor Henry F. Osborn of Columbia College, Dr. Thomas Morong of Columbia College, Professor Franklin W. Hooper of Brooklyn Institute, and Professors John B. Smith, Byron D. Halstead, and Julius Nelson of Rutgers College. These lectures, though of a high order, are not technical, and are enjoyed by all the students. It is expected next year to add a course in botany of a somewhat similar nature to that in zoölogy for the benefit of those desiring summer work in this subject.

For students who have taken the elementary course or its equivalent and desire more advanced work, no definite line of instruction is laid out, but each student's work is planned for himself. It may be that he wishes to study embryology; he is then set at work upon the development of some animal, and shown how to study its various stages and interpret their meaning, and taught how to preserve specimens for future study. It may be some special group of animals which he desires to study; then the collecting apparatus is put into use to provide him with as large a variety of the group in question as is furnished by the region. It may be microscopic anatomy that he desires; then he is given practical instruction in tissue preservation, section cutting, and staining. But, whatever the line of work such student may choose, it may be independently planned for him, and its chief aim must be in all cases to teach methods of work. For college students who have studied under constant minute direction, this somewhat greater freedom of work with living specimens, rapidly developes independence of thought and accuracy of observation, and is of the utmost value as training for future work.

A special line of work in bacteriological methods has been offered during the last two years. This line of work has no special relation to a marine laboratory, but there are many students, especially among medical schools, who desire to learn methods of bacteriological work, and find no time for it in their regular course. For this purpose practical instruction in making culture fluids and cultures, in separating and determining species of bacteria, is given. A course of twelve lectures upon the history of bacteriology has been given by Professor Conn, during the present summer. The lectures were delivered before the whole Laboratory, and those who wished have taken the practical work of making cultures and the study of the bacteria in water and milk, with other simple elementary bacteriological problems.

Thus it will be seen that the school at Cold Spring Harbor is especially intended for those desiring instruction and facilities for acquiring practical knowledge of biology. But its plans do not end here. Hitherto it has not been able to offer special inducements to those desiring to undertake original research; yet several investigators have been engaged in such work during the last two summers, and it is the design of the management to offer such opportunities as fast as facilities admit and occasion demands. The new Laboratory in contemplation will contain private rooms for research, and will be especially fitted up with reference to this work. Every endeavor will be made to meet the needs of those who desire to use the Laboratory as a place of research. The Laboratory aims first, however, at being an institution of biological instruction and to allow other lines of work to grow as occasion demands.

The session of the Laboratory lasts eight weeks, during the months of July and August. The regular course of lectures occupies the first six weeks, the last two weeks being reserved for reviews and special independent work by the students. The tuition fee for the general course is $20; for the whole session, $25. Board is furnished at $5 per week and rooms can be obtained at a

price varying from $1.50 to $4 per week. The Laboratory is open to both ladies and gentlemen.

Cold Spring Harbor is only about an hour's ride from New York, and is in itself a delightful place to spend the summer. It offers opportunities for bathing, boating, and fishing, and a visitor is never at a loss for some pleasant employment. The New York Fish Commission has one of its hatching stations here, and much of interest and profit accrues to the members of the Laboratory from the study of the specimens in the hatchery. Information as to methods of fish-hatching and fish-culture is to be had simply for the asking; for the staff at the hatchery are on the best of terms with the members of the biological school, and are willing to accommodate them in every way.

In short, the school at Cold Spring Harbor proposes to offer to all interested in biology a method for spending the summer vacation pleasantly and at the same time profitably. Many are inclined to think the summer vacation of our colleges too long; but it is not so to one who attends such a school, for here he gains both recreation and profit. The Laboratory offers him a chance for acquainting himself with living nature and the living principles of biological science. If he is already an advanced student he is offered chances for special work in the line of topics of his own choosing. If he is a teacher, he can get practical experience with animals and plants, and can make collections for his classes; and for the college professor the recreation of the holiday is combined with facilities for research along lines of biological investigation.

Last, but not least, to all is offered opportunity for personal association with educators and original thinkers in lines of science. The school has been successful thus far, and its future promises greater growth and wider influence.

ON SOME HABITS OF AMPHIUMA MEANS.

BY CHARLES W. HARGITT, SYRACUSE UNIVERSITY.

THROUGH the kindness of Professor H. J. Clements, M.D., of New Orleans, I had sent to me from the Louisiana swamps a half-dozen of the so-called "Congo snakes" early last spring. Two of them were adults of from twenty to thirty inches in length, the others being young ones not exceeding twelve inches from "tip to tip." They were shipped in damp gray "moss," Tillandsia usneides, and with a single exception all came through alive and in good condition.

They were, for want of better quarters, placed in an aquarium in which were a number of fresh-water clams (Unio). At first they were quite sluggish and seemed not at all disposed to be "at home" in their new surroundings. This was especially true of the adult. Gradually, however, the young "Congos" began to show signs of interest and appetite. I found an empty clam-shell one morning in the aquarium, and further observation soon explained it. No sooner did a clam show signs of declining vitality by an unusual gaping of the shell than it would be seized by one, often indeed by two, of the amphibians, and there was seldom any release till the shell had been relieved of its occupant. The struggle which ensued when two of them would seize a single clam was exciting and amusing in the extreme. Such tugging, writhing, and twisting into perplexing coils one seldom sees, especially among members of this class.

They proved to be exceedingly voracious; and it was but a short time ere they had disposed of some two dozen clams and had shown a remarkable growth, proving the healthfulness of the diet.

This activity, however, pertained only to the young. The adult became more and more sluggish, and it became evident within a fortnight that it would not long endure the conditions. It moreover became quite ugly of disposition, and would bite savagely at anything within reach, even maiming itself. It was consequently consigned to the dissecting-table.

The clams having been disposed of by the others, they were left for a few days without food. My attention was one day attracted to the aquarium by an unusual commotion, and, to my surprise, upon examination, I found that one of the more thrifty had turned cannibal and had half swallowed one of his less vigorous fellows. He was made to disgorge by a sharp squeeze about the thoracic region, and I hoped the thing was at an end. But in less than an hour the same thing was repeated even more savagely and upon the same victim. I immediately removed both from the tank, killing the badly injured one and leaving the other by itself. Within another day the same thing had been repeated between the two remaining in the aquarian, but was discovered before it had gone so far. They were subsequently fed upon fresh meat from other sources, birds, etc., but did not seem to thrive upon it, finally refusing to take it. They would take earthworms, but showed no disposition to take insect food. One of the number still lives in the same aquarium, and seems fairly at home, so long as fed satisfactorily. It has gone for some time without food with apparently no discomfort. These notes may add something to our knowledge of their probable mode of life. That they are carnivorous is quite certain. At no time did they show any disposition to touch vegetation, though a variety was growing at hand. That under certain circumstances they, with others of their class, will turn cannibal, is also quite certain. I have known the common bull-frog, Rana catesbiana, to devour no less than a half-dozen fair-sized leopard frogs, Rana virescens, within as many days. The same disposition has been noted among the members of other genera. It is less common, indeed rare, between members of the same species and approximately the same size, as was the case under consideration.

NOTES AND NEWS.

BULLETIN 41 of the Purdue University Agricultural Experiment Station contains information of interest and importance concerning wheat as grown in Indiana. The following are some of the points of importance, as given in the Bulletin: 1. Velvet chaff, Michigan amber, and Fultz varieties of wheat have been grown for nine years on the university farm, and rank in value as named, though Michigan amber surpasses Velvet chaff as a rust-resisting variety. 2. Red Clawson and Jones's winter fife are the two most promising recently introduced varieties. 3. For eight years, six pecks of seed sown per acre have given the most satisfactory results. 4. In the region of Lafayette, a higher average yield has been secured from wheat sown Sept. 20 over other dates of sowing. 5. Judicious rotations, including grass, have given better return than constant grain-cropping. 6. Heavy applications of manure and fertilizers to a worn soil growing corn and wheat alternately have given paying returns. 7. The average results of all the experiments at this station with fertilizers and manures upon wheat during the past three years, in full or two-thirds doses, have not been profitable. 8. The use of hot water or copper sulphate failed to destroy the spores of loose smut. 9. Bunt, or stinking-smut, in wheat was successfully destroyed by using hot water or copper sulphate. 10. Early and late harvesting of wheat had practically no effect on yield or weight of grain. 11. Yield of grain and straw were considerably reduced by mowing wheat on certain plats in spring to check rankness of growth. 12. In comparing forms of nitrogen for fertilizing the wheat plant, sulphate of ammonia gave rather better yield than nitrate of soda or dried blood. 13. As the plants fertilized with nitrate were slower to mature than the others, these also suffered more from rust than did the others. Persons interested in a more complete account of these wheat experiments, or who wish the publications of the station, can secure free copies of the same by addressing C. S. Plumb, director of Experiment Station, Lafayette, Ind.

— *The Illustrated American*, which has achieved great popularity as the handsomest illustrated weekly published in our country, has been reduced in price from twenty-five to ten cents. This reduction has been brought about by improvements in its engraving and printing establishment, and, it is claimed, will in no way affect its literary and artistic excellence. This change places within the reach of all a most excellent periodical.

— Harvard University is about to publish a reprint of certain important "State Papers and Speeches on the Tariff," by Hamilton, Gallatin, Webster, and other statesmen, with an introduction by Professor F. W. Taussig.