THE

NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

OFFICIAL ORGAN OF

AMERICAN NATURE-STUDY SOCIETY

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CONTENTS

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MONTHLY EXCEPT JUNE, JULY, AUGUST

FRED L. CHARLES

UNIVERSITY OF ILLINOIS

EDITOR

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[Names of contributors are printed in small capitals. Abbreviated titles of books eviewed are in quotation marks. The abbreviation n.-s., for nature-study, is used. ages of issues by months—Jan. 1-32; Feb. 33-52; Mar. 53-86; April 87-117; May 118-152; ept. 153-186; Oct. 187-220; Nov. 221-254; Dec. 255-283.

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THE

NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

VOL. 6 JANUARY, 1910 NO. 1

AMERICAN NATURE-STUDY SOCIETY

The third annual meeting of the American Nature-Study Society was held January 1st, 1910, in Huntington Hall, Massachusetts Institute of Technology, Boston, Mass. Although falling upon the day after the adjournment of the American Association for the Advancement of Science, the attendance was double that of previous meetings of the Society. Members were in attendance from many states, even the Pacific Coast and Hawaii being represented. The printed program was followed, President C. F. Hodge presiding. The meeting lasted from 9:30 A. M. to 12:30 P. M. and was followed by an informal luncheon in which a considerable number participated.

Following the report of the Secretary-Editor which will be printed in a later number of the Review, the annual election was held, the following officers being chosen: Pres., Otis W. Caldwell (Ill); Vice-Presidents, H. W. Fairbanks (Cal.), S. Coulter (Ind.), F. L. Stevens (N. C.), B. M. Davis (Ohio), D. J. Crosby (D. C.); Directors to serve two years, L. H. Bailey (N. Y.), C. F. Hodge (Mass.), C. H. Robison (N. J.), S. C. Schmucker (Pa.), Delia Griffin (Vt.); Secretary-Editor, Fred L. Charles (Ill.). The following directors continue in office another year: G. H. Trafton (N. J.), Ruth Marshall (Ill.), J. Dearness (Ontario), F. L. Holtz (N. Y.), Alice R. Northrop (N. Y.), Mrs. A. B. Comstock (N. Y.).

The general topic for the meeting was "The Course in Nature-Study for Elementary Schools". The following papers were read: "The Course of Study" by C. F. Hodge, "Physical Nature-Study" by John F. Woodhull, "The Place of Children's Gardens in Nature-Study" by Ellen Eddy Shaw, "What Should be the Essential Principles Underlying a Course of Nature-Study?" by G. H. Trafton, "Some Desirable Activities for the A. N.-S. S. in 1910," by Fred L. Charles. Mr. F. L. Holtz requested permission to omit his paper owing to the lateness of the hour. The discussion from the floor was animated and much interest prevailed. Abstracts of the papers appear in this issue, Professor Woodhull's article being printed in full.

The spirit of the meeting would indicate a very favorable out-look for the Nature-Study movement in this country. Not only in the meeting of the A. N.-S. S., but in the sectional meetings of the American Association much interest was manifested in the scientific studies of elementary and secondary schools. Several popular lectures were given. The educational section of the A. A. A. S. held important meetings, including a joint session with the Physics section. Friday afternoon an informal conference on Physical Science attracted many leaders in nature-study and secondary science. Prof. John F. Woodhull of Teachers College, Columbia University, presided. Much impetus was given to this phase of science teaching. The next meeting of the A. A. A. S. is to be held at Minneapolis, Minn.

THE NATURE-STUDY REVIEW

With this number the Nature-Study Review enters upon its sixth year. It was established in January, 1905, by Professor M. A. Bigelow, of Teachers College, Columbia University, and was maintained as a private enterprise until 1908, when the A. N.-S. S. was organized at Chicago and this publication was adopted as its official organ. Until the present time, however, Professor Bigelow has assumed entire financial responsibility in addition to his service as editor. His contribution to the nature-study movement in this country has been great, for through the medium of this journal he has brought together the various agencies which have hitherto been working quite independently toward a common end. He has borne the burden during the most trying period, and although we regret that his plans involve temporary withdrawal from active work among us, we congratulate him upon what he has achieved and upon the hopefulness of the situation as he leaves it. We shall welcome his return to active work among us.

Under Prof. Bigelow's direction the Nature Study Review has achieved a high rank among educational journals. Its limited fiield has appealed to a relatively small clientele, but its advanced stand for a sound scientific and pedagogical basis in nature-study teaching has made it a profound influence for good.

The American Nature-Study Society owes its existence to a small group of scientist-teachers who have not outgrown the naturalist spirit of youth and who realize the immense opportunity for service to childhood and to science in the organization and presentation of nature materials, on an educational basis, in the elementary schools. The alert, eager, inquiring attitude of childhood, when given play upon environmental materials under the direction of a teacher who is equipped for the task, makes possible an educative result that can be equalled, perhaps, by no other subject in the elementary curriculum, The contact is so immediate, the related interests so vital, that the possibilities cannot be measured. The wonder is that the field has been so long neglected, or so superficially cultivated.

The Nature-Study Review has now, so far as we know, the undivided support of the leaders in nature-study and elementary science in America. With the transfer of the Review to the middle west, the editor fully appreciates the necessity of holding the ground that has been gained. We must do even more,—the call to advance has been sounded. The sentiment for nature-study long ago outstripped its rational development. The period of exhortation and inspirational effort has passed, and the time for demonstration is at hand. Throughout the United States and Canada able men and women are working at the problem. That the best progress may be made, organization and cooperation are essential. The American Nature-Study Society and its journal, the Nature-Study Review, afford this opportunity. The Secretary-Editor for 1910, in assuming office, bespeaks the generous and active assistance of all workers in this field; without this assistance success is impossible. Suggestions, news items and contributed articles will be welcomed.

Just now the greatest demand is for an increased membership in the American Nature-Study Society. The subscription list to the Nature-Study Review should be greatly extended; the rank and file of elementary teachers should be reached. The personal sacrifice which Prof. Bigelow has borne so long and so uncomplainingly has brought the journal practically to a self-supporting basis. But we need a fifty per cent increase in our numbers at once, and we shall make a much greater gain than this if our present membership, appreciating the need, will assume the aggressive and undertake a campaign for new members. Will not every reader enlist?

PLANS FOR 1910

Owing to the transfer of the headquarters of the Review, the appearance of the January number has been unavoidably delayed. It will be followed shortly by the February number, and subsequent issues may be expected to appear early in the month for which they are dated.

As the official organ of the A. N.-S. S. this journal should not only contribute to the shaping of ideals, but should take the lead among those agencies which are endeavoring to organize the materials of science for the purposes of elementary education. To this end, it will undertake to make every issue immediately helpful to teachers through the presentation of concrete illustrations of approved nature-study lessons.

Each number for 1910 will be devoted to some particular subject of general interest, thus assuming the form of a ***teaching monograph*** on that subject. Each issue will make its individual appeal to some special group of workers, and at the same time the series will be valuable in its entirety to all educators.

The numbers now tentatively planned are as follows: January, PHYSICAL SCIENCE; February, HYGIENE; March, BIRD STUDY; April, GARDEN NUMBER; May, AGRICULTURAL EDUCATION(or RURAL SCHOOL NUMBER); September, INSECT STUDY; October, COURSE OF STUDY; November, HARVEST STUDIES; December, WEATHER STUDIES.

While each issue will thus assume a distinctive character, other features will not be neglected. There will be occasional discussions of a more general nature, nature-study news will be followed and current literature reviewed.

The plan as above outlined has met with the approval of those to whom it has been presented. We shall not be satisfied until the Nature-Study Review is recognized as an essential in the material equipment of every live and progressive teacher of children.

The annual membership fee in the A. N.-S. S. is one dollar, which sum includes the subscription to the Nature-Study Review for one year. Contributed articles and business communications should be addressed to

THE NATURE-STUDY REVIEW
Urbana, Ill.

PHYSICAL NATURE-STUDY*

By JOHN F. WOODHULL, Ph.D., Professor of Physical Science, Teachers College, Columbia University

In Christmas week of the year 1826, Faraday inaugurated the course of lectures in Physical Science to children, which has been repeated annually in the lecture room of the Royal Institution, London, ever since. The eighty-fourth course of lectures in this series has just been given this week. The most famous course was Faraday's lecture on a candle given about half a century ago.

Fifty years ago much attention was paid to the teaching of natural philosophy to boys and girls of 12 to 15 years of age in this country. Boston was the leader in that movement and even so long ago as 70 years she bought for each of her Grammar Schools physical apparatus to the extent of about 100 pieces, costing $275 a set. Following her lead doubtless, New York City has maintained, at least ever since 1855, a course in elementary physical science in the upper grammar grades.

In the annual report of the New York City Board of Education for 1857 we find that one quarter of the time in the schools was allotted to what was called descriptive science. It included geography, astronomy, physiology and natural philosophy. For something over 50 years natural philosophy or physics has occupied the attention of the two upper grammar grades. The report of City Superintendent Kiddle for 1866 contained the following: "The discoveries in physics and the applications which have been made of them to the conveniences of social life, constitute the peculiar glory of this age and we should most assuredly be guilty of strange neglect, should we leave our children in total ignorance of the simple principles and facts which explain the phenomena in nature and art, everywhere meeting their curious gaze. I am of the opinion that it would be better to add to this part of the course, the outlines of chemistry, even though it should be necessary to extend the period of time assigned to it."

This work during the past 25 years has had great vicissitudes in various parts of the country. In some cases it has been neglected by those best able to foster it, and in other cases, it has been well nigh killed by having prescribed for it a syllabus, which was merely an excerpt from the high school sylla-

*Read at the third annual meeting of the A. N-S. S., in Boston, Mass. Jan. 1, 1910.

bus of college requirements. It has, of course, suffered from the great pressure of other subjects to gain admission, but it has suffered most by certain projects imposed upon it. The general aim of the work, so far as the printed announcements of it go, has always been good. It seems to have been consistently maintained for half a century at least that the purpose of this instruction is the interpretation of nature and of life's experiences, but the method of procedure has always been a series of trials and failures which might all be characterized as steps preparatory to doing something, which thing was never really reached. It was conceived of as merely preparation for high school science or for college science or for some experience to be met later in life. It had nothing to do with present experiences, but was a sort of getting ready of tools for future work. We have had series of lessons for teaching observation as a "faculty," claimed to be of great importance for some future occasion. We have had wearisome lessons on the correct use of "scientific terms"—definitions of attributes and of things, sometimes illustrated with objects, to be sure, but without presenting any science to which the terms applied and without offering any excuse for having the terms. We have had an era of teaching the art of "classification" in physical as well as in biological science. A list of a dozen so-called "properties" of matter have been defined, and if we illustrated them by objects or by experiments we felt quite up to date in our methods. We have laid great stress upon the necessity of distinguishing between adhesion and cohesion, gravity and gravitation, mass and weight, dew falling and dew collecting, three classes of levers, and "six mechanical powers". We have tried to make the children afraid to use the word "force" lest it should be "unscientific", but our labors have been of no avail for they have discovered that all men, learned and unlearned, use these terms indiscriminately, and wholly without fear of consequences; and like the rest of us, they rely upon the assurance that language will continue to be made by custom in spite of the schools. How the interpretation of nature is to be furthered by this punctilious attention to the latest conventions in scientific parlance, no one has attempted to show.

History shows that education, although a very conservative thing, must be conventional and must follow—even if from afar—the customs of a people and of the times. We are living in an age of machinery. It is safe to conclude that the public will insist upon the children receiving instruction in physics which is the science of machinery. Life is fast becoming embarrassing to those who are unable to understand and to use machines. Automobiles, motor boats, electrical appliances of all sorts and countless instruments of applied physics have done and will do more than all the school men can toward shaping our future courses of study in science. It is only a few years that we have dwelt together in great cities. We used to drink from family wells, with impunity. We must now have elaborate and enormously expensive water systems. New York City is forced to plan for an outlay of $160,000,000 to get water, and this involves more problems in applied physics than the building of the Panama canal. Our citizens need to be well informed upon these matters before giving their support.

The gas supply, the milk supply, the pure food supply, heating and ventilation, production and uses of electricity all make it essential that the ordinary citizen should be instructed in physics and chemistry, and these subjects are not beyond the capacities of grammar school pupils except as we make them so.

J. J. Thompson in his presidential address before the British association last summer, said: "I think a famous French mathematician and physicist was guilty of only slight exaggeration when he said that no discovery was really important or properly understood by its author unless and until he could explain it to the first man he met in the street". When we claim that physics cannot be taught to children we disagree with Faraday and perhaps show that we do not properly understand either physics or children.

There will be no such thing as a private dwelling house in New York City in the future. We are all moving into apartment houses—great community dwellings. A modern apartment house is a complete physical laboratory, or better a machine shop, and each inhabitant must understand most of it, otherwise he will be ridiculed for his greenness or condemned and ostracised for his ignorance. A rich and valuable course of instruction might be built upon the following list of physical appliances: Furnaces and boilers, blowers, dynamos, motors, pumps, filters, water meters, gas meters, electric meters, plumbing equipment, hydraulic or electric elevators, appliances for cooking by gas or electricity, ingenious devices to be found among the cooking utensils, dumb waiters, refrigerating machinery, vacuum cleaners, laundry machinery, steam dryers, devices for controlling temperatures, fireless cookers, steam or electric heaters, coffee perculators, double boilers, thermos bottles, ice cream freezers, chafing dishes, coffee mills, egg beaters, electric lights, electric bells, telephones, machanical piano players, sewing machines, electric irons, children's mechanical toys, the baby's go-cart, bicycles, clocks, watches, fountain pens, trolley cars, etc.

It goes without saying that young people who dwell outside of large cities will have abundant contact with machinery, in these days when nearly every man who earns a living on a farm or in a shop does so by operating some machine.

The children should study interesting accounts of the struggles, trials and successes of inventors and their inventions. Goodyear and vulcanized rubber; Elias Howe and the sewing machine; Stevenson, Fulton, Watt, and Bessemer, and promoters like Morse of the telegraph, Field of the Atlantic cable, Marconi of wireless telegraphy and Edison the inventor and promoter of appliances innumerable. Cooking and other domestic processes furnish countless illustrations which belong to the realm of physical science: Combustion, canning and preserving; cracking of fats in frying and roasting; combustible vapors formed from a kettle of hot lard; characteristics of boiling cocoa, milk, soap suds, etc., compared with those of boiling water; osmose; diffusion; emulsion; charring. Bread gets dry, and crackers get moist. Changes of starch and sugar; action of baking powder, yeast, soaps and other cleansers; disinfectants. Effect of water, alcohol, hot dishes, etc., upon polished tables; bleaching; fading; tanning; soldering; welding; tempering; sharpening knives; properties of iron, tin, brass, copper, aluminum and silver; rusting; tarnishing; alloys, galvanized iron, agate iron, enamelled and plated ware. What is there in iron which should make two stoves which look alike cost such widely different prices? Why should one knife cost 25c, and another $1.50?

Physics and chemistry quite as much as biology lead us to hygiene and the public welfare. Teachers have done much to make boards of health possible. They have aided the movement for introducing fresh air into public buildings. Let us next propose to ventilate, filter, and humidify the air of large apartment houses. When the public demand comes upon us with full force, it will make our present teaching of physics and chemistry in schools and colleges seem foolish. The study of machines will not then begin and end with a few formulas concerning the so-called "mechanical powers".

Of course, physical science deals with much besides machines. It furnishes answers to nine tenths of the questions which the children ask, and even biology itself is three quarters physical science. It is the first subject which the child voluntarily studies before he begins school and it is the only study which he persists in, during all his school days, with the help of his teachers and elders if he can get it, otherwise in spite of them. No year of school should be without it. I am not particular what we call it. "Nature-Study" is good enough, without any other limiting adjective. What is wanted throughout the whole elementary school is not the teaching of the principles of science, as a catalogue, but the cultivation of instincts, and the accumulating, comparing, and interpreting of experiences. The person who learns to ride a bicycle, swim, walk on stilts, fly kites, play marbles, ride horse back, sail a boat, play billiards or tennis, or golf, is acquiring experiences which raise a multitude of questions and prepare the way for understanding their answers. The finding of these answers constitutes the study of physics. Laws of motion are simple enough if learned by experience and without quantitative treatment.

1. You ride standing in a street car holding on to a strap; when the car starts suddenly you pull hard upon the strap to get your body in motion because "a body at rest tends to continue at rest", and when the car stops abruptly you pull hard to make your body stop moving because " a body in motion tends to continue moving", and when the car rapidly turns a corner you pull hard to bring your body around the corner because "a body in motion tends to continue moving in a straight line". So much for the first law.

2. Now suppose you jump out of an upper winow and jump away from the building so as not to land on a picket fence. You depend upon gravity to bring you down, regardless of the fact that you have projected yourself horizontally to escape the fence. If the window is 16 feet from the ground and you jump horizontally at the rate of 10 feet per second you will reach the ground in one second and land ten feet from the

building. Each motion having proceeded without being in any wise affected by the other. Your path of descent will be a curve, because the horizontal motion is uniform, while the vertical motion was accelerated—and hence the second law.

3. Suppose you attempt to throw a heavy weight, you learn by experience that you must brace yourself to prevent the weight from throwing you backward. For every action there is a reaction and the fact that these are equal is interesting and entirely acceptable to the pupil upon so good authority as either the text-book or the teacher. Physical nature study stands most in need of readable books, books fuli of information about every day experiences. The fact that many writers are applying their literary art in the service of biological nature-study is the chief reason why it occupies so largely the attention of pupils and teachers. Physical nature-study will never secure much attention in school so long as we cling to the idea that it must get on without books and that teachers and pupils must evolve it wholly from objects.

We have the richest subject in the whole school curriculum. It lies nearest to the hearts of the pupils. It has in it the greatest possibilities of furnishing both information and training. It simply remains for those who can—to do their duty.

THE SILO

By JOHN F. WOODHULL, Ph.D., Professor of Physical Science, Teachers College, Columbia University

In proposing this topic for nature-study I have merely presented the facts to be taught and said nothing about the method of presentation. It would be my idea to expand each one of the topics mentioned in the preceding paper (read at the Boston meeting), or others according to the locality, somewhat after the manner of this one on the silo.

Cows need green food, but it is impossible for them to have it for more than half the year unless we preserve it in some way. For our own food in winter we have many farm products preserved by drying, by canning and by pickling. For the cattle, also, we have farm products preserved for winter by drying, as, for example, hay; and in the case of the silo we preserve green food by a process much like canning in its results.

In canning fruit or vegetables for our own use, we heat to kill the germs of fermentation and then seal to keep other germs of molding, fermentation, and decay from getting in. The silo enables us to preserve green corn in the stalk so that

SILO FROM WHICH MOVABLE TRACK AND CAR ARE USED TO CARRY SILAGE TO MANGER
(Plate loaned by Dairy Dep't., College of Agriculture, University of Illinois)

it will keep quite as good as fresh for months or years. Indeed, we may, if we choose, preserve it in years of plenty to feed out in years of dearth. The silo even enables us to make into good food coarse grass and weeds which are not naturally fit to feed to cattle. Many things like the vines of peas, beans and hops, and the tops of beets, turnips, carrots, etc., which cannot be dried and fed as hay, may be made into excellent food by the silo. Root crops, like potatoes, which may have chanced to freeze, or have been infected by disease and would otherwise spoil, may be preserved in a silo and made into good food for cattle.

When corn is allowed to ripen on the stalk there is little of value for food in it beside the kernels. Cows will eat the dried leaves, to be sure, if they are hungry, but the hard dry stalks are not only poor food, they are a nuisance either as litter in the barn yard or as obstruction to tillage of the fields. Yet the stalks which grow on a single acre may, if preserved in a silo while they are green, make food enough to keep half a dozen cows a whole year.

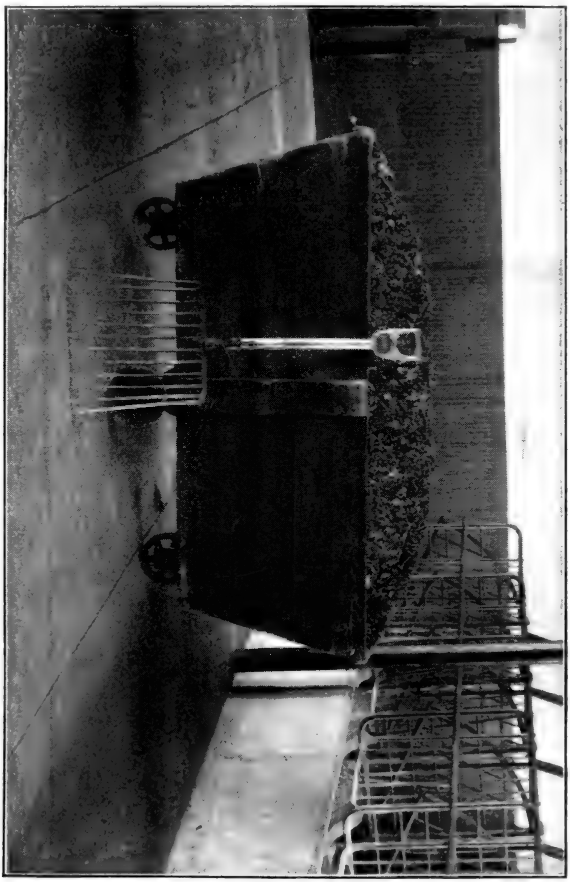
The silo which I have in mind is a wooden cylinder, 18 feet in diameter and 30 feet high. It cost $175 and will hold 150 tons of green corn stalks. It furnishes three quarters of the coarse feed given to 30 cows during eight months of each year.

We let the corn grow until the lower leaves begin to turn yellow and the kernels begin to dent. We then cut it while the stalks are still juicy and the kernels are still full of milk. We chop this—stalks, leaves, kernels, cobs, and all—into very small pieces and pack the silo with it as tight as possible. In two or three days this mass begins to ferment and grow hot—about as hot as a hot bath, say 110 degrees F. We call it silage.

An interesting experiment may be performed, to parallel this process in a small way, by chopping some green stuff and packing it in a large pail, or ash can, with a cover. Thrust a long-stemmed thermometer down into this mass to note its temperature from day to day.

We are familiar with the fact that animals are warm while they live but grow cold when they die. We connect this with the fact that they take in oxygen from the air, cause it to unite with carbon in their bodies and give out carbon dioxide. We show the presence of this carbon dioxide gas in the breath by breathing into a wide mouthed bottle containing a spoonful of lime water, shaking it and noting that it becomes milk white. Plants likewise absorb oxygen from the air and give out carbon dioxide. This process in plants likewise produces heat—although slowly, because the process is slow in them. Hence we do not think of plant heat as we do of animal heat; ordinarily the heat escapes as fast as it is produced and does not accumulate sufficiently for us to detect it.

Plants do not die as readily as animals when chopped and mashed to pieces. The chopped corn in the silo is still alive and continues so for several days during which time it absorbs the oxygen of the air which was entangled with it when it was packed. Carbon dioxide is given off and the heat produced by



SILAGE CART FOR USE ON CEMENT FLOOR
(Plate loaned by Dairy Dep't., College of Agriculture, University of Illinois)

this chemical action, being kept in by the large mass of closely packed stuff, may rise as high as 150 degrees. The thermometer which we put into the pail of silage will not rise as high as that, simply because there is less material both to produce heat and to confine the heat. It will, however, show a considerable rise in temperature. This may also be detected by thrusting the hand down into the silage. That carbon dioxide is produced in the pail may be shown by putting a spoonful of lime water into an open bottle and placing it inside the covered pail. After a time take it out and shake it. The lime water will become milky white, showing the presence of the gas. This carbon dioxide in the silo kills the germs of fermentation which were present when the corn was packed in it, just as it would kill a man who might go into the silo during the first few days without ventilating it. That is, the germs of fermentation are stifled by lack of oxygen. In the same way the plant cells are killed. Hence carbon dioxide gas accomplishes for the silo what cooking does in the case of canning fruit and vegetables in the household. It is most essential that the silage should be packed germ-tight, or as we usually say air tight, because air passing in would carry not only oxygen but also germs of molding, fermentation and decay with it.

When all life in the silo ceases, heat is no longer produced and the temperature very gradually tends to become that of the surrounding air. The chemical changes which were produced during the first few days by the living cells and by the ferments, appear to make the mass more palatable, more digestible, and in every way a better food. If the process were allowed to go on farther, it would spoil the food; but in a large, well-packed silo, the process may be arrested completely at the right stage and the silage may be kept without change indefinitely.

The experiment in the pail should be carried on for many weeks to show what sour and mouldy stuff would be produced in a silo if it were not big enough and not packed tight enough to completely arrest the chemical action. Of course ferments attack the top layer of silage in all cases and make it sour and musty. This action however takes place only in the upper layer. When feeding from the silo begins we reject the top layer and afterward the cattle use it fast enough so that no silage remains on the surface long enough to spoil.

In Europe, silos were dug in the earth fully 2000 years ago for preserving certain foods, but the first silo in America was built in 1879. They have been perfected and have come into general use only during the last 15 or 20 years.

Good silage is good food for milk cows, and no reasonable objection has thus far been made to it.

The silo suggests several kindred studies. After mowing the lawn, rake the green grass into a heap, the larger the better. Let it stand for two or three days and note how hot it becomes down in the center of the heap. Well cured hay in the mow produces some warmth by reason of chemical changes. These carried to a certain extent give the pleasing aroma of new hay and the flavor which cattle like. The warmth of the hay mow is well known and liked by tramps. I once went into the hay mow on a dark night to pitch down some hay for my horse and the first thrust of my fork brought out a yell from a sleeping tramp who had crawled in out of the cold and covered himself in the warm hay. Most tramps have matches and a pipe, and it seems more probable that fires in barns are due to them than to the spontaneous combustion of heating hay. The heating of any substance above 160 degrees either kills or greatly restrains the action of organisms which may be present and hence the temperature of fermentation is self-limited. Laboratory experiments show that hay will not kindle until its temperature rises above a thousand or fifteen hundred degrees. It decomposes, chars and produces a vast amount of smoke before it inflames.

New grain piled in elevators is liable to heat. Malting grain gets hot. Cotton with the cotton seed left in, heats. Linseed oil absorbs oxygen from the air and produces heat. Cotton waste which has been saturated with linseed oil and piled up so as to admit air, but at the same time retain heat, gets very hot. Insurance companies believe it may cause fires. It would be a satisfaction to have the experiment tried and reported. In a case like this when the chemical action is not due to living organisms, the rise in temperature hastens the process and spontaneous combustion is altogether conceivable. Manure in piles gets hot, but the temperature is limited to about 160 degrees because the heat is chiefly due to the action of ferments which cannot live above that temperature. Fermenting apple juice grows warm, but a temperature of 140 degrees would kill the yeast germs in it which make the cider, and later a temperature of 104 degrees would kill the acetic ferment which makes the vinegar. Chemical action causes the heat of the human body, but we cannot endure long a higher bodily temperature than 98.3 degrees, although birds live normally at 110 degrees. Hence Pasteur said they are immune from some of the germ diseases which attack us.

We now have evidence that their immunity is due to other causes.

Chemical action is the most common cause of heat. The action of lime and water may be cited as one among a hundred illustrations. Both may be cold to begin with but a temperature as high as boiling water is soon reached. If we use a large quantity of lime and the appropriate amount of water, the heat produced will set fire to wood. The large quantity serves two purposes; 1, it produces more chemical action and hence more heat; and 2, it covers and prevents the loss of heat. The reasons for taking only the appropriate amount of water are, 1, if we take too little the action will not produce heat enough; and 2, if we take too much the heat will be dissipated by warming and evaporating the extra water. When the proper amount is taken no water is left. The mass is absolutely dry, all the water having been changed chemically into something else.

When we cover ourselves with so-called warm blankets we do not produce heat thereby, but we prevent the loss of that which is produced. It is not possible for us to increase our bodily temperature much by covering, since this merely restrains the life process which produce the heat. On the other hand we may accustom ourselves to go with little clothing, even in winter, and our bodies, like automatic machines, keep up the normal body temperature by producing more heat.

Many experiences impress upon us the fact that chemical action produces heat. My next study would lead us to the furnace and the boiler.

A RECORD OF SOME STUDIES IN MAGNETISM

By JESSIE R. MANN, Assistant in Science, Northern Illinois State Normal School, Dekalb, Ill.

The subject of magnetism is a very old one to the textbooks but a rather new one to the nature-study course. It has proved a very interesting subject to a class of thirty-four pupils, twelve boys and twenty-two girls, who have just completed the eighth grade in country schools.

In performing the simple experiments, the children have worked in groups of four except in a few cases where the teacher, with the help of one or two pupils, has demonstrated.

The apparatus needed is inexpensive and most of it very easily obtained. It includes a lodestone, bar magnet, compass, two or three knitting needles, a half-dozen sewing needles, a few tacks, pins and nails (wire and cut nails), a cork, a piece of sewing silk, some sort of support from which to suspend needles, a little cheese-cloth sack of iron filings and several large sheets of paper for each group. Besides these, they have used a wall map, a schoolroom globe and a couple of soft iron rods a foot and a half long. The use of a laboratory is not necessary, though convenient. When mapping fields of force with iron filings, the sheets of paper were laid on the floor and the children gathered around them. They have taken up the following topics, all of which are treated in textbooks and accessible to any teacher, even in a country school. The class has used no text.

I. Study of the lodestone.
   - Examination.
   - Experiments with tacks and discovery of poles as spots when attraction is strongest.
   - What lodestone is; where found.
   - Making magnets of needles by rubbing them with pole of lodestone.
   - Kind of magnet thus made, artificial.

II. Study of artificial magnets.
      - Bar
      - Horseshoe.
   - Experiments with large number of different things and classification into magnetic substances and non-magnetic substances.
   - Best way to magnify a needle.
   - Poles of a magnet.
   - Experiment with suspended magnetized knitting needle and discovery of north-seeking and south-seeking pole.

III. The Compass.
   - Its use; great value to sailors.

IV. Law of magnets.
   - Experiments with two magnetized needles floated on cork and observation of behavior of poles toward each other; bar magnet held near suspended needle, etc.

Statement of the law worked out by the class.

V. Further study of poles.

Effect of breaking a magnetized needle into two, four, eight pieces.

Effect of placing one pole of a magnet in contact with the middle of soft iron bar.

VI. Temporary and permanent magnets.

VII. Theory of magnetism.

Illus. experiment: Fill test-tube partly full of iron filings; cork; turn on side and distribute evenly; magnetize by drawing one pole of magnet from center out to end and other pole from center out to other end. Test with compass and suspended needle. Shake and test again. Explain.

Use this to illustrate what happens to a needle when a magnet is drawn over it. (See "Principles of Physics" by Gilley, page 391.)

[Note: These children had some notion of the molecular theory gained from their fall study of osmosis in plants. Otherwise that would have to be given here.]

For diagrams see "First Course in Physics" by Millikan and Gale, p. 233. A good plan is to cut little cardboard oblongs making one pole blue and arrange them as in an unmagnetized and as in a magnetized bar. This will require much discussion, but it is well worth while.

Go back over previous experiments and see how this theory helps us to explain many curious things in the behavior of magnets.

Work out the difference between a theory and a law.

VIII. Study of magnetic fields and lines of force.

Experiment by placing a bar magnet on sheet of paper and putting a magnetized sewing needle suspended by an untwisted silk thread near north-seeking pole and gradually moving it in a half-circle around to the south-seeking pole. Mark the path of the needle on the paper.

Map field of force by using iron filings (see any text book.) Draw field of force as shown by filings.

Again use the suspended needle carrying it from north-seeking to south-seeking pole above the bar magnet and get the image of lines of force passing out from north-seeking pole to south-seeking pole in numberless planes until they form an invisible sphere of influence about the magnet.

Place two magnets with like poles near together and demonstrate the direction of the lines of force by means of filings. Place two magnets with unlike poles near one another. Try placing two magnets side by side with like poles together; with unlike poles together.

(Gilley is good for suggestions.)

Develop a definition of magnetic field and lines of force.

IX. Making magnets by simply (1) putting a piece of iron or steel in contact with a magnet.

(2) By merely bringing it within the field of force of a strong magnet.

X. The earth as a magnet.

Illustrate by putting a magnet within a globe, or build a sphere around a magnet (as suggested by Gilley), and experiment by placing the compass in different positions upon the globe. How does it point? Locate on map and on globe, the north and south magnetic poles. Care must be taken here or confusion will arise between the magnetic and the geographical poles. Use the suspended needle and with it held near the globe containing the magnet, let it trace lines of force about the globe. Sketch on the board.

XI. Dipping needle.

If we should take a magnetized knitting needle suspended from a string to the north magnetic pole of the earth, what position would it take? At the south magnetic pole? Half-way between them? How would it stand here? (Slanting.) Can we find out how much it would slant? (Class suggest.) (Millikan and Gale give excellent directions for making a dipping needle. Everything depends upon the care with which the needle is balanced and upon not destroying the equilibrium while magnetizing it.)

Measure the slant or inclination in degrees by using a protractor. This may require some time to work out, if the children have never measured angles before, but it is not too difficult if the teacher wishes to undertake it.

XII. Magnetizing a piece of soft iron by means of the earth's magnetism (See Gilley, or Miilikan and Gale.) Test poles with a compass and with magnetized needle. Discovery that steam-pipes in the room are magnetized by the earth's magnetism.

* * *

In handling so large a class, very little individual assistance could be given except in the case of a few who especially needed help. The pupils made their own laboratory manuals, and every laboratory lesson except the first, was discussed beforehand and specific directions for performing the experiments were worked out as a class exercise and copied from the blackboard; also suggestive questions to be answered. The recitation period following laboratory work was spent in discussion and in writing up the experiments. Simple sketches were made to supplement the brief notes.

Contrary to our expectations the girls have been as much interested as the boys and have done fully as good work. As the last question of a test, they were asked to state which they had enjoyed more, their study of magnetism or of dairying,—the favorite topic of the fall term. All but two voted for magnetism, and these were girls.

In choosing between the various topics, or experiments, most liked best the dipping needle. As one boy expressed it: "I liked the dipping-needle best, because it took a good deal of patience but when we succeeded in making it we found it something worth while. It had to be almost perfect else the experiment was a failure. Taking it as a whole, I like the topic of magnetism very much. Of course there is quite a bit of it supposed, but one does not care always to study things that have been proven by every body; that is, it's something of which you have a right to express your own opinion or else try to prove what others have tried to prove."

A girl wrote: "I have enjoyed most the working out of the fields of force, because it brings out some things invisible and it seems almost magical the way the filings take their positions. It was very interesting to experiment with the magnets in different positions because it keeps one wondering what will happen next. It makes you think lots to understand why they go the way they do."

The work here outlined is being followed by a study of electro-magnetism and its application to modern industrial life, the crane used in foundries, the electric bell, the telegraph, etc. A prominent aim, as in all nature-study work, is to bring the child into closer relations with his environment.

THE PROBLEM THAT FACES US

(The following communication from the president of the A. N-S. S. is timely and in keeping with the announced purposes of the Review. ED.)

The movement that has been so well started by Professor M. A. Bigelow—first in the form of the Nature-Study Review, and secondly in the form of the American Nature-Study Society—deserves the active cooperation of every one who is interested in elementary science in any of its forms. In starting the Review and in organizing the society Mr. Bigelow has helped greatly in giving definiteness to what had previously been much more divergent interests. He has done this work at much sacrifice in time and money. It is understood that Mr. Bigelow is soon to return to active assistance in both magazine and society, but on account of other work, we are informed, absence for a time from these duties is necessary.

To further the interests of the magazine and society, at least three things are necessary. First, there are a good many people who are interested in the nature-study movement who are more or less out of sympathy with some of the things that have been done in the name of nature-study. Will not all these people take an active hand in doing something constructive in connection with the work, instead of using their energy in decrying the real or imagined evils that may have been practiced? The American Nature-Study Society and the Nature-Study Review are intended to be large enough to include all who are really interested in the movement. Magazine and society were organized in the interests of constructive work, and all who are doing anything with nature-study or who are directly interested in those who are doing anything, should feel it a matter of opportunity and duty to study the situation in a constructive way. Evils may have been conspicuous, even ludicrous, but if we continue to put in so much time pointing out evils, a doubter who is not well informed may properly wonder if nature-study does not consist pretty largely of evils. Those who organized both magazine and society stand for this constructive work, and we bespeak the assistance of all in extending and making more real this ideal.

Secondly, a society of the scope in purpose of this one should reach a very large number of people—more than it is now reaching. It can be made to do this very much better if those who are now familiar with it will feel responsible for bringing it to the attention of teachers and others who should be interested in the movement. The editor-secretary, who doubtless will give all the time that can be expected of him, and more, will be unable adequately to present the case to any considerable number of those who can be reached by the members if these members will make it their duty to follow this suggestion. The editor-secretary will have much to attend to, and should have your assistance in this matter of extending the membership of the society to the end that its work may be extended and that it may have the assistance of people who are not now engaged in its work. Those who are not teachers know several of their friends who may be interested. Teachers know some of their fellows who might profit by the organization and also might contribute some first-hand experience for the pages of the magazine. Those who are teaching preparing teachers in normal schools and colleges, have students who will benefit by being informed of the society and magazine and the teaching should be more effective thereby. If all will attend to this, there will be an increase in the membership that will make the work of the editor-secretary easier and more valuable to the society.

Thirdly, cannot the members of the association assist in making our contributions to the magazine very concrete? Instead of continuing to state theories about what nature-study is, let us see what it is by having more of it presented. What some teacher has actually done, what some one has observed in nature, illustrations of natural phenomena, plans for work based upon some experience in doing nature-study work; papers, discussions, drawings, garden plans, nature experience of children will help to make the subject tangible, and will help teachers to feel that the subject is possible and worth while. Reports of observations and discoveries of children and grownups are stimulating, stimulating to one who reports as well as those who read. These reports should come not only from teachers in the schools, though naturally many of them should come from that source, but from out of school as well. There are in the elementary schools, the high schools, the normal schools and colleges and in community organizations many observations and experiences that are worth reporting to others. Real nature contact both in determining what is true in nature and in determining how it may be taught so that the best educational results may be had, are the things concerning which we need discussion. More nature and more experiment in doing something with nature will be helpful to us all.

Otis W. Caldwell

RELATION OF ELEMENTARY SCHOOL NATURE-STUDY TO SECONDARY SCHOOL SCIENCE

Committee Report Presented to Central Association of Science and Mathematics Teachers—November 26, 1909.

[EDITOR'S NOTE: This report will doubtless be of interest to readers of the NATURE-STUDY REVIEW, as it is an attempt to sum up the present situation. As it has not been printed elsewhere, except for distribution at the meeting, it will be new to most of the readers. The committee consisted of Fred L. Charles, Chairman; Otis W. Caldwell and J. A. Drushel. The report was criticised as being somewhat pessimistic, but it was not intended by the committee that such interpretation should be made.]

I. INTRODUCTORY

1. Definition of Nature-Study; 2. Purposes of this investigation; 3. Significance of the problem.

II. THE EQUIPMENT DESIRED OF THE CANDIDATE FOR SECONDARY SCIENCE COURSES.

1. A body of concrete knowledge—acquaintance with common phenomena. 2. Manual experience—in field, laboratory (and shop). 3. Problem-solving attitude—enthusiasm for investigation—initiative—persistence. 4. Disciplined senses—alertness. 5. Some power of organization—ability to think by points. 6. Some knowledge of sources—appreciation of scientific authority. 7. Proper skepticism—insistence upon conclusive evidence. 8. Imagination—within proper limits. 9. Sane appreciation of the aesthetic. 10. Reverence for eternal values.

III. THE PRESENT CONDITION OF NATURE-STUDY

(A) Popularly speaking, rather in ill repute; unorganized as to principles and course of study

Causes:

1. Lack of preparation on the part of teachers; ignorant of subject matter; spirit of inquiry absent; scant appreciation of scientific method; sometimes dominated by adult or pure science view point; in bondage to books.

(a) To what extent are the high school courses responsible for this lack of preparation?

(b) In what measure should secondary science endeavor to remedy the situation?

(c) Apply questions (a) and (b) to the elementary school curriculum.

(d) What should be the nature of the science courses in the Normal School?

(e) What is the function of the College in the preparation of elementary teachers (of Nature-Study and Geography)?

(f) Other agencies; e. g., extension courses.

2. Lack of preparation of supervisory and administrative force, which lacks familiarity with materials, methods, aims and values.

3. Indifference or opposition on the part of patrons and public generally; classical ideals; failure to appreciate the function of science training.

4. Immensity of the field

The entire natural environment, including the pupil himself, and much of the artificial environment.

(B) Present trends

1. American Nature-Study Society.

2. Schools of Education and Normal Schools.

3. Numerous attempts now being made toward better organization of science materials in grades and High Schools.

4. Industrial education.

5. Farmers' Institutes.

6. Elements of agriculture.

7. General movement toward rural life and rural interests; out door art.

8. General science course in first year of High School.

IV. THE PRESENT CONDITION OF SECONDARY SCIENCE.

1. A period of unrest and inquiry; new demand for definition of aims, formulation of principles and organization of courses. Evidenced by literature, programs of meetings, the demand for vocational education, the "new movement in physics teaching", the purposes of the American Federation of Science and Mathematics Teachers, etc.

2. Variance in curricula, as to

(a) Sequence of sciences.

(b) Length of courses (term, semester, year; also periods per week).

(c) Required subjects.

(d) Organization of courses, as determined by purposes for which they are taught.

3. The proposed first year general science course.

(a) As expedient until Nature-Study comes into its own, affording an organization of the knowledge of environmental materials.

(b) As an introduction to the differentiated sciences which come later.

(c) As furnishing a necessary life view.

4. Characteristics of the present secondary science courses, as to aims and content.

General status of

Physiography	Physics	Astronomy	Physiology
Botany	Chemistry	Agriculture	
Zoology	Geology	General Science	

5. Preparation of teachers.

(a) In special field.

(b) In general educational ideals and practice.

(c) In sympathetic touch with the elementary school.

6. Preparation of pupils.

(Note the universally admitted "gap" between elementary school and secondary school. Cause of this gap? Are we to find its explanation in the pupil, the teacher or the system? Attempts to close it.)

(a) As to maintained interest

where Nature-Study is not taught,
where Nature-Study is badly taught,
where Nature-Study is well taught.

(b) As to maturity and equipment of pupil for pursuit of differentiated sciences as now taught.

(c) As to attitude toward industrial (or household) science.

7. Influence of college ideals and entrance requirements.

8. Advantages to science afforded by sex segregation.

V. CLOSER ARTICULATION BETWEEN NATURE-STUDY AND SECONDARY SCIENCE IS DESIRABLE, TO BE EVIDENCED IN NINTH GRADE PUPIL

By 1. Maintained interest. 2. A ready fund of concrete knowledge and varied experiences. 3. Manual and sense disciplines. 4. Habits of study; in particular, the scientific attitude. 5. Special equipment for the various sciences.

VI. TO ACHIEVE THIS END, NATURE-STUDY SHOULD BE ORGANIZED SOMEWHAT AS FOLLOWS:

1. Subject matter

Although specific materials must vary with the locality, certain dominant lines should run through the grades and serve as dependable bases for secondary science.

2. Course of study

(a) Must be based on fundamental educational principles derived experimentally.

(b) The studies must be sequential and cumulative.

3. Method

(a) Dignified.

(b) Scientific.

(c) On a laboratory and field basis.

(d) Should center in problem-solving.

4. Equipment

(a) Each elementary school should possess simple, generally useful apparatus. For example: Platform balance, thermometer, metric rulers, simple microscopes, compound microscope, horseshoe and bar magnets, compass, prism, lenses, rubber and glass tubing, air pump, acid, alkali, litmus, flower pots, tumblers, bottles, etc., etc.

(b) A working museum should be available.

(c) A school garden is highly desirable.

5. Correlation

Nature-Study interests and values should be recognized in all the other studies of the grade curriculum.

VII. SECONDARY SCIENCE MAY CONTRIBUTE TO THIS END

1. By taking active interest in elementary school Nature-Study.

2. By modifying the science of the first year.

VIII. THE PROPOSED FIRST YEAR GENERAL SCIENCE

A. Advantages

1. As an articulating agency.

2. As an outlook to life.

B. Objections

IX. RECOMMENDATIONS

In the interest of better scientific instruction in both elementary and secondary schools, your committee recommends the appointment of a committee whose duties shall be

1. To inquire into the present status and trend of Nature-Study in the territory covered by this association.

2. To advocate a more dignified discussion of Nature-Study in science meetings and teachers' associations.

3. To enlist other bodies in a study of the broader problems of elementary school Nature-Study.

4. To stimulate extensive experimentation in teaching Nature-Study in the grades, to the end that scientific data upon the question may be collected.

5. To report to this association in general meeting next year.

WHAT SHOULD BE THE ESSENTIAL PRINCIPLES UNDERLYING A COURSE IN NATURE-STUDY?

By G. H. TRAFTON, Supervisor of Nature-Study, Passaic, N. J.

(Abstract of paper read at Boston meeting.)

In discussing a question of this kind, for whatever subject it may be, we may look at it from three viewpoints. First and most important is that of the child. What are his needs and interests at the different ages? It is a mistake to assume that the child is naturally any more interested in nature-study than in the other subjects taught. We must employ just as good methods to arouse and hold his attention and interest as is done for other subjects. Second, the question may be viewed from the standpoint of the subject. What are its possibilities, and which of these are really worth while to the child? The third viewpoint is from the schoolroom. The actual conditions found here often compel us to modify very materially the ideal results which we might wish to accomplish.

Our problem then, may be restated as follows: What are the possibilities of nature-study which are most worth while to the child; and how much of these may we hope to accomplish under the present schoolroom conditions as they actually exist? To state the matter briefly, the thought underlying a course in nature-study should be to try to teach the child to see, to enjoy and to serve. Nature-study may also help develop reasoning power, but this does not appear to me to be its chief function.

Great care should be exercised in the choice of material. It is not enough merely to use anything which will develop power of observation. There is a large field from which to select and those things should be chosen, the observation of which is really worth while. This is specially important if that school of psychologists is correct which maintains that when the child is observing trees, he is simply increasing his power to see trees, and not his power to see other objejcts. In the lower grades there should be combined with the observations a large amount of hand work, such as drawing, coloring and cutting.

That the adult and child need some source of enjoyment in life is so evident as to need no discussion. Enjoyment is the lubricant for the wheels of life. And yet how little attention is given in our schools to the matter of how the leisure hours should be spent! How many of our boys and girls are lead into vice thru seeking pleasure in wrong channels!

That a proper system of education should teach the child to be of service to his fellows is also so evident as to require but the stating.

From the standpoint of the subject, are these attainments possibilities of nature-study? That it is especially adapted for developing powers of observation is well understood; no other subject in the curriculum seems adapted to serve this particular function, unless it be home geography, which in the lower grades is closely related to nature-study.

I most strongly believe that a knowledge of nature adds to the enjoyment of life, even though in some cases a person may be unconscious of it. Dr. Elliott in his essays on "Education for Efficiency," and "The New Idea of the Cultivated Man," refers several times to the value of nature-study in our curriculum for the enjoyment which it brings to life. Training for avocation is something which our educational system seems quite largely to ignore; nature-study may serve an important and neglected function here.

Nature-study may lead the child to be of service to the city and state in two important ways; in the preservation of health, both from the standpoint of personal hygiene and of public sanitation, and in the conservation of our biological resources, such as the forests, birds and fishes.

I would make the observational idea predominate in the primary grades and occupy a place of decreasing importance in each successive year. The esthetic may have a minor place in the primary grades with gradually increasing importance through the remaining grades. The economic idea may begin with a minor place in the intermediate grades and be dominant in the upper grades.

I wish to call special attention to the actual schoolroom conditions under which nature-study must be taught, because here is the point to which we should bend our energies in order to make the greatest progress. We must pay more attention toward helping the teacher.

One factor limits very materially the amount we may hope to accomplish,—that is, the time generally alloted to nature-study. I will compare the time devoted to biological nature-study with that devoted to the course in high school biology. This course is much better organized than is that in nature-study, and we know about what can be accomplished in it, so that this may serve as a somewhat definite standard for comparison. From data gathered from a number of New Jersey cities and towns, I find that about thirty minutes a week is alloted to nature-study, and occasionally forty-five or sixty minutes. As an average we may take three-quarters of an hour. I have not attempted to gather statistics for the whole country, but doubtless these conditions found in my own state are typical of many other eastern states. It is a common plan to restrict biological nature-study to the first six grades, which, with 45 minutes per week would give 4 1-2 hours weekly through all these grades combined. Little nature-study is generally taught during the winter, either on account of the difficulty involved in securing material, or because the time is occupied by physiology. This would take away about one-third more of the time, leaving 3 hours weekly as the total time devoted to biological nature-study in the grades. To the course in high school biology, five periods of about fifty minutes each are generally given, making about 4 hours weekly. Thus the time allowed for nature-study in all the grades is less than the time given to the year's course in high school biology. Other considerations to be taken into account in comparing these two, are that the children in the grades are less mature, averaging five years younger than in the first year of the high school; the grade teacher is not so well prepared in this particular line as is the high school teacher, and is usually obliged to provide her own material while the high school teacher usually has hers provided by the city authorities. All of these considerations point to the one conclusion, that under present conditions much less can be accomplished in biological nature-study throughout the grades than in the secondary course.

This leads me to the point I wish to make finally, that too much has been expected in the grades, and that one thing needed is to simplify very materially our nature-study outlines by reducing the amount required and including some of these eliminated topics in the high school biology. So from another approach I would reach the same conclusion as Prof. Hodge: "Simplify, simplify, simplify."

NATURE-STUDY NEWS

A Last Effort to Find and Save from Extinction the Passenger Pigeon—The following is quoted from a memorandum read at the meeting of the American Ornithologists' Union, Dec. 9, 1909.

"Through the interest and generosity of Colonel Anthony R. Kuser I am able to offer the following award:

"THREE HUNDRED DOLLARS ($300.00) for first information of a nesting pair of wild passenger pigeons (Ectopistes migratoria) UNDISTURBED.

"Before above award will be paid such information, confidential and exclusive, must be furnished as will enable a committee of expert ornithologists to visit the nest and confirm the finding. For the first nest with parent birds found undisturbed the award will be promptly paid.

Signed, C. William Beebe,
New York Zoological Park,
N. Y. City, Dec. 3, 1909.

"Colonel Kuser withdraws his former offer of $100.00 for a freshly killed wild pigeon. He does this on account of the great present danger of complete extermination of the species.

"Until Jan. 1, 1911, during Mr. Beebe's absence from America, address all correspondence on the subject to C. F. Hodge, Clark University, Worcester, Mass., who will arrange for confirming party and payment of the award, in case a nesting pair or colony is discovered."

Col. Kuser's offer is for the first undisturbed nest or mating colony discovered on the American continent. In addition to this, Mr. Mershon offers a reward of $100.00 for the first nest confirmed in Michigan; and I am authorized to announce a similar state award, also of $100.00, for the first nest reported and confirmed in Massachusetts. We want to secure at least one similar volunteer award for each state and Canadian province, in which the bird is likely to occur.

Further details, with plan of campaign, will appear in THE NATURE-STUDY REVIEW for March.

C. F. Hodge, Clark University.

Jan. 1, 1910.

THE NEW JERSEY TEACHERS' ASSOCIATION has appointed a committee to cooperate with the nature-study forces of the state with a view to strengthening the elementary school science interests.

NEW YORK CITY BRANCH—On Jan. 22, at Teachers College, Dr. C. F. Hodge gave an interesting and inspiring address to the New York Section of the A. N.-S. S.

The gist of his talk was that in nature-study we should work through the natural interest of the child. By beginning with some primary instinct or interest, as with pets, the child could be led naturally to related topics in which he might otherwise have little interest. Thus gardening might be distasteful to some children; but if they had chickens, cows, etc., they would be intensely interested in raising food plants for these animals. He emphasized the moral effect that comes from associating with pets and plants.

Dr. Bigelow gave an account of the Boston meeting and commented favorably upon the present status and tendency of nature-study throughout the country.

A committee was appointed to revise the New York City Nature-Study Syllabus to make it conform more to the environment of the child in congested parts of the city.

Enthusiasm in California.—At the annual meeting of the California State Teachers' Association in San Francisco last December, the Nature-Study section held one of the most enthusiastic meetings in its history. The following addresses were made, each topic being discussed by two or more speakers: "Health Study in Relation to Nature-Study", Dr. E. B. Hoag, Berkeley; "Present Status of Nature-Study in California", Dr. H. W. Fairbanks, Berkeley; "Some of the Problems of Nature-Study and How to Meet Them", C. A. Stebbins, Chicago.

The officers elected for the ensuing year are: President, E. B. Babcock, of the College of Agriculture, University of California; Secretary, C. A. Stebbins, Berkeley.

The meeting voted to organize then and there as the California Branch of the American Nature-Study Society and the above officers were elected as officers of this organization. As this business was delayed until after the close of the regular session, only seventeen remained to sign as charter members, but already the roll has been increased to about thirty and the outlook is bright for making this a strong active branch of the national society.

We trust that other states will follow this example.

The 1909 Annual of the Winnebago County (Illinois) Schools, prepared by Co. Supt. O. J. Kern, Rockford, Ill., is fully up to the expectations of those who look to Mr. Kern to set the pace for attractive and suggestive reports of rural school progress. It is a 96-pp. pamphlet and breathes the atmosphere of the twentieth century school.

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

OFFICIAL ORGAN OF

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SOCIAL HYGIENE: ITS PEDAGOGIC ASPECTS, AND ITS RELATION TO GENERAL HYGIENE AND PUBLIC HEALTH

By WINFIELD S. HALL, Ph.D., M.D., Professor of Physiology, Northwestern University Medical School, Chicago.

The expression Social Hygiene, in its broadest sense applying to the maintenance of health in the body social, has been in recent years applied particularly to that phase of social well-being associated with sexual well-being on the part of the units of the body social, that is, sexual right-living on the part of individuals, especially so far as this sexual right-living affects society.

The teaching of social hygiene must begin in early childhood, and its importance as a part of education should never be lost sight of by parents or teachers until the individual is well launched in the adolescent period. By the end of puberty, the fifteenth years in girls, and the seventeenth year in boys, the youth should possess sufficient knowledge on sexual matters to protect him not only from the vices that are so likely to become habitual during these years, but also from making mistakes in the case of the sexual system, which might lead to the undermining of the general health.

The development of the sexual equipment and function, and the knowledge of the same, has a double bearing upon development and training of the mind. In the first place, a knowledge of the function of reproduction and a proper attitude of mind regarding it must be recognized by educators to be a necessary part of the equipment of very young persons for life. In the second place, parents and teachers are morally bound to treat all questions of sex in the same, simple, straight-forward, truthful way that other life problems are treated. In this way only may we expect that a proper mental attitude toward Reproduction can be cultivated.

I. Pedagogic Aspects

1—*General Considerations*

Responsibility for the proper instruction of youth in all matters regarding sexual development and the care of the sexual apparatus, together with the great social problem of sexual right living, must in the nature of the case, rest upon the shoulders of the parents.

However, parents, as a matter of fact, are as a rule not discharging this responsibility. Statistics gathered from a number of representative colleges in the middle states show that only one young man in twenty received from his parents any adequate instruction on these subjects before he left home. If such young men, representing such homes, go out into the world uninstructed, to grope their way in the darkness of ignorance, what must be the mental condition of the youth from less thrifty families?

This condition of widespread ignorance regarding some of the most fundamentally important questions of social life and individual development came gradually to be understood among educators and professional men and women, and finally a representative body of educators, physicians, clergymen, lawyers, and social workers met in New York City four years ago and organized a Society of Social Prophylaxis, whose object, as indicated in the name of the Society, was by the dissemination of information to protect the individual and the body social against the dissemination not only of physical disease, which wrecked both, but of those low ideals and vicious customs which make the highest life impossible.

2—*Segregation*

The most important lesson learned during these years of experience in presenting this subject to all kinds of audiences, is the importance of segregation. By this I mean that boy hearers should be separated from men hearers. Mothers should be segregated from fathers. Furthermore, mothers and daughters should be addressed in separate audiences.

The more homogeneous the audience, the more definite and positive can the statements of the speaker be. It is easy to see that in an address to a mixed audience of parents and children, sex problems would have to be discussed in a most general and indefinite way. The circumlocutions would be so veiled and the allusions so remote that the speaker would probably be only vaguely understood by the more intelligent and experienced of his audience; while he would probably be grossly misunderstood by the less intelligent and inexperienced. Let such an audience be segregated along sex lines, namely, the women and girls in one audience and the men and boys in another. The situation would be somewhat relieved, though not by any means wholly corrected. One can talk more freely to a group of boys when they are alone and get more free and frank response from them when he has them alone, than he can in the presence of the fathers. The same thing would be true, of course, in an audience of mothers and daughters. Similarly one would discuss with an audience of fathers certain subjects which boys in the early years of adolescence should not know; such problems as those that concern the ethics of the home, for instance, between husband and wife, problems of maternity and paternity, problems involving the social evils and prostitution. All such matters may be discussed freely and frankly with an audience of men, but, manifestly, youths below the age of seventeen or eighteen should not be present in the audience.

Concerning a division of the audience on age lines, the sexes being mixed, audiences of the parents and then audiences of young people—actual experience makes it clear to me that a public speaker, particularly a physician, can talk much more freely to an audience of mothers than to a mixed audience of mothers and fathers. Before such an audience of mothers the problems of maternity, paternity, adolescence of the son and daughter, the mother's relation to adolescent youth, even reference to venereal diseases against which the mother should guard her younger children through instruction in the use of any public utensils, and against which she should warn her adolescent daughter—all these subjects may be discussed freely before an audience of mothers, women teachers and social workers, by a physician. But before a mixed audience of fathers and mothers he instinctively begins to deal in glittering generalities that may mean much or little and that are easily misunderstood.

As to the teaching of the story of life to young people in mixed high school or college classes, there seems to be some difference of opinion among social workers as to how that should proceed. There are in the country a few experienced high school and college teachers of biology, who beginning with the lower animals in their life history and life processes, discuss freely, among other things, reproduction in these lower forms, beginning with the protozoa and passing up step by step to the higher animals, until finally reproduction among the mammals is freely discussed as to its biological and physiological relations.

That these teachers ever carry the subject so far as to discuss with their pupils problems of human sex life, I doubt. However, the student of biology who has followed the subject as far as indicated above, would readily infer a very large part of the application of the general principles to the human subject.

An attempt to present even the biology of reproduction to a mixed audience of young people in a single address would be in a high degree unwise. As a rule, then, to which there can be few and rare exceptions, the problems of sex should be discussed in homogeneous audiences where one sex and age is segregated from another.

3—*The Matter to be Presented*

Having divided the hearers into homogeneous groups, what shall be presented to each group? Manifestly, the parents are interested in the far broader field and capable of understanding a far greater range of facts than are the children.

A group of boys of ten to fourteen should be told only those things that boys of that age need to know; for example, questions regarding reproduction: What goes on in an egg during incubation? What has the rooster to do in the process? Where do babies come from? What are general steps of their development within the body of the mother? Why do they begin to develop within the body of the mother? What has the father to do with this process? Then there are questions of physical development in the boy. To many boys these questions do not occur, but they should have them brought to their attention. They should be told how every boy passes through stages in his development in which he assumes gradually the stature, the mental qualities and the functions of manhood. It should be made clear to the boys that, to a large degree, they have it in their hands whether this development shall be a normal one, leading to stalwart virile manhood, or an abnormal one absorbed by vicious habits.

A group of older boys, fourteen to seventeen, may be given another chapter in the story of reproduction. Boys of that age are beginning to experience the "primordial urge" or sexual desire. Many boys of fourteen come to believe that all natural desires should be gratified, but the teachers of social hygiene must explain to the youths that the fires of passion must be banked, in order that the energies of manhood may be conserved to a time when they may be put to their legitimate use, namely, the begetting of a healthy offspring after the establishment of the home.

A matter of the greatest importance for youths of this group to understand is the influence of internal secretions from the sexual glands upon the body and its development. Most youths have seen the influence of castration upon the development of a young male animal. This profound effect is due to the loss of those glands which produce the internal secretions, distributed with the blood to muscle and nervous system. Without this secretion the animal never develops those splendid physical and temperamental qualities typical of the male of his species.

The matters to be presented to the girls, young women and mothers, are parallel and analogous to those presented to similar audiences of boys, youths and men.

4—*Method of Presentation*

How shall this carefully selected matter be presented to these carefully selected and homogeneous groups? This is a problem of pedagogy. In my presentation of this matter to boys I have used three defferent methods: the biological, the moral and the "heroic."

The biological method was not a success because I was able to meet the group but once and no adequate biological presentation can be made in one meeting of a class or audience. Several, or better yet, many such meetings should follow in regular succession, where actual living material collected from the plant and animal kingdom should be prsented and studied with the aid of the equipment of a biological laboratory. Manifestly such a presentation is out of the question for social workers, physical directors, and public lecturers. While this must be conceded to be the ideal method of presenting the subject of reproduction and sexual life, it is a method feasible only for the teacher of biology of a high school or college. A physician could, of course, with the facilities of his office, teach a group of boys and girls with this biological method, but the physician can rarely devote the time required for such a course of study.

The moral method was used after I satisfied myself that the biological method could not be used in the short space of one hour. By the moral method, I refer to an appeal, from a moral standpoint, for right living. After several attempts to stir up boys to a high and noble desire for right living, putting my arguments strictly on a moral basis, I came to the conclusion that the method was not effective, that it didn't really stir the boys.

The heroic method succeeded, because it was based on the human instinct of hero worship. Heroes appeal to boys. When one begins to discuss the real hero, every boy in the audience is awake and alert. He believes in heroes. He hopes to be one. He knows a few, and they inspire him to do and to dare. When one gets hold of an audience through discussing with them some great heroes, he has their undivided, almost painful attention when he asks the question: "What is the secret of the hero's success?" "What is the secret of manhood?" and "What can a boy do to grow into the highest type of virile manhood, which alone makes possible heroic deeds?" The lecturer can answer that in the last five minutes of a forty-five minutes' talk, and leave every boy in his audience convinced and determined.

As to the method of presenting these matters to young people and parents, I am convinced that incomparably the most effective method is a frank presentation of the findings of science. Don't try to point too many morals. If the presentation has been clear and convincing, the listeners will very readily draw their own conclusions and formulate their own morals.

II. Its Relations to General Hygiene and Public Health

As educators we must face the fact that social wrong living,—illicit and promiscuous sexual intercourse,—is certain sooner or later to be followed by a natural retribution in the form of a venereal disease.

These diseases are communicable by contagion, and are as readily caught by innocent parties as by guilty ones, when they are subjected to contact with a diseased person.

The leper of the orient was segregated and isolated. When he met a pedestrian upon a public highway he was required to stand aside, lift a warning hand and cry: "Unclean, Unclean!"

The syphilitic of modern times, however, with a disease no less contagious at certain stages of its course, mingles in society, and in the mart, drinking from our public fonts, wiping his face and hands upon our roller towels, using public conveniences in the toilet rooms of our public buildings and railways. He never raises a warning hand and his own family may not know of his revolting "uncleanness." In some cases the infected individual even subjects members of his own household to the dangers of infection. Thousands of innocent people, right-living men, women, and little children, come in contact with the virus and get an infection which may ruin the health and happiness for all the future.

But this is too dark a picture; let us put it aside and try to forget it. However, let us not forget to warn every youth to observe every precaution in the use of public facilities of every kind.

Fortunately, the rules of sanitation necessary to observe with respect to accidental infection with the virus of veneral diseases are general rules applicable to many other contagious diseases. Not too much emphasis should be laid upon the danger of catching venereal diseases from the use of public utensils and facilities. Venereal diseases should be simply mentioned as one of the possibilities.

Personal association with lewd and unclean people is an incomparably greater source of danger and every boy and every girl should know of the danger.

WHAT TEACHERS MAY DO TO PROMOTE PERSONAL HYGIENE AND PUBLIC HEALTH

By Dr. W. J. MACNEAL, Assistant Chief in Bacteriology, Agricultural Experiment Station, University of Illinois

1. School building and grounds should be kept in as nearly ideal condition as possible. Particular attention to cleanliness in the toilet rooms, water closets as clean and wholesome as any in the best homes of the community, provision for clean cups for drinking water,—proper attention to these things will yield a valuable return in the physical, mental and moral development of the pupils.

2. The physical well-being of the pupils must receive attention. Defects of the eyes and of the throat may be discovered by the watchful teacher when they have escaped the atten-

tion of the parents. The early recognition and correction of these faults is of tremendous importance to the developing child. In the absence of definite inspection of school children by a physician or nurse, this work must be done by the teacher or not at all.

3. Some attention should be devoted to public health questions. The importance of pure food legislation, and especially the U. S. Food and Drugs Act, for the well being of the community and the promotion of honesty in the food industry; the importance of state and municipal control of local food supplies, and especially the municipal control of milk, may well receive attention.

4. Preventable diseases and more particularly tuberculosis, which causes one-fourth of all deaths among the effective population, should receive some attention. The prevention of tuberculosis by anti-spitting regulations, proper lighting and ventilation, good food and proper work and exercise, by the education of consumptives as to the nature of their disease and the care necessary to avoid infecting others, and by providing sanitation for advanced and hopeless cases, should now form a part of our common school education. The success which generally attends the proper treatment of consumption in its early stages may also be emphasized.

5. Much may be done to instill a proper appreciation of the value of physical exercise, and especially of school games. The interest and personal participation of every pupil in some sort of outdoor physical activity should be encouraged. Proper education along these lines will not only promote the physical, mental and moral well-being of the pupils, but may also do much to accelerate the advance to a more wholesome attitude of mind toward all school and college athletics.

BUTTER-MAKING IN THE SECOND GRADE

From the study of the cow, the question of butter-making arose. The children first thought that in order to make butter one must go to the country, get a churn and so forth, and then proceed to make the butter. After this notion had been eliminated, nothing would satisfy the children, but to make butter. Several children brought sour cream, two brought quart mason jars, others, salt, a bowl and a knife. We put the sour cream in the mason jar, corked it securely, and then each child shook it until finally the butter had formed. We then took the lumps from the jar, and washed it several times in a bowl of cold water. It was then mixed carefully, in order to get all the water out of it. A child tasted it and found that it lacked salt, so he proceeded to mix in a sufficient amount of salt. Now the butter being ready, my children, as all others, were very anxious to eat it. I had predicted this and so had arranged that crackers be handy when the time came. We buttered our crackers with our own home-made butter and had, as the children called it, a very enjoyable party.

ROSE KLEIN

CHICAGO NORMAL SCHOOL

ORAL INSTRUCTION IN HYGIENE: FIFTH GRADE TOPIC—CARE OF THE TEETH

By PROF. JOHN G. COULTER, Illinois State Normal University, Normal, Ill.

NOTE – The editor has requested presentation of a "unit lesson" in "physiology" for some one of the grammar grades. The writer, though desirous of doing what he can in the interest of nature-study, is reluctant to attempt the thing requested. For he doubts whether such a thing may be properly called nature study; at least he has mental reservations on the matter as not conforming to *his* particular idea of nature-study. However, with this preparatory note, realizing that, whatever the editor has requested, he has not requested a defense of the position that physiology or hygiene in the grades is not nature-study, the writer proceeds to present something which may do no harm, even though it may seem to have crept under the wrong covers, if it is deserving of printed covers at all.—J. G. C.

It certainly is a bother to brush our teeth. When we get through dinner or supper there is nearly always something interesting to hurry off and do, and what a a nuisance it is to go up to the bathroom or to our bedroom and get out a tooth-brush and some water and perhaps some sort of stuff to put on the tooth-brush and then scrub our teeth! What's the use anyhow? Our mouth feels all right, and tooth-brushing doesn't seem to do any good. Well, let's see if it does.

Perhaps this is the way of it. Perhaps tooth-brushing doesn't do any good, but perhaps "not" tooth-brushing does a lot of harm. Whichever it is we want to find out, because it's not going to be forty or fifty trips to the dentist, or false teeth for us, when we grow up, if we can help it; not even if it takes a little extra bother now. Dentists hurt too much, and they cost too much, and they cost a lot, too; so a good set of teeth, not just now, but all our lives, and no bother with dentists—that's as good as a lot of money in the bank. Every time we brush our teeth we may be saving a dollar and a "holler" at the dentist's. Anyhow, let's see.

Dogs don't have to brush their teeth, and they seem to have pretty good ones. Why do we have to brush ours? That's not a very easy question to answer, but there's an answer all the same. If we ate the same things a dog eats, chewed bones and all that, perhaps we wouldn't have to brush our teeth either. Away back there, ages and ages ago, before tooth-brushes and dentists and false teeth were invented, there were boys and girls all right. What about their teeth? Did they get holes in them, and have toothache, and go howling around the caves their fathers lived in till they got smacked to make them keep still? Perhaps not. For in those days the boys gnawed on bones the way dogs do now, and cracked nuts the way squirrels do, and their teeth were harder than our teeth are now; so they didn't get holes in their teeth and have to go to dentists to have the holes filled. And so the teeth didn't decay and fall out.

But it's very different now. For a long, long time boys and girls haven't been brought up on bones and hard nuts. More likely you were brought up on mush and milk, and don't get anything harder to chew than a piece of tough meat.

All right, then, let's just go out and chew bones and bite nuts. That will be more fun than tooth-brushing, anyhow. Yes, but you can't do it that way now. It's too late. You see you and your grandfathers and all their great-great grandfathers have been leaving bones and nuts alone for so long that now your teeth are soft to begin with, and you'll only hurt yourself and perhaps break your teeth by trying to do now what that little cave boy did so easily long long ago.

So we just can't get out of it. If we are going on living in houses instead of caves, and going on eating the good things at home instead of what dogs and squirrels eat, why, we have just got to brush our teeth and keep brushing them every day unless we want to wind up with forty-seven different kinds of tooth-aches, and a set of false teeth to finish up with.

Out in San Francisco there is a fine old man who goes up and down the docks where the ships tie up that come in from the Pacific Ocean, and every ship has one or more cabin boys aboard. What do you suppose those cabin boys do when they get a toothache way out in the middle of the Pacific Ocean, perhaps thirty days from land? Well, usually, at least on those sailing ships and freight steamers, they just have to grin and bear it. Or else the captain ties a string around the tooth and then sticks a hot poker in the boy's face and away he jumps and out comes the tooth.

Well, all that good old man does is to go up and down the docks looking after the cabin boys. And the first thing he says to a new boy when his ship comes in is, "Well, Jack, open your mouth." And that old man told me that there is not one boy in a hundred that comes in on those sailing ships that he does not have to take off to the dentist to have his teeth fixed. "And most of those poor kids," said Father Maloney, for the good old man is an Irish priest, "Most of my poor kids," said he, "have laid awake night after night, hollering in their poor dark little bunks, without a mother to comfort them, just because they didn't have sense enough to use a tooth-brush every day."

Well, have you sense enough? Or are you going to grow up and have false teeth and plenty of toothaches, just because you haven't sense enough to use that old tooth-brush now?

THE PLACE OF CHILDREN'S GARDENS*

By ELLEN EDDY SHAW

The chief reason for Children's Gardens in the school curriculum is perhaps physical; it is a racial instinct. It is as old as civilization, for it was one of those influences whch caused primitive, nomadic man to settle in one spot, because of his start at soil culture. It behooves us first to train a child along the easiest avenues, those of inheritance, to give him the benefit of the wholesome influence of the soil and to foster the love of the country and its activities.

Children's gardening should always be, at least in the spring, the key note of the nature work. Garden work is the live wire of nature study. It is the chief line of nature work which strikes back hard at the home, or better which forms a sure link between home and school, for children's gardens which are merely school gardens have lost their chief force. The school end of it should be the smallest part; it is to the home where the school garden interest should go. I know of

*Abstract of paper read at Boston meeting.

no avenue of work either in nature-study or any study so full of opportunity to work with the whole community as this special one.

I had a shortage of garden space at the Rochester City Training School. I asked for volunteer offers of back yards in two sixth grades. Thirty were offered. Thirty homes were actively touched. Fathers, mothers, babies, all helped. Not only were there thirty homes interested but the others all about these thirty centres. It is the business of the school garden to leak over into the back yards, the front yards, the side yards of the children and neighbors. There are thickly populated city districts where the big school or association garden is the only bit of ground space a child can get hold of. The products go home and often times an old tin can, a window box or a roof garden is the after effect. When the garden work loses this vital, human touch it might better give way for something else. It is a line of work which comes to a child at a certain restless, unbalanced time of his development, enters into his soul and acts as a balance, an anchor, a safe-guard to hold him, sometimes for all time, sometimes for just that time when he needs a temporary wholesome influence to save him from that which is not wholesome. To other children it comes merely as a big broadening life interest which stays as a source of pleasure and resource forever. To a community it comes to wake up, to draw together, to humanize.

The first two grades represent periods of gathering in of many percepts; the middle grades, periods of separating out and linking together of these same percepts; and the upper grades of grammar school a time of generalization from these same associations previously formed. This is but a loose summing up of the situation.

So in the first stages we cannot teach much of definite, specific garden work, but we can give a child a great deal in a very general way. At this time it may be a key note for the work appearing in all the free expression work. All the activities of the entire garden work may be followed by the child; he can help in clearing the garden spot, watch the ploughing and marking off of the garden, know what the other children are to plant. The garden work of these lower grades offers a splendid opportunity for the upper grades to assist in teaching the younger children. One of the best pieces of planting work I have ever seen was a seventh grade teaching a kindergarten class to plant corn and beans.

The middle school represents the place of keenest garden interest. It is good disciplinary work, too. Here rivalry is keen and it is the time to take advantage of it. The fifth year is a fine time to throw the work back home even though the school has its garden. I would have at that time all the home gardens possible. The third and fourth years should have very stiff work along lines of lessons in planting, transplanting, the indoor starting of seedlings, the arithmetic side of the garden, plan making, the writing of directions in good, clear English. Out of the fifth year home work ought to spring very spontaneous interesting English work.

In the upper grades splendid opportunity presents itself for problematic work. The original plan of the garden, its color scheme, the arrangements for getting and distributing seed, special economic work, e. g., raising of fibre plants, inoculation of soil, spraying experiments with special problems at home, the raising of certain marketable products for actual profit, etc.

Correlated with this is the arithmetic of the garden plan, keeping of debit and credit accounts, art work, good business letters. This unstrained sort of correlation is worth while because it has a reason for being.

I have not touched upon the work along the line of garden pests, of the value of birds, of the trees, of all those nature subjects which, in an unforced way, work naturally around this garden interest, and out of it. Learning about six common weeds is dead as compared with learning of those weeds which destroy the garden and which must be dealt with to protect the garden.

A grade course which fits a city, is not one for a town and is certainly not one for the country. In general the garden work to pursue in a country district lies along lines of improvement of school grounds and of special problems which strike back to the farm and interest the people at home; the work for the town usually is that of home improvement of back yard and of front yard and has large aesthetic value; the work of the city is in some cases, the big vacant lot problem, in others, the making the most of roofs, small yards and window boxes.

The whole matter of children's gardens resolves itself into a local problem.

EDITORIAL NOTES

The letters which have been called forth by the announcement of the plans of the Review for 1910 are very gratifying and indicate a lively interest on the part of elementary teachers throughout the country. The teaching monograph idea meets with especial approval. The March number, which should appear about the middle of the month, is already attracting much attention and orders for extra copies are coming with almost every mail. This Bird-Study Number will be copiously illustrated with photographs of domesticated song birds, game birds, birds of prey, and the like, tame, yet free. The articles accompanying these attractive pictures will be practical and helpful to teachers, and at the same time genuine contributions to bird literature. Already several orders have been received calling for large quantities of the Bird-Study Number for use in classes or for distribution to the teachers of a city or a county. Special rates will be given where these quantity orders are placed in advance of publication.

Owing to circumstances known to members of the A. N.-S. S., the first two issues of the Review this year have been somewhat late in appearing. Unless the unforseen happens, the March number will appear about the middle of the month, and the April number early in April. Henceforth we shall plan to have the Review reach its readers during the first week of the month for which it is dated.

* * * *

The American Nature-Study Society has from its inception conceived its interest to cover all places of natural history studies in elementary schools. Those environmental materials appropriate to the uses of primary education are the object matter of nature-study. The life-touch, the significance of these materials in child experience, gives the cue to the subject matter. To the pupils of the lower grades, these materials are but crudely differentiated, unorganized into nomenclatures. With the technical aspects of science the elementary teacher—though she may well be informed as a student—is not concerned as an instructor. She is to deal with the child world.

Among the standing committees of the A. N.-S. S. is a committee on Hygiene. The Review offers no apology for devoting its present number to this important general topic. One of the contributors in this issue, in prefacing his article, questions the propriety of including physiological studies, hygiene, etc., under the head of nature-study or under the covers of the Review.

The Review will continue to stand for fullest freedom in the discussion of the problems with which it is concerned. However, the editor entertains a liberal view as to the legitimate scope of this journal. No material object under the sun is of greater interest or of more significance to us humans than is the pulsing body which constitutes our earthly temple. There is every reason why its problems should be associated in the mind of the truth-seeker—of whatever age—with the problems of other animal or of plant life. From the study of the gnawing type, the flesh-eating type, and the grinding type of feeders to the human omnivor, is but a step,—or is one and the same study. The author of the article in question has succeeded well in popularizing his subject, but in so doing the "physiology" has disappeared. What shall we call that which remains?

* * *

It will not be amiss in this, our second number, to outline again the plans of the Review for 1910. The prospectus published in the January issue served to attract many new members to the society, and for the benefit of readers who may not have seen that number, the prospectus is here repeated.

As the official organ of the A. N.-S.S. this journal should not only contribute to the shaping of ideals, but should take the lead among those agencies which are endeavoring to organize the materials of science for the purposes of elementary education. To this end, it will undertake to make every issue immediately helpful to teachers through the presentation of concrete illustrations of approved nature-study lessons.

Each number for 1910 will be devoted to some particular subject of general interest, thus assuming the form of a *teaching monograph* on that subject. Each issue will make its individual appeal to some special group of workers, and at the same time the series will be valuable in its entirety to all educators.

The numbers now planned are as follows: January, PHYSICAL SCIENCE; February, HYGIENE; March, BIRD STUDY; April, GARDEN NUMBER; May, AGRICULTURAL EDUCATION (or RURAL SCHOOL NUMBER), September, INSECT STUDY; October, COURSE OF STUDY; November, HARVEST STUDIES; December, WEATHER STUDIES.

While each issue will thus assume a distinctive character, other features will not be neglected. There will be occasional discussions of a more general nature, nature-study news will be followed and current literature reviewed.

The plan as above outlined has met with the approval of those to whom it has been presented. We shall not be satisfied until the Nature-Study Review is recognized as an essential in the material equipment of every live and progressive teacher of children.

The annual membership fee in the A. N.-S. S. is one dollar, which sum includes the subscription to the Nature-Study Review for one year. Contributed articles and business communications should be addressed to

SECRETARY, AMERICAN NATURE-STUDY SOCIETY, Urbana, Ill,

BIRD-STUDY NUMBER.

As previously announced, the March issue of the Nature-Study Review will be an attractively illustrated monograph number devoted to the study of birds. An unusual number of original photographs illustrating bird-life and bird-study will accompany the various articles contributed by students and teachers of this most popular subject.

Quantity orders for class or county use should be sent to the Review in advance of publication.

The single copy rate is 15 cents. Orders for 100 or more copies, reaching this office *before March 15* will be filled at the rate of $10.00 per 100 copies. The expense of preparing the many illustrations renders a lower price impossible.

Annual subscriptions beginning with the March number will be filled for $1.00, which will insure the receipt of the equally attractive numbers which are to follow.

Address all orders to

Secretary, Amer. Nature-Study Society, Urbana, Ill.

REPORT OF SECRETARY FOR 1908-1909

1908

Receipts

From members' annual dues, subscriptions of non-members, advertising, and sale of back numbers—all sources	$ 787.16
Contributed by the secretary on account of deficit....	240.72
Total income	1027.88

Payments

Printing and mailing nine issues of The Nature-Study Review	$ 748.53
Clerical work on the Review	119.15
Stationery, postage, printed matter used in interests of A. N.-S. S.	160.20
	1027.88

1909

Receipts

From Jan. 1 to Dec. 31, 1909—all sources	$ 967.71
Deduct advance payments of members' dues for 1909	357.82
Net receipts for 1909	609.89
Contributed by the secretary on account of deficit....	93.74
Total income for 1909	703.63

Payments

For printing nine issues of The Review	530.34
Postage, mailing sample copies, circulars, etc., not included in charges for The Review	73.29
Clerical and stenographic work	100.00
Total payments for 1909	$ 703.63

It should be stated that in 1908 and 1909 about one-half of the necessary clerical and stenographic work was done by an assistant whose time was not charged to the A. N.-S. S.

Deducting the clerical work for which the secretary paid cash, the deficit for 1908 is reduced to $121.57 for 1908; and there is an actual balance in the treasury of $6.26 for 1909. Since the undersigned had agreed to manage the affairs of the Society for the two years, the charges for clerical work might properly have been omitted from the statements above. However, it seemed best to include them in order to show that the new secretary of the Society needs assistance to the value of at least $200 per year. In estimates previously published, and reported at Boston, regarding the deficit fund for 1910, it has been pointed out by the undersigned that in all fairness the Society should guarantee to the new secretary at least $100 per year for assistance. This will leave at least one-half of the clerical work to be arranged on the personal responsibility of the secretary.

The reduced cost of THE REVIEW for 1909 is due, (1) to the reduced number of pages printed in several numbers; and, (2) to a revised contract which allowed printing 1200 copies in certain months when 1500 were not needed. There is some demand for back numbers, but not sufficient to justify printing more than one hundred reserve copies. Also, illustrations were used in 1909 even less than in 1908. It seemed better to economize in these lines and to keep the cost of THE REVIEW as near as possible to the income available for publication.

The reduced cost of secretary's office expenses was made possible by a stock of printed matter sufficient for two years, but charged to 1908 account.

The somewhat reduced net income for 1909 is due to less sale for back numbers of 1905, 1906, and 1907; and to the unpaid dues of many members enrolled in 1908. THE REVIEW has not been mailed to members in arrears for 1909 dues. Some of these arrearages may yet be paid, and in that event should be credited on receipts for 1910.

Experience shows that it is impossible in many cases to distinguish between members of the A. N.-S. S. and subscribers to THE REVIEW. Since the price is the same ($1.00 per year), the secretary must depend entirely upon the application blanks which give official positions for publication in the directories. A new plan for membership will be proposed to the council of the Society.

In the number of this magazine for March, 1907, it was estimated that to carry on the work of the Society would require $1000 per year. An analysis of the report above, shows that the original estimate was correct. The one difficulty is that the Society has not one thousand members who can be counted on for regular annual support.

There is in stock in New York City back numbers of THE REVIEW published before 1908 which can probably be sold for $100 within five years. There are also sets and loose numbers of the 1908 and 1909 volumes from which it may be possible to realize as much as $120. All these back numbers are considered the property of the Society, and orders placed with the present secretary at Urbana, Ill., will be filled by the former Secretary.

The proprietary rights in THE NATURE-STUDY REVIEW have have been transferred to Professor Charles by a mutual agreement in legal form in which he agrees that at the end of his term of office as editor for the Society he will transfer the ownership of the magazine to his successor-elect, or to the trustees in case the Society becomes incorporated. Professor Charles also binds himself to the conduct THE REVIEW in the interests of the Society as interpreted by the constitution and the council. Such is the only possible legal arrangement satisfactory to printers and postal officials so long as the Society is not incorporated.

Financial Arrangements for 1910

I. It is understood that the secretary is guaranteed against (1) personal responsibility for cost of publishing nine issues of THE REVIEW with an average of 22 pages each month, (2) $100 for clerical work, and (3) office expenses such as printed matter and postage. In the circular which solicited special subscriptions to the deficit fund, it was stated that the maximum expenses would be kept within $1000, otherwise deficit subscriptions are void.

II. In reply to the special circular and mimeographed letter which was mailed in December with the bills for 1910, subscriptions to the deficit fund amounting to $280 have been received. The amounts subscribed range from 50 cents to $100. It is understood that these subscriptions will be called pro rata in case of a deficit in December arising in accordance with the provisions in the paragraph next above. In order to reduce the individual responsibility, other such subscriptions are needed.

Experience shows that it is possible to estimate in May the probable income for the year. In case the receipts in the first half of this year and the special subscriptions to the deficit fund do not equal the estimated expenses of the entire year, it will be necessary to reduce the number of pages of THE REVIEW in the second half of the year, in order to avoid involving the secretary in personal expense. This should be clearly understood by all members. Hereafter the Society should not allow its secretary to contribute more than his time. This remark has no bearing upon past years, for in them the personal responsibility of the secretary was voluntarily undertaken in connection with the organization of the NATURE-STUDY REVIEW and of the American Nature-Study Society, and the cost in money has been made more than good by the pleasure of the organizing work. Future secretaries will naturally approach the work from a somewhat different point of view, and should not be allowed to give more than their time for the privilege of conducting the affairs of the Society. Hence, the undersigned urges the greatest possible financial support for the incoming secretary.

(Signed) MAURICE A. BIGELOW,
Secretary, 1908-1909.

I have examined the records of the A. N.-S. S. for the years 1908 and 1909, transferred to me by the retiring secretary, and I find them correct.

FRED L. CHARLES.

* * * * *

It will greatly assist the Review office in the preparation of its mailing list and other records, if members for 1909 who desire to renew their subscriptions will signify their intention at earliest convenience. The details incident to transfer of editorship and place of publication are multitudinous, and prompt action by delinquent subscribers will be appreciated. Postal regulations necessitate prompt word from those who wish to receive the journal without interruption. New subscribers are urged to begin with the January number, thus assuring a complete file of the Review for the year and also meeting in full the requirements for membership in the American Nature-Study Society.

THE

NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

OFFICIAL ORGAN OF

AMERICAN NATURE-STUDY SOCIETY

Vol. 6, No. 3
WHOLE NO. 45

CONTENTS

March, 1910

BIRD STUDY NUMBER

Published Monthly except June, July and August by Fred L. Charles, Editor

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THE

NATURE-STUDY REVIEW

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VOL. 6 MARCH, 1910 NO. 3

NATURE-STUDY AND THE BOBWHITE

By C. F. HODGE, Clark University

If nature-study could give but a single bird its proper place on the American continent, let that one be the bobwhite. Gibson has called the song of the toad "the sweetest sound in nature". It must be that he never heard the flock-talk of a

WHISTLING ON HAND, A COMMON PERCH

covey of young bobwhites. Then, too, we have the exquisite gathering call of the flock at evening and the cheerful whistle, and, at closer range, no end of small talk by both old and young birds all day long. With this one species our world would not be devoid of pleasing bird music. Again, to hold the insects in check and to destroy the weed seeds we need, as we shall see later, to have our gardens, fields, pastures and roadsides literally alive with these most useful birds.

And finally, the birds are delicious eating and very prolific and furnish, many claim, the finest field sport of any game bird. After the country is fully stocked, the enormous surplus, which would have to be killed every fall would put beef trusts to confusion. How can nature-study and the work of our boys and girls put this bird, properly appreciated, into every garden, field and corner in America?

The first thing we can do is to unite upon an appropriate name, and this has now been practically decided upon. In the southern states it has been called the "partridge" and in the north the "quail". Both names really belong to quite different European birds; so North and South can not do better than to unite upon a good American name, "Bobwhite," the name he whistles to his mate.

The range of the bobwhite extends from the Gulf states and Florida to southern Maine, westward to central South Dakota and south to eastern Texas, thus including almost the entire eastern and central United States. The bird is pushing its range westward with the home-makers, and we could help it much farther north by a little attention to winter feeding and protection, particularly during ice and sleet storms. At such times the coveys become imprisoned under the crust and starve before they can escape. With plenty of weed seed within reach, the hardy little fellows would doubtless withstand almost any degree of cold. A few piles of weeds, millet or buckwheat disposed about the farm in sheltered, sunny places might thus extend the range of the bobwhite far to the north.

We can supply both food and shelter and also protection from enemies by combining brush and weeds in the same piles—a device which the writer has used successfully for three years past. Cut weeds of any and all kinds, especially wild millet and pigeon grass, as soon as the seeds ripen and before they begin to shell. They ought to be cleaned out of the garden, barnyard and fence corners at this time anyway. Selecting a sheltered place on the south side of a hill or grove put down a pile of the weeds, say a foot thick, on top of this lay a good foot of stout brush, add another layer of weeds and another of brush; cap the whole with a thick layer of weeds and put a rock or two on top to keep the wind from blowing it away, or lean a few sticks over the pile, and you have the greatest possible device for feeding and protecting your winter birds. The purpose of the brush, of course, is to make spaces through which the sun can shine deep into the pile. If many birds are feeding, and there is danger of the seeds running low, loft sweepings, screenings or millet may be thrown into the south side of the rick any time after severe storms in the winter. The brush must be strong, so that no amount of snow or ice can crush it down; or, instead of a safe shelter, we may have a death trap.

Bobwhites sometimes come into the barnyards to feed with the poultry and coveys may often be brought through the winter by encouraging them to do this.

A reasonable estimate places our annual loss caused by weeds at $17,000,000, and the yearly tax imposed by insects

BOBWHITE CHICK THREE WEEKS OLD—USUAL OCCUPATION

at $795,100,000. The natural food of the bobwhite is weed-seed and insects, and it seems to like the worst kinds best.

Mrs. Margaret Morse Nice has just completed an exhaustive study of the food of the bobwhite. Instead of killing the birds and analyzing the contents of the crop, she has worked by the living feeding-test method. That is, she has offered different foods to the birds and has counted or weighed the amount eaten. The total food for a day forms a natural unit in this work and a great many of these daily dietaries have been studied; among them we may quote a few:

1,350 flies, eaten in one day by a laying hen along with weed seeds and green food.

5,000 aphids, besides other food.

1,286 rose slugs, July 2, (Test by Mazie Hodge, aged 8 years).

37 grasshoppers and 2,400 seeds of pigeon grass, by a six-weeks-old chick.

65 large black crickets, October, no grain or seeds; half of these crickets must have been females and packed with eggs.

84 large and medium-sized grasshoppers, October, by a seven-week-old chick; no seeds or grain.

700 insects, 300 of them grasshoppers, by a laying hen in July—about one ounce of insects.

1,532 insects, 1,000 of them grasshoppers, weight nearly an ounce, by a laying hen in July.

48 grasshoppers (19 gm.) and 10 gm. seeds, by an adult in Oct.; together a little over an ounce.

Interesting tests were also made to determine how many weed seeds of a single kind a bird would eat in a day. They were not given insects or grain, but were always allowed all the green food, apple, chickweed, lettuce, cabbage, etc., they needed in addition to the single seed offered. Some of the tests were:

Burdock, 600	Plantain, 12,500	Smartweed, 2,250
Curled dock, 4,175	Pigweed, 12,000	Evening primrose, 10,000
Dodder, 1,560	Beggar ticks, 1,400	Lamb's quarters, 15,000
Black mustard, 2,500	Rabbit's foot clover, 30,000	

By this method Mrs. Nice has added 61 weed seeds to the 68 species which the Department of Agriculture had previously discovered by stomach examination. Among the additions are such pests as "pusly", Canada and bull thistle, dodder, fireweed, wild carrot, ironweed, plantain, mullein, ox-eye and yellow daisy, burdock, and witch grass.

CHUMS

The bobwhite has been discovered to eat 135 different kinds of insects, many of them the most injurious that we have; the potato beetle—which few other birds eat — cucumber beetle, cut worms, army worm, wire worms, chinch bugs, cotton boll worm, and cotton boll weevil. Mrs. Nice's observations have added a few specially significant species to the government lists, among them mosquitoes, typhoid and stable flies, (larvae, pupae and adults), squash bugs, plant lice of many species, moths, cabbage butterfly, peach-tree borer, codling moth, carpet-beetle, clothes moths, and the Hessian fly.

These studies, which constitute the most careful and complete investigation ever made of the food of any bird, have enabled Mrs. Nice to estimate that a bobwhite hen will eat an average of 75,000 insects and 5,000,000 weed seeds in a year—about 7½ pounds of insects and 10 pounds of weed seed. The paper, soon to be published in full, will constitute the most complete evidence that, the bird, until the country is well stocked, is worth one hundred fold more alive and at work than dead. Three years ago, I was told of a farmer who was asked by some hunters to allow them to shoot bobwhite on his land. He replied, "I don't like to be unneighborly, boys, but I had much rather you would go into my barnyard and shoot my chickens". From the point of actual money values involved, the farmer may well have been right. As a farmer boy I have seen chinch bugs two or three inches deep on the platform of the reaper—more bugs than wheat. We harvested three or four bushels of shrivelled grain to the acre—but there were no bobwhites on the farm.

The above is not intended to suggest any objection to field sport. The more we have for the boys, and for the girls too, the better; but is not the bobwhite worth too much, for the work it is able to do, to use for sport, until the country is fully stocked with them, up to the natural limits of insect and weed-seed food supply? When this condition is reached, both farmer and sportsman will reap a rich reward.

A pair of bobwhites has been known to produce 100 eggs in a season. Five hens reared by the writer produced an av-

BOBWHITE'S NEST UNDER THE SPRUCES

erage of 65 eggs apiece. The birds do not brood well in confinement, but toward the end of the season both the cocks and hens have incubated successfully and have reared their broods. The method followed has been to leave the nests undisturbed until well filled, and then, if neither bird is inclined to brood, the eggs are put under cochin bantam hens and plaster of Paris casts of the eggs are placed in the nests. They do not seem to know the difference, and continue laying as before. If the cock begins to brood, the hen usually makes a new nest and continues laying. If there are no rats, cats or other vermin about, and especially if turkeys can be raised in the locality without danger of black-head, the bantam hens may be allowed to rear the chicks. We must be sure that they have plenty of insects for the first few days. We may get these by sweeping the grass with an insect net, by setting wire cage traps for flies, singeing their wings before feeding, by turning over stones and gathering the "ants' eggs" under them, by cutting branches and plants covered with plant lice—the best first meal for the chicks—and by collecting meal worms about the feed bins and pigeon lofts and, best of all, spiders about the cellar and stable windows. Fly maggots are a good food and we can raise them by the bushel, as people commonly do for young turkeys and pheasants. They should be allowed to reach their growth, empty themselves of all food matter and wallow themselves clean in dust before being fed. We can also raise mealworms in any quantities, and they have tided many a flock over a week of cold or stormy weather, when maggots would not grow and all other insects were in hiding.

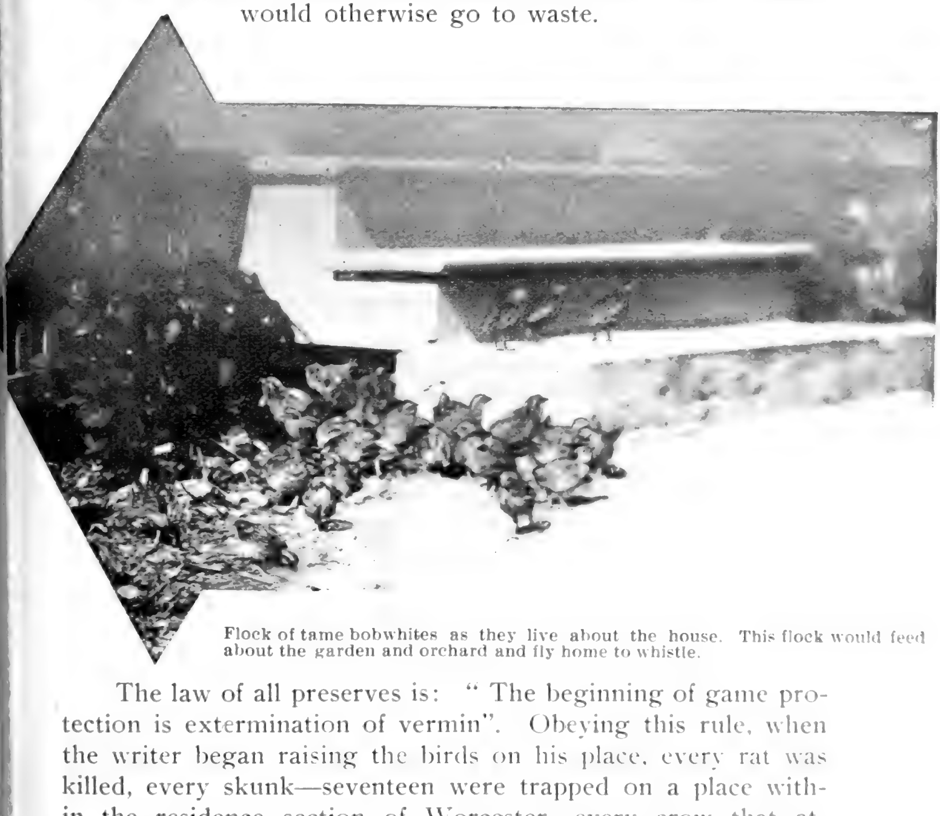
Artificial foods are also good to tide over a scarcity of insects. Sour milk curds, common cheese grated or crumbled, bread crumbs, either dry or moistened with sour or fresh milk, boiled rice, grated carrot, boiled potato, all sorts of berries in season, and apple, fresh chickweed, sorrel, clovers, grasses, lettuce—these offer a sufficient variety to keep the birds for a considerable time. The standard food is "plain custard" (made by beating an egg with a half cup of fresh milk and baking or scalding until coagulated.) Rich foods must be fed sparingly—a difficult thing to do—and the one rule to insure health is keep appetite keen and vary and alternate sharply different kinds of food. Bear in mind the ceaseless variety which the birds find as they feed naturally, here a few insects, there some berries, next weed seed or tender leaves.

If rich meals follow in succession, bacteria are likely to develop along the alimentary canal and kill the bird. If a meal of custard is followed by one of strawberries, blackberries or raspberries, sorrel blossoms, chickweed, anything coarse and sour, the pestiferous bacteria are killed or swept out. Bacteria grow best in neutral or alkaline media and so sour milk and sour curds are good to alternate with custards. If there is no black-head disease, or other fowl ailment about, the chicks may be permitted to forage for themselves about the lawn and gardens. If the ground has been contaminated with disease germs, they cannot be reared with hens and must be cared for in brooders and allowed to run and forage only where barnyard fowls do not go.

In brooders, with careful feeding and strict cleanliness, bobwhite chicks can be reared as easily as bantams. They grow rapidly and need very little care beyond the first month. They tame readily, and if, for the first weeks, a whistle is used consistently while caring for them, they soon come to answer it and follow it as they would the call of a parent. After ranging out and filling their crops they will fly home to the whistle from a distance of several hundred yards until late in the fall and they are practically full grown. To give the call, hear the cheerful answer and suddenly have the air filled with whirring wings about your head as the flock alights at your feet, is a delightful experience which I hope all my readers may enjoy with flocks of their own. I had fully expected to be obliged to pinion or clip their wings as they began to use them, but the little charmers richly repaid me for not doing so. I am always careful, however, to have the home cage the most comfortable place they can find. There is always fresh water, and their seed mixture to scratch over, a little pile of brush and weeds for cover—they love cover as ducks love water—and, above all, a tray of fine warm dust. A place with all these attractions is a "home" rather than a "cage", and the birds learn to depend upon it.

I give these hints about rearing the chicks for just one reason. Thousands of nests are cut over or disturbed and deserted every year in the harvest and hay field, and with knowledge of the great value of the birds and of how to rear the chicks, the boys and girls of the country might have many of these eggs, now wasted, start a race of tame bobwhites, work everywhere for intelligent conservation of the birds, and within ten years have them, properly appreciated and protected, in every garden and farm in, at least, the natural range of the species. Is it too much to ask of nature-study that it do just this for the Country and for the bobwhite?

The first thing to know is that the eggs may be carried at any stage of incubation in a hat worn on the head, and for hours, if necessary. The writer has had ruffed grouse eggs carried thus—walking and riding in trolleys and trains—from nine in the morning until nearly seven in the evening, and a few days later every one hatched. One clutch actually hatched successfully in the hat of a man who was bringing them home. After making a portable incubator, with hot water bottle, thermometer and alcohol lamp, they were all discarded after trying this easy method, and it has left nothing to be desired. Most people wear hats—felt are the best for this purpose, but straw hats have often served, with a handkerchief laid in the crown to retain the heat—and any eggs may be kept warm and transported by the hat method and thus saved, which would otherwise go to waste.



Flock of tame bobwhites as they live about the house. This flock would feed about the garden and orchard and fly home to whistle.

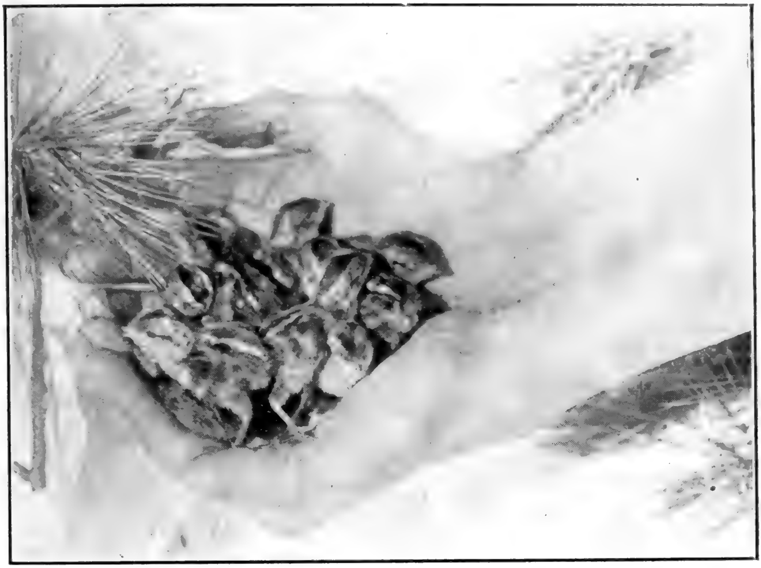
The law of all preserves is: " The beginning of game protection is extermination of vermin". Obeying this rule, when the writer began raising the birds on his place, every rat was killed, every skunk—seventeen were trapped on a place within the residence section of Worcester—every crow that attempted to hunt on the premises was, at least, shot at, and,

BOBWHITE COCK

This bird brooded a nest of 16 eggs, bringing off 15 chicks. He had been reared in domestication the year before.

with due warning to all concerned, no cat was permitted to leave the place alive. Not a bird could have been reared, had not these measures been taken; and the one and only enemy that has caused great loss and intolerable misery throughout the whole work has been the uncontrolled cat.

Follow with me just one actual story for part of a season. The cock shown in the picture with the young is brooding his nest of 16 eggs. He is in a wire-covered yard forty feet square, including the bases of two large spruce trees. The period of incubation is 24 days. All goes well for the first two weeks; then the dog, obtained to keep the cats away, deserts to a former home. Four times during the last ten days the bobwhite is frightened off his nest by cats climbing about over the wires. Each time the eggs are quickly taken from the nest and placed under a bantam hen kept brooding for the express purpose. Plaster of Paris eggs are put into his nest, the yard is hunted over tuft by tuft with a lantern, he is found and put back on his nest. While he is off to feed next day, his own eggs are put back. He finally brings off 15 fine, healthy chicks, his



"A LITTLE MORE CAT FEED"

mate now joins him in their care and they have reared the brood of perfectly clean and healthy little fellows for three weeks. The dog takes another vacation on a cold, dewy, almost frosty night, a cat disturbs them and only three of the chicks are alive next morning. The rest are found scattered and chilled in the wet grass. "Perhaps it was something else", you say? The cat was caught in a trap at the corner of the cage the next night.

No one has any objection to cats, as pets properly cared for and controlled; but we must face this problem fairly. We may start our twenty million children to protecting and caring for the birds. Under present conditions, all this effort will mean: "A little more cat feed". People everywhere are asking: "Why do we not have more birds?" or: "How can we have more birds?" Forbush followed a cat for a single day and actually saw her break up six birds' nests, killing all the young and two of the parent birds. For a number of localities observed by the writer he is convinced that cats have done more to exterminate the bobwhite than sportsmen and all other natural enemies combined. Study this problem, each school for its own district, and let us have the results in the NATURE-STUDY REVIEW.

MAZIE HODGE AND HER PET BOBWHITE

But after all, the bobwhites themselves have paid the score in full by the delight they have given as pets. It is the great value of these birds in this relation to our children that affords the hope that they may be, ere long, properly appreciated and protected in every field, garden and home in the land.

"Mazie, don't you like Dinah the best of any pet you've ever had?" "Yes, papa,—*all but the quailies*"'

* * * * *

The New England Association for the Advancement of AGRICULTURAL EDUCATION announces a meeting in connection with the New England Conference on RURAL PROGRESS, at the State House, Boston, Mass., March 4. The program includes a survey of the work of schools now teaching Agriculture, a discussion of the proper limits of Agriculture as an elementary school subject and as a secondary school subject, and an outline of a one-year course and a four-years' course.

FACTORS IN BIRD MORTALITY

By ISAAC E. HESS, Philo, Ill.

The life of a bird is one of continual danger and few deaths occur other than in tragedies.

In considering the factors responsible for the general decrease in bird life, I should divide the forces into those which cause immediate death to birds and those which spread disaster to the increase. Of the first forces in order of importance, I should tabulate the elements, cats, other mammals, birds of prey, man, snakes.

Of the forces mostly responsible for destruction of eggs and young I should name the agriculturist, storms, squirrels, cats, cowbirds, crows and jays, small quadrupeds, snakes, collectors.

Birds come into life with an instinctive fear of man and

most other animals. By kind treatment man may overcome to a considerable extent this feeling of dread and succeed in attracting many birds to dwell near our homes.

And strange as it may seem, man's very efforts in enticing birds to seek homes in our gardens and shrubberies, are often responsible for the loss of great numbers of bird lives. We coax the birds into a feeling of security until they feel safe in making their homes near us and then we allow the innocent (?) house cat to roam at will over our properties, devouring every young bird which attempts the first flight from the nest and often capturing the parent birds which seek to defend their young. Would this not come under the charge of criminal negligence?

Those who introduce the red squirrel (Sciurus hudsonius) into their groves and parks, do so at the expense of the bird inhabitants. One cannot have both, for only the Baltimore oriole (Icterus galbula) which hangs its pensile nest far out on the slender branches, is safe from the depredations of this acrobatic despoiler of bird homes. Cats and red squirrels are recognized by all birds as their most dreaded enemies.

The accompanying illustration of the catbird at home, represents the first settler in my back-yard bird retreat—a result of a continued warfare on the "household pets" of the neighborhood. The retreat has developed into a haven of safety and no less than nine species have built their homes and reared their young within its borders.

Because of individual habits of certain species, great catastrophies during the nesting season of birds are annually recorded. Immediate enemies are always recognized, but birds are unable to reason, and year after year their homes are constructed where the harvesting of crops is sure to spread disaster.

SECOND OR "THISTLE NEST" OF DICKCISSEL

The first nests are nearly all destroyed by mowing clover.

The dickcissel (Spiza americana) so abundant in the Mississippi valley, builds extensively each May in the growing fields of clover. When the mower gets into action, untold thousands of these nests are destroyed. The giant thistles are then the chosen sites for the second attempt at home-making, and our modern farmers with their recently acquired habit of mowing the roadsides in early July when the thistles flourish, are the "thorns in the flesh"—however innocent—of our little dickcissel. I followed a mower in a twenty acre field of clover at the edge of the village one May day and picked up no less than twelve nests with eggs scattered on the ground.

The prairie horned lark (Octocoris praticola) is another victim of the agriculturist. The first nests of the season are placed in closely cropped pasture land in late March and early April. The young family is therefore awing before stock is turned into the field. On account of its early nesting date probably 95 per cent of these first broods are successfully reared. But woe to the second nests of the season which are placed by the hills of growing corn about the first week in June. Then comes the farmer with his plow, and thoussands upon thousands of horned larks' nests are covered up forever. With the third attempt at nesting comes the second plowing and the tragedy is repeated each season with scant hopes of this bird every learning from experience.

FIRST NEST OF HORNED LARK
Second nests at hills of corn are nearly all destroyed

The chipping sparrow will soon become extinct, with the elements as chief factor, unless it learns to build upon stronger foundations. Few of these little unattached homes of hair and grasses can weather a summer wind storm.

When all the factors of bird mortality and the forces that work against their increase are considered, it is wonderful that we are blessed with any bird life at all.

BIRD IDENTIFICATTION CHART

(NOTE: The undersigned designed this chart several years ago for use in Normal School classes, to direct observation of unknown birds and to insure detailed field study of known birds. It has been used successfully with bird-study classes in the upper grades of the elementary school, and is printed here as a suggestion to teachers in the study of living wild birds.—Fred L. Charles).

OBSERVER.................................

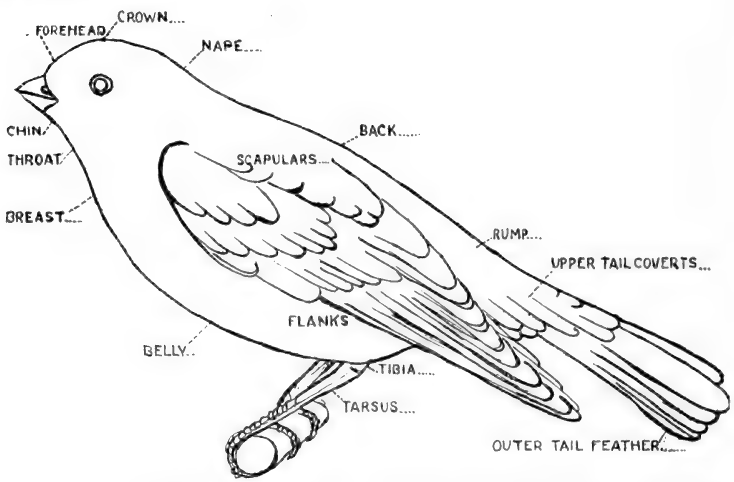
ADDRESS...... ....

DATE........................ HOUR.............

LOCALITY;

WEATHER CONDITIONS:

REMARKS:



[Indicate color of all parts, including beak and foot: also any variation in length and shape of bill, neck, wing, leg, foot, tail, etc.

NAME OF BIRD:

Employ underscoring when it will suffice. Write any additional memora nda on the other side of this sheet

I. Number of Individuals Seen, (estimated)

Single; pair (s); scattered; flock (s).

II. Favorite Haunt:

WATER—Open water; shore; marsh; stream; overhanging bank; bridges.

GROUND—Upland; lowland; shallow grass; deep grass; tall weeds; plowed fields; woodland.

UNDERBRUSH—Bushes; brush heaps; low trees.

TREES—Trunk; lower branches; high branches; small twigs.

FENCES; TELEGRAPH POLES OR WIRES; BUILDINGS.

HABITUALLY ON THE WING.

III. Characteristic Behavior:

How occupied:

Movements:

Disposition: solitary—social; wary—unconcerned; quiet—noisy; sluggish—restless.

Call or song:

Feeding habits:

IV. Size:

Smaller than English sparrow; about size of English sparrow; smaller than robin; about size of robin; smaller than crow; about size of crow.

V. Coloration (see diagram):

Most striking features ("recognition marks"):

Sex differences:

VI. Form (see diagram):

Body slender—heavy; adapted for

Bill:	Wing:	Leg:
Neck:	Tail:	Foot:

VII. Flight:

Sulking—bold; short—long; slow—rapid; high—low; direct—jerky; even—undulating; silent—calling or singing.

Slow wing stroke—rapid wing stroke; full stroke of wing—half stroke; uniform stroke—interrupted stroke (sailing with wings spread or bounding with wings closed).

Position of legs: Tail:

VIII. Movement After Alighting:

Swimming; diving; wading; walking; running; skulking; hopping; flitting; returning to same perch; going up tree trunk; going down trunk; wagging head; spreading wings; pumping tail; preening feathers.

IX. Nest, Eggs and Young:

NESTING HOUSES FOR THE BIRDS

By G. H. TRAFTON, Surpervisor of Nature-Study, Passaic, N. J.

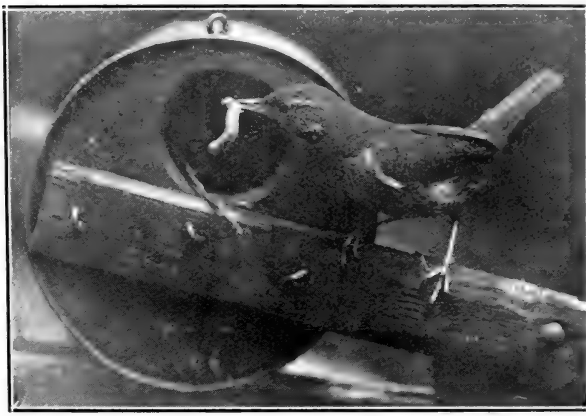
A line of successful bird work with children may be carried on by encouraging bird protection from the positive side. The children may be encouraged to do something for the birds by providing them food, water or nesting sites. While this is one

CHILDREN WITH BIRD HOUSES, FRANKLIN SCHOOL, PASSAIC, N. J.

of the most effective means of protecting birds, of much greater importance, it is a means of developing in the child a spirit of helpfulness and kindness toward living things through the efforts he is making to help them.

The most successful work in this line here at Passiac has been done in connection with the providing of nesting boxes. The enthusiasm of the children is easily aroused in the early spring, even the children in the second grade displaying much interest. The essential features to be considered in constructing a bird house are explained and the chief difficulties to be encountered are mentioned that the children may be prepared for them. The children are then allowed to use their own ingenuity in working out the details. No attempt is made here to correlate this with the work in manual training, the children making their houses at home. When the bird houses are occupied, suggestions are given to direct the children in their observations, which are frequently reported to the school.

The chief difficulty encountered is the English sparrow, which drives the other birds away. For several years experiments were tried with moving bird houses, but it was found that



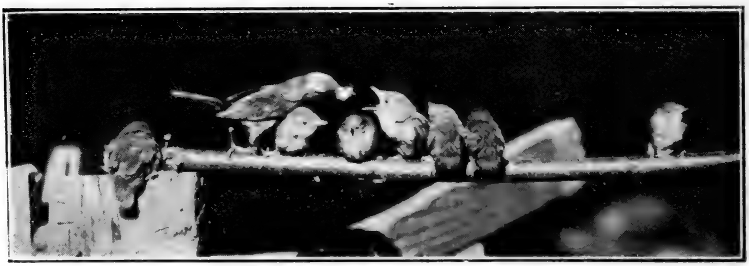
A USEFUL CITIZEN

these were used just as freely by the sparrows as by the other birds. The children are now advised to make a majority of their boxes with small entrance holes for the house wren; and if houses are put out for the bluebird, to keep the hole covered until the bluebirds return in the spring, and to provide the house with a movable cover so that the eggs of the sparrow may be taken out as fast as laid. Occasionally a robin or a starling is reported as using the houses, if large enough. A summary of the results for the last three years is given in the following table:

		Per cent Occupied			
	Total number of houses	By wren	By bluebird	By Eng. spar.	Altogether
Stationary houses	126	32	16	16	46
Moving houses	52	17	9	8	34
Total	178	28	14	14	56

Less success has attended the feeding of winter birds, chiefly on account of that omnipresent pest, the English sparrow.

Fewer experiments have been tried here in Passaic with drinking and bathing fountains. In Worcester some very successful work has been done. In one school yard there has been erected an artistic fountain, which is visited by many species of birds, and which also serves as an ornament to the yard.



* * * *

COLORED PLATES FOR APRIL NUMBER

Mr. William Dutcher, President of the National Association of Audubon Societies, has offered to supply colored plates of the passenger pigeon and mourning dove for the April number of the Nature-Study Review. The search for the undisturbed nests is rapidly assuming continental scope and the general interest gives ground for hope that, if any of the pigeons are found, they may be adequately protected and the species restored. A complete list of the awards and conditions governing them will be printed in the April number. We should state, however, that John Lewis Childs has added $700 to Colonel Kuser's original award of $300, making the first undisturbed nesting pair or colony discovered anywhere on the continent of North America, draw a prize of $1,000. The total sum now pledged to this cause is $3690.00.

Signed,
C. F. Hodge

* * * *

Nature-Study Interest in St. Louis is rapidly growing to the point of enthusiasm and it is altogether likely that a branch of the American Nature-Study Society will be organized in that city during the present year. Prof. J. A. Drushel, of Teachers College, is a leader in the movement and several of the elementary school principals are actively interested.

LESSONS ON THE ROBIN FOR THE UPPER GRADES

By Prof T. L. HANKINSON, State Normal School, Charleston, Ill.

Lesson I. The Living Robin

Preparation: Pupils to make trips about home or school grounds individually or in small companies, without teacher, for the purpose of learning facts at first hand regarding the robin. The teacher should not instruct pupils as to what to see, but should give them directions preliminary to this field work as to how to see the birds. Special attention, in such instructions, should be given to the manner of approaching robins, method of recording facts observed, and places where birds are found.

Recitation: Oral accounts of observations made on trips, to be given by pupils. The teacher should not give information, but simply direct the discussion.

Lesson II. The Living Robin, Continued

Preparation: Pupils to make further field observations after hearing each other's accounts in recitation of first lesson.

Recitation: The teacher should question pupils. The following outline may be used as a basis for the recitation:

A. Habitat of the Robin.

B. Locomotion.

1. On the ground:
   - a. Does it walk or hop?
   - b. What parts of the body are involved in locomotion?
   - c. Does it ever run?
2. In a tree:
   - a. How does it move from one limb to another?
   - b. How does it move from one point on its perch to another?
3. In the air:
   - a. Is its flight direct or undulating?
   - b. What positions do the wings take during flight?
   - c. Compare the robin's flight with that of other familiar birds—crows, hawks, swallows, sparrows, etc.

C. Feeding.

1. From what kinds of places does the robin get its food?
2. How does it get food?
3. What things was the robin seen to eat? (A list of things fed upon by robins should be kept by the class).

4. Amount of food eaten in a given time by one robin.

D. Behavior of the Robin.
   a. Toward other robins.
   b. Toward other kinds of birds.
   c. Toward animals other than birds.
   d. Disposition of the robin.

E. Voice of the Robin.
   a. Description of song.
   b. Does the robin sing at all times of the day?
   c. Does it sing while on the ground or from some perch above it?
   d. At what time in the morning does the robin begin to sing? How late in the evening does it sing?
   e. Describe and try to interpret any other notes of the robin besides its song.

Lesson III. The Living Robin, Concluded

Preparation: Pupils should go afield again after their attention has been called to the points mentioned in the last lesson. Teacher may accompany sections of ten or less pupils.

Questions should be asked by the teacher while on these trips with pupils.

Lesson IV. The Robin's Nest

Find an old, last-year's robin's nest in good condition. This can be studied by pupils and teacher together, noting its form, size and structure. By carefully taking the nest to pieces, the materials composing it can be determined and the relation of these to each other. Careful note should be made of every kind of substance found making up the nest.

Lesson V. Construction of the Nest

Find if possible a nest in the process of construction. Pupils and teacher together may visit this at intervals. With proper precautions so as not to disturb the birds any more than necessary, individual pupils may watch the nest at all times during the day. By working in relays, the whole process of nest building may be witnessed by the class. The following points among others should be given attention:

a. Frequency with which material is brought to nest.
b. Nature of material.
c. Method of shaping nest.
d. Length of time taken to build nest.

e. Does either the male or female work at the nest, or do they both work together?

All facts obtained about the building of the nest should be recorded on the blackboard, either by each individual pupil or by the class as a whole. These should be used as a basis for a recitation on nest-building by robins.

THE ROBIN AT HOME

Lesson VI. Eggs of the Robin

The nest studied in the last lesson can be used after egg-laying in it begins. The contents of the nest may be examined with a mirror if it is in a place where it can not be examined from a point above it. The following points with others should be noted by the class:

a. Color of eggs.
b. Form of eggs.
c. Arrangement in nest.
d. Interval of time between the completion of the nest and the laying of the first egg.
e. Care given eggs by birds. Do they ever purposely move the eggs? Do both male and female sit upon the eggs?
f. Number of eggs in the completed set.
g. Length of time between the completion of the set and the hatching of the eggs.

This study can only be made by continued observations from day to day.

Lesson VII. The Young Robins in the Nest

The methods of observation are the same as those mentioned in Exercise VI. The following points should be noted:

a. Time of hatching.
b. Form, color, and general appearance of young at time of hatching.
c. Helplessness of young at time of hatching compared with chickens.
d. Development of plumage.
e. Changes of form due to growth.
f. Length of time in nest.
g. Care of young by parents.
    1. Food fed young. Identify and record the nature of this as far as possible. The amount of food given the young in a certain number of hours may be determined by having pupils observe in relays.
    2. Methods of keeping nest clean.
    3. Protection of young against enemies, such as cats, crows, and blue jays.

These observations must be made through a number of days as were those in Lesson VI. Quizzes may be given at intervals concerning nesting of robins. Special problems, some of which may be suggested by the above topics on bird nesting, may be assigned to certain pupils. These individuals may report to the class what they have learned.

LESSON VIII. THE YOUNG ROBIN OUT OF THE NEST

Young robins under the protection of their parents are commonly seen in late spring. When found these should be watched by any pupil finding one of these birds, and all facts learned about it should be reported to the teacher or to the class. Especial note should be made of

a. Its helplessness against enemies.
b. Methods used by parents in protecting it.
c. Its dependence upon parents for food.
d. Its efforts at flight.
e. Its flight compared with that of the parent.

LESSON IX. IMPORTANCE OF THE ROBIN TO MAN

The facts learned from the study of the robin at first hand by the class should be looked over, and all which have any bearing on the relation of the robin to man should be discussed by the teacher and pupils.

A short talk on this subject may be given by the teacher after studying the literature on the economic importance of the robin.

Some helpful references for conducting the above lessons are:

Home Life of Wild Birds, by F. H. Herrick, published by Putnam & Son.

Schoolroom Study of a Robin's Nest, by Jessie R. Mann, Nature-Study Review, December, 1908.

The Robin, Educational Leaflet No. 4, National Committee of Audubon Societies.

Some Observations on Robins' Nests, by Fred L. Charles, Transactions of Illinois State Academy of Science, Vol. II.

* * * *

MOVING PICTURES OF THE HOUSE FLY, or as it is henceforth to be called, the typhoid fly, in its relation to disease were publicly exhibited for the first time during the recent meeting of the American Association for the Advancement of Science at Boston. They have recently been exhibited by Dr. L. O. Howard, entomologist of the Department of Agriculture, at Washington. These pictures present in a most striking and convincing manner the filthy habits of this ubiquitous insect pest. It is probable that before many months the films will be available to all who desire them.

AN EXPERIMENT IN THE TEACHING OF BIOLOGY

By C. M. McCONN, Principal of the Academy of the University of Illinois.

One of the most mooted of the larger questions confronting those who are interested in nature-study is certainly that of the traditional formal or "pure science" approach versus the "human" or "practical" or "economic" approach now so widely advocated. The experiment here described is an effort to contribute something of tangible fact to the almost wholly theoretical discussion of this point that is now raging. It may be interesting, also, as an application in the field of school science, of a comparatively new method of investigation, that of parallel groups—one that could be used in any grade or any subject in the school, and that promises to furnish much more definite data than any that are now available for most phases of methodology.

This experiment was originated and is being conducted by Mr. John P. Gilbert, instructor in biology in the Academy of the University of Illinois. It has reference primarily, therefore, to secondary work; but whatever evidence is obtained can hardly fail to have at least suggestive value for the nature-study of the elementary school as well.

Mr. Gilbert states his specific problem and outlines his method as follows: "The purpose of the experiment—is to determine the relative merits of two methods of approach, two incentives, to a study of biology. Section A studies the subject from the standpoint of a cultural and disciplinary aim. Section B covers the same ground as section A, but emphasis is laid strongly upon the economic relations and the relations to the transference of disease, of the forms studied."

He is comparing with some definiteness—that is, in mathematical terms:

(1) The interest of the two sections;

(2) The amount of biological fact assimilated by the two sections;

(3) The power of interpreting biological phenomena and attacking simple biological problems developed by the two sections.

The first point, interest, is tested by the amount of voluntary extra work, in the way of optional reading, optional field trips and extra laboratory practice done by members of each section. The second point, assimilation of fact, is determined in the usual way, by written examinations, the same questions being given, of course, to both sections. The third point, power of interpretation and original attack, is judged from the results obtained on laboratory problems given alike to both sections.

The parallel groups used are divisions of a class in first-year biology—called Zoology the first semester, Botany the second. They are approximately equal in size. They use, of course, the same laboratory and equipment, and are furnished the same materials. Both are provided with the same textbooks and the same manuals—books chosen because of their neutral character with respect to the point at issue. It should perhaps be added that the instructor is not a man with a theory which he is attempting to prove; he is a man with a question, to which he is seeking an answer either one way or the other.

During the first six weeks of each semester the work of the two sections is made the same, and by tests during this period on all three of the points in question, and by a comparison of the grades of the students in other subjects, a measure is secured of the inevitable difference in native ability of the two groups. This measure is used to interpret the data on the same three points obtained after the differentiation of the two courses.

This differentiation begins with the seventh week of each semester. It is a matter of emphasis, secured by the introduction of outside material by the instructor, partly in the recitation, partly in assigned reading. The supplementary material for section A is of the "pure science" type. Darwin and Huxley, for example, are drawn upon to extend the treatment of evolution in the text; and an appeal is made to what may be called the naturalist's interest—the interest in living things simply as such,—using such authors as John Burroughs. In section B, on the other hand, the text is made to suffice for such phases of the subject, while the economic phases are supplemented, the material being drawn largely from the bulletins issued by the Department of Agriculture and the various colleges of agriculture.

It will be noted that the course remains in both cases a course in biology. Both sections complete the text, and are examined primarily upon the text. The differentiation is one of emphasis, approach, incentive. The specific problem involved is ultimately that of the character of adolescent interest in nature.

Little in the way of results can be reported as yet. In the data obtained during the first semester, a slight advantage is found, after all corrections have been made, in favor of the economic approach; and a summary of these data, by Mr. Gilbert, will appear in an early number of the JOURNAL OF EDUCATIONAL PSYCHOLOGY. But the complicated nature of the experiment, the difficulty of controlling some of its factors, and the lack of developed technique for such experimentation will undoubtedly make it necessary to try the thing a number of times before any dependable conclusion can be reached.

It may be submitted, however, that such experiments, made in the schoolroom itself, under the actual working conditions of teaching, are of the only kind that can ultimately solve the problems of method; and that many such experiments should be attempted in many places and reported for what they are worth, to help at least in the development of the needed technique.

* * * *

ACKNOWLEDGMENT

The Review expresses its appreciation of the assistance it has received from contributors and others in assembling the material for this issue for publication at the earliest possible date. It acknowledges indebtedness to H. W. Fay, of DeKalb, Ill., for the loan of certain plates, and to the Florida Audubon Society for the loan of plates for four of the illustrations in the article by Prof. C. F. Hodge. These four plates were used in the beautiful leaflet on the Bobwhite, issued by the Florida Audubon Society. This leaflet (contributed by C. F. Hodge) may be obtained by non-residents of Florida, at $1.50 per 100, from Mrs. L. P. Bronson, Treasurer, Florida Audubon Society, Maitland, Florida.

* * * *

THE ILLINOIS STATE ACADEMY OF SCIENCE at its recent annual meeting, provided for a committee of three "to cooperate with existing agencies for the advancement of nature-study in elementary schools." It will be recalled that the California and the New Jersey academies have taken somewhat similar steps indicative of the general interest in nature-study throughout the country.

SOME OBSERVATIONS ON ROBIN NESTS

By FRED L. CHARLES

(Readers of the Review will recall the article by Miss Jessie R. Mann, "Schoolroom Study of a Robin's Nest," published in the Nature-Study Review, Vol. 4, No. 9, Dec., 1908. Miss Mann's paper discussed the pedagogy and educational value of these studies in which she and the writer cooperated. Because of the wide-spread interest manifested, the following additional notes are presented, being an abstract of a paper read before the Illinois State Academy of Science and printed in Vol. II. of the Transactions of that body. That such complete data were secured is due largely to the enthusiasm and ability of Miss Jessie R. Mann, Assistant in Science, Northern Illinois State Normal School, DeKalb, Illinois. Readers are referred to the references given above for a description of the two nests from which the following data were obtained.)

The nests are located in widely separated portions of the building, the May nest having an eastern exposure and the June nest a northern. The observations were taken under absolutely normal conditions, from within the building, the window (in the second story, in each case) being raised after the first few days and the observer sitting at ease at close range.

The May nest was first noticed April 23 and was completed April 27. The first egg was laid during the forenoon of April 29; the second, on April 30, between 9:45 and 10:32 a. m., the female being on the nest during that period. The third and last egg was laid between 10:45 and 11:30 a. m., May 1. The female began sitting that afternoon and was on the nest the greater part of the time through the cool or rainy days that followed. The male was first seen May 8. Two of the young were found hatched on the morning of May 14, and throughout the day the male brought food, most of which was fed to the young by the mother bird, which left the nest occasionally but rarely brought food. These first feedings consisted chiefly of earthworms, myriapods (?) and various lepidopterous larvae. The third young was hatched early on the following day (May 15).

All-day observations were made on May 19, 20 and 21, thus giving complete data for the sixth, seventh and eighth days in the life of the two older nestlings. Frequent observations—including the weight of the young—were made May 22-25, and on May 26 all-day observations were resumed and continued until the young left the nest on the morning of May 28, the fifteenth day. Several pieces of food were obtained and identified through the courtesy of the state entomologist's office.

For the five days of full observation, the working day—meaning the period of activity of the parents at the nest—averaged nearly 15 1-2 hours, from 4 a. m. to 7:30 p. m. At

first the female brooded throughout the night, but toward the end of the period, when the fairly fledged young filled the nest, both parents were absent at night. The young were brooded on their sixth day—at frequent intervals—for a total of 8 hours, or somewhat more than half of the daylight period. Two thirds of the feeding was done by the male. In contrast with this, on the thirteenth day (May 26) the female did not settle once during the day, nor did she spend the previous night or the following night upon the nest. While near the nest, she perched either on its edge or near by on the window-sill. Once she stood over the nest. Usually, however, she left promptly after feeding. The cock robin did less than one third of the feeding on this day.

For the five days on which complete data were taken, the number of feedings were as follows:

Day	By Female	By Male	Total
Sixth	22	44	66
Seventh	39	46	85
Eighth	54	31	85
Thirteenth	64	30	94
Fourteenth	86	16	102

The data of feedings by hours, when plotted, reveal a rather sharp maximum frequency of feeding from 4 to 7 p. m., a more or less level period during the greater part of the day, and a less pronounced maximum from 5 to 7 a.m. The greatest number of feedings in any one hour during these five days was 14; there was never an hour without at least one feeding: the average number per hour (from 4 a. m. to 7:30 p. m.) during the five days was 5.6.

The maximum number of pieces of food given to the young by the parents in one day with 444; the minimum, 278; the average, 356. The average number of pieces brought in one visit was 4. For the five days, lepidopterous larvae comprise one half of the food pieces; earthworms, 28.8 per cent; ants, 6.6 per cent; Diptera, 5.7 per cent; and Coleoptera, Orthoptera, Myriapoda, adult Lepidoptera and other winged insects the reminder. Certain species were especially prominent in the diet, and of these, specimens were captured and identified as above mentioned. Some of them are of considerable economic significance.

The weights of the three young birds increased very rapidly until about the tenth day, after which they remained practically stationary save for the nocturnal shrinkage and diurnal gain.

From the view-point of behavior, or comparative psychology, some notes of interest were taken. Almost invariably, after feeding, the excrement was promptly voided, the parent waiting for this act and usually swallowing the excreta. The nest was not soiled. The sun shone directly upon the nest for about one hour each day, during which time the female brooded in striking attitude. At one time when the young had been weighed in a bowl and the bowl had been placed upon the sill close to the nest preparatory to returning the nestlings, the mother appeared and brooded for some time upon the empty nest, utterly indifferent to the presence of the young in the bowl.

The June brood was under observation throughout the entire sixth and seventh days (June 24 and 25). All-day observation was resumed on the thirteenth day, as in the case of the May brood, but the young left the nest during the morning of that day, making comparison impossible for the later period. In the main, the essential points in the two sets of data are in harmony, although the fact that the male was found dead on the ground below the nest after a storm (cause unknown), before all-day observations were begun, prevented any comparison of the activities of the two sexes. This circumstance, however, gave opportunity to note what adjustment was effected by the widow under the pressure of hunger of the nestlings. She came with food on the sixth day 98 times, and on the seventh day 127 times, as against 66 and 85 for both parents on the corresponding days for the May brood. In both cases the number of young was 3.

In the June brood the period of most active feeding was from 4 to 8 p. m., with a less pronounced maximum in the early morning, as in the May data. On the basis of number of pieces of food, the results are similar, the morning and evening morsels greatly outnumbering those fed at midday.

The young from each nest were followed after their first flight—which was witnessed in both cases—and their experiences on the "first day out" were noted. The struggle for existence became a very real affair to the passive observer, and the records are not without mortality tables.

* * *

Note.—Since this paper was presented, two additional broods have been under observation, one of them throughout the entire period from hatching to leaving the nest, with complete data. The results of these more complete observations have not yet been published.

NATURE-STUDY NEWS

A CHICAGO SECTION OF THE A. N.-S. S. is among the probabilities for the coming spring. Plans are on foot to hold an organization meeting at the Chicago Academy of Sciences during the latter part of March.

THE NATIONAL COMMITTEE ON AGRICULTURAL EDUCATION met with the Department of Superintendence of the N. E. A. at Indianapolis, Ind., Monday evening, February 28. Agricultural nature-study received attention together with secondary and college phases of the subject.

NATURE-STUDY TEXTS are always anticipated with much interest. It is understood that several new books of this character will appear during the present year.

PROFESSOR M. A. BIGELOW, of Teachers College, Columbia University, former editor of the Nature-Study Review, sailed for Europe early in March. He will devote several months to study, returning to New York in the fall.

DEAN L. H. BAILEY, of the College of Agriculture, Cornell University, will again assume the active duties of his position next fall, after a year of absence devoted to travel.

SCIENTIFIC TEMPERANCE INSTRUCTION in Illinois is to be studied by a committee consisting of educators, ministers, and members of the W. C. T. U., the entire committee being selected by the president of the Illinois State Teachers' Association.

A NATIONAL BUREAU OF PUBLIC HEALTH with a Commissioner of Health at its head, is an aim set for immediate accomplishment by the Committee of One Hundred on National Health. A fund of forty thousand dollars is estimated as necessary for carrying on the campaign during this session of Congress.

A CONFERENCE OF THE TEACHING OF AGRICULTURE IN THE COMMON SCHOOLS of Illinois is announced to be held at the College of Agriculture, University of Illinois, March 24, 25 and 26. Leaders in agricultural nature-study throughout the state will be present and much is expected from this gathering.

* * * *

BOOK NOTES

The House fly at the Bar: Guilty or Not Guilty—is the compelling title of a 48-page indictment drawn by the Merchants' Association of New York (April, 1909) through its Committee on Pollution of the Waters of New York. It was Edward Hatch, Jr., chairman of this committee, who financed the difficult undertaking of preparing the moving picture films mentioned elsewhere in this issue. This publication, and a previous report by Dr. D. D. Jackson on Water Pollution, (July, 1908), are well illustrated and should be in the hands of teachers everywhere.

The Bulletin of the Committee of One Hundred on National Health is a 2-page leaflet published monthly from 69 Church St., New Haven, Conn. The February number gives interesting items of public health news, and presents a bibliography of prominent health articles in January magazines.

The Survey, a weekly journal of constructive philanthropy, in its issue of March 5, 1910, emphasizes in several articles the value of fresh air. Teachers will find much of interest in this worthy publication.

The School Century for April has in its nature-study department a somewhat extended study of the Robin.

The Mississippi School Journal has for its leading article in the March number, "Nature-Study in the One-Teacher School," by Superintendent Andrew Allison of Ellisville, Mississippi.

The Oregon Teachers' Monthly devotes 20 pages of its March number to poetic selections for Arbor Day, reprinting all such selections that have appeared under its covers for the past ten years.

The Circus Reader for first and second year pupils, by Bertha E. Buffington, Theresa Weimer and R. G. Jones (Benj. H. Sanborn & Co.), is an attractive primary reader which will interest all who are following the nature-study idea. The authors have hit upon material which invarably appeals strongly to children and the reviewer can confirm the testimonials of others as to the response of children when the material of this book is presented. We do not presume to pass criticism on its technical excellence, but the inspiration is certainly a happy one, and the reader is attracting much attention. It will doubtless contribute to the circus habit.

A Short Course in Nature-Study

Conducted by Frank C. Pellett

is just the thing for teacher's institutes, summer schools and chautauquas. Includes the study of birds, butterflies, moths, bees and other insects as well as higher animals, plants, etc. Methods of propagation of plants are demonstrated. The students are taught budding, grafting, layering. Mr. Pellett is not a school man but a naturalist who spends his time in the woods and fields when not on the lecture platform.

A Live Bee Demonstration

Mr. Pellett has a large cage of wire screen in which he opens a bee hive and while delivering his lecture on "Bees" illustrates it with the bees themselves. Without veil or gloves he handles bees by handfuls as if they had no stings.

"I am glad to say that I had the pleasnre of hearing Frank C. Pellett, of Atlantic, Iowa, in two very helpful and interesting addresses. He entertains and instructs. His demonstration as to the proper handling of bees is unique and surprisingly successful. I shall not hesitate to recommend him for any institute or lecture courses in which I am personally interested.

PROF. F. E. KING, Supt. City Schools, Ames, Iowa

An Unusual Lecture

In the lecture "Economy of Nature in the Plan of Eden" Mr. Pellett has brought together an array of facts of surpassing interest to the student of nature, and has succeeded in attracting the attention and interest of a large class who do not attend the ordinary nature lectures. For a single entertainment you will find it admirable.

"The lecture by Frank C. Pellett at the M. E. Church South, Friday evening, was an excellent one. Mr. Pellett is a naturalist of rare ability, and his lecture, "The Plan of Eden," is very interesting and instructive.

—WARRENTON, Mo. Banner.

Descriptive Circulars on request.

Address,

Frank C. Pellett, Atlantic, Iowa

THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

OFFICIAL ORGAN OF

AMERICAN NATURE-STUDY SOCIETY

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CONTENTS

April, 1910

GARDEN NUMBER

Published Monthly except June, July and August by Fred L. Charles, Editor

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THE

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VOL. 6 APRIL, 1910 NO. 4

AGRICULTURAL NATURE-STUDY AS EXEMPLIFIED IN THE SCHOOL GARDEN

By FRED L. CHARLES, University of Illinois

For some years the writer has been interested in adapting for pupils of the fourth grade and older, experimental studies with plant varieties and with fertilizers, of such a character that definite scientific results should be achieved both for education and for agriculture. It is his contention that a thorough working knowledge of a subject, together with a thorough working knowledge of children, will make it possible for the fundamentals in almost any field of science to be satisfactorily presented in the nature-study course of the elementary school. The present article will give somewhat briefly the method and results of some garden studies made by a fourth grade class in the training school of the Northern Illinois State Normal School at DeKalb.

The point in vegetable gardening for profit is to get into the market early. In the school garden, likewise, it is desirable to grow crops which will mature before the end of the spring term, thus avoiding the vacation problem. To be sure, certain crops which do not mature until fall and which demand a minimum of cultivation, may be grown without serious difficulty under usual conditions, but such quickly maturing vegetables as the radish, lettuce, pea, spinach, chard, cress (pepper grass) and beets (for greens), are perhaps best for work with younger pupils.

The essentials in market gardening, as in other forms of agricultural pursuit, are a definite plan, good seed, good soil, a good season, good sense, and something of the science of agriculture.

(1) A definite plan involves a drawing of the garden plat to scale, indicating the planting scheme, the varieties to be planted and the area devoted to each. In a class where gen-

eral gardening is to be done several lessons should be given here, preferably during February or March. Individual plans should be submitted after a preliminary discussion, to be revised and corrected after criticism by the class. Many problems will arise, such as time of planting, sequence—where more than one crop is to be grown on the same area—distance between rows and between individual plants in the same row, depth of planting, the growing of tomato, cabbage, etc., in hotbeds for later transplanting to the garden, preference among different varieties of one vegetable, etc.

UNFERTILIZED RADISHES

If only one or two vegetables are to be grown, the problems are fewer.

(2) Good s e e d has not been valued as it should be, even by "practical" farmers. The school garden which fails to develop a sense of hereditary values seriously misses the mark. (We do not overlook environmental factors which operate upon the seed before planting.) Nothing is more fundamental to the public good than a knowledge of and faith in the influence of heredity, and it is the privilege and duty of nature-study to give the child an "attitude".

In selecting seed, the children send for a catalogue from one or more reliable wholesale seed stores. (An admirable motive, here, for "language work".) The study of the catalogue should follow promptly after the discussion of the garden plan. The question of varieties will quickly arise, and if the experimental spirit has been properly cultivated, the natural suggestion will be to try out several varieties and thus to discover which should be planted hereafter in the home gardens, or in the individual plots in the school garden. For the fourth grade work this "variety study" is carried on very successfully in the case of the radish. The plant is small and easily cultivated, the seed is relatively large, the different types readily available from marked individuality, the plant matures quickly and may contribute to the pleasure of a school-room dinner before the close of the spring term. In our experiment seven striking varieties were selected for the test, after the interesting discovery by the class that more than one hundred types of radishes have been "invented" by plant breeders. Any grocery store will probaly have half a dozen varieties of radish seed for sale, the colored picture appearing on the face of the package. Both red, white, black, brown and yellow varieties may be obtained, and, in each case, the form may be spherical, oval, or tapering like the old-fashioned radish of two decades ago, which is now so out of date that some of the children in our class had never seen it. One lesson is devoted to the characteristics desirable in the radish, such as table appearance, tenderness, rapid growth, degree of pungency, and freedom from disease or insect attack. This discussion alone may open a new world of thought to the children. An item of interest is the psychological advantages possessed by the scarlet-coated spherical form which, when partially peeled, suggests a rosebud on the table.

All of the preceding work should be out of the way before the time has arrived to prepare the garden for planting.

(3) Good soil is that which is in proper condition physically and which has an abundance of available plant food. The preparation of the seed bed, including the question of fertilizing, is the subject of more than one lesson both indoor and out. Our fourth grade class was told at the proper time that a certain white substance resembling salt, easily applied, is reputed to be valuable as fertilizer, acting quickly upon the growing plant. The name was asked for and promptly given —nitrate of soda. We decided to test its value in forcing rad-

ishes and lettuce for early market. (Varieties of lettuce had been selected also.)

The conditions of the experiment discussed, we were ready for the planting. It was decided to combine the variety test with the fertilizer test. The plots used were each ten by ten feet square, separated by three foot strips of sod, the soil being uniform throughout so far as we knew. In the first plot were to be planted seven varieties of radish—a row to a variety—and no fertilizer applied. The next plot was to be similarly planted, with the same varieties, but treated with nitrate of soda. On two other plots lettuce was to be used in a parallel experiment.

FERTILIZED RADISHES

(4) The season, fortunately, was favorable, and our radishes matured quickly. Let it be understood, however, that intelligence in farming is rated higher than a "providential" season, by those who have a right to speak on the subject.

(5) Good sense was at a premium when it came to the actual planting. How to mark the rows, how far apart they should be, the distance between seeds in the row, the depth of covering, and the like, afforded problems in arithmetic, geom-

etry, struggle for existence, etc. An important point in the planting is to eliminate the personal equation, and the children readily understood that if the experiment was to be worth anything, there must be no difference between the two plots—the fertilized plot and the "check"—save the one difference of fertilizer applied. It was arranged that child A should plant row No. 1 (variety No. 1) in both the fertilized and unfertilized plots; B should plant row No. 2 in each plot; C, row No. 3; and so on. So far as possible, the planting was uniform throughout, but by this scheme we endeavored to secure the most uniform planting possible in the two rows under immediate comparison. A second set of children covered the seeds, child M covering row No. 1 in each plot; N covering row No. 2 in each bed; and so on. The best writer in the class was selected to label the rows.

(6) The science of agriculture is claimed by many to be unsuited to the purposes of elementary education, but it is perhaps true that the fundamentals of scientific agriculture are, in their lowest terms, available for nature-study uses in the hands of one who understands both agriculture and children. The children who were conducting this experiment in soil fertility thoroughly understood at the end of the experiment, if not at the beginning, that a plant hungers and must be fed, as truly as an animal. This is more than the average tiller of American soil as yet apprehends, as is evidenced by the average yield of corn in the United States. Immediately before planting, nitrate of soda was sprinkled lightly over the soil in one bed until the "salting" was easily apparent to the eye—giving a grayish cast, but still sparsely strewn. It was then lightly raked over until it was incorporated in the upper half inch of soil. The radishes (and in the parallel experiment, the lettuce) were then planted in the two beds. After ten days, when the seed leaves were well above the surface and the plants were growing rapidly, a second application of the nitrate was made on the fertilized bed, this time sprinkling the fertilizer lightly on either side of each row, at a distance of two inches from the plants; then working it into the soil, using for this purpose a lead pencil. Similar lead pencil cultivation was given to the rows in the checked plot. Between applications, both plots were cultivated alike, watered alike, as occasion demanded, and the plants thinned alike (one child taking the same row in the two beds).

Ten days later, or twenty days after planting, a third application of nitrate was given in the same manner as the second.

The results of our experiment are fairly shown in the two accompanying illustrations. While the different varieties had different growth periods, one in particular having less foliage than the others and maturing more quickly, on the average the radishes in the fertilized bed were ready for market a week before those in the checked plot. At any given time after the roots were fairly started, the difference in the two plots was very apparent, both foliage and root being sturdier in the radishes of the fertilized plot. In the illustrations, the photographs being taken on the same day, the difference in the individual plants may be seen by comparing the single specimens which lie in the foreground between the rows in either bed.

The claim is not made, neither did the class understand, that in this experiment we were exploring the unknown or contributing to the advancement of science through trustworthy data, save as scientific advance lies in the guidance of children, through actual experience in genuine problem-solving, into an appreciation of scientific method. Children so taught may not become scientists, but they will be the more ready in later life to accept the teachings of science, and from their ranks will come its patrons.

SCHOOL-GARDENS IN ELIZABETH CITY COUNTY, VA.

By ELLEN GUY LINDSAY

At the beginning of the present session, the school board of Elizabeth City County decided to add nature-study and school-gardening to their course. In the county there are four large grammar schools and a number of one-room buildings. A supervisor, Miss Lewis, a student from Cornell University, was employed to take charge of the work. She visited the country schools and planned and directed the garden work in the large schools. Last fall only one garden was laid out, but this spring three are under cultivation.

At the West End School of Hampton, the garden is 120 x 120 feet. It contains class plots for the first and second grades and individual plots for the third, fourth, fifth and sixth grades. The garden was laid out for the pupils, and their first work was planting.

The Phoebus garden contains class plots for the first three grades and individual gardens for the fourth and fifth grades. The border around the garden is cared for by the sixth and seventh grades. This garden is the best arranged for work, because a room in the building opening on the garden is used

PLANTING LESSON, FIRST GRADE, PHOEBUS PUBLIC SCHOOL
GARDEN AT WEST END PUBLIC SCHOOL; FIFTH GRADE

as a tool-room and there are three spigots in the basement from which the garden can be watered. No time is lost in reaching the garden from the school.

The garden at Symes Eaton School is very small because a large lot could not be obtained near the school.

Tools, seeds, etc., are paid for by the school board. One set of tools (two dozen rakes and two dozen hoes) serve for all the grades, only one grade working at a time. A class goes to the garden accompanied by the grade teacher and generally the supervisor. Vegetables are planted in the individual gardens and flowers in the borders. Vegetables that will mature by the middle of June have been selected and in each plot at least one plant from small and one from large seeds are used to teach different depths of planting. There is little trouble in regard to discipline so long as the pupils are kept busy. We find it very helpful to the teachers who have a few large troublesome boys in a grade, to send them to the garden when they are restless; to water the plants and clean up the walks.

In the country schools where one teacher has four or five grades to teach, school gardens have not been attempted, but we have tried to encourage home gardening. The children are told how to lay off and work their gardens, and penny packets of seed are sold to them. A flower festival has been planned for the first of June at which the country children will exhibit the best products from their gardens.

As far as possible indoor nature-study work is correlated with language and geography. The seventh grade of Phoebus School has regular instruction in elementary agriculture. The class is required to make as many simple experiments as possible besides text-book work. Each member keeps a record of all experiments made. As far as possible simple apparatus is used.

It is believed that the effect of interesting pupils in nature-study will make the matter of discipline a less formidable task than it has hitherto been in our crowded school rooms.

* * * * * *

The colored plates which, through the generosity of Mr. William Dutcher, are to appear in the Nature-Study Review, are unavoidably delayed until the May number. The preparation and printing of color plates is necessarily a slow process. We have seen a preliminary proof of these beautiful pictures—of the passenger pigeon and the mourning dove—and can assure our readers of their unusual merit.

We trust that a large number of bird lovers will avail themselves of the opportunity, afforded by our May issue, to obtain these attractive bird pictures.

SCHOOL GARDENS IN LOUISVILLE, KY.

By EMILIE YUNKER

The School Garden in Louisville is no longer an experiment. It has had steady growth as to its value for health, happiness and wholesome exercise for the children. As an important factor in the educational system, it is becoming more and more recognized.

For years several schools have had window gardens. Outdoor gardening, however, was begun at the Normal School in 1899. Like many others, this entire yard was paved, with the exception of a small grass plot in front. After having indoor laboratory work with seeds and plants the children were anxious to make a garden out-of-doors. Shrubs and tools were donated and soon a trip of ground near the house was converted into a flower border. Finding the garden rather small, a back-yard was accepted, where vegetables and flowers were grown. In the fall a basketful of popcorn was gathered and

FOURTH GRADE BOYS BUILDING A FENCE SEPARATING THE VEGETABLE GARDEN FROM THE PLAYGROUND. NORMAL SCHOOL, '07.

popped one frosty afternoon over a grate fire, much to the delight of the young gardeners.

In 1904, the principal succeeded in having the bricks taken up in the back yard and a vegetable garden 17 ft. x 25 ft. was planted. Two years later two feet of bricks, running the entire length of the yard, were removed, where hardy flowers and vines were planted. The boys of the fourth grade, under the supervision of their teacher, built a fence separating the vegetable garden from the playground.

Many shrubs and hundreds of bulbs have been added to the flower garden. Here the strictest rules of landscape gardening have been observed.

The products of the vegetable garden, such as onions, radishes, lettuce, beets, and others that mature early are frequently sold, and the funds reinvested in the garden. For three years, the children of the City Beautiful Club of the Normal School have taken care of the garden during the summer. The money they receive from the sale of vegetables is further invested in tools, and bulbs for the school yard or for distribution among the neighbors. The Club now has $10.50 to its credit in a Savings Bank.

These children not only help in the school yard, but improve their own premises by making gardens at home and by helping others.

Civic pride has been aroused. This garden, in the heart of a large city, is having its influence on the neighborhood. So far, not a flower has been missed. Ofttimes a passerby will stop to ask the name of a flower. Now and then a plant is given to the inquirer, with some instruction as to culture.

In some instances, a few schools have undertaken this work without any assistance. Others, with the hearty co-operation of the Woman's Outdoor Art League and the financial support of the Commercial Club and the school board, have been beautiful with flowering shrubs, hedges, vines, hardy plants and lawns, until at present there are few schools without a garden.

At the Crescent Hill School a clay bank was converted into a park, with its restful lawn and its flower borders all enclosed by a California privet hedge. The Atkinson School had tulips second to none in the city. The Morris School had beautiful asters of superior quality. The Portland School raised early vegetables, the beans bringing $2.25 per bushel. About $12 was secured from the sale of beans alone. The Maiden Lane Colored School had strawberries and early vegetables, which were raised in the school garden.

To stimulate the work, seeds are offered by the Woman's Outdoor League at 1c per packet and gladiolus bulbs at 1c apiece. In March, printed circulars containing lists of seeds and suggestions for planting are distributed among the school children under the supervision of the assistant superintendent.

CITY BEAUTIFUL CLUB AT WORK IN NORMAL SCHOOL GARDEN, LOUISVILLE, KY., VACATION, '07.

Leaflets on the making of window gardens have been sent out this spring to all the schools, prefacing the work out-of-doors.

In this indoor laboratory, the children find out for themselves the depth of planting, necessity for light, heat and moisture, and the value of good soil. Independent observation is encouraged. Many opportunities are furnished the alert teacher for the correlation of these activities with art, literature, English, etc.

In mathematics, the children measure the stakes, markers, rows of plants, distance apart. They also use the thermometer, measuring the heat at regular intervals during the day, recording on a chart the temperature in the school room, out-of-doors and in the hotbed. All kinds of manual work is encouraged. Window boxes, stakes, labels, seed envelops, rustic baskets for ferns, and tomato frames are made.

A former pupil of the Normal School, sixteen years of

SCHOOL BOYS CLEANING UP VACANT LOT, LOUISVILLE, KY.

age, made two sundials which record perfect time, one of which he presented to the school.

Now and then a bunch of iris, strawberries, tomatoes weighing 1½ to 2 lbs, and other vegetables are placed in some show window where every one can see them.

Creditable exhibits have been held in individual schools. In 1909, the first Public School Exhibit of Louisville was held at the State Fair, at which flowers, plants and vegetables raised by the children were shown, as well as specimens of art, manual and written work.

So successful was the exhibit and so much attention did it attract that hereafter this will be a permanent feature of the State Fair, and all the schools of the state will be represented.

Much attention is given in some schools to the planting and the care of trees. Two years ago, some sugar maples were planted along the side walk in front of the Normal School. The neighbors continued the line until it reached the corner. In 1909, more trees were planted on Arbor Day. This year, the Park Commission has given us 36 trees, including sugar maples, pin oaks and ash trees for planting in the school yards. In addition, tulip trees have been purchased. This we hope to make the state tree.

We have learned that gardening vitalizes the school work and fills it with interest; that the spirit of industry thus developed is carried into the schoolroom; that the children who have learned the lesson of making flowers and vegetables grow where nothing grew before, have gained a valuable lesson in life, applicable not only to plants. There is no question as to its making better citizens of them.

THE EDUCATIONAL MUSEUM OF THE ST. LOUIS PUBLIC SCHOOLS AND ITS RELATION TO GARDENING AND NATURE-STUDY

The problem of presenting museum material to the children in the schoolroom, just at the time when it is needed to illustrate school work, has been met in the city of St. Louis by the establishment of a unique institution, a traveling museum, known as the Educational Museum of the St. Louis Public Schools.

This institution consists of a display room, wherein are exhibited about one thousand (1000) collections of various assorted materials for the teachers' inspection and study; a packing department in which from ten to twenty duplicates of each collection are boxed ready for delivery to the school; a Teachers' Library of some seven thousand (7000) volumes ranging from reference books on all museum subjects to pedagogical works of all varieties; a department of educational exhibits, showing work in manual training, domestic science, drawing literature, the sciences, etc., from foreign countries, and our own school work from Kindergarden to Teachers College; and last, but most important, a delivery system, consisting of two wagons which are kept busy delivering museum material and books to the hundred and twelve public schools of St. Louis.

Every teacher has a catalogue showing what material is available, so that she can make her selection and mail her requisition to the Museum; the wagons then deliver to her school what she may have ordered. All material sent out is allowed to remain in the school for one week, the wagons reaching every school once a week, making the new delivery and collecting last week's delivery for return to the Museum.

Books from the reference and pedagogical library are delivered and returned by the same wagons, the teachers being

DELIVERY SYSTEM OF THE EDUCATIONAL MUSEUM

supplied also with library catalogues and order blanks.

That the unique scheme finds great favor is attested by the fact that during the school year of 1908-1909, 22042 collections were delivered to the schools, while for more than a year past twenty wagon-loads per week have been carried to and from the schools.

As to the practical results obtained among the children many interesting incidents might be related, showing how the use of this museum material aroused in the children a desire to know more of the wonders and beauties of nature; of experiments with seeds procured from the museum specimens; of home and school gardens developed as a result of this interest; of how these gardens led on in the most natural way to the study of troublesome weeds, of injurious and beneficial insects, of birds and their place in the economy of nature, of atmospheric and climatic conditions, and so on.

In this connection the school gardens and greenhouses of the Teachers College are proving of great practical value, the young teachers thus being prepared to give sympathetic, intelligent assistance to their future pupils when this love of na-

GREEN HOUSE AND SCHOOL GARDENS OF THE TEACHERS COLLEGE, ST. LOUIS, MO.

ture begins to assert itself in the form of gardening and plant study.

Incidentally also this interest reacts to the benefit of the Museum in the replacing of worn specimens and bringing in of new material by the pupils, such as the blossoms, seeds, fibers and entire plants of hemp, flax, sorghum, sugar cane, rice, etc., grown in the home and school gardens, and specimens of mineral and plant life procured during field trips, as a result of the closer observations to which the children had been stimulated.

As to the variety of material, of course the scope of such an institution might be endless. At present the Educational Museum of the St. Louis Public Schools contains most of the common cereals, grains and other food products; the various vegetable and animal fibers, and other products used for clothing material; commercial exhibits, showing processes of manufacturing; minerals, rocks and ores of many varieties; woods, plants, and models and charts of plants; specimens of sea life; hundreds of mounted birds and small mammals; thousands of stereoscopic views; models of home and field implements, wearing apparel, charts, colored pictures, maps, etc., illustrating the life and history of different peoples; art objects and models used by the classes in drawing; a fairly comprehensive collection of physical apparatus; and, lastly, what is proving of great assistance to the teachers, the well assorted reference library.

By this system of bringing the museum material into the schoolroom, the loss of energy necessarily attending the taking of large classes to the museum is avoided, and the child's attention is concentrated on one collection instead of being distracted by the innumerable variety presented in the museum.

The desire for investigation on the part of the children must always be appealed to when presenting museum material. The teacher should use this material in such a way as to arouse the spirit of curiosity and research. The aim should be to give the child a knowledge of his tools, so that he may go out into the vast home of Nature with eyes and ears and fingers ready and eager to continue these investigations, stimulated by the conscious desire to know, to love and to understand.

A REMARKABLE OBSERVATION ON BIRD BEHAVIOR

By NINA L. SWEETLAND

[EDITOR'S NOTE: The following interesting letter is furnished us by its recipient, Miss Jessie Phelps, Assistant Professor in Zoology, Michigan State Normal College, Ypsilanti, Mich. The comment which follows, by a recognized student of bird life, is complimentary to the accuracy of the observer.]

My Dear Miss Phelps:

I'm sure you will be surprised to receive a letter from me, but I had a novel experience the other day and I thought it might interest you, as it did me. The experience was nothing less than seeing a real bird's ball!

It was a morning late in May, warm and sunshiny. I first noticed a sweet warbling, as if several birds were having a concert. It sounded familiar, but I thought nothing of it until there sounded, sweet, clear and true above the warbling, two short notes, sung first on one tone, then in a moment repeated on a higher tone, then on a still lower, then on the first tone. It was like an orchestra as you have heard one instrument break away from the others and arrest your attention in a burst of sweet music for which the other instruments are making a beautiful accompaniment. No well trained orchestra could have played in more perfect time nor have blended its instruments in sweeter harmony than did these strange musicians of the air. I wish I were musical enough to be able to represent on the staff the short, flute-like notes and to show the tones in which they were sung, but I couldn't do it if I tried.

Sister and I both went out to see what strange birds these were, for though the warbling had sounded familiar, the rest was not and so I thought they must be some new birds. Finally we espied them in the top of a tall oak. They were too high for us to see what they were, but we could now see the strangest part. The birds were dancing! It was none of your modern ragtime dances with their hurrying, awkward movements, but a figure executed with as much stateliness and grace as our great grandmothers ever put into the Virginia reel. During the warbling the birds sat on their perches bowing and singing; but the short quick notes were the signals for the figures, and some or all of the birds would hop on their branches, bowing deeply and flirting their tails. Sometimes the birds hopped together, sometimes one after another, sometimes one, sometimes all, but however they did it they kept the most perfect rhythm, never making a movement but it seemed a part of the music. For about five minutes we watched them so fascinated that we almost held our breath, then suddenly they rose on their wings and flew away over our heads. We craned our necks to see what they were; but we didn't need to see, for as they flew overhead they one and all called out with voices in startling contrast to the sweet tones of a moment before, "Jay! jay! jay!"

Sister and I looked at each other in astonishment. Such music from bluejays and not more than five of them at that! I have often heard bluejays give the warbling sound and supposed that to be their song, though as I heard it that morning I couldn't place it. In a tree less than two rods from the oak a pair of bluejays had been building a nest. Who knows but that this jubilee was to celebrate their wedding?

To me this experience was something new, and I have never read of anything like it, even among birds more noted for their musical abilities, and so I knew that if this was something musical you, too, would be interested in hearing about it.

Sincerely yours,

NINA L. SWEETLAND,

JUNE 8, 1908 SALINE, MICH.

Editor Review:

The account which you enclose is certainly an interesting one. I have little doubt that the observations recorded were correct. With reference to the music, it is not an uncommon occurrence to find occasionally a few individuals of even the most unmusical species developing considerable musical ability. I recall at one time that I heard even a kingbird give quite a respectable musical performance.

As regards the "dancing", birds do occasionally perform rhythmical movements. They have developed to some extent what may be called a play instinct, which is sometimes closely connected with the mating instinct. Or this may have been connected with the performances which the male birds often make before the female in the mating season.

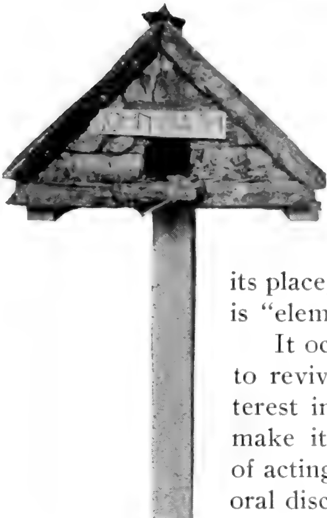
Flocks of birds on the wing are known to perform regular movements. An observer from Germany informs me that the starlings have been seen to go through a sort of drill with great regularity and precision.

(Signed) G. H. TRAFTON

Members of the A. N.-S. S., who are interested in FRESH WATER (*Jar*) CULTURES, will be pleased to learn that material of this character, especially *Nitella*, may be obtained from Mr. A. B. Seymour, 26 University Museum, Cambridge, Mass. Mr. Seymour's interest in nature-study leads him to offer this material without expense other than the payment of postage. As is well known, the living *Nitella* is of special interest for demonstration of protoplasmic movement.

NATURE-STUDY AND VOCATIONAL TRAINING

By JOHN D. HANEY, Principal, P. S. 5, Bronx, New York City



The syllabus of studies for the New York City schools makes no provision for "nature-study" as such in the last three years of the elementary grades. Nature-study, if the efforts of the public have counted for anything, is "finished" in the fifth year. In the sixth, there is nothing to take its place, and in the seventh and eighth there is "elementary science".

It occurred to the writer last year, to try to revive, in the four upper grades, an interest in the moribund nature-study and to make it function in some other than that of acting as an excuse for drill in connected oral discourse, and he decided to see whether the constructive instinct of boys and girls would not help him out.

He chose bird houses as his theme, or core of interest, and suggested to the classes that they try their hand at getting up a practical exhibition for May 5th, Audubon Day, a day he thereupon established in his school as a perpetual reminder of the birth of America's foremost exponent of the beauty and charm of America's native birds. The date was convenient, being near to that of the state Arbor Day and kindred in its interests and emotional appeal.

Some pupils elected to make houses and others chose to make posters advertising the coming exhibition of houses.

Under the able guidance of the teacher of constructive work, the pupils entered with zest upon their problems—the planning of space, subject matter and color of their posters, and the working drawings of their houses.

Some fundamental facts were enunciated; e. g., the hole for the entrance must be big enough for the tenant to enter and not so big as to allow, for instance in the case of the wren, the usurpation of interlopers; the exterior must attract and not repel by its artificial appearance; the roof must shed the rain; access must be allowed for the purpose of cleaning the box at the end of the season; protection from enemies must be afforded; similitude to real houses for man's occupancy is not the criterion of merit in a bird house.

Such propositions as these started trains of thought that only study could adequately investigate, and the library was appealed to in order to provide data for accomplishment. The girls gave their attention mainly to the posters and the boys to the houses. And how they did work!

The school had no shop, no bench, no vise, no lumber, and few tools. But an old soap box that could be had for the asking, a jack-knife, a saw, a hammer, and a few nails, can do wonders, and the boys were not dismayed by the scarcity of material. The open lots still bore trees,—alas, too soon to disappear before the advancing "flats", and bark was not wanting for the rustic exteriors.

The weeks flew by and the term drew all too rpaidly to a close for those whose heart had got into their work, and by May 5th there had been constructed over thirty houses and as many posters that were to make the exhibition. Interest was never greater. There was something tangible to work for, something not too hopelessly unattainable, and there was the promise, too, of getting the house back and actually having a chance to set it up in the back yard to see whether it would work.

The experiment was a decided success. The park authorities of Bronx Park offered to take all the bird houses we could make, and more than one visitor regarded enviously the minature structures that would have looked so cosy on "that little place up in the country".

The title of this article is misleading; it is a little too ambitious; but it is real so far as it goes The boys learned to look beyond the tedious old string-winders and pencil-sharpeners that the "course" called for, found new life in a subject that had seemed as dead as Methuselah, and new capabilities in the untried resources of every household. Nature was brought home (in both senses) and observation of the commonplace, or at least the usual, was sharpened. The teacher felt that constructive work was possible to a greater degree than ever before and a correlation was more obvious; while the principal learned anew the frequently reiterated, and too frequently ignored, potency of the doctrine of interest.

PROGRAMS FOR ARBOR AND BIRD DAY

April is a month of tree planting and of returning birds. To Nebraska is due the origin of Arbor Day and to Pennsylvania, Bird Day. Throughout the United States these two days are now commonly celebrated together in the school. Of late, women's clubs and other organizations are taking an active interest in these special days. It is common for the governor to issue a special proclamation setting the day,—or perhaps one in the spring and another in the fall—and calling upon the citizens to observe it in spirit and in letter.

The usual "suggestive program" is merely a list of declamations suitable to the occasion. A more commendable program consists of the report of nature-study classes and the demonstration of materials intended to attract birds, or of tree seeds, seedlings, cuttings, bulb plants, and the like, representative of class work. A second part of the program should consist of actual work out-of-doors in keeping with the day. Four such representative programs, actual records of former celebrations in a State Normal School, are here given, in the hope that they may be of service to teachers in planning for Arbor and Bird Day for 1910.

ARBOR DAY AND BIRD DAY CELEBRATION.

April 22, 1904. N. I. S. N. S.

In the Auditorium. 1:30 P. M.

1.	Song: The First Violets	Normal School
2.	Reading of Gov. Yates' Proclamation	Ethel Bryant
3.	Origin of Arbor Day	Ruth Heath, Grade VI.
4.	How to Make Friends with the Birds	Irene Ruby, Grade IV.
5.	Song:	
	(a) Daffy-down-dilly	
	(b) Sunbeams	
	(c) Pussy Willows	Primary Grades.
6.	Downy Woodpecker	Mary Moore, Grade VIII.
7.	How to Transplant a Tree	Carl Benson, Grade VIII.
8.	Arbor Day Song	Mixed Chorus

On the Campus. Tree Planting. 2:15 P. M.

1.	Grade 1 Scotch Pine	Song, Class
2.	Grades II and III. Snow Apple	Song, Class
3.	Grades IV and V. Horse Chestnut	Harry Hamilton
4.	Grade VI Russian Mulberry	Clarence Morey

5. Grade VII. Mountain Ash — Raymond Mork
6. Grade VIII. Redbud — Florence Moorehead
7. Glidden Society. White Birch (Presented by Mr. Ed Johnson) — Miss Hosley
8. Ellwood Society. Norway Spruce (Presented by Mr. Ed Johnson) — Mr. Calloway
9. Freshman Class. Balsam Fir — Mr. Kays
10. Junior Class. Sycamore — Miss Rode
11. Senior Class. Norway Maple — Miss Fuller

BIRD AND ARBOR DAY

I. In the Auditorium, 1:30 *p. m.*

1. Arbor Day Song — Normal and Training School
2. Reading of the Governor's Proclamation — Mr. Perry
3. Songs — Primary Grades
   - (a) Daffy-Down-Dilly — Grades II and III
   - (b) Song of the Robin — Grade I
   - (c) Five Little Chickadees — Grade I
   - (d) The Bird's Nest — Grades I, II and III
4. Why it is Fitting That We Celebrate This Day — Mr. Hatch
5. The Native Wild Wood (Illustrated) — Mr. Rowley
6. How to Attract Desirable Citizens — Breese Rosette and Lewis Bush

II. On the Campus, Tree Planting, 2:30 *p. m.*

1. Grade I. Austrian Pine. — Song by the Class
2. Grades II and III — Early Richmond Cherry
   Voting for the Cherry Tree by the Class
3. Grades IV and V, White Ash — Fritz Fisk
4. Grade VI, White Oak — Bert Olsen
5. Grade VII, Raising a Martin House — Charlie Talbot
6. Grade VIII, White Flowering Dogwood — Mary Jordan
7. Glidden Society, Plum — Miss Worthington
8. Ellwood Society, Arbor Vitae — Mr. Farr
9. Freshman Class, Red Cedar — Miss Brownell
10. Junior Class, Cut-Leaf Weeping Birch — Mr. Schell
11. Senior Class, Ginkho — Mr. Skiles
12. The Glidden Elm — Miss C. Partridge
13. The Ellwood Elm — Miss Spoor

ARBOR AND BIRD DAY PROGRAM

April 23, 1908.

1. (a) Song
   (b) Recitation
   (c) Song — Primary Grades
2. Reading of State Superintendent's Letter — Miss Farley
3. Bird Nest Boxes — Geo. Dadd, Grade IV.
4. The State Tree — Henry Wagner, Grade V.
5. Exhibit of Vine-plants — Marjorie McMurry, Grade VI.
6. Quartette — Grades I and II.
7. Plant Propagation (illustrated) — Roy Rundle, Grade VII.
8. The State Flower — Marjorie Bristow, Grade VIII.
9. Water Birds — Henry Lundberg, Grade VIII.

10. The Price of Lumber — Lucy Quinn, Freshman Class
11. Song — School

ARBOR and BIRD DAY
N. I. S. N. S.
April 23, 1909

Auditorium, 2:15 P. M.

1. Chorus, "Beautiful Springtime" — Grammar Grades
2. The Call to Celebrate — Dr. Cook
3. Songs,
   (a) Dear Little Robin
   (b) Naming the Trees — Primary Grades
4. The History of Arbor Day — Hazel Underwood, Junior Class
5. Improvement of the Home Grounds — Marie Gilhain, Freshman Class
6. History of Bird Day — Florence Bollinger, Senior Class
7. Exhibit of Material to Attract Birds — Grades II and III
8. Vocal Solo, "The Sparrow" — Marporie McCurray
9. Exhibit of Bird Houses — Grade VI.
10. Exhibit of Some Tropical Birds — Mr. Charles
11. Reading, "An English Apple Orchard in the Spring" — Miss Farley
12. Arbor Day Song — Normal and Training Schools

Adjournment to the campus to plant trees.

* * *

BOOK MARKS DISTRIBUTED AMONG SCHOOL CHILDREN are being used to further the movement for outdoor improvement in Louisville, Kentucky. An attractive card reads as follows:

> What can I do to make Louisville more beautiful?
> I can help keep it clean;
> By burning the rubbish where possible.
> By never thowing it or sweeping it into back or side yards, streets, gutters, alleys or vacant lots.
> By putting it into a can for the City to haul away.
> By never spitting on any side-walk, crossing, school yard, street car or public building.
> By beautifying the vacant lots near my home.
> By planting trees and flowers wherever possible.

PASSENGER PIGEON INVESTIGATION

By C. F. HODGE

For the first information, exclusive and confidential, of the location of a nesting pair or colony of wild, or passenger, pigeons, anywhere in North America; when properly confirmed and if found by confirming party with parent birds and young UNDISTURBED:

Colonel Anthony R. Kuser will pay on award of	$300.
John Lewis Childs will pay an award of	$700.

This means that the first nesting discovered, if found undisturbed by confirming party will draw a prize of $1,000.00 This amount may be increased by local awards.

For First Nesting Discovered in the Following States:

John Burroughs, New York	$100.
A. B. F. Kinney, Massachusetts	100.
Anonymous, Massachusetts, for 2d find	100.
Allan B. Miller, for 1st nesting found in Worcester Co., Mass.	20.
Edward Avis, Connecticut	100.
H. S. Hathaway, Rhode Island	100.
Worthington Society, New Jersey	100.
John Dryden Kuser, for 2d nesting found in New Jersey	100.
Henry W. Shoemaker, Penns. (adds $25, if nest is protect ed)	125.
W. B. Mershon, Michigan	100.
R. W. Mathews, Minnesota	100.
Professor C. O. Whitman, and Ruthven Deane, Illinois	100.
John B. Thayer, to be assigned April 15	500
John Lewis Childs, to be divided to finds after first	500.

For Expenses of Investigation:

C. F. Hodge, for office and traveling, $100.; John E. Thayer, for confirming of reports, $100.; National Association of Audubon Societies (Wm. Dutcher) $100.; George Bird Grinnell, for minor expenses, $25.; John H. Sage, $20.; C. K. and Chester A. Reed, for leaflet and colored plate, $400.

Total to date	$3,800.00

The purpose of the above offers is to secure an intelligent search of the American continent for breeding pigeons in the hope that, if found, the species may be saved from extermination.

None of the money has been paid in and none will be called for until nests have been reported and confirmed, or until expenses have exceeded $100. Expenses to date, about $18.

All above awards are offered solely and only for information of location of undisturbed nestings. We do not desire possession of any birds, alive or dead, but are working solely to save the free, wild pigeon.

To insure intelligence and good faith, informants of nestings are advised to agree to forfeit at least $5 in case they have failed to identify the birds correctly. This is only fair, since the amount will cover but a small part of the loss occasioned by a false report. The money will be immediately returned, if the birds are found to be the true wild, or passenger, pigeon (Ectopistes migratorius). In the case of nesting pigeons, there can be no excuse for sending in false reports.

Priority of claim will be decided by time of receipt at post or telegraph office. Awards will be equally divided, if two or more letters or messages bear record of same date and hour.

A number of encouraging reports have been received covering a wide territory—New Hampshire, Massachusetts, Connecticut, New York, Pennsylvania, Ohio, Ontario, Wisconsin, Nebraska, Kansas—or pigeons observed during 1909. Still not a single instance of the birds seen this spring has come in to date. Now is the time. Bendire's earliest record of nesting is for the first week in April, in Wisconsin and Iowa; latest dates of nesting, June 5 and 12, for Connecticut and Minnesota. The next two months ought to decide the question whether the great North American pigeon is extinct or not.

As soon as a pigeon nesting is found and surely identified, telegraph or write the undersigned, who will arrange for confirming party and for payment of the awards.

Signed, C. F. Hodge,
Clark University,
Worcester, Mass.

* * * * * *

THE N. W. PA. SCIENCE AND MATHEMATICS ASS'N will meet at Alleghany College, April 30. The members are largely public school teachers, many of them from country schools. Nature-study will be prominent on the program. There is a movement on foot looking toward the establishment in Pennsylvania of a Nature-Study Bureau similar to that of Cornell University.

ORGANIZATION MEETING OF THE CHICAGO NATURE-STUDY CLUB MARCH 19, 1910; A NEW SECTION OF THE AMERICAN NATURE-STUDY SOCIETY

A most conspicuous time, when the interest in returning birds was at its height, was chosen for the initial meeting of the Chicago Nature-Study Club, and the fact that so many responded to the call augurs well for its future. The program sent out by the organization read as follows:

Complimentary Exhibition of Flower Portraits

CHICAGO NATURE STUDY CLUB

Chicago Academy of Sciences, Lincoln Park, Chicago
Saturday, March 19th, 1910, 10 A. M.

You are invited to be present at the Chicago Academy of Sciences, Lincoln Park, Chicago, Saturday, March 19, 1910, 10 A. M., where will be given a

Complimentary Exhibition of Flower Portraits

by Jesse L. Smith, President of Geographic Society of Chicago, on the occasion of the Organization Meeting of the

CHICAGO NATURE-STUDY CLUB
as a branch of the American Nature-Study Society.

Program

Worrallo Whitney presiding

I. BRIEF REMARKS

By Frank C. Baker, Otis Caldwell, Fred L. Charles H. S. Pepoon, Miss Kate Reedy and others.

Organization of the Chicago Nature-Study Club

II. WILD FLOWER PORTRAITS

Jesse L. Smith

These beautiful studies are of rare excellence, and are presented by one who has the viewpoint of both naturalist and scientist. All teachers who are interested in nature-study are invited to attend this meeting. There is no admission fee.

Before organizing, a number of brief but lively and pertinent remarks were made by several persons who were already members of the A. N.-S. S. One of the charms of the meeting was its informality. A number of institutions, such as the Normal School, University of Chicago, and the Chicago Academy of Sciences, offered to open their doors at any time for our meetings. The latter institution deserves much credit for the substantial way in which it is cooperating with the teaching force.

The purposes of the club, as stated in the constitution adopted, are (1) to encourage and promote general interest in nature-study on the part of residents of the Chicago district;

and (2) to advance the nature-study movement in public and other schools. A strong plea was made to keep the work of the club of such a character that it shall interest not only those connected with the schools, but also those in other walks of life, and especially parents.

Representatives of various women's clubs spoke encouragingly of our movement and of their interest in it. About 175 were present, and 138 signified in writing their desire to join the club. (Several names have later been added to this list.) The city is divided into three sections—north, west and south sides,—each of which has its own officers and holds meetings at its own discretion. The work of each section is to be reported at the annual meeting of the entire club. The annual dues are $1.25, $1.00 of which is sent to the Secretary of the American Nature-Study Society, 10c is retained by the Secretary-Treasurer of the Chicago Nature-Study Club, and 15c is turned over to the Secretary-Treasurer of the section with which the member allies himself.

The following officers were elected by the charter members of the club: President, W. W. Whitney, Bowen High School; Secretary-Treasurer, Emily C. Westberg, 911 Roscoe St.; Director on the Council of the A. N.-S. S., Mr. Grant Smith, Chicago Normal School.

A real treat was in store as the closing number on the program. Mr. Jesse L. Smith, of Highland Park, Ill., showed his superb stereopticon views of wild flowers. He made us realize how beautiful are the maligned weeds, and how, if our minds are susceptible, a railroad embankment, clothed with verdure, is not to be despised.

Another point brought out by Mr. Smith, and one that all should heed, was that of self-control. His contention is that flowers belong to their environment and vice versa, and as there can be no separation without injury to both, it behooves everyone who is a lover of nature to allow the flowers to remain upon the plants. Children can be trained to such an extent that they will so enjoy seeing flowers grow that they will have no desire to pluck, merely to throw them away when wilted, as is often done. This cultivation of self-control is needed quite as much by grownups as by children.

Emily C. Westberg,
Sec.-Treas.

EDITORIAL NOTES

We print in this issue an account of the work of the Educational Museum of the city of St. Louis. This institution serves a most useful function in the school system, and other municipalities may well study its organization and methods. Miss Meissner, custodian of the Museum, is a woman of strong personality, an excellent teacher and a tireless worker. The work which she is directing should be an inspiration to all who are interested in the use of nature-study materials.

* * * * * *

We are pleased to announce that the apparent revival in nature-study interest is continuing unabated. Elsewhere in this issue is an account of the organization of a Chicago section of the A. N.-S. S., on March 19, 1910, on which occasion 140 members joined. The membership has increased since that time. By this action Chicago assumes a position in the front ranks of the nature-study movement in this country.

The St. Louis membership will soon reach the hundred mark requisite for a local section of the national society. California has already organized. Rockford, Ill., is the latest aspirant and is actively seeking recruits.

The American Nature-Study Society and its official organ, the Nature-Study Review, exist solely in the interests of the best type of nature-study, and wherever genuine nature-students exist we invite them to join our numbers. To elementary teachers, especially, we offer practical assistance which should attract thousands of reading members.

* * * * * *

The March issue of the Nature-Study Review was an attractively illustrated monograph number devoted to the study of birds. An unusual number of original photographs illustrating bird-life and bird-study accompanied the various articles contributed by students and teachers of this most popular subject.

This number has brought many letters of appreciation and many orders from teachers for a number of copies for class use. For the benefit of those who desire practical suggestions in bird study and who have not seen the March number, the topics of the leading articles are here given: Nature-Study and the Bobwhite, by C. F. Hodge; Factors in Bird Mortality, by Isaac E. Hess; Bird Identification Chart, by F. L. Charles; Nesting Houses for the Birds, by G. H. Trafton; Outlined Lessons on the Robin, by T. L. Hankinson; An Experiment in the Teaching of Biology, by C. M. McConn; Some Observations on Robin Nests, by Fred L. Charles; Nature-Study News; Book Notes.

Quantity orders for class or county use may still be filled.

The single copy rate is 15 cents. Orders for 25 or more copies will be supplied at the rate of 12 cents per copy. The expense of preparing the many illustrations renders a lower price impossible.

* * * * *

Each number for 1910 will be devoted to some particular subject of general interest, thus assuming the form of a *teaching monograph* on that subject. Each issue will make its individual appeal to some special group of workers, and at the same time the series will be valuable in its entirety to all educators.

The numbers now planned are as follows: January, PHYSICAL SCIENCE; February, HYGIENE; March, BIRD STUDY; April, GARDEN NUMBER; May, AGRICULTURAL EDUCATION (or RURAL SCHOOL NUMBER), September, INSECT STUDY; October, COURSE OF STUDY; November, HARVEST STUDIES; December, WEATHER STUDIES.

While each issue will thus assume a distinctive character, other features will not be neglected. There will be occasional discussions of a more general nature, nature-study news will be followed and current literature reviewed.

The annual membership fee in the A. N.-S. S. is one dollar, which sum includes the subscription to the Nature-Study Review for one year. Contributed articles and business communications should be addressed to

SECRETARY, AMERICAN NATURE-STUDY SOCIETY, Urbana, Ill.

NATURE-STUDY NEWS

The University of Illinois announces four lectures by Prof. Jacob, Reighard, Professor of Zoology in the University of Michigan, on THE ORIGIN OF CERTAIN STRUCTURES AND INSTINCTS IN FISHES. The topics of the lectures are: The Evolution of the Nest Building Instinct in Fishes; The Evolution of the Parental Instinct in Fishes; Warning Color and Mimicry, a Criticism of Current Theories based upon Studies of the Coral Reef Fishes; and The Role of Internal Factors in the Evolution of Certain Fish Structures. These lectures are given April 11 to 13, and summarize the results of Prof. Reighard's studies. He has succeeded in observing individual fish through long periods of time and in photographing them in characteristic places and occupations.

THE CONFERENCE ON THE TEACHING OF AGRICULTURAL NATURE-STUDY IN THE RURAL ELEMENTARY SCHOOLS OF ILLINOIS, which met at the University of Illinois March 24, 25, and 26, was the first gathering of its kind ever held in this country. About fifty of the leading workers of the state gathered to discuss present day problems in this subject which is now attracting so much attention generally. A few were present from other states. It was arranged that a second meeting of the conference should be held next February, in connection with the agricultural short course. Definite plans were laid for the promotion of agricultural nature-study in Illinois. The program and a full account of the meeting will appear in the May number of the Review.

* * *

BOOK NOTES

Gardens in Institutions is the title of a well illustrated article in The Survey for March 19. "Adam's trade, the job that needs no employer"—meaning farming—has come to be recognized as a most desirable form of occupation for asylums, convalescent homes, poor houses, reformatories, penitentiaries, etc.

The Illinois Arbor and Bird Day Bulletin for 1910 was recently issued by State Supt. Blair. Like the two preceding volumes, it is an attractive booklet, well illustrated, and of permanent value on the shelves of any elementary school library.

How to Destroy English Sparrows is the subject of Farmers' Bulletin 383, issued by the U. S. Department of Agriculture under date of January 20, 1910. The Bulletin is of special interest following, as it does, soon after the lively discussion in Chicago over the propriety of encouraging school children to feed this pest. Although the extermination of the bird is impracticable, "a reduction of its numbers is feasible and important. The present bulletin aims to describe the best methods of destruction." The author is Ned Dearborn.

The Proceedings of the Second Annual Conference on Agricultural Science in the Summer School of Agriculture, Massachusetts Agricultural College, has just been issued by the Department of Agricultural Education of that institution. The topics discussed are: Nature Study and Agriculture in Rural Schools; Elementary Agriculture as a Subject of Study in the Grades; Some Connections between School Studies and Home and Industrial Activities; Agriculture for High Schools; Relation of the Physical Sciences to Agriculture; and Biological Sciences in Their Relation to Agricultural Sciences.

County Schools of Agriculture, Manual Training and Domestic Science are discussed by W. S. Hiser in The Educator-Journal for April, 1910. A second paper of interest in this number is entitled "General Hygiene in its Social Bearings".

General Biology, a Book of Outlines and Practical Studies for the General Student, by James G. Needham, Ithaca, New York. Comstock Publishing Co., 1910. Pp. 530, 64 practical studies, 287 text figures, and 9 portraits. $2.00 (Postpaid, $2.16.) This eagerly awaited text has just been issued in attractive form with very serviceable flexible binding.

"It is not a formal text and not at all a treatise, but only a guide intended to assist the student in acquiring for himself some real knowledge of living nature." This statement from the preface is evidence that the author appreciates a present need. He has endeavored to escape the dominance of morphology and to give a more equable treatment than has been customary, "in the hope of leading the student to a practical acquaintance with elementary phenomena in the whole broad field". The book is intended as a college text; the subject matter is arranged to suit the seasons of the college year, and more than a year's work is outlined in order that selections may be made. This is quite in keeping with the growing recognition of the nature-study view-point as extended to secondary and collegiate instruction.

The general plan is indicated by the topics of the comprehensive chapters, of which there are but seven: The Interdependence of Organisms; The Simpler Organisms; Organic Evolution; Inheritance; The Life Cycle; The Adjustment of Organisms to Environment; and The Responsive Life of Organisms.

Each chapter has its important divisions and includes a number of practical exercises. An appendix deals with laboratory materials and methods, together with suggestions for field work.

A valuable feature is the number of portraits of noted biologists from Aristotle to Mendel and Pasteur.

The book is an important contribution to educational biology.

THE

NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

OFFICIAL ORGAN OF

AMERICAN NATURE-STUDY SOCIETY

Vol. 6, No. 5
WHOLE NO. 47

CONTENTS

May, 1910

RURAL NUMBER

Published Monthly except June, July and August by Fred L. Charles, Editor

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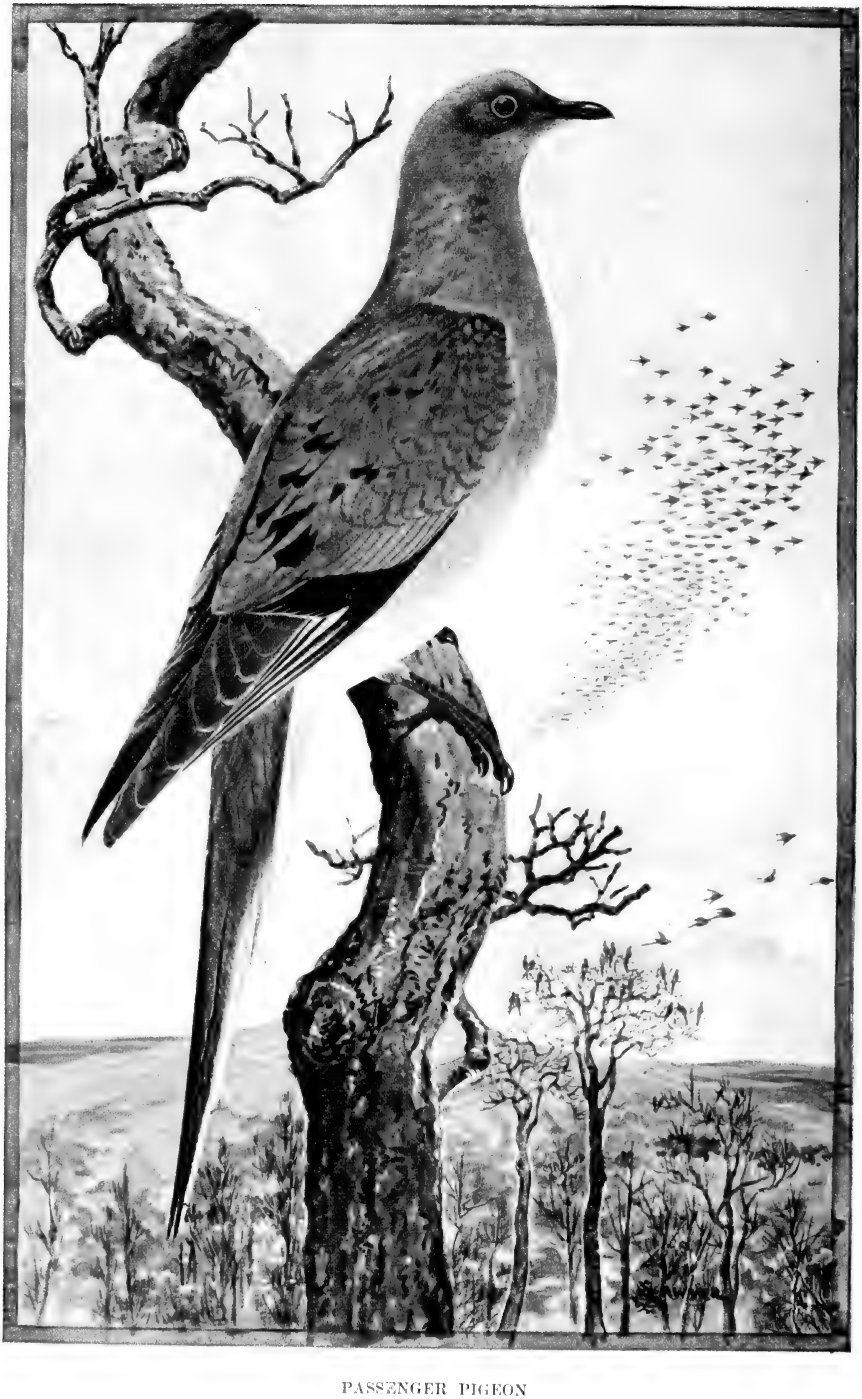
Entered as second-class matter February 7, 1910, at the post-office at Urbana, Illinois. under the Act of March 3, 1879.



PASSENGER PIGEON

Order COLUMBÆ — Family COLUMBIDÆ

Genus ECTOPISTES — Species MIGRATORIUS

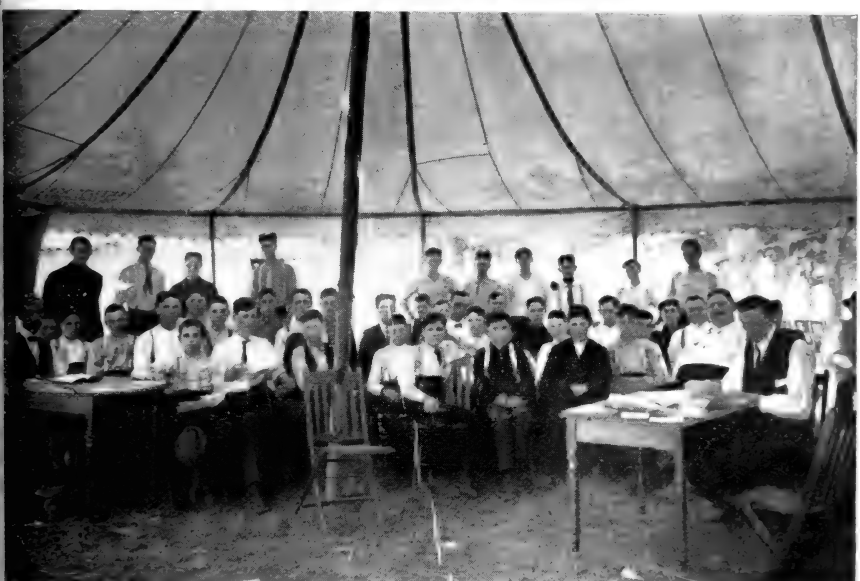
THE
NATURE-STUDY REVIEW
DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

VOL. 6 MAY, 1910 NO. 5

FARM BOYS' ENCAMPMENT, OR FARM SCHOOL

By H. G. RUSSELL, SUPT. OF SCHOOLS, GREENFIELD, ILL.

The idea of this practical school for boys was conceived by Hon. A. P. Grout, of Winchester, Illinois. When it is known



JUST BEFORE SCHOOL BEGAN
(CUT LOANED BY DEPT. OF AGRIC. EXTENSION, COLLEGE OF AGRICULTURE, UNIV. OF ILLINOIS)

that Mr. Grout is a college graduate, a lawyer, a banker, a manufacturer and a farmer, with several thousands of acres of fertile land which he personally supervises, his fitness to engage in such work and to determine what practical education is, can be easily understood.

Though Mr. Grout is all of these and a millionaire, he is first of all a man, philanthropic and brainy, who believes that service is the test of a man's worth, and that the American boy should first of all be made efficient, mechanically, intellectually and spiritually. That he might help to make boys more efficient he planned the first farm school and held it on one of his beautiful farms near Winchester, Illinois, in August 1906.

Sleeping tents, together with a large tent for class work and lectures, were rented and erected in a beautiful grove; all kinds of farm machinery were placed at convenient distances for operation and study; cattle, hogs, sheep and horses were on hand to be studied and judged. Various kinds of soil were brought in for examination and tests and all the products of Illinois farms were gathered for careful and even technical study in class.

Six or eight able men connected with the College of Agriculture of the University of Illinois were present and gave instructions, every instructor being an expert in his line.

A plant was built and the grounds beautifully lighted with electric lights. A gasoline engine was taken apart, put together again and made to furnish the power. The work was done by the boys under the direction of the teacher of farm mechanics. Gang plows and binders, long out of order, were brought in, set right and made to do better work than they had ever done before.

Beginning at 8 o'clock in the morning, instructions were given in the form of class work during the day and popular lectures in the evening. The school continued for one week and the entire expenses were paid by Mr. Grout from his own pocket.

Boys attended from ten counties (the 20th Congressional District) and so great was the interest that Mr. Grout concluded to repeat the effort and study results. The school of 1907 proved even a greater success than the former one and it was decided to make it a permanent affair.

The first location, being four miles from city or railroad, was inconvenient and unnecessarily expensive, and it was decided to find a more suitable location. After carefully considering several places, Greenfield was selected.

The school is now held the latter part of August each year in a beautiful park one mile from Greenfield. Sleeping tents are provided free of cost to the boys. The boys come, bring their blankets, camp out, have a good time and learn more in the same length of time than they could possibly learn under any other conditions. Meals are served in a large dining tent on the ground at 20c per meal, the boys paying for their meals.

The best talent the country affords is assembled here to instruct them, with no cost to the boys. Corn and stock judging, soil analysis, drainage surveys, a careful study of farm machinery and helpful work in forestry are all carried on under the direction of an expert. Examinations are conducted at the close and a certain number of those standing highest are given scholarships in the Short Course in the Agricultural College in the University of Illinois.

The expenses are now met by popular subscription which is taken in Greenfield and vicinity. The cost is about $300.00 each year, which amount is raised without effort, as everybody is much interested and gives freely and even asks the privilege of contributing. The boys are at no expense save their railroad fare and meals. Instruction, tents, lights and amusements are furnished free to them. The day programs are open to all who wish to enter the classes and actually study or take the work. The evening programs are open to the general public and thousands attend. The moving throngs are kept far enough away frrom the lectures to insure good order at all times. The grounds are policed day and night and the best of order prevails.

Boys from fifteen years up may attend and men who are really interested may take the class work. The last school enrolled 138 boys from seven counties, about half of whom came from the county in which the school is located.

The boys are awakened to the wonderful possibilities of the study of agriculture and are aided greatly in discovering themselves. They are inspired to look up and go on into better living and thinking. Some twenty or more have each year been persuaded to attend the University. Their lives have been enlarged and their usefulness increased. Contact alone with their instructors has been of sufficient value to warrant the continuation of the school.

A full course in Domestic Science is given at the same time and better health, better homes and better living have resulted. In short it has set the young and old to thinking about self improvement and community advancement.

Similar schools can be held in any county in any state, but the dominant interests of the community should be made the most prominent feature in the instructions. Similar schools can be held in any city, where instruction should be given in business, factory work, railroad work and other vocations.

SCHOOL GARDENING AND ELEMENTARY AGRICULTURE IN THE SCHOOLS OF ONTARIO

As Encouraged and Directed By Schools' Division of the Ontario Agricultural and Experimental Union, Ontario Agricultural College, Guelph, Canada; A Plan For Co-operative Work with Schools

BY PROF. S. B. McCREADY, DIRECTOR.

Aims: This Division has been organized for the purpose of bringing the schools of the province into closer touch with the Ontario Agricultural College; to help teachers in their efforts to introduce some simple, real and useful form of nature-study or elementary agriculture; to arrange a line of work that may be followed by all, to the end that there may be unit of purpose and experience amongst teachers; to assist teachers and trustees to make for improvement in their school grounds and buildings as well as in the quality and nature of the instruction imparted; to arouse early interests in children in the working of the soil and the growing of plants, so that as they grow older they may become increasingly alive to the many problems of farming, gardening, re-foresting, etc., and in helping to solve them, gain pleasure and profit.

While its first concern is to help the rural schools to give a more adequate and fitting education to country children, it is at the service of the graded schools of towns and cities as well.

The work is supported by a special government grant made to the Experimental Union. It is not carried on for any gain whatsoever; on the other hand, indeed, the expenses are by no means inconsiderable.

The Work of 1909: The results of the work for the season of 1909 were very satisfactory. They showed that many teachers in Ontario were ready to co-operate in testing the value of gardening as a means of education. Through the co-operation of their teachers, more than 6,000 children were provided with vegetable and flower seeds at 1 cent a packet; this number was made up of pupils in 117 schools; and as a number of these were graded schools, over 150 teachers were represented. Fifty per cent of the teachers sent in reports on their work and almost without exception declared it to have been of advantage to the school and pupil alike. Most of the schools were in the country, but many town and city schools engaged in the work also.

In addition to the distribution of seeds to pupils, 22 schools were supplied with material for conducting observation plots in the school grounds. From these only 6 reports were received. It would seem that teachers find it less difficult to conduct the work through gardening operations at the children's homes than through school plots.

SOME OF THE UNION GARDENERS OF 1909 AT SCHOOL NO. 1, CAPE CROKER INDIAN RESERVE, BRUCE COUNTY

The Work of 1910: This year an extended list of offerings was made as follows:

1. Seed Packets of Flowers and Vegetables for Children's Gardening—2c each.—The Union co-operates with horticultural societies or civic improvement societies in distributing these packets through the teachers and schools, but does most of its work direct with the teachers.

2. School Collection of Forest Tree Seedlings—Free.—Sent to schools that have school gardens.

3. School Collections of Seeds for Demonstration Plots in Agriculture, Horticulture and Forestry—Free.—Including seeds of different kinds of wheats, onions and trees; sent to schools that have school gardens.

4. Picture of the Ontario Agricultural College.—Free.—Sent to schools which undertake to have it framed and given a place in the school.

5. The Schools' and Teachers' Bulletin—10 cents—A monthly publication which aims to keep teachers informed regarding vocational education.

6. School Collection of Agricultural Seeds—25 cents.—

Comprising over twenty packets of selected seeds, such as are grown on Ontario farms.

7. School Collection of Tree Seeds—25 cents.—Comprising the seeds of about twenty different kinds of forest and cultivated trees.

8. Weed Seed Collection—25 cents.—A mounted collection of the seeds of thirty-five common weeds, useful for reference or as a suggestion for weed seed mounting.

9. School Collection of Tulip Bulbs—$1.50.—A collection of 120 bulbs, suitable for a formal bed or for planting in a border and for fall planting.

10. School Collection of Hardy Climbers—$1.00.—A collection of Virginia Creeper, Boston Ivy, and Climbing Roses, for training on the school walls, covering outbuildings, etc.

There has been a very marked and enthusiastic response to the Division's announcement in several counties of the province. The interest is directly traceable to the activity of the School Inspector in most cases; where the inspectors are not interested

THE BACK YARD GARDEN OF ONE OF OUR HAMILTON GARDENERS FROM THE CHARLTON AVENUE SCHOOL, 1909

in the work very few teachers undertake it. In all there are more than three hundred teachers co-operating and the majority of these are in rural schools. Many of the teachers who engaged in the work last year are continuing it.

Instruction sheets are sent to the teachers, outlining plans for supervising the work and for teaching nature lessons based on the pupils' actual experiences. The pupils are also provided with booklets on gardening. The seed packets, too, give directions for planting and cultivating and also suggest specific lines of observation. More than 6,000 children in about 200 schools will be interested in the work this year, in at least one feature. One of the gratifying responses has been applications from forty schools for the vines. About sixty schools will have forestry seedling plots at the schools. More than this number are framing a picture of the Agricultural College as a school decoration.

The work is only in the experimental stage. There are signs that it may grow into large, influential uses as time goes on.

SCHOOL GARDEN EXHIBIT, SHEDDEN FAIR, 1909

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Our supply of the January, 1910, issue being nearly exhausted, we shall be glad to exchange for each January copy received in good condition before June 1, one copy of this (May) issue, containing the two attractive colored plates. Mail magazine flat instead of rolled. (Two cents postage will carry it.)

NATURE-STUDY AND THE SCHOOL GROUNDS

By A. PHELPS WYMAN, Assistant Professor of Landscape Gardening, University of Illinois

Some studies must have laboratories for their greatest efficiency, and nature-study is one of these. The school grounds

A BANK OF SPIRAEA VANHOUTTEI PROPERLY PLANTED TO CONCEAL THE FOUNDATION AND SUPPORT THE CORNER OF THE BUILDING
(CUT LOANED BY HORTICULTURAL DEPT., UNIV. OF ILL.)

themselves may be such a laboratory. Every school yard ought anyway to be planted with trees and flowers and shrubs, and while the grounds are arranged for beauty they can at the same time be made means of instruction in nature-study.

What features does a school ground require for beauty that it already has not now? Happily beauty does not depend so much on extraneous things brought in, as in giving necessary objects a position that is useful and attractive and a form which fulfils its purpose. But in addition some few things may be added, and these are trees and flowers and bushes. In the case of grounds where nature-study is the desideratum, there need not be planting additional to what is required for landscape gardening purposes.

For the primary arrangement of school grounds, one must go back to actual needs. The two chief objects are the schoolhouse and playground. The schoolhouse is best placed at one side so as to leave a liberal space for the playground. Then it is ready for the creation of a laboratory.

It is a first principle of landscape gardening to leave the space between the buildings and boundaries open and in grass, and to plant the borders. This is evidently necessary in the case of the playground and is quite as much so with other spaces. A few trees are needed to shade the building and the borders of the yard. A school yard is a bare place without them but they must not interfere with the playground. One must also study the protection they give from wind and sun. It is of little use to plant trees on the north side of a building

THE COMMON BARBERRY (BERBERIS VULGARIS) IN ATTRACTIVE FRUIT
(CUT LOANED BY HORTICULTURAL DEPT., UNIV. OF ILL.)

but they are needed on the south. Against the house and boundaries and about the sheds is the place for shrubs.

Trees may be studied from two points of view, their artistic and their botanical values. A study of the artistic qualities means a comprehension of their form, their texture and their colors. The oak has spreading branches, is open and rugged in texture and has brilliant color in fall. Its vigor is expressed by the manner in which its buds and branches start out on all sides of their twigs and trunks. Botanically, this last point is interesting also. Its flowers are monoecious, stamens are hanging catkins and the fruit, an acorn, matures in one or two years according to the species. Its leaves are of interest from both standpoints and during the summer its leaves are beautiful. In winter its branches exhibit more of the bony framework of the tree. It harbors all kinds of insects and fungi Birds are at home in its branches in their season.

A still better laboratory for the study of bird life are the bushes planted around the borders. Birds love a thicket in which to build their nests and to hide. Such a thicket even attracts birds to its vicinity. Kinds may be selected which birds like especially for food, such as the mulberry. But other kinds may be selected for other interests, such as their fruit, both botanically and artistically, like the barberry and cranberry. Others have striking bark, like the dogwood, which should not be planted too plentifully. For an example of curious flowering there is the witch hazel, which blooms just before winter sets in. As a matter of fact, it makes little difference about selecting bushes for such a laboratory, for the kinds which are most unassumingly attractive and succeed best are just those which are best adapted to nature-study. There should be examples of native kinds like the dogwoods, the vibernums, hazels and winterberries. But if one can also obtain easily other kinds which are of foreign origin but which have been used long enough so that they seem to belong to us, like the lilacs and weigelas, the planting is that much more enriched. They may be planted irregularly three or four feet apart and from two to three plants wide against the fences and schoolhouse and especially in the corners of the grounds, making the kinds heaviest at the corners of the schoolhouse and lot.

School is still in session when some of our finest flowers of the perennial class come into bloom. These are the plants which die to the ground every year but whose roots continue to live on and throw up stalks again. Flowers have more interest botanically than shrubs, and a place can easily be found for them. A bed two or three feet wide may be dug in front of the shrub border and the roots of the flowers planted from time to time about a foot apart. They ought not to be put by themselves in the middle of the lawn but they are more attractive and more out of the way when not wanted, if planted with the shrubs.

If a garden is desired where the growth of seeds and vegetables is studied, a true vegetable garden must be prepared in a corner by itself and in such a way as not to break into the openness of the yard and playground.

The school ground can easily be a laboratory and a beauty spot as well.

A LOW-ROOFED COTTAGE UNITING WITH THE LANDSCAPE. WHY NOT SUCH ARCHITECTURE AND SUCH PLANTING FOR OUR SCHOOLHOUSES?

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The ERRATIC WEATHER of this spring has seriously damaged fruit and shade trees in the upper Mississippi valley, although the injury is not so great as was at first anticipated. It will be interesting to note what harm, if any, has been done to the flora of this region. Bird migration does not seem to have been affected to any considerable extent. In this connection, the report of the north-side section of the Chicago Nature-Study Club, which appears elsewhere in this issue, will be of interest.

A SUNDAY BOYS' OUTDOOR CLUB

By CHAS. W. FINLEY and OTIS W. CALDWELL, University of Chicago

[EDITOR'S NOTE: This account of a Sunday morning outdoor boys' club conducted in Chicago, Ill., by Dr. Otis W. Caldwell, assisted by C. W. Finley, is reprinted from the Hyde Park (Chicago) Baptist church paper for September, 1909. The Sunday School of this church takes a summer vacation, and this class work was done during the vacation period.]

At the close of the year's Sunday-school work, it was decided to arrange a Sunday Boys' Club for the pupils in certain classes. Consequently the assistance of Mr. C. W. Finley was

secured and upon the closing day of the Sunday-school an announcement was made to the boys. It was hoped that the boys might have wholesome and instructive contact with nature under competent direction to the end that real appreciation and interest might be further enhanced. It was in no sense our purpose to use nature as a basis for sermonettes to the boys, but to extend natural interests, develop appreciation and enjoyment, through knowledge of the wonders and truths of nature, and to widen the horizon for nature interests in the meaning of things that are about us.

It was intended that the boy's conduct while upon the trips should be such as should be expected on Sunday or any other day.

While upon the first trip, the club elected officers, President, Vice-President, Treasurer and Secretary. There were fourteen members.

On the ten trips there was an average attendance of nine. This low average was doubtless caused by the fact that several of the boys went to the country for a period of weeks. Five of the boys so doing were anxious to retain their places and asked to be promised a chance to continue the trips upon their return to the city. In at least one case one boy did not go on the longer trips, because his parents were afraid for him to go so far away from home.

On the long trips the boys were expected to pay but a small part of their fare, a fund having been raised to defray expenses. For the ten trips the average transportation expense to each boy was twenty-nine cents for those paying full fare, and fifteen cents for those paying half-fare.

Mr. Finley, who had immediate charge of this work, has prepared the following outline report:

FIRST TRIP—JACKSON PARK

The first trip was taken to Jackson Park, the main object being to study woodland and marsh birds. The boys were fairly well acquainted with the former, but the marsh birds were new to them. Among the marsh birds seen were: spotted sandpiper, Virginia rail, long-billed marsh wren, red-winged black-bird, and killdeer. Fifteen different species of birds were seen. The Wilson's Fern was entirely new to the members of the club. On this trip the boys organized the club.

SECOND TRIP—LINCOLN PARK

In Lincoln Park we spent our time seeing the caged wild animals. Some of the boys seemed not to appreciate this trip, as they said: "We have seen these so often; let's go to the country." The things taking most attention were the young of the animals, lions, leopards, two buffalo calves, baby monkeys, etc. An old duck with a bunch of newly hatched ducklings aroused more interest than any other feature in the park.

THIRD TRIP—DES PLAINES RIVER, FLOOD PLAINS

West of the city in the Des Plaines valley is a typical flood-plain forest. As yet few of the trees have been cut. Large elms, ashes, hickories, and walnuts predominate. Here, too, we examined the fauna of a rotten log. We found millipedes, centipedes, snails, ants, woodborers, and larvae of many beetles and earthworms. The ants were of the species which keep "aphid cows." Probably ants and their habits are amongst the easiest things in nature in which to interest boys.

FOURTH TRIP—MILLERS, IND.

At Millers, Indiana, we made an all day's trip. We set out diagonally from Millers through the scrub pine forest, aiming to skirt the "blind" end of the Calumet River. We ate our lunch in the forest and after walking for more than an hour were surprised to come again to the place where we had eaten our lunch. We climbed a tree on top of one of the dunes, got our bearings and soon reached the lake. The boys celebrated the event by taking a good swim in the lake. On this trip we saw the white pine, the juniper, the scrub oak, and the scrub pine. The prickly pear cactus was in full bloom and a photograph of it was taken.

At 90th Street and Stony Island is a bare outcrop of Niagara limestone. In the past there were two stone quarries here but now they are deserted and contain water. In one of these we caught a fairly large "bullhead" with our hands. We found here a large "cat-tail" swamp miles in extent. Where the limestone came to the surface the scratches of the old glacier were easily seen.

SIXTH TRIP—WOLF LAKE, IND.

In the recent geological past Lake Michigan, by its recession, left many interesting regions. One of these is a strip of shallow water some 1,500 acres in extent, the present Wolf Lake. Here boats were taken and we rowed a mile and a half to where swamp plants on the shore and a forest are now rapidly encroaching on the lake. The plants of lake and shore proved of much interest. On this trip we also studied pond insects in a small pond near the lake. Among the insects seen were dragon flies, both larvae and adults, horse fly larvae, whirligig beetles, giant water bugs, and backswimmers.

SEVENTH TRIP—CHICAGO LAWN

Far out on 63rd Street at Chicago Lawn is a prairie region still uncultivated. Large bowlders here and there show that the region has been glaciated and the character of the soil shows that it has at one time been covered with water. The predominating plant here is the prairie dock, rosin weed, or compass plant. There were two species of these plants here in full bloom. Two species of prairie clover, red and white, were also in bloom. Other plants seen were blazing star, golden rod (2 species), asters, several species of sunflower, sweet clover and milkweeds or butterfly weeds.

EIGHTH TRIP—PINE, IND.

South of the lake near Pine, Ind., is a series of ponds showing all stages of extinction through the filling-up process of plants, aided perhaps by erosis. These ponds are long lagoon-like areas and run parallel to the lake. Some of them are so nearly filled up that plants are now growing in the center of them. Many of them show the zonal arrangement of plants, as: the scrub zone, the bullrush zone, the water lily zone, the zone of potaniogetona, and often a zone of free swimming plants. On this trip we saw a solitary wasp, the Bembex, dig its peculiar den and saw the flesh flies depositing their young on the carcasses of dead fish that had been washed ashore. Water lilies were in full bloom and several dozen were brought in by the boys.

NINTH TRIP—MILLERS, IND.

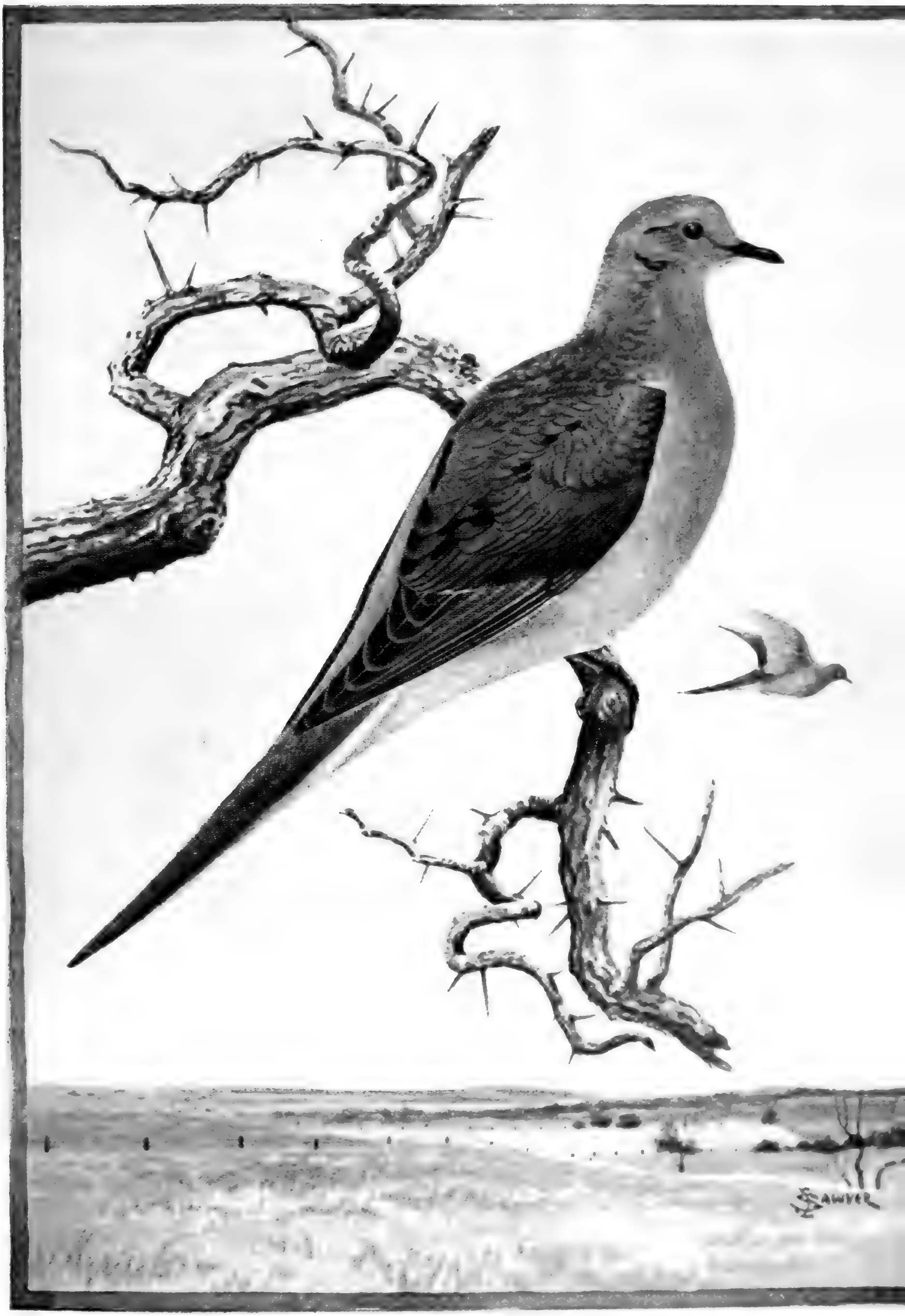
Again we went to Millers, this time, however, for quite a different purpose. We visited a tamarack or peat-bog swamp south and west of Millers. All of us got our feet wet and were badly mosquito bitten in the swamp. The water was a little higher than usual and in many places we had to wade. Many of the tamaracks had been blown over, showing the shallow root system. We also studied a moving dune. Directly north of Millers are excellent examples of live and moving dunes. One is traveling directly across the Calumet and unless the predominating effect of the wind changes, the dune will have crossed the river in a few years.

TENTH TRIP—PALOS PARK

Southwest of Chicago at Palos Park is a deciduous oak woods containing red oak, white oak, burr oak, ash, haw, and crabapple trees. Flowing through the forest is a spring-fed stream. The drinking water for the day was furnished by springs along the brook. On this trip we found a red-eyed vireo's nest and five young.

Such are the main outlines of the trips. We did not confine our attention to the things mentioned but had those things as a main object in view. It goes without saying that the boys took interest. All normal boys are interested in outdoor studies of some kind. Just how much the boys got out of the trips, no one can tell. It is probable, however, that the parents can tell more of what the boys seemed to get from the trips. Being so thoroughly interested in the work, probably one's opinion is biased but it would be hard to find a more wholesome and profitable employment for the boys during the Sunday-school's vacation period.

Chas. W. Finley,
Otis W. Caldwell.



MOURNING DOVE

PASSENGER PIGEON INVESTIGATION

Clark University, Worcester, Mass.,
April 29, 1910.

Twelve reports of pigeon nestings have come in to date and one "undisturbed" (sic(k)) nest has been sent me by express. Luckily this turned out to be mourning dove, and probably all the rest so far reported are also nests of mourning doves. None have been confirmed as yet, and I have received, in fact, but one really business-like report; and, while this man was awaiting to get expert assurance that the birds were the true passenger pigeon, the nest and probably the birds were stolen. He writes me that the branch with nest on it was cut away and that the birds had disappeared. This serves to show the necessity of extreme secrecy, and the reason for asking that reports be strictly "exclusive and confidential," as specified in all my announcements.

I wish the reports that come in in future might be more intelligent and business-like. A report should describe the birds and the nest in a way that could leave no doubt that the birds are properly identified (most of them do this now, to leave no doubt that the nest is that of a mourning dove). All reporters should also enclose or definitely agree to forfeit the $5.00, if they are mistaken in the birds. It should also be repeated and strongly emphasized that all awards are offered for "UNDISTURBED nesting PAIRS or COLONIES". No award will be paid for any "undisturbed" nest unless both male and female birds are found with it (they both take part in brooding).

Professor Whitman maintains that it is absolutely sure that the passenger pigeon never lays but one egg at a nesting. If two eggs are found, it means that two hens have layed in the same nest. The egg of the pigeon is large—1½ inches in length—while that of the dove is little more than one inch long. This may prove a good means of distinguishing the species.

A number of most encouraging reports are coming in of pigeons seen in various parts of this country and Canada. One, even, has come from Chile, South America.

Can we "get down to business" in this matter and have a "little sense"? I feel greatly obliged to the thousands of good people, who, when they find a dove's nest, do not write me about it. And still I would rather be bothered by a thousand "idiotic" reports than miss one nest of the real passenger pigeon.

We are desperately in earnest, and the month of May ought to decide whether the finest race of pigeons the world has ever seen is extinct or not.

Signed,

C. F. Hodge.

Nest of mourning dove, with two eggs, sent to Dr. Hodge in competition for the award offered for an "undisturbed" passenger piegon's nest. Luckily for all concerned this is not a nest of the pigeon, but if it had been, the fact that it has been disturbed would forfeit to finder all claim to award. A paper disc is inserted for comparison, the size of a passenger pigeon's egg. Difference in size of egg will be one of the means of distinguishing between dove and pigeon.

Pigeon's egg. 1.50 x 1.02 (roughly as 1½ in. to 1 in. in length).

Dove's egg 1.50 x .80.

All authorized awards are offered solely for information of location of undisturbed nesting pairs or flocks of pigeons. Both male and female birds with eggs or young must be found unmolested before any award will be paid.

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It is probable that many members of the A. N.-S. S. and subscribers to the Review will change their location next fall. The September issue will be mailed early in September, and the editor requests those who change their address to notify him, wherever possible, before the first of August, so that a correct mailing list may be prepared.

SOME OBSERVATIONS UPON A FAMILY OF WHITE-FOOTED MICE

By JAMES EDWARD ACKERT

White-Footed mice (Peromyscus leucopus) are commonly found both in the woods and in the open fields, though in the latter they are not abundant. In the woods they make their homes under decaying logs, or among the roots of trees, while, in the fields, they live in underground tunnels. These mice are about the size of House-mice, but may be distinguished by their large prominent eyes and ears, and soft fur, which is grayish-brown above the white below.

The writer has recently had occasion to make daily observa-

WHITE-FOOTED MOUSE (FEMALE) AND TWO SURVIVING YOUNG

tions , for a period of four weeks, upon a family of White-Footed mice. His frequent visits to their nest have revealed some interesting and characteristic habits of these little mammals.

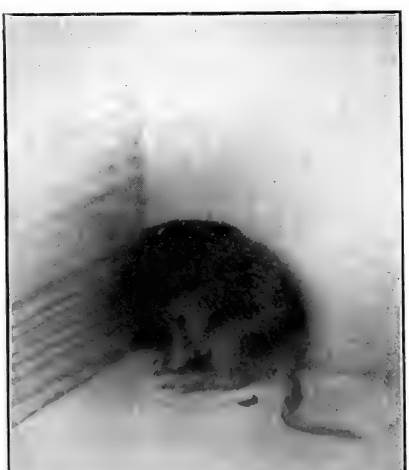
On March 25, 1910, while collecting salamanders near Calhoun, Ill., an old White-Footed mouse with five naked little ones was taken from a burrow on the bank of a pond. Three salamanders had been removed from this runway before the nest was reached. The latter presented a dilapidated appearance. Here and there a shivering little form and a fragment of dry grass lay in the loose dirt. A few inches beyond, at the end of the burrow, the frightened mother was caught.

The nest occupied a central chamber, which was about seven inches from the surface and approximately three inches in diameter. Into this, four runways led from various directions. Two of these were blind, extending but a short distance beyond the nest. In one the mother was caught. There was also a passage directly down from the surface to the chamber. It is possible that the portion occupied by the salamanders was no longer used by the mice, but the presence of the former probably influenced the mice in locating in that region, for Hahn, writing on White-Footed mice in southwestern Indiana says, "Two were taken about an old pond shortly after a period of exceptionally heavy rainfall——.when the salamander eggs had been deposited around the edges of the pond.......The stomachs of both White-Footed mice taken at this place contained some gelatinous matter which I could not positively identify, but which resembled the coating of salamander eggs more closely than any other substance likely to be found in such a place." Eighty-five salamanders were taken from the banks of the pond previous to the capture of the mouse, and eggs and larvae in various stages of development were abundant.

The following day the mouse family was taken on a hundred-mile journey to this laboratory, and immediately placed in a glass aquarium jar. The little ones lay prostrate in the bottom, while the mother, who had gotten wet on the trip, ran ruthlessly over her babies. Presently a squeak was heard and, to my astonishment, the mother was seen ravenously devouring one of her babes. Whether this strange performance was due to hunger, or to the changed environment, the writer is unable to state; but upon the introduction of some freshly cracked black walnuts, she immediately gave up her prey. Nevertheless, in the presence of corn, walnuts and water, another young one disappeared before night, leaving but three out of five. Animal food proved to be the salvation of the remainder of the litter, for the carnivorous parent showed her fondness for May-beetle larvae, earthworms and fresh beef steak. Crackers, cheese, cake, bread, milk and boiled potatoes were also taken at times, but bits of fresh beef, water-soaked corn and water were preferred. With the latter for diet, and a roll of cotton half buried in the sand for a nest, the White-Footed mouse settled down to rear her family. Occasionally she was seen running about with the young ones attached to her teats. If, by chance, one lost its hold, it quickly obtained another. This led me to suspect that it might attach itself to the mother's hair. But the three examinations made failed to support this theory. One clung so tenaciously to the nipple that the blood oozed out on the surface of the teat when the little one was removed.

The young mice grew rapidly and, at the end of two weeks, they opened their eyes. Their white underparts stood out in bold contrast to the dark backs and sides. An occasional exploration of the mouse home by a little one, undaunted by the presence of an observer, gave evidence of the boldness that is so characteristic of young mice.

At that time, it was necessary for me to be away for a few days. During my absence, four half-grown House-Mice (Mus musculus) were put in with the White-Footed mice. Upon my return, I was surprised to find that the White-Footed mother had adopted the four strangers, which were twice the size of her own children. Fearing that the occupants would be too numerous for the apartment, I allowed only one of the intruders to remain with the family. For an experiment the other three young House-mice were placed in the nest of a meadow mouse (Microtus orchrogaster) that had recently devoured the last of her seven little ones, even in the presence of animal food. She immediately pounced upon one and then another, biting them so savagely that they had to be removed at once. The three orphans were carefull tucked away and given food similar to that of the White-Footed mouse. They lived but thirty-six hours; while the adopted brother, at present writing, (fourteen days later,) is nearly grown, having been nourishing during all this time by the milk of the foster mother.



YOUNG HOUSE-MOUSE ADOPTED BY WHITE-FOOTED MOUSE

These White-Footed mice, which are nocturnal, were rarely seen outside the nest in the day time. In twilight, they were invariably active. The mother was always out, and the young ones frisking around, some endeavoring to climb up the side of the jar, others running on the cover, back downward.

In the matter of cleanliness, they far surpassed the House-mouse and the Meadow-mouse, while in captivity. In washing as well as in eating, these mice sat in an upright position, using their hands much as a person does.

A few remarks in regard to catching and caring for mice may not be out of place. In digging, it is well to follow a burrow to the nest or central chamber, then to ferret out the runways one by one, beginning each time at the chamber and working outward. Take the mouse by the end of the tail and place it in a wide-mouthed bottle, with a tight-fitting cap of wire-netting. That of one-fourth inch mesh is serviceable. Such a bottle may readily be carried in one's pocket. A wire cage or a glass jar six inches in diameter is adequate for rearing purposes. It is advisable to place sufficient sand in the jar, so that a small drinking bottle may be lowered in it to the neck. Cotton or dry grass serves well for a nest. Food should be supplied sparingly.

It is scarcely necessary to mention the now universally recognized economic importance of these little animals. The good they do by eating weed seed and the larvae of May-beetles and other injurious insects probably outweighs the damage done to crops. However, too little is known about their food and habits. Researches upon these little creatures have been both interesting and instructive, but further studies of this nature should be pursued in the zoological laboratories. Work of this kind may also be carried on in the rural schools, where each pupil may not only contribute and observe, but report the results first hand to the farmer.

Zoological Laboratory,
University of Illinois.

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THE NATURE-STUDY DEPARTMENT of the Summer Session Cornell University, for 1910, will be under the charge of Prof. L. S. Hawkins, of the Cortland Normal School. The courses are designed especially for teachers and supervisors and also to give practical instruction to those interested in out-of-doors.

BIRD STUDY NOTES

By FRED L. CHARLES

When the final postmortem is held over the nature faker, one of the most interesting bits of evidence brought to light will be the photographic ingenuity of this enterprising individual. Though his ways cannot be called dark, his tricks are many, and when to his wiles is added the smooth-tongued story of the popular lecturer, the unsuspecting layman usually accepts the photograph as genuine.

This great blue heron (often passing under the name of blue crane) stands apparently alert in a thicket of underbrush. In reality it is a "stuffed" bird, carried into the garden of a city home. The store building which loomed so plainly in the background, is eliminated from the print. Twinkle, the house cat, laps milk from a saucer—in the original photograph—the idea being to picture a "happy family". On second thought the photograph of the bird alone was deemed more desirable, and in this illustration the cat has been "retouched". (A worthy example, this, when choosing between bird and cat.) The writer presents this illustration for the purpose of throwing teachers on their guard when confronted by books, charts and "views" of a character frequently offered for sale. The writer has known zealous nature "workers" to obtain beautiful photographs of insects feeding upon flowers and supposedly pollinating them, the unfortunate item being that the insect in question (taken from a collection and glued to the flower) never visits this species of plant.

It is a good rule to buy only standard works, prepared by authors of established reputation in scientific fields.

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Bird migration is one of the seven wonders of the scientific world. To the popular mind the autumn exodus of the birds finds ample explanation in the hardships of a winter in the north, but this is not always a tenable conclusion. Doubtless the food problem is a more impelling factor than the inclemency of the weather, yet birds migrate from regions where both food and temperature are satisfactory, so far as we can discover, throughout the year. It is not the purpose here to discuss theories which would attempt to account for the phenomena of migration, but simply to suggest certain frequent experiences that befall migrating birds and to point out to the teacher certain opportunities for most interesting lessons on bird life and bird mortality.

Some migrants fly by day, others at night, but in every case the dangers are many. Meeting with adverse winds when flying over a large body of water, pursued by hawks, beaten down by sudden storms of sleet or hail, striking when in swift flight in the darkness such objects as telegraph wires, tall chimneys, light houses, etc.,—in these and other similar ways countless thousands of birds meet their death in spring or fall.

The accompanying photograph of a king-fisher sitting upon my hand, does not tell the tale of an established friendship but rather one of near-tragedy. The arrangement of the large plate glass windows on opposite sides of our large school building so deceived the birds, especially during their passion of migration, that many flew against the glass in anticipation of a clear field ahead. Our humane janitor, discovering the dead bodies beneath the window, made it a point to lower the shades every afternoon. This kingfisher struck the glass as the janitor was passing beneath, and the warm yet apparently lifeless body was brought to the class and the bird was laid upon the table as dead, but to our surprise it soon recovered from the shock it had experienced and in all its pulsing beauty sat upon my finger for its picture.

Scarcely a school day passes in April or May without its full quota of bird suicides brought in by the children. In such cases, it seems a pity not to make use of these beautiful specimens, usually unmarred by the fate they have experienced, and the teacher who has learned to prepare and preserve a bird-skin can build up an extensive collection from this source alone. A sympathetic teacher proceeding thus openly with her class, placing emphasis upon bird life rather than upon taxidermy, will be in no danger of encouraging the air-gun or the sling-shot.

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EDITORIAL NOTES

Through the generosity of Mr. William Dutcher, President of the National Association of Audubon Societies, we are able to present to our readers in this issue colored plates of the passenger pigeon and the mourning dove. These artistic reproductions are most timely in view of the present continental search for surviving members of that great race of pigeons which only yesterday obscured with countless million wings the sun. The present status of the investigation is given elsewhere in this issue. Readers of the Nature-Study Review, and humanitarians everywhere, will appreciate Mr. Dutcher's kindness in providing these two most admirable plates for publication in the Review.

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With this number, in accordance with our custom, we suspend publication until September. This has been a good year for nature-study in America. The fakers have been discredited; sentimentalists have been losing ground; many scientific men of note are becoming interested in problems of elementary education; instructors in secondary schools are lending a helping hand in the grades; scientific organizations are recognizing nature-study values and co-operating with existing agencies in promoting development in this field; and the membership of the American Nature-Study Society is larger than ever before. It is no longer commendable to scoff at errors that have been made, mistaking weak practice for false pretensions. To contribute only destructive criticism where constructive effort is needed, is out of harmony with twentieth century ideals. Men of science who have the interests of popular education at heart are coming to the front in the new nature-study movement. None can be of better service than they.

However, the teaching of science and the science of teaching must join hands in this matter. Teachers of science have too long neglected to turn their own methods of research back upon their own instructional problems.

* * *

Just now there is being felt everywhere the impetus of the agricultural movement, affording a basis for nature-study instruction which, if not quite new, is at least thoroughly sound. The same insistent, economical appeal to be found in agricultural problems will win the support of many who have resisted other claims of elementary science as a subject of instruction in the common schools.

There are some who would make sharp distinctions—for elementary school purposes—between agriculture and nature-study, maintaining that agriculture "as such" has no place below the high school, or that at most it should not go below the grammar grades. Such discussion is but wasted effort. As well discuss whether culture, as such, has a place in the course of study. Physics, as it has generally been organized for instructional uses, may be inappropriate for elementary schools, yet the youngest children under instruction should have daily contact with physical phenonena—they have it "anyway"—and their interests in this direction demand recognition. So everywhere with hygiene, and so, in rural communities, with that mode of life known as agriculture. Agricultural nature-study is coming, and when it has arrived it will not pass away.

* * *

The imperative step now, whatever aspect of nature-study is being emphasized, is a thorough investiagtion of the entire field, gathering data upon what has been achieved and then undertaking experimental studies which shall throw light upon principles, materials and methods. This will be pioneer work, for but little genuine research has been made upon the problem of adapting the fundamentals of the various sciences to the needs of the common schools. Te reduce the holdings of science to lowest terms and yet maintain their integrity, to steer clear of stultifying sentimentality in dealing with nature facts, to meet confidently the open-eyed interrogations of boys and girls and to guide them well in their search for truth until eternal order emerges out of wonder,—surely this is no mean task in the always difficult art of teaching. That is the problem. And toward its solution the American Nature-Study Society and the Nature-Study Review intend to contribute in every possible way. This, indeed, is our raison d'etre.

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NATURE-STUDY NEWS

A basket picnic and celebration upon the completion of new buildings on the University Farm, Davis, Calif. (University of California), held May 3, attracted 2400 persons. 160 automobiles were "among those present". Addresses were delivered by Pres. Benj. Ide Wheeler and David Starr Jordan, and other addresses were given in connection with the dedication of five new buildings. The University Farm School, of which Dr. Leroy Anderson is superintendent, is for boys of fifteen years or older who have finished the grammar school. The full course is for three years of about eight months each. In addition, many of the elective courses offered to students of the College of Agriculture (Berkeley) are given at the University Farm.

The Biology Section of the Central Association of Science and Mathematics Teachers, which meets next November at Cleveland, Ohio, desires to include in its program the report of experimental investigations in the teaching of Biology. The method of parallel classes is recommended. A start should be made this spring. Any teacher interested to undertake such experimentation is requested to communicate with the chairman of the section, Mr. W. L. Eikenberry, Univ. H. S., Chicago. In working out a method, the article by Prin. C. M. McConn in the Nature-Study Review for March will be found helpful. A more detailed report of this experiment will appear in the Journal of Educational Psychology.

Experimentation in the Teaching of Nature-Study, similar to that in biology referred to in the preceding paragraph, is a present day necessity. The Central Association has a committee on The Relation of Elementary School Nature-

Study to Secondary School Science, the members of which are Otis W. Caldwell, University of Chicago; J. A. Drushel, Teachers College, St. Louis; J. H. Smith, Austin High School, Chicago; William M. Butler, Yeatman High School, St. Louis; and Fred L. Charles, University of Illinois, Chairman. The 1909 report of this committee was printed in the January (1910) Nature-Study Review. The subject is to be further developed and presented at the Cleveland meeting this year. It is especially urged that careful, scientific experimentation be made in nature-study teaching, the results to be reported next November. Members of the committee will gladly assist any who are interested to co-operate in this important investigation.

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A letter from Prof. M. A. BIGELOW, now in London, expresses his satisfaction in the continued growth of the American Nature-Study Society. He plans to leave for Paris May 17, thence about May 25 to Switzerland, and thence to Germany for two months in Berlin or Munich.

In connection with the FIFTIETH ANNIVERSARY OF THE FOUNDING OF THE UNIVERSITY OF CALIFORNIA, there will be an exhibit representative of the activities of all the various departments. The department of Agricultural Education will prepare an exhibit illustrating its work in encouragement of nature-study in the elementary schools of California.

The first field meet of the ST. LOUIS MEMBERS OF A. N.-S. S. was held April 29. Sixty members of the Society, including sections in bird study, botany, insect study, mushrooms, and topography, under the leadership of Mr. Drushel of the Teachers College, made the trip from Jefferson Barracks to and through Cliff Cave, making observations upon the springs, sink-holes and underground streams of the St. Louis limetone.

The report of the CONFERENCE ON THE TEACHING OF AGRICULTURAL NATURE-STUDY, held recently at the College of Agriculture, University of Illinois, has been crowded out of this issue. It may be be given some attention in later numbers.

Just as we go to press, we have the cheering news from MILWAUKEE of A NEW CENTER of THE American Nature-Study Society in that city. The leading spirit is Prof. I. N. Mitchell, of the State Normal School, who reports a meeting at which several new members joined our society.

Prof. H. L. Bailey, Dean of the College of Agriculture, Cornell University, is now in England. It is understood that he will return to this country about the first of July.

A Conference to Discuss Outdoor Improvement for the homes, towns and cities of Illinois, is called to meet at Springfield, May 26 and May 27. All organizations interested are invited to send representatives. The conference will be held under the auspices of the Illinois Outdoor Improvement Association. The Secretary of the Association is Mr. A. P. Wyman, 17 E. Van Buren St., Chicago.

The Second Annual Session of the Agassiz Summer School of Recreation and Education—"Seashore, County Suburbs, and the Stars Above"—Will be held under the management of The Agassiz Association, Arcadia, Sound Beach, Conn., beginning June 27. "Price of tuition—what you wish to pay. Course of study—left for you to decide." The director is Edward F. Bigelow, President of the A A and Editor of "The Guide to Nature". The A A is an incorporated society of long standing and most worthy character. Its purposes are "the promotion of scientific education, the advancement of science, the collection in museums of natural and science specimens, the employment of observers and teachers in the different departments of science, and the general diffusion of knowledge".

To Stimulate the Study of Forestry, the Indiana Staet Board of Forestry recently offered $40.00 in prizes for the best essays on "Forestry in Indiana". The prizes are to be distributed as follows:—$20.00 is to be given the country graded schools, $10.00 to the pupil who sends the best essay from each of the 7th and 8th grades; $20.00 to the high schools of the state, $10.00 for the best essay from the freshman and sophomore classes, and $10.00 for the best from the junior and senior classes.

The essay was limited to 1,000 words and must have reached the Board by May 1st. The Board reserved the right to publish any paper sent in. Besides giving the cash prizes the Board expects to publish the prize winning papers.

In response to this offer, fifty-three essays were submitted and are now in the hands of the Board for grading. Similar prizes are contemplated, covering other fields.

THE ORGANIZATION MEETING OF THE SOUTH SIDE SECTION OF THE CHICAGO NATURE-STUDY CLUB was held at 9 a. m., Saturday, April 16, 1910, at the University School.

About one hundred enthusiastic nature lovers evinced their interest by attending this meeting. The program was as follows:

I. Bird Study in Jackson Park. 7 to 8:30 a. m.

Mr. Whitney and others will be in the park for Bird study. Those who need assistance may report to Mr. Whitney for leaders.

II. Organization of the Section. 9 a. m.

Election of officers, receiving new members, planning excursions for the spring term.

III. The School and the Community. Brief Talks.

1. Civic Relations of School and Community.
   Miss Kate W. Kellogg, District Superintendent.
2. School Garden Work at the Marsh School.
   Miss Katharine Cullen, Marsh School.
3. How a Woman's Club Co-operates.
   Mrs. Bishop, President South End Woman's Club.
4. How the High School Can Help.
   Mr. Worrallo Whitney, Bowen High School.

IV. Glimpses of the Home Life of Birds.

An Informal Lecture. Illustrated from life by colored lantern slides. Dr. R. M. Strong, University of Chicago.

Our only regret was that illness interfered with Miss Kellogg's appearance.

Miss Cullen of the Marsh School, impressed us with her indomitable, persevering spirit in promoting the school garden work in her district, showing how keen interest was aroused in the children and maintained to an ultimate success in the exhibition of fall fruits and flowers.

Mrs. Bishop detailed briefly plans for municipal gardens in South Chicago. The property owners cheerfully accorded permission to use a large tract of unoccupied land.

Stereopticon views in which the children recognized their gardens and themselves in the midst, proved an efficient appeal to the children who entered the contest given by the Calumet Juvenile Protective League, according to Miss Swayne.

Mr. Whitney, President of the Chicago Nature-Study Club, presented several excellent feasible plans by which the high school might co-operate with the community and the elementary schools. One of these plans was encouraging the high school students to visit the elementary schools and give the benefit of their experience and knowledge to the younger pupils, also to interest them in field work and assist in gardening. He also advocated the making of a lagoon in the high school yard for use in the botany and zoology classes.

Dr. R. M. Strong, University of Chicago, favored us with a delightful informal lecture on the Home Life of Birds, illustrating it with beautiful colored stereopticon views, which elicited great appreciation.

Printed announcements were distributed giving the details of the five excursions planned for the South-side Section this spring. These "field meets" are to be as follows:

April 30, Bird Study in Jackson Park; May 7, Fort Sheridan; May 14, Palos Park; May 20 and 21, Starved Rock; May 28, Tremont, Indiana.

These are not walking trips and there will be abundant time for studying birds, trees and flowers on all trips and competent leaders to help those who wish. Bring your lunch.

All interested in Nature-Study are cordially invited to join the Club. Visitors accompanying the Club on these excursions will pay a fee of 25 cents. Luella Roesch, Sec.-Treas.

* * *

THE SOUTH SIDE SECTION OF THE CHICAGO NATURE-STUDY CLUB met and organized April 16. 1910.

Dr. H. S. Pepoon was elected chairman, Miss Emily C. Westberg, sec'y-treasurer, and the Misses Deborah Ford, Grace Mac Leod and Leola Blackman, members of the executive committee.

The meeting was well attended. The membership numbers sixty-three.

The following tentative program of six meetings was submitted by the chairman:

I.	Annual meeting	2nd Saturday of April
II.	Field meeting	1st Saturday of June
III.	Field meeting	1st Saturday of October
IV.	Lantern and lecture	2nd Saturday of November
V.	Lantern and lecture	2nd Saturday of January
VI.	Lantern and lecture	1st Saturday of March

Dr. Pepoon gave the following interesting facts about the spring of 1910, which is the earliest since 1842:

Apples in bloom April 12; next earliest April 23, 1873.

One hundred sixty out-door plants in bloom April 15; in 1909 this occurred May 20.

Winter killed most roses to the ground and yet no frost and deep snow.

Birds are as late as usual, pay no attention to early springs.

Lilacs, hawthornes, phlox and hosts of May flowers in blossom (during first half of April).

Peonies in full bud or early in bloom.

The section had a trip that proved very successful as far as the flowers were concerned, but the birds were scarce due to the fact that there is no wireless connection between north and south in birdland. Emily C. Westberg, Sec.-Treas.

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THE WEST SIDE SECTION OF THE CHICAGO NATURE-STUDY CLUB held its first meeting Saturday morning, April 16, at the Pavilion in Garfield Park.

Preliminary to the meeting—from 8:30 to 10:00 a. m.—Mr. T. H. Holmes of the Tuley High School conducted a field study of the birds in the Park. With the general theme of the relation of nature-study to the individual, the school and the community, a program of short before-dinner addresses was given by Frank C. Baker and Fred L. Charles, T. H. Holmes, A. H. Conrad and others.

Miss Kate A. Reedy, Principal of the Columbus School, was elected Chairman of the section, and Mr. A. H. Conrad, Sec.-Treas. Several new members joined. After the program, luncheon was obtained in the Pavilion and informal discussion of nature-study interests was enjoyed by all. In the afternoon, Director Sells and his assistants conducted the members through the Garfield Park Conservatory. This is probably the largest building under glass in this country, if not in the world, and contains many rare and beautiful plants. The great fern room, with the plants naturally grouped among the rocks, is especially pleasing. The courtesy of the West Park Board and Supt. Schraeder in extending to the Society the privileges of the Pavilion and the Conservatory was much appreciated.

A. H. Conrad, Sec.-Treas.

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BOOK NOTES

Prof. A. B. Graham, Supt. of Agricultural Extension in Ohio State University, ably handles the subject of The Country School of Ohio, in **The Agricultural College Extension Bulletin** (Columbus, Ohio) for February (Vol. V., No. 6). The bulletin has a large number of excellent illustrations and will be very helpful to any student of rural education.

"Education in the Country for the Country", an address read by Hon. John Zeller before the Department of Superintendence of the N. E. A., is printed in full in the April issue of **The Ohio Teacher** (Athens, O.). One of his suggestions is that "there might be organized with profit an interstate commission on agricultural education, composed of states whose climatic and industrial conditions are quite similar".

The Sierra Educational News for January has an article on Agriculture in California Schools by Prof. E. B. Babcock, of the University of California, in which he discusses the general plan for organization of nature-study in elementary schools.

The Illinois Outdoor Improvement Association (Office, 17 E. Van Buren St., Chicago) has issued Pamphlet No. 2, entitled Street Tree Planting for Illinois, written by J. H. Prost, City Forester of Chicago. Price 5 cents. This admirable pamphlet, admirably illustrated, should be in the hands of every teacher of nature-study.

The Canadian Teacher (36 Shuter St., Toronto, Canada) has in its issue of May 2nd, under the heading of "Current Events", an illustrated article on Halley's Comet. Teachers will find useful information here.

Otwell's Farmer Boy (Carlinville, Ill.) is an enterprising monthly paper devoted to the encouragement of better agriculture by better boys. This spring it is promoting a corn growing contest among the farmer boys of America.

The Elementary School Teacher (Chicago, Illinois) is publishing an excellent series of articles on Agricultural Education, by Prof. B. M. Davis, of Miami University, Oxford, Ohio. The May number gives the seventh of the series.

The One-Room Country Schools in Illinois are exhaustively treated in a bulletin published by the **Department of Public Instruction**, Springfield, Illinois. The bulletin was prepared by Mr. U. J. Hoffman, the State Supervisor of Country Schools, and is being used extensively throughout the state in a general effort to uplift rural school conditions. It is especially helpful in giving plans and specifications for the building and equipment of the one-room rural school.. The illustrations are excellent.

The rural schools, like the plant breeders, are placing much emphasis on the study of maize, which because of its size, attractiveness, economic importance, and response to selection, has thus far profitted more than the other cereals from the attention it has received. A most excellent publication is Bulletin 212 of the Ohio Agr. Exp. Station (Wooster, Ohio), entitled **Corn Judging: Studies of Prominent Ear Characters in their Relation to Yield**. The Oklahoma Agr. Exp. Station (Stillwater, Okla.) has just issued Bulletin 87, entitled **Corn Culture**, treating of the whole process of corn growing, and hence suggesgestive to teachers who wish to follow the crop throughout the year. **How to Test Seed Corn in School** is admirably presented by Director A. C. True in Circular 96, Office of Experiment Station, U. S. Dept. of Agric. It is a seven-page illustrated circular, bearing the date of April 9, 1910, and gives practical directions for school or home study of germination tests. A fourth recent agricultural experiment station publication on **Corn** is Bulletin 118 of the South Dakota State College of Agriculture and Mechanic Arts (Brookings, S. Dak.). It is general in character and copiously illustrated. A series of well illustrated pamphlets on Corn are published by the Guaranteed Seed Corn Producers, Plano, Ill., from whom they may be obtained free of charge.

With such helps as these readily available, there is no reason why the study of corn should not be well handled by teachers.

Habit-forming Agents, meaning such drugs or beverages as dispose to habit formation, or drug addiction, receive their just deserts in Farmers' Bulletin 393, issued April 29. It speaks plainly of the disastrous effects of soothing syrups, medicated soft drinks, "remedies" for catarrh, cough, consumption, headache, tobacco-habit, etc. Parents, teachers, all who believe in health, in science, or in childhood, should assist in the dissemination of the facts presented. The bulletin is written by L. F. Kebler, Chief, Division of Drugs, Bureau of Chemistry.

School Nature Study, (published quarterly by George Philip & Son, Ltd., 32 Fleet St., London, E. C.) is the official organ of the "School Nature Study Union". The April issue has several articles of much interest, and the supplementary number presents detailed and extensive suggestions for a scheme of nature-study. This supplement will be valuable to all who are concerned with the course of study. It may be obtained, price 6d., of Mr. H. E. Turner, 1 Grosvenor Park, Camberwell, S. E.

The School Exchange (Newark, N. J.) makes of its March issue a special number on the Superintendents' Meeting of the N. E. A. recently held at Indianapolis. It furnishes valuable reading for teachers who are studiously interested in the welfare of children.

THE

NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

OFFICIAL ORGAN OF

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POLYPHEMUS MOTH AND COCOON

THE
NATURE-STUDY REVIEW
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VOL. 6 SEPTEMBER, 1910 No. 6

INSECT STUDIES

By ANNA B. COMSTOCK, CORNELL UNIVERSITY, ITHACA, N. Y.

I. THE STUDY OF ANTS IN THE SCHOOLROOM

One whose knowledge of ants is confined to meetings with these insects during their forays on the pantry after sugar and other sweets is sure to have a prejudiced mind concerning them even though somewhat acquainted with their reputation for foresight and industry. But let the same person really "go to the ant and consider her ways", or rather, bring the ant and her household home and establish them in a Lubbock nest where every act may be observed, from the toilets of individuals to the communal housekeeping processes and care of the young, and opinions are likely to be reconsidered.

THE LUBBOCK NEST

This study of ants in a Lubbock nest may readily be carried on in the schoolroom. The nests are easily made and are so named from the fact that the English scientist, Sir John Lubbock, used a similar contrivance while making the long study of ants and their ways which added so much to his fame. The materials needed are:

A piece of plank, about twenty inches long, sixteen inches wide and at least one-fourth inches thick.
Two pieces of window glass, ten inches square.
A sheet of tin, eleven inches square.
A piece of thin, flat board or a sheet of tin, ten inches square.

To make the nest:

Cut out a groove from the upper side of the plank, about an inch deep and of the same width, near its outer edge all around. This furrow is to be kept filled with water to make the nest a prison from which there is no escape, for clever as ants are, they have never yet mastered the art of swimming. The plank should be painted well to keep from checking or warping and it must be free from knot-holes. The eleven-inch sheet of tin is made into a tray by turning up its edges three-eighths of an inch. Place this tray in the middle of the plank, and lay within it one of the panes of glass. Around the edges of the glass, lay four strips of wood about a half-inch wide and a little thicker than the height of the ants that are to live in the nest; or burned matches may be used instead of the strips of wood. Walls an eighth of an inch high, or less, are about right for most species for they do not like lofty ceilings. For the roof, lay the remaining pane of glass on the strips of wood, first cutting off a small triangular piece from one corner. To darken the nest, it should be covered with the bit of thin board having a screw-eye in the center to lift it by, or a piece of tin with a handle soldered in the center. A piece of thick blotter or very thin sponge should be placed in the nest near the corner which has been cut off, where it can be kept moist with a pipette without removing the upper glass. The ants will soon die if this is not moistened daily.

Now the moated grange is ready for its occupants. To obtain these we must go hunting in the nearby pasture or meadow, armed with a garden trowel and a two-quart glass fruit can. We turn over all the flat stones we see, and under some of them we are sure to find a small colony of ants with plenty of eggs and larvae. We carefully scoop them up, ants, eggs, larvae, pupae, dirt and all, trying not to injure the specimens. While digging we keep a sharp lookout for the queen, which may be recognized by her larger size. But even though her royal highness is missed, if plenty of eggs, larvae, and pupae are secured, the ants will be very contented in their new nest while taking care of them. We must never combine specimens from different colonies, for ants in their little nests agree only when they are of the same sisterhood. After gathering as many of the same colony as possible, cover the can, carry to the schoolroom and gently empty the captives, dirt, young and all, on the trop of the board which covers the nest. As an ant's first thought is never for its own safety, but for the preservation of the young, the little workers at once begin to look about for some safe, dark place, where their eggs and larvae may be protected from the dry air and from the light. Soon they find the way into the nest at the cut-off corner of the upper pane of glass, and begin to carry in the young, usually taking the pupae first, for ants seem to realize the cost and care of rearing their families and when their households are attacked, save first, the oldest of the helpless inmates. After they have carried all their family into the nest, which should be within two or three hours, we may remove the dirt left on the cover, and the nest is ready for observation.

Food provided for the prisoners should be soft but not fluid, and should be placed on the plank rather than in the nest, for then their preferences may be observed and we are better able to clean away the refuse. Crackers or bread soaked in sweetened water, cake, jam, sugar, crushed yolk of hard-boiled egg, bits of raw meat or freshly killed insects may all prove acceptable to the little people.

What things shall the teacher and pupils watch for in the glass house, as the ants go about their business within it? So many and so wonderful are they that this article would be far too long if I were to mention the half of them.

First, of course, should be the appearance of the little six-footed Martha herself. Her slender thorax, with its three pairs of most efficient legs, stronger and more swift, in comparison to her size, than those of a Marathon winner; the head, with its formidable jaws, working sidewise like a pair of shears, with which she can behead a foe in battle, crush and carry

ANTS FEEDING AND AT THEIR TOILETS

the soil from the tunnels she builds, or gently lift and move the tender young in her nest; and the ever-moving antennae, more sensitive than the fingers of the blind, with which she judges the qualities of everything she meets, and which are also the evident means of her communication with her kind.

We wonder as we note that most of the virtues we admire and strive to attain are known and practiced by the ants. Their cleanliness is extreme. Not only does each ant keep herself "neat as a new pin", but they help each other at their toilets, and the queer attitudes which they assume while brushing and licking themselves and each other are very funny to see. Their housekeeping is equally nice, and they have particular places for refuse, as far as possible from the livingrooms and nurseries. They love their fellows and are kind. Does a well-fed ant meet a hungry sister? She will give to her even from her own partially digested food; the two will stand mouth to mouth for some minutes during this process. They are brave, and without an instant's hesitation will sacrifice life to protect their homes and young from any creature, even man. They allow no aliens within their gates and will fight against any odds. At the same time they will not refrain from attacking an adversary, three or four dozen to one; anything to overwhelm an enemy. They are tirelessly industrious, and above all, seem to be supremely unselfish, each one living for the good of all. It is the community and not the individual which seems to them important. So it is that the ants' most shining virtue is their devotion to the young. No mother instinct is this, for though all worker ants are females, they are undeveloped sexually. All the eggs are produced by the queens, of which there may be several, though sometimes only one in a nest. The eggs are taken as soon as laid and are cared for by the nurses through all the stages and changes of their growth. A teacher may work out a most interesting series of questions concerning these nursemaid duties to be answered by the pupils from their own observations.

Note the appearance of the eggs and what is done with them; the size, shape, and color of the larvae when hatched; how they are fed, cleaned and carried about; that the young of different ages are kept in different nurseries and fed on different food; for the very young it is partially digested and regurgitated by the nurses, but as they grow older, food is brought to them or they are taken to it, and then do their own eating. Ants seem to be able to retard or hasten the growth of the young by regulating the kind and quantity of food. They are very particular about temperature and even more so about draughts on their babies; so, in the ground nests, they carry them down to the lower galleries during the heat of the day and bring them up near the warm stones in the evening; in the Lubbock nests they are always carrying the young about with reference to the wet blotter or sponge. Tell in what ways the pupae differ from the larvae; how long they remain in the pupa stage; the different color and helplessness of the "callow", as the newly emerged youngster is called; this, though as large as its sisters, seems feeble and stupid and is tenderly waited on; crumpled leg and antennae are straightened out and each is licked and brushed from "tip to toe".

If one has been so fortunate as to secure a queen when getting the inhabitants for the nest, the attentions she receives may be observed. Note that she has her own "royal apartment" and is always surrounded by attendants who care as assiduously for her food and toilet as they do for the young.

While watching the ants in the nest, it is well to keep an eye on those that are free and out of doors. Perhaps one may see them gathering honey-dew from the aphides, or "plant lice", their "cows" which seem entirely willing to yield the sweet, and in return are sheltered and moved to good feeding grounds by the ants, who will also fight against and destroy the insect enemies of the aphides. This partnership between the ants and the aphides is one of the most interesting in nature, and has helped to put the ant on the wrong side of the economic question.

II. STUDY OF A MOTH

A very interesting experiment for the schoolroom is the rearing of a moth or butterfly from the caterpillar or even from the egg. Not many species may be observed in all their phases of life, so late as the beginning of the school year, but among the few is that common, but very interesting moth, ***Telea polyphemus***. Polyphemus caterpillars may be found from June till late October and the eggs may be discovered on the under sides of the leaves, on which it feeds, as late as August or in early September.

If, by any turn of the world's great wheel of fortune, this country should be deprived of the product of Chinese silkworms, here is the species which could supply that luxury in their place. Its silk is smooth and strong, exceedingly fine and lustrous and very durable. From each cocoon is unwound about eight hundred feet of unbroken silk. The caterpillar is not so dainty in its choice of food as its Chinese relative, but

POLYPHEMUS CATERPILLAR, FULLY GROWN

manufactures its fine raiment out of almost anything, feeding freely on beech, birch, maple, chestnut, walnut, oak, elm, apple, pear, wild cherry and many other trees.

The egg is round and flat, like a lozenge; the flattened sides are white and the edges brown. This brown band has a white dash across it in one place and opposite to this a white dot. The period between laying and hatching varies with the state of the weather, being usually from ten to fifteen days. The eggs darken before hatching and the little caterpillars eat their way out at the white dot on the side. The wee

POLYPHEMUS EGGS ENLARGED

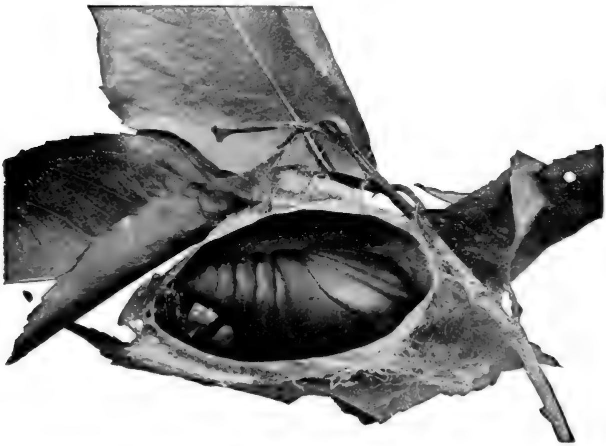
"worms" are then only a quarter of an inch long and have round, red-brown heads, large in proportion to their bodies, which are yellow with side lines of dark spots.

But they eat, and eat, and eat, till their skins become too tight to live in and are cast off or molted, at intervals, till they have become changed four times. They drink too, so it is necessary that when fed, their leaves should be not only fresh but dipped in water. After the first molt their bodies become green, blue-green above and yellowish below the lateral line, with orange tubercles. The segments of the body are deeply and sharply cut. When full grown, polyphemus larvae are about three inches long and as thick as a grown person's thumb. The creature has a way of drawing itself up with the front part of the body lifted, and remaining motionless for a long time, looking from the side very much like a tooth-edged leaf. Undoubtedly it often escapes notice thus and one wonders whether it has any realization of the fact.

In nature, caterpillars have many enemies. Not only are they tidbits for birds and squirrels, mice and bats, but fungous diseases attack them, parasitic flies deposit eggs upon or within their soft and juicy bodies, where they hatch and feed upon the living host, slowly destroying it. This is well, for otherwise their numbers would so increase in the land that man would be unable to cope with them. But it follows that when one wants adult specimens without blemish, the best way to secure them is to rear them for oneself, away from the reach of all such harm. At the same time one learns the full life history of the insect.

Any box close enough to keep the caterpillars from escaping will do for a feeding-cage. For the sake of observation, one of its sides should be of glass. A large glass battery jar covered with cheese-cloth or wire netting makes an excellent cage, for in it leafy twigs may be placed in vials of water to keep them fresh and the crawlers may feed in full view from all sides.

Pupils should be required to take very full notes, putting down nothing to which their own eyes have not testified. Such points as the length of time the larvae feed before the first molt; how they attach themselves to a support while casting the skin; how long they rest while molting; any changes of color, size and form caused by the molts, should be noted and also a very full description of the caterpillar when full-grown and ready to pupate. How they behave when preparing to spin and the length of time required to finish the cocoon. The appearance of the cocoons, of which a few should be opened to



COCOON OF POLYPHEMUS, OPENED TO SHOW CHRYSALIS
NOTE WING-CASES AND ANTENNAE

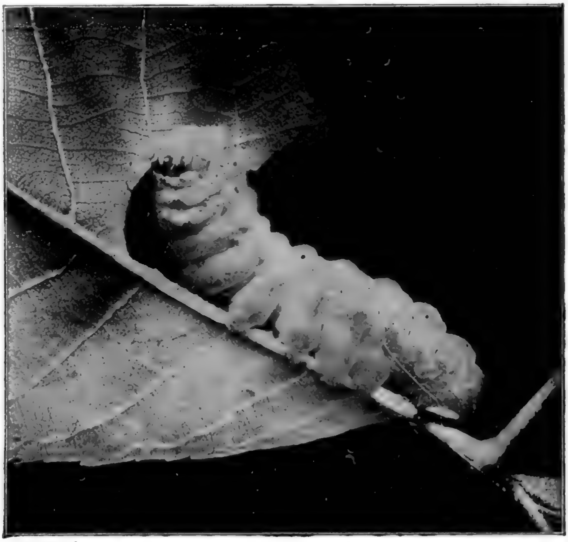
observe their texture and thickness and also to note the length of time required for the transformation from larval to pupa state and the color and shape of the pupae.

Polyphemus is generally single-brooded in the northern states, and even in southern latitudes the occupant of a late-spun cocoon will remain snugly enclosed until the coming spring. It should be remembered that naturally these cocoons lie among the dead leaves on the ground, or occasionally cling to the twigs all winter, exposed to rain and snow and all extremes of temperature. This does them no harm, on the contrary, they die if kept too dry and warm, and if indoor preservation is attempted, the cocoons should be dipped in water about once a week. A better way is to enclose them in a box and tuck them away in some open shed or under some bush out-of-doors, taking them in about the beginning of May before they feel spring's call to come out.

The cocoon of the polyphemus being spun with an unbroken thread, the moth must make an opening for itself when emerging. This is done by wetting the case with an acid liquid which it secretes in its mouth for the purpose and then pushes its way out through the threads. Its appearance when first emerged, with its pursy abdomen and mere flaps of wings is quite different from what it will be a short time later. This swift development is most interesting to watch and when it is complete, the pupils should endeavor to give an accurate description of the moth. Its beautiful coloring, the "window-panes" as children call the transparent membrane in each wing, the decorative lines and spots should all be noted. Sex may be distinguished by the female's ovipositor and the claspers of the male; also by the comb-like antennae, those of the male being the broader. With a good lens, one may see the scales on the wings.

LUNA MOTH

Cocoons may be searched for and gathered in the autumn among the fallen leaves when the children go nutting, and many others beside the polyphemus may be preserved and their occupants identified when they emerge in the spring. With the polyphemus cocoons may be some which resemble them very much, only perhaps a little thinner, with the leaves in which they are wrapped a bit more trigly rolled about them. It is always a delightful surprise to have these cocoons which one had supposed to be polyphemus yield the lovely ***Tropaea luna***, most beautiful of all the silk-worm moths. No wonder it has been named "Queen of the Twilight" and "Empress of the Night". The wings are an exquisite pale green, the front ones seemingly bordered with rose-purple velvet, and the body is clothed with delicate white fur. Because it flies only at night, lovely Luna is supposed by many to be as rare as it is beautiful, but it is really one of our common species, having a wide range.



LUNA CATERPILLAR, FULLY GROWN

Acknowledgment

We are indebted to Charles Scribner's Sons for their courtesy in furnishing to us for publication in this number the excellent colored plate of butterflies which serves as frontispiece to Holtz' "Nature-Study". One of the most marked characteristics of recent nature books is the use of illustrations reproduced from original photographs. When color is added, the attractiveness of the picture is greatly enhanced. Teachers generally are eager to possess such illustrative material, and we are confident that our readers will generally appreciate the favor extended them by these publishers

ENTOMOLOGY IN SECONDARY SCHOOLS

By J. W. FOLSOM, ASSISTANT PROFESSOR OF ENTOMOLOGY, UNIVERSITY OF ILL.

In any agricultural community the teacher ought to be able to tell the pupils how to protect crops from the attacks of insect enemies. By so doing he could increase his usefulness. The high schools in farming regions might to advantage replace the third and fourth years of Latin, Greek and ancient history by more useful subjects, including a certain amount of entomology. In city schools there is no great necessity for teaching economic entomology; but any high school that is sufficiently advanced to offer botany or zoology should offer also the elementary entomological facts that no educated person should be ignorant of.

Entomology is not taught in secondary schools for two reasons: (1) the curriculum does not call for it; (2) the teacher knows little or nothing about it. Put entomology in the curriculum and teachers will soon hurry to learn something about it. They will buy books, or go to the public library; and some

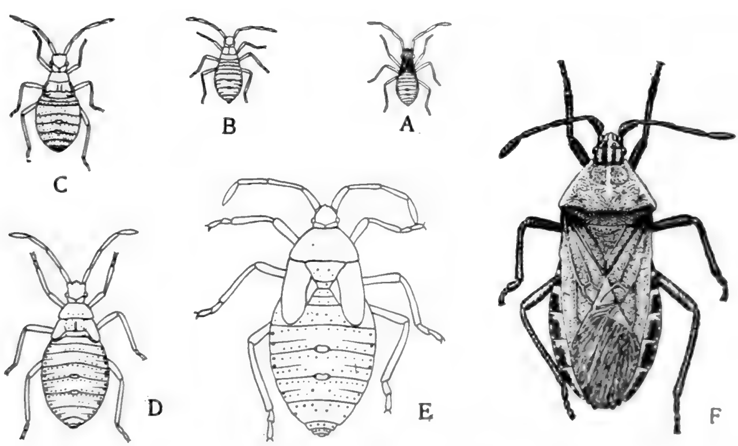


FIG. 1. STAGES IN LIFE OF SQUASH BUG

of them will have enough enthusiasm and originality to go outdoors and learn something through their own investigations. If unable to attend courses in entomology, one can, nevertheless, get help in difficulties by writing to university instructors, to state entomologists or to state experiment stations.

If you are teaching natural history to young people, you will not need to use any special methods to attract and hold their attention. Young people are investigators by nature. Under the rule of their teachers they gradually get overmastered by the influence of authority, until when they get to the university and take courses in science, it takes perhaps two years to get them to use their own eyes again, and only a few students ever attain a condition of real mental self-reliance. Young people are full of curiosity, to be sure, but they are too hasty in their observations and conclusions. So the teacher must direct their mental processes, to the end that their obervations may be accurate and thorough, and their inferences correct.

In the short time allowed to zoology in the high school, the largest results can be had only by a careful selection of a few subjects for study. For elementary work on insects this list of subjects is a good one: grasshopper, squash bug, potato beetle, cabbage butterfly, meat fly, honey bee. Each of these

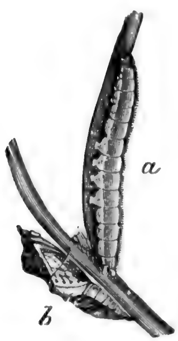


FIG. 2. LARVA AND PUPA OF CABBAGE BUTTERFLY

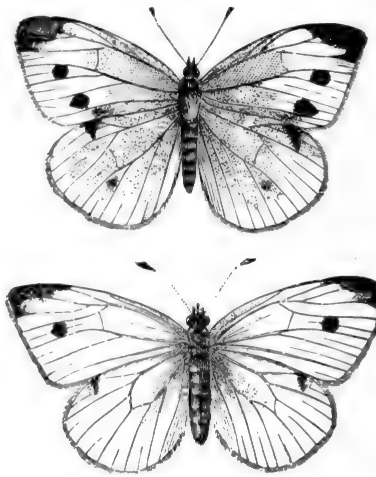


FIG. 3. FEMALE (TOP) AND MALE (BOTTOM) CABBAGE BUTTERFLY

should be collected in all its stages if possible. These types give a good idea of the anatomy and transformation of insects, are good illustrations of the principal orders of insects, and are species of economic importance. Squash bugs (Fig. 1) in several stages, are as a rule, easy to obtain in autumn on cucurbitaceous plants. The Colorado potato beetle is a convenient form to use, but the larvae and pupae must be obtained beforehand, in summer; the latter by allowing full grown larvae to transform in compact earth that is not too dry. All stages of the cabbage butterfly (Figs. 2, 3) are common in autumn. The several species of meat flies (Fig. 4) will lay their eggs on raw meat ex-

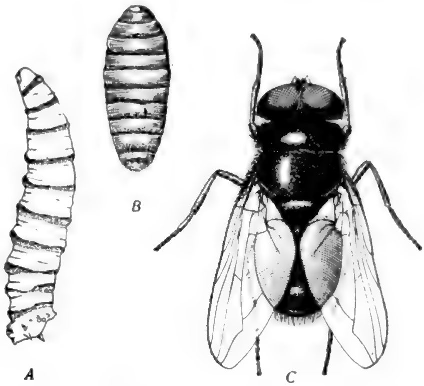


FIG. 4 MEAT FLY: LARVA, PUPA AND ADULT

posed out of doors, and the maggots can be fed with cooked meat. Honey bees (Fig. 5) are easily caught from flowers; often

FIG. 5. HONEY BEE: QUEEN, DRONE AND WORKER

a frame containing eggs, larvae and pupae can be obtained from some beekeeper near by. Mosquitoes, also, (Fig. 6) are instructive forms to study. To obtain their eggs it is simply necessary to set out a bucket of water and leave it over night.

A certain amount of field work is highly desirable. Some school authorities seem to think that outdoor work is necessarily a picnic, with lack of discipline. Such is not the case, however. A good teacher can manage his students out of doors as well as in the classroom. If necessary, the field work can be limited to holidays. Without personal observations in the field, the orchard and the garden, the student can form but imperfect

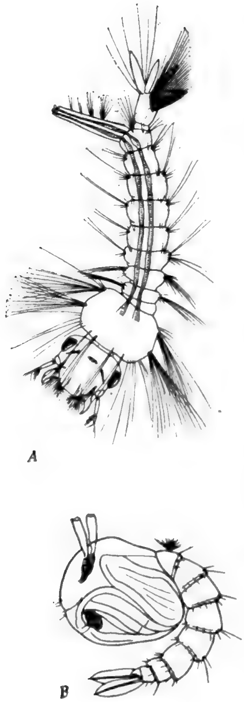


FIG. 6.
A—MOSQUITO LARVA;
B—PUPA

conceptions of the habits of insects and of the injuries inflicted by them. Moreover, by such personal studies the student can get something that is more important than the particular facts that he learns, and something that he gets too little of in the schools, namely, the habit of trusting his own senses and his own reason.

The best part of the school year for the study of insects is autumn. Among the more important insect pests available for study at that time are the following:

Corn root-louse, ***Aphis maidiradicis***. (Fig. 8.) A bluish green plant louse on the roots of corn, attended by ants. The aphids can be kept alive in the laboratory on the roots of seedling corn, and their eggs obtained.

Northern corn root-worm, ***Diabrotica longicornis***. (Fig. 9). The injury by this insect is common in old cornfields, but by autumn the larvae have transformed to small grass-green beetles, that are abundant on the blossoms of thistle, sunflower, clover, etc., and on the rinds of squashes.

White grubs, several species of ***Lachnosterna***. Larvae and fresh beetles can be found by following the plow in early fall, or by digging up injured corn plants or strawberry plants.

Wireworms, ***Melanotus***, etc. (Figs. 10,11.) The larvae are common in the soil, and the adults also plentiful, many of the species hibernating as beetles.

Corn worm or cotton boll worm. ***Heliothis obsoleta***. The caterpillars, familiar objects on ears of sweet corn, are common in autumn on ears of field corn, under the husks. The larvae burrows and the pupae are not difficult to find in the soil of a cornfield that has just been badly infested.

Chinch bug, ***Blissus leucopterus***. (Fig. 12.) This pest has

FIG. 7. CORN ROOT-LOUSE; WINGLESS VIVIPAROUS FEMALE

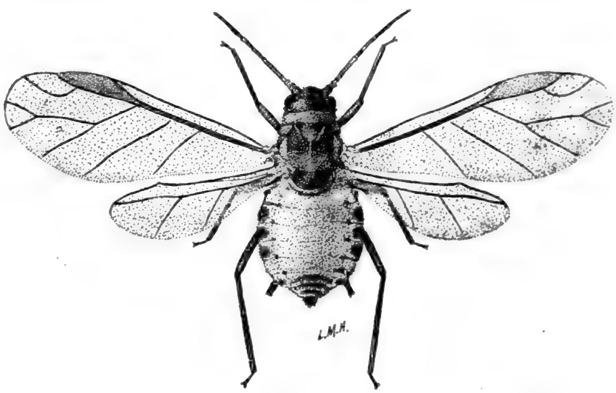


FIG. 8. CORN ROOT-LOUSE; WINGED VIVIPAROUS FEMALE

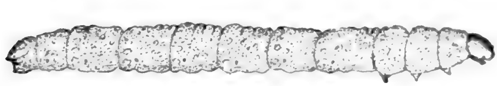


FIG. 9. NORTHERN CORN ROOT-WORM

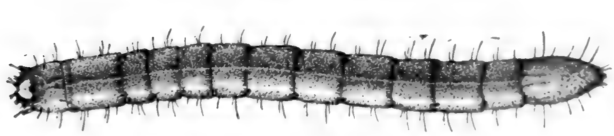


FIG. 10. WIREWORM

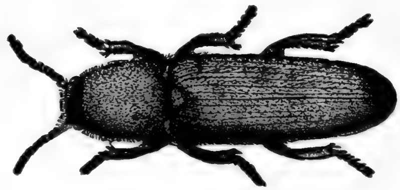


FIG. 11. ADULT

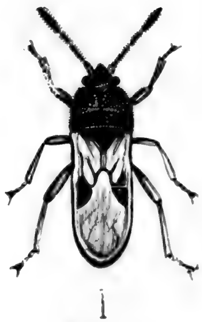


FIG. 12
CHINCH BUG

done its damage by autumn, at which time the adults fly about and seek places in which to hibernate.

Hessian fly, ***Mayetiola destructor.*** In regions where this pest occurs, the habits of the autumn generation should be studied.

Codling moth, ***Carpocapsa pomonella.*** The larvae are often as common in red haws as they are in apples. They hibernate in cocoons, which can be found under flakes of bark on old apple trees that have recently borne fruit.

Peach tree borers, ***Sanninoidea exitiosa, Synanthedon pictipes.*** The larvae of various sizes are easily dug out of their burrows, which are located by means of the gummy exudation.

Fruit-tree bark-beetle, shot-hole borer, ***Scolytus rugulosus.*** (Fig. 13.) In autumn adults are common especially on peach and plum trees. The small round holes in the bark open into the characteristeric galleries between the bark and the wood. The larva winters in a chamber in the wood, a few millimeters below the bark.

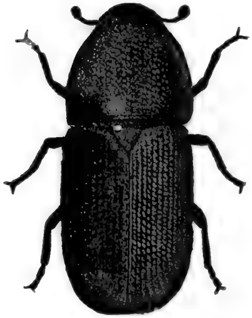


FIG. 13.
SHOT-HOLE BORER

Plum curculio. ***Conotrachelus nenuphar.*** The beetles, even though common in autumn, are difficult to find on the ground but are occasionally found under chips or boards near plum trees or seen on the trees in daytime. In summer, it is an easy matter to get larvae, pupae and adults from fallen plums placed on a layer of compact, damp earth.

Wooly plant louse, ***Schizoneura lanigera.*** The white wooly clusters of this aphid are conspicuous on apple, occurring either on old scars on the limbs or on the "water-shoots", or "suckers". The same species frequents also the crown of the tree, just below the surface of the soil.

Pear slug, ***Eriocampoides limacina.*** (Fig. 14.) A slimy slug-like larva that skeletonizes the leaves of pear, cherry, and plum.

FIG. 14. PEAR SLUG

Scale insects, ***Coccidae.*** Of the many species of scale insects, the most injurious kinds should be selected, for example, San Jose scale, scurfy scale, and oyster-shell scale. Along with the scale insects their predaceous or parasitic enemies should be studied.

Plant lice, ***Aphididae.*** These are usually abundant, on many kinds of food-plants. Associated with the plant lice, are their natural enemies of many kinds; as lady-bird beetles (larvae and adults), lace-wings (eggs, larvae, cocoons, adults), syrphid larvae **(Figs. 15, 16)**, hymenopterous parasites, and the fungus ***Empusa.*** The habits of attendant ants should be studied. For such purposes a hand lens is necessary.

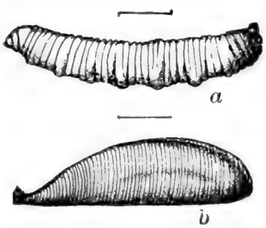


FIG. 15. SYRPHID LARVA (a) AND PUPARIUM (b)

Cutworms. (Fig. 17, 18.) Many species of cutworms hibernate as partly

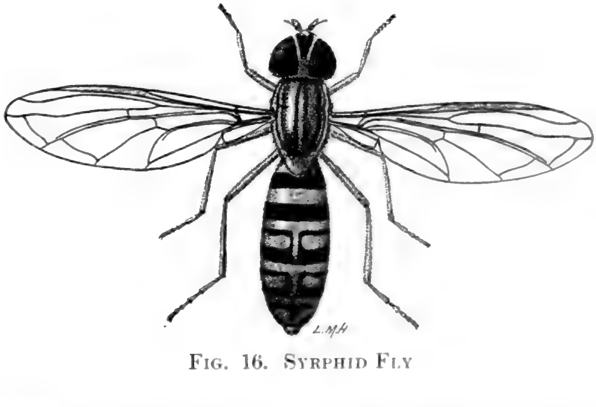


FIG. 16. SYRPHID FLY

grown caterpillars, and are common in autumn in grass lands, especially under stones, boards, etc. Several species are to be found in clover fields, in the debris on the ground.

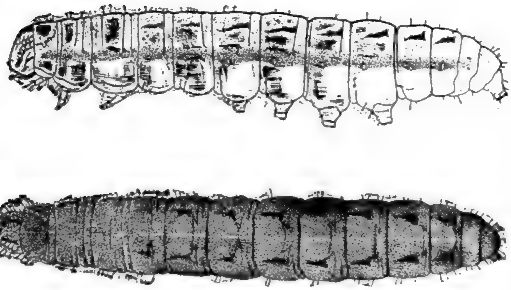


FIG. 17. CUTWORMS

FIG. 18. ADULT OF CUTWORM

Striped cucumber beetle, *Diabrotica vittata*. This pest is abundant on autumn flowers and on the rinds of squashes.

The cabbage worm, *Pontia rapae*, and the squash bug, *Anasa tristis*, should be studied in the field as well as in the laboratory.

For reference purposes the teacher can easily get some of the following works on general entomology: Comstock's Manual (Comstock Publishing Co., Ithaca, N. Y.); Kellogg's American Insects (Henry Holt & Co., New York); Packard's Text-book (Macmillan Co., New York); Folsom's Entomology (P. Blakiston's Son & Co., Philadelphia).

On injurious insects we have Smith's Economic Entomology (J. B. Lippincott Co., Philadelphia); Smith's Our Insect Friends and Enemies (Lippincott); Saunders' Insects Injurious to Fruits (Lippincott); Sanderson's Insects Injurious to Staple Crops (John Wiley & Sons, New York); Chittenden's Insects Injurious to Vegetables (Orange Judd Co., New York); and Harris' old but useful work, Insects Injurious to Vegetation.

For fuller information than is given in these books, one must look to the following publications which contain the great mass of our knowledge on economic entomology: Bulletins and Reports of the State Experiment Stations and of the State

Entomologists; Reports and Bulletins of the U. S. Entomological Commission; Reports of the Entomologists of the U. S. Department of Agriculture; Farmers' Bulletins, Dept. of Agriculture; Bulletins and Circulars of the Bureau of Entomology; Insect Life, formerly published by the Division of Entomology; The Journal of Economic Entomology, now published at Durham, N. H. A practically complete bibliography of economic entomology in America has been written by Henshaw and Banks and published in eight parts by the Department of Agriculture. This work may be found in public libraries, but some of the parts are now so scarce that even an entomologist has difficulty in getting a complete set.

Often one will find just the entomological information that he wants in the publications of his own state. Here in Illinois we have a rich and original source of information in the reports of the state experiment station and the Bulletin of the State Laboratory of Natural History. Especially helpful are the eighteenth and twenty-third reports of the state entomologist, constituting a monograph of the insect injuries to Indian corn; and the twenty-first report, which treats of a great number of common insects.

The Bureau of Entomology at Washington, D. C., has issued many useful circulars on injurious insects. These, as well as the Farmers' Bulletins, are sent free, on application to the Secretary of Agriculture. Circular 76 is a list of publications of the Bureau of Entomology. Some of these are free and others are to be had at a nominal price from the Superintendent of Documents.

A work of great usefulness is Bulletin No. 81, of the Bureau of Entomology, entitled "A List of Works on North American Entomology". Unfortunately, the demand for this bulletin is such that each new edition is soon exhausted.

By making a little effort, any teacher can get the entomological information that he desires.

Note—Most of the cuts used in this article were kindly loaned by Prof. S. H. Forbes, State Entomologist.

THE UNIVERSITY OF CALIFORNIA has appropriated $2,000 with which to advance the work in agricultural nature-study in grammar schools. Prof. E. B. Babcock and Mr. C. A. Stebbins, well known to readers of the Review, are directing the work. Much is expected from this movement.

THE SCIENTIFIC METHOD IN EDUCATIONAL RESEARCH

By PROF. W. C. BAGLEY, DIRECTOR OF SCHOOL OF EDUCATION, UNIVERSITY OF ILLINOIS

The need for definite educational standards has been keenly felt for some time. Until the school can measure in an effective way the actual results of its work,—until it can determine with some measure of precision how its processes work out in the lives of its pupils,—the work of teaching will not be able to command the rewards that everyone is willing to admit it deserves. Education of one sort or another is responsible for certain important differences in human beings. But precisely what these differences are and how they are to be measured and what teacher or what school or what books are responsible for them,—these are questions for which, at the present time, no satisfactory answer is forthcoming. Dogma and opinion are always ready with hypotheses, but for every opinion that is ventured, another equally convincing and of quite the opposite trend, can be advanced. If one asserts that over one-half of the men and women listed in "Who's Who in America" are college-bred, and concludes therefrom that college training increases one's chances for preeminence, the skeptic is always ready with the opinion that the colleges select the best material, and that the preeminence is consequently due to native gifts and not to college training. If one maintains that the discipline of the natural sciences furnishes a protective armor against fraud and deception, the same skeptic may very quickly present a long list of eminent scientists who have been shamelessly hoodwinked by clairvoyants, spiritualistic mediums, and other "psycho-fakers"—from whom, by the way, the general public stands in far greater need of protection than from the much-abused "nature-fakers".

The advocates of every subject now taught in the schools or clamoring for a place in the curriculum has each his own imposing array of "reasons" which justify the employment of schooltime and the expenditure of public money in the "teaching" of the subject. And yet, when these reasons are analyzed, they are found to be based practically without exception upon what is "supposed" to to be the outcome. That this outcome is even tolerably certain we have, in the majority of cases, absolutely no evidence. This does not mean, of course, that the teaching of these subjects is necessarily inadequate, nor that the results are deplorable; it means simply that we cannot say definitely whether this or that teaching is good and the results commendable. In the absence of fundamental standards, both the teacher's efficiency and the value of the subject are judged very largely by standards that are important enough so far as they go, but which fail to measure true efficiency. A subject may, for example, be justified because it is "interesting". This criterion is obviously accessory and not fundamental. Even admitting that a subject from which valuable educative results are to be derived should be presented in an interesting fashion in order to realize its value, it does not necessarily follow that all subjects that can be so presented are valuable. The investigations of Reudinger and Strayer (Journal of Educational Psychology, May, 1910) indicate that the ability to maintain good order is the most important single factor in the supervisor's judgment of a teacher's efficiency in the elementary school. But, important as order is in the schoolroom, the veriest tyro in school management knows that it is only a means to an end, or, at most, only one end out of many that should be sought.

What we lack primarily in educational science, then, is a series of standards by which the growth that pupils make in the realization of our educational ideals may be adequately measured,—standards somewhat analogous to those furnished by the clinical thermometer, the bacterial stains, and the optical and acoustic tests in medicine, by the various devices for measuring the strength of materials in engineering and by the seed-vitality tests in agriculture. Even jurisprudence has now the opportunity to reduce one of its numerous fields to the rule of exact procedure through the development of accurate methods of determining the validity of testimony. In short we are coming to see that the possibility of precise determinations is not limited to the objective sciences, but that even the operations of the human mind may be definitely measured and accurately compared. Nor are some phases of educational activity far behind these other human callings in availing themselves of the instruments of quantitative determination. Binet in France has devised a scheme of measuring intellectual capacity that will undoubtedly mark an epoch in the education of defective and abnormal children; and Stone's recent investigations in arithmetic ("Arithmetical Abilities: Some Factors Determining Them." New York, 1908) indicate very clearly the possibility of measuring results in the teaching of elementary arithmetic with a fair degree of accuracy. Unless we are seriously mistaken, the educational progress of the next decade will be chiefly marked by the development of accurate methods of testing the results of teaching.

It is obviously in the fields of education that are chiefly concerned with the development of skill, that such standards can be most readily agreed upon and most easily applied. Next to these, the fields in which a definite knowledge-outcome is desired offer the most favorable field for the application of exact tests of efficiency in teaching. In those fields in which the educational outcome is to be characterized in terms of ideals, tastes, attitudes, and sympathies, the sitution is much more complex and, at first glance, quite unfavorable to quantitative treatment. And yet, even here, there is a possibility of devising tests that will furnish a measure of efficiency far more satisfactory than the uncertain and indefinite standards of judgment that are now applied. Whatever may be the outcome of an educative process,—whether it be a set of habits, or a mass of facts and principles, or an ideal of method or procedure, or a taste, or an attitude,—this outcome can always and must always be expressed in terms of conduct,—in terms of action. When we think of education as developing conduct-controls, the problem of an effective test is seen in a new light. Are we seeking in our science courses to develop an ideal of the scientific method of procedure? If we are, it will be possible to test the efficiency of our work by placing the pupil face to face with a new situation and determining whether he reacts to that situation in the way that we expect. Such a test was devised by Gilbert in connection with the experiment described in Nature-Study Review for March, 1910, and a preliminary report of which appears in the Journal of Educational Psychology for June, 1910. In fact, all of the so-called "intangible" results of education lose their intangible character when translated into terms of actual conduct. And is this not, in any case, the ultimate test? How else is the work of teaching to be judged? The sources of human motive may be hard to discover, but the outcome of human motive is a very real thing. How much the processes of education contribute to this outcome and how much must be attributed to inherited traits and congenital variations, we are unable now to say. But if, in a series of closely observed and carefully controlled cases, a repeated variation in the educative process continually produces a concomitant variation of the conduct-outcome, we may be fairly confident that the teaching stands to the conduct-outcome as cause to effect,—although through what series of intervening links we may be quite unable to say.

Under the conditions of present-day school organization, there are two methods of comparing variations in methods of teaching or organization of materials with variations in conduct-outcome. One is the statistical method which is illustrated by Stone's investigations referred to above. This method involves a comparison of a large number of schools operated under different conditions, subjecting the pupils of all the schools to the same test, and then determining whether there is any "correlation" between the differences in results and the differences in organization of subject-matter, method of teaching, or other factor in which the several schools may differ. This method is important in that it deals with large numbers of pupils among whom unforeseen individual differences, or differences not included among the correlated factors, may be assumed to be equally distributed; in other words, these unrecognized differences offset one another, and may consequently be neglected.

The second method of investigation is that of "parallel groups". In this method, two classes, approximately equal in number, age, home environment, and capacity, are subjected to different methods or different types of subject-matter and the effect of these different treatments is compared by subjecting both classes or groups to the same test. This method might be perhaps characterized as yielding results less general in their application than the statistical method, but on the other hand, it permits a comparison of the results of disputed methods under conditions where a test of the former type would be impracticable, and the results obtained, if sufficiently suggestive, would warrant the repetition of the experiment until a sufficient number of cases had been accumulated to permit the drawing of general conclusions. Such experiments, carefully planned to account for all known influencing factors, and repeated to discover whether any factors not foreseen were really operating, would ultimately yield very valuable results.

The net outcome of educational investigation which follows the general lines here indicated would be a gradual accumulation of standards to which the progress of pupils could thereafter be referred, and definite conclusions drawn as to the efficiency of the teaching. Certain factors are already fairly well established from the investigations already undertaken. In connection with arithmetical abilities, for example, it is clear, both from Stone's results and from Rice's earlier work (see Forum, 1902), that home environment is a factor of far less importance in determining such abilities than the average teacher supposes. Whether this holds for other types of ability (for other conduct-controls) is still to be determined, but one thing is pretty definitely established: generally inadequate results in arithmetic are not to be attributed to the operation of out-of-school factors.

In connection with the parallel-group method, the objection is frequently raised that the bias of the teacher is an all-important factor, and that the results will be valid only for the teacher who conducts the experiment. In how far the "personal equation" can be eliminated in this type of research is a question that is to be determined only by repeated tests of the method, and even if such repeated tests show undoubtedly that "results" are entirely independent of any factor save the teacher's enthusiasm, it will simply mean that organization of subject-matter and method of teaching are topics that need not concern us further. This will be a valuable result if it is established, for it should put an instant stop to the controversies over subject-matter and method that rage so violently in every educational camp. It is hardly probable, however, that, if personal bias and prejudice can be eliminated in every other form of scientific inquiry, educational research will form so conspicuous an exception to the general rule. It will be recalled that the same objection was voiced when psychology adopted the experimental method of research, and yet the results of experimental psychology stand today as a substantial answer to the criticism. But the criticism has its value in pointing to the danger of applying the experimental method *ad libitum* and without due reference to the ever-present need of the scientific attitude. Investigations of this type should be most carefully scrutinized, and every possible source of error pointed out. Indeed, not the least valuable result of such program as is here indicated will be the inevitable discovery of factors that have hitherto escaped attention.

Finally to those who object to the scientific investigation of educational problems on the ground that such investigation tends to materialize a process the essence of which should be spiritual and ideal, it should be pointed out that the accurate knowledge of facts and conditions that science attempts to reveal is not now, and never has been, inconsistent with the highest type of idealism. After all has been said and done, the permanent goods of life are its visions and its ideals. Facts and principles are but guides to the realization of the ideals, and the more accurate and precise the knowledge, the safer it is as an instrument for the realization of whatever purpose may dominate life. It is true that education must do something besides furnish knowledge. It must do what it can to implant ideals and develop worthy purposes. But it must also furnish the means of realizing ideals and purposes. And while in the work of education itself, it is the ends and ideals that are fundamentally important, the perfection of the instruments through which we strive to realize our ideals must claim a share of our attention.

In connection with what we term the "newer" subjects of the curriculum,—among which nature-study has an important place,—good service could be done by the application of the quantitative methods of investigation. Do we justify nature-study because it gives the pupil a disposition to depend upon unprejudiced observation for truth? If so, it should not be difficult to show that we either are or are not justified in our assumption. Pupils who have undergone the courses in nature-study should, in certain situations, react in a way that would differentiate them from pupils who have not "studied" nature. If we have a definite conception of what nature-study ought to do, it should not take us very long to devise a series of tests that will measure, with a fair degree of accuracy, our achievements in teaching the subject. Do we believe that nature-study will give to those who properly pursue it a sympathy for nature and a disposition to seek their recreation in the woods and fields rather than in the "nickelodeon", the penny-arcade, or the pool-room? There is no insurmountable difficulty in the way of a test that will prove or disprove our hypothesis. Pupils there are in abundance who have never "taken" nature-study. And this group could be duplicated by another, similar to it in every significant respect except the latter have studied nature under the guidance of sympathetic teachers. What now will be the difference between these two groups in terms of the habits, standards, ideals, prejudices, and tastes that we believe nature-study to foster and develop? Do we maintain that the "natural-history" approach forms the best introduction to the study of the secondary-school sciences,—that it is better than the economic approach or the "pure-science" approach? The method of parallel groups, applied with a careful regard for the scientific proprieties, and repeated in several different localities, would either give our judgment a sanction that no amount of dogmatic opinion to the contrary could question; or it would demonstrate that our assumption was fallacious. If the latter condition exists, we should be more anxious to know about it than should anyone else.

It would seem, indeed, that accurate data concerning educational standards, functions, and values ought, in all consistency, to be furnished by those who are engaged in teaching the sciences; for such teachers are, by hypothesis, imbued with the true spirit of science. By hypothesis, they are possessed, first, of the courage, of the modesty that will keep them from undue arrogance if they succeed in establishing the beliefs and theories upon which they have been basing their work; and finally, of the impeccable veracity that will lead them to acknowledge and proclaim the truth when they have found it, even though the finding of the truth may sound the death-knell of their own theories.

"The Forward Movement", Chicago, whose aims are social, physical, industrial, and experimental for the betterment of society, held a summer school on the eastern shore of Lake Michigan near Saugatuck, in which Prof. W. W. Whitney, of the Department of Biology, Bowen High School, Chicago, and President of the Chicago Nature-Study Club, directed the classes in nature-study. His courses involved the studies of birds, trees, wood life, sand dune life, water and marsh life, agronomy, the camera and physiography.

Friends of Dean L. H. Bailey the country over were shocked to learn of the injury he sustained by being struck down by a runaway horse on the streets of Ithaca, New York. He received injuries to his hip and his neck. Although confined to his bed, upon last reports he was improving and it is expected that he will soon be able to be upon his feet again.

Monarch, ♂	Cabbage butterfly, ♀	Cosmopolitan, [illegible]
Anosia plexippus.	*Pieris rapae.*	[illegible]
Red admiral, ♂	Tiger swallow-tail, ♂	Roadside butterfly, ♂
Vanessa atalanta.	*Papilio glaucus turnus.*	[illegible]
Mourning cloak, ♂	Great spangled fritillary, ♂	Red-spotted purple, ♀
Euvanessa antiopa.	*Argynnis cybele.*	[illegible]
Buckeye, ♀	Black swallow-tail, ♂	Violet tip, [illegible]
Junonia coenia.	*Papilio polyxenes.*	[illegible]

(From specimens arranged by the Children's Museum, Brooklyn.)

EDITORIALS

With the re-opening of the schools renewed activity is to be anticipated in the ranks of the American Nature-Study Society, manifesting itself in part in the formation of new sections. Centers of interest were developed last spring in Rockford, Ill., Milwaukee, Wis., and Louisville, Ky. St. Louis will doubtless organize at once with a membership approximating one hundred. The secretary will agree to furnish information and literature to any who are interested in the organization of local nature-study clubs. To any group of teachers interested in this field we shall be glad to afford the evident advantages of affiliation with the A. N.-S. S.

New Sections

The response to the request voiced in the May issue of the Review inviting correspondence from teachers interested in experimentation in the field of nature-study or science teaching, is most gratifying. Replies have been received from able teachers in elementary school, high school and normal school. Many problems in education can best be solved by teachers who are disciplined in scientific method and to whose scientific training there is added a genuine interest in education. The article by Professor Bagley in this issue is a scholarly discussion of methods and values of experimentation in teaching. The caution is urged that such studies should be undertaken only with the utmost regard for scientific procedure in every step. Guidance should be sought from experienced workers in this new field.

Experimentation in Nature-Study Teaching

The momentum which inheres in united effort towards specific ends is gradually being recognized by the schools. Arbor Day, Bird Day, Corn Day, and the like, have come to stay. Why not "Mosquito Day"? Not all of our work even with the children can be constructive. Now and then the evil must be attacked, and when it comes to battle with insect pests "child labor" may well be employed. If rightly pursued, the work will be in its larger aspects constructive, making for intelligent citizenship. Such work as is described by Professor C. F. Hodge in the Nature-Study Review for February, 1907, furnishes one of the best types of nature-study. One of the Worcester, Mass., schools attacked the mosquito problem in

"Mosquito Day": Why Not?

earnest and practically exterminated the pests in a certain district. Community interest was much aroused by this work of the children.

The editor recalls having seen, during a journey through Texas, a newspaper of that state which described the celebration of "Mosquito Day" by the children of the public school of a certain city. He cannot recall the name of the city and extended inquiry has failed to elicit the information desired. Although a set date might not be desirable, an occasion when conditions are right may be selected for a general attack upon these always troublesome and often dangerous insects. The work is rich with problems of genuine nature-study and the approach is economic and most real; indeed there can be no question about the "point of contact".

Likewise "Fly Day"

The typhoid-fly, long recognized under the indulgent name of house-fly, has worked his will upon us altogether too long. It is time that the lord of creation, as man modestly calls himself, took vigorous measures to abate this omnipresent two-winged evil. Rather than ten or twelve million dollars annually spent for screens, together with such clumsy devices as fly paper, fly poisons, fly traps, fly spatters, and the like, an anti-pest campaign in the schools will bring greater and far more permanent results. The cry to battle has already been sounded; let the nature-study teachers of America promptly respond.

An Endowment for Nature-Study

Fortunes have been given to advance higher education. Scientific research has been promoted by the generous contributions of men and women whose efforts have won prosperity. Individual donors have aided many worthy causes. But in this country the Nature-Study Movement has as yet received only minor attention from those who choose to give generously from their abundance. Leaders in this field should, as opportunity affords, make known the values that lie in the early introduction of children—through the nature-study method—to the materials of science and the scientific method of thought.

Throughout the Dominion of Canada admirably equipped rural schools and an awakened country folk bear living testimony to the benificence of Sir William Macdonald. In the United States today $25,000.00 trophies are being offered to stimulate the flight of dirigibles and aeroplanes. This serves to hasten our conquest of the air. Many thousands of dollars are annually awarded as prizes in fairs, institutes, corn contests, and the like, for samples of products grown by the youthful exhibitor (or perhaps his father, uncle or chum). This adds zest to industry and is well and good if not overdone. Much greater service would be rendered, we believe, by endowing the nature-study movement, as represented by the American Nature-Study Society, with funds sufficient to promote scientific studies upon the problems of teaching, the methods of popularizing the achievements of science, the promotion of sound nature-study in the schools and the publication of the best literature to advance these ends. Monies thus invested would bring dividends in every boy whose mind was quickened to wrest a secret from nature; in every girl whose pulse was quickened by appreciation of the wonders of the commonplace; from every parent whose child found wholesome occupation in the out-of-doors; from every community which felt the touch of out-door improvement.

Nothing that the school affords has richer opportunity to mold the lives of boys and girls. The Council of the A. N.-S. S. is chosen from the leaders in American nature-study, men and women worthy to serve as trustees of a great trust. If conditions were known, it is possible that funds might be provided. It is not too good to be true.

The wants of graduates in universities are being gradually provided for. Some day soon a national benefactor will center his interest in the boys and girls of the elementary schools.

* * *

THE ST. LOUIS MEMBERS of the American Nature-Study Society plan to organize on the first Saturday of the school year as a section of the American Nature-Study Society. The membership is now nearly one hundred and will doubtless be much increased at this organization meeting.

PROF. F. L. HOLTZ, of Brooklyn Training School for Teachers, delivered three lectures on nature-study during the spring, at the College of the City of New York, the lectures being a portion of the Saturday Teachers' Extension Course. The average attendance was four hundred. He also gave illustrated talks on school gardening to several Brooklyn mothers' clubs.

BOOK REVIEWS

Civics and Health. By Wm. H. Allen. Ginn & Co., 1909. Pp. 411. $1.00. The family, the church and the school have so neglected the physical welfare of the children, and instruction in matters of public health generally, that an undue burden has been thrown upon the state. This timely book, proclaiming that "There is a physical basis of citizenship", should be read and studied by teachers, parents, preachers and law-makers everywhere, and we are glad to see it being adopted by state "Teachers' Reading Circles". While evidently written with New York City conditions uppermost in mind, this fact by no means hampers its use or applicability to any community, either urban or rural.

The author decries the present condition of hygiene instruction in the U. S., recognizing what must be evident to all who know our schools,—that although statutes in practically all the states require regular instruction in this subject, "the present situation discredits both law and hygiene" and "is most demoralizing to teacher, pupil and community". The moral crusade spent itself in forcing compulsory laws" which in most cases are unsuited to the demands of twentieth century pedagogy, and in all cases suffer the evils of non-enforcement. The author is especially sane in his discussion of the so-called scientific temperance physiology. "Of the many reasons for not drinking and smoking, physiology gives those that least interest and impress the child." "Courses in regulating the traffic in alcohol are more necessary than courses in the effects of alcohol upon digestion and respiration." We would most earnestly commend Dr. Allen's book to such as desire light upon the teacher's objections to "alcohol and tobacco physiology". A positive stand is taken toward rational instruction in sex hygiene.

The great contribution of the book, however, will be its stimulus to the teacher to give more serious thought to matters of personal hygiene and public health as problems of schoolroom instruction. The coming generation may well call us criminally negligent if we further neglect this field, now that it is being forced upon us through so many agencies. The whole body,—not that portion merely which resides within the cranium—merits the solicitude of the parent, the teacher and the pastor. The problem becomes intricate where the social whole is complex, and Dr. Allen has done well to stimulate and instruct us where our visions of civic righteousness and civic efficiency has been incomplete. F. L. C.

Elementary Zoology. By T. W. Galloway, Professor of Biology in the James Millikin University, Decatur, Ill. 1910. Pp. 418. $1.25.

Among science teachers today there is a noticeable and noteworthy trend, due to several causes, to examine their methods of instruction, to the end that better teaching may result. One of the ablest leaders in this movement is Dr. Galloway, whose "Text-book of Zoology" is well known, and whose pedigogical discussions in School Science and elsewhere have attracted much attention.

The purpose and plan of the work are admirably set forth in the preface. The present book anticipates the drift toward an approach and emphasis (in biology) which shall all be primarily economic, with the scientific viewpoint supplementary. However, since most of our teachers have been trained in the older view, the author deems it unwise to break too suddenly with the past, fearing that zoology would suffer as has nature-study, from lack of preparedness and an appreciation of the viewpoint on the part of instructors. "We need an evolution rather than a revolution in our biologocal pedagogy."

A novel introductory exercise in the laboratory, which the author has tried out with success, is the study of a series of objects, such as sand, pebbles, crystals, shells, plants, and animals, thus developing the ideas of form, composition, comparison and classification, discrimination between essential and non-essential qualities, distinction between inorganic and organic, etc. In this type lesson, introductory to scientific method, the author emphasizes the value of pedagogically "carrying through" the whole thought process that the pupil may gain the complete mental reaction to which he is entitled, rather than stopping short with mere observation and description as is so often the case with laboratory exercises.

The treatment throughout is pleasing and dignified, perhaps rather too heavy for the first year of high school. One who holds to old methods will take kindly to the insistance upon the pedagogical view; and while the "human-interest" advocate may regret the prominence of old-line technical matter, he will welcome the text for its appreciation of newer ideals and values in zoology teaching.

When one shall be so bold as to frame upon a nature-study basis, a basis of first-hand study of environmental materials from the viewpoint of human interest—a text in high school zoology, we trust that the task may fall to one so sanely turns the method of science back upon his problems of teaching as does Professor Galloway.

F. L. C.

"Children of the Land", the story of the Macdonald Movement in Canada, is the topic of a well-written illustrated article by H. F. Sherwood in the Outlook for April 23, 1910. It gives a graphic account of the rural uplift throughout the Dominion due to the beneficient giving of Sir William Macdonald, prompted and in the main directed by Dr. James Wilson Robertson, formerly Commissioner of Agriculture and Dairying for the Dominion and later President of Macdonald College at Ste. Anne de Bellevue.

Human Body and Health: Elementary. By Alvin Davidson, Professor of Biology in Lafayette College. American Book Company, 1910. Pp. 191.

This worthy book fulfills its title by emphasizing hygiene rather than physiology and placing health above a knowledge of anatomical details. Intended for use in the elementary school, it endeavors to present important truths "not by dogmatic assertion but by citing facts appealing to the child mind in such a way as to make a lasting impression". The illustrations are good and the material is in part from original sources. The book is a distinct improvement upon the usual type of text in "Physiology". F. L. C.

Field Zoology. By Lottie E. Crary, Assistant Professor of Biology and Geology, Kansas State Normal College, Emporia. Blakiston's Son & Co., Philadelphia, 1910. Pp. 364. $1.25.

Frankly, we are greatly disappointed in this book, supposedly a companion volume to Galloway's Elementary Zoology (by the same publishers), but falling far short of that text from every point of view. The illustrations are not new, the subject matter is weak, and the book does not justify its title. F. L. C.

NOTES ON BOOKS AND PERIODICALS

The Progressive Farmer and Southern Farm Gazette (Starkville, Miss.) devoted its issue of June 25 to school topics. The number is designated as the "Educational Special". It contains much of interest to all interested in rural education.

In the **American Magazine for July** is a well illustrated article by Samuel Hopkins Adams on "Warring on Injurious Insects". The work of the United States Bureau of Entomology is presented and various illustrations given of the service accomplished by economic entomology in the subjection of insect pests.

Pheasant Raising in the U. S. is treated in Farmers' Bulletin 390 (issued April 18, 1910). It is comprehensive, illustrated with pictures of different breeds, and well suited to the uses of teachers who are following "dynamic biology".

The Work of Luther Burbank is discussed by Charles H. Woodbury in the May number of The Open Court. Photographs of potatoes, apples, spineless cactus, wonder berry, Australian star flower, and a likeness of Mr. Burbank accompany the article.

The Ottawa Naturalist (Ottawa, Canada) for May has an excellent article on House-Flies and the Public Health, by C. Gordon Hewitt, Dominion Entomologist. The paper is an abstract of a lecture delivered before the Ottawa Field-Naturalists Club.

Rural High School Education is discussed by W. E. Larson, Wisconsin Rural School Inspector, in **The Wisconsin Farmer** for May 5.

The Department of Health of Chicago (Dr. W. A. Evans, Commissioner) issues every Saturday a Bulletin of Sanitary Instruction which is well worthy of the attention of teachers. In addition to timely discussions, facts and figures, each issue gives a number of pointed "Healthgrams" intended to catch the eye or the ear. Witness:

Dry-dusting moves dust; it doesn't remove it.

Closed windows are open avenues to consumption.

If your milk is not safe your life is not safe.

Breathe fully and freely; the more you expand your chest the less you will contract colds.

The digestive tract is about 30 feet long. The combined length of the blood vessels of the body is many miles. If you want your food to go a long way, chew it thoroughly.

Your lungs can't be washed but they can be aired.

You wouldn't offend your stomach with dirty water; then why offend your lungs with dirty air.

Too much fresh air is just enough.

Dirty milk is better food for bacteria than for babies.

Cleanliness is next to godliness, but it takes many godly people a long time to get next.

Swat that fly.

This excellent leaflet should go regularly to every schoolroom in the city (and country).

The fly-fighting committee of the **American Civic Association** has issued a four-page bulletin calling attention to the dangerous character of this common insect, describing its life history and filthy habits, cautioning against indifference to its presence, and giving instructions for killing and prevention of breeding. The head lines of the bulletin are reproduced on our following page. We are indebted to Mr. Edward Hatch, Jr., of New York, Chairman of the committee, for the use of the illustration, which speaks more loudly than words.

SPECIAL BULLETIN

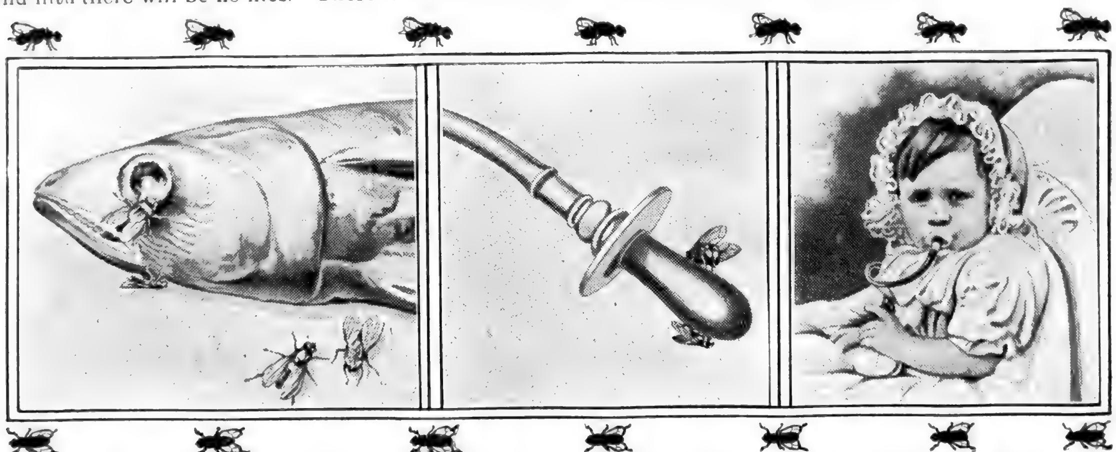
OF THE

Fly-Fighting Committee of the American Civic Association

WASHINGTON, D. C.

BEWARE OF THE DANGEROUS HOUSE-FLY

Wherever he goes death and disease may follow. War to the death should be declared upon the little pest. His presence is a disgrace. His touch may be deadly. Either man must kill the Fly or the Fly will kill the man. If there is no dirt and filth there will be no flies. There will be fewer DEAD BABIES if there are NO FLIES.



From Putrid Matter Flies Carry Disease Germs to the Baby, as Pictured Here (From Photograph)

McClure's Magazine, through special arrangement with the American Health League, is printing frequent articles on topics relating to public health. The May number gives a very complete account of the warfare against the rat. The August issue has an extended article entitled "Oxygenizing a City", picturing the fresh air uplift as evidenced in the home, the zoo, the shop, the school, and various public buildings.

The admirable illustrations which accompany the article by Mrs. Comstock in this issue are from original Slingerland photographs. On another page appears an advertisement of colored lantern slides made from these unusual photographs.

THE

NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

OFFICIAL ORGAN OF

AMERICAN NATURE-STUDY SOCIETY

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VOL. 6 OCTOBER, 1910 No. 7

SHOULD THE NATURE-STUDY COURSE BE ORGANIZED WITH DEFINITENESS?

By OTIS W. CALDWELL, University of Chicago

The advocates of nature-study present many plans for work, and these plans have a wide range in content, method and purpose. There are those who wish the schools to consider a very few topics in nature and to consider these in a detailed scientific way, and there are those who would have nothing pre-planned, no necessary consecutiveness in the topics, no regular lessons, but who would avail themselves of nature materials and nature inquisitiveness whenever these things chance to appear. Such differences are due largely to a very wide range in ideas concerning what nature-study is. One prominent writer says: "Nature-study, then, is not science. It is not knowledge. It is not facts. It is spirit. It is an attitude of mind. It concerns itself with the child's outlook on the world." Those who hold this view say that it matters little what facts or topics in nature we use or in what grade we use them. Regular lessons should be avoided, but we should utilize the chance opportunities to stimulate the nature-study spirit. The spirit is the important thing, the content of no consequence. This spirit, they say, must not be endangered by formality, regularity, lessons that are required and orderly arrangement of work. No satisfactory statement of what this spirit of nature-study is has been forthcoming, though many have asked for explanation. When we ask, we are told "Oh! you cannot understand, else you would not have to ask".

To some of us who try to keep out of the above class, it seems that real nature-study has some things in common with other subjects that are used in school work. It seems to us that the real spirit of history study, arithmetic, or of nature, comes through some well ordered first-hand contact with vital affairs in the particular field of study. The true history teacher says little or nothing about the spirit of history, but says much about facts relative to the lives and interrelations of man and the significance of those facts. Indeed, he is much concerned about his facts and their meaning. He has graded these facts and interpretations to the native interests and abilities of his pupils so that they may seem worth while to them. If he maintains a truth-seeking attitude withal, in some way there develops from his teaching a love for study of the lives and doings of men, and a method by use of which pupils may of their own initiative go on with safety and profit into new interests. It is the truths of history and their significance, not primarily the spirit of history, that interests him. But truths of history and justifiable interpretations of the significance of those truths are attained through interest in and respect for truth, and the possession of workable methods of finding truth.

In nature-study, it seems to me, the truths of nature, their significance, and reliable ways of finding both of these things is our immediate goal. The larger ends—interest, proper attitude of mind, intellectual and industrial efficiency with nature materials, concrete knowledge, and belief in law, cannot be attained except through this constant attention to immediate ends.

Definite organization has been necessary in other subjects. In history, arithmetic, etc., we have had little success when we depended upon casual meetings with the field to offer our opportunity for study. Furthermore, we have found by experience that some truths and relations in these subjects are better fitted to lower grades, others to higher grades, and have therefore organized courses in these subjects. Imagine what confusion there would result should we accept the day's casual occurrences as guide for all work of the day. The eighth grade class might consider the simple problem of how much two pounds of steak cost at 25 cents per pound, while the first grade might coincide with the calculation of the size of the wheel-rim that the toy wagon must have in order that the wagon may be raised to the desired height. We want all our school materials to bear close contact with practical life, but it does not follow that all things that occur in practical life are usable in instruction in any grade. In nature-study, the casual and irregularly periodic study has given a comparable result in that it is intangible, indefinite and often not discoverable.

There are some teachers who have been experimenting with plans that look toward an organization and gradation of nature materials for use in school work. It has been found that certain kinds of work are most appropriate psychologically and educationally in certain grades. In different locations the materials used may vary, but the processes used in a given grade are the same. This variation in the particlar materials used must often be had in nature-study, since the materials of nature are so diverse in different localities. The same thing is true, however, to less extent in arithmetic. For example, the sale of cotton in one locality may furnish the basis for work in arithmetic, and in another the sale of wheat furnishes this basis. But the arithmetical processes involved are uniform—their significance is seen through local manifestations. It is so with nature. We need to use for study those processes that are appropriate to definite stages of pupil advancement, and select our material from our local environment.

THE COURSE OF NATURE-STUDY IN THE ELEMENTARY SCHOOL

By FREDERICK L. HOLTZ, Department of Nature-Study, Brooklyn Training School for Teachers

Looked at superficially, nature-study courses seem hopelessly divergent. Examined more carefully, many of them reveal certain principles of construction that they have in common. Some of the principles it is the purpose of this paper to point out and consider. We need never expect to find identity of topics nor even a similar order of topics in all courses—this is not even desirable—but we should come to an agreement as to the principles by which those topics are selected and arranged.

The complexion of the nature course depends primarily upon the aim or purpose of the course. Without arguing the relative merits of the culture aim, the aim of imparting information, the aim to train for habits of observation and independent thought, I think we all agree that nature-study would not be serving its fullest purpose were it to ignore either or any of these aims. By the cultural aim, we mean the aesthetic and ethical treatment of nature-study, by which the child appreciates and enjoys nature directly, or indirectly through literature, geography, etc. Under this aim we should place a large body of facts not necessarily useful, but still affording satisfaction to mere curiosity or speculation. The identification of nature objects must be placed here in part. While I see the danger of sentimentalism in this cultural aim, I must confess I am a strong advocate of it nevertheless.

That nature-study should give practical information, goes without saying. Like all education, nature-study should fit the child for life. The mistake is often made to make this practical knowledge applicable chiefly or only in later life. The information should, however, be immediately available or applicable in the everyday life of childhood, in work and in play and in the interpretation of what he sees and of what arouses his curiosity.

In spite of the bad repute of the formal discipline theory in some quarters, I must press the importance of nature-study as a mental discipline. Through it the child may be trained to habits of careful observation and truthful and logical thinking. He should get the idea of intellectual honesty and make it a habit of thought. He should be taught how to depend upon himself alone in finding the answers to his questions about nature. We should teach him how to attack and solve nature problems. In other words, we should at least lay the foundations for acquiring the scientific habit of thought. The subject matter of a nature course, and its arrangement seriously affect this disciplinary aim.

The course of study is also determined by the method of instruction. In the first place, we have to deal with the child. We cannot, as in the high school and college, make him conform to the logical requirements of sequence in the subject as a science. We have to adapt the subject matter to his psychological capacity. From this general principle follow others. We here find the reason for the variety and the choppiness of the nature course. Young children need variety and tire of long systematic units.

Nature-study must be adapted to the interests of the child. Primary pupils care more for the aesthetic than for the economic treatment; more for habit than structure; more for living things than for inanimate nature; more for animals than for plants. They are not as capable of reasoning, nor so interested in reasoning processes, as older children. As pupils get older their interest in economic aspects, in inanimate nature, in structure, increases, and they show more conscious interest in their own logical processes in studying and hence are more interested in reasoning out adaptations, inter-relations and classifications.

Again, the principle of the apperceptive basis must be recognized. We must go from familiar to less known types in order to build up a stable mass of knowledge.

There is another factor which I might call the principle of expediency. We should, in a measure, follow the line of least resistance and utilize the materials at hand. That is, the nature course should be adapted to the environment. Obviously, if one aim of nature-study is to furnish useful information, such knowledge must come from the field in which the life of the child is spent. But this principle, so evident, is largely neglected City children study a course adapted for the country, and country nature-study has only recently begun to be adapted to farm life. This principle of fitting nature-study to the local setting should be the only one to make a difference in widely different localities. Even in a single city, especially the larger ones, such a variation should be permitted. Congested New York City is especially concerned with the agents and processes of industrial life and with personal and municipal hygiene. Therefore the nature-study of this part of New York should concern itself with those problems. Outlying suburban schools have other opportunities and interests. Let each school be adapted to and utilize the material at hand. This is not only sound pedagogy, as far as the pupil is concerned, but would simplify the teacher's problem of finding illustrative material.

Another principle under the general head of expediency is that of adapting the nature course to the seasons. Although Dr. John Dewey, the other day, in his destructive criticism of our scientific efforts in education generally, referred facetiously to how the child in nature-study observes and records the changing phenomena of the "rolling year, till at the end the child, like the proverbial rolling stone, gathers no moss," he surely would admit the foolishness and futility of trying to study robins and flowering trees in winter instead of in their proper season. To remove things of nature out of their seasonal setting is to lose a large part of their significance. There is a psychological moment when nature phenomena and natural objects are most striking and interesting—that is in their season. Interest being so great a factor in education, we cannot afford to neglect it here.

The chief criticism of nature-study is that it lacks coherence. The criticism is deserved, and probably from the nature of the case will always apply in a measure. The necessity of sacrificing system to variety, the necessity of adapting the study to the seasons will always prevent nature-study from being a systematic unit as high school or college science may be. But this extreme systematizing of nature-study is not desirable, considering the age of the pupils.

While it may be undesirable to systematize nature-study like a science, the course should hang together logically. There are too many courses, so called, which are mere lists of unrelated topics and only serve to prevent duplication. We should have a reason for every topic introduced into the course and for assigning it a certain place in the course. It should be related to other topics. Some underlying motives, aims or principles, as above mentioned, should run through and underly the whole course. If all the topics chosen were thus associated, there would be sufficient unity. Because somebody cannot make head or tail of a course some one else has constructed, does not argue necessarily that there is no such distinction or correlation. Unless a complete key is supplied to a course of study, it will always seem to lack organization. The task of organizing, and the testing of a course for organization, are made easier by keeping in mind the principles of aim and method I have here set forth.

One further principle I should add is that of correlation with other subjects. Here, again, we find a wide difference of opinion, which has resulted in widely different courses. Shall we correlate with literature and art as is so generally done in the primary grades; shall we correlate with geography, which would lead to a beautiful, simple course; or shall manual training, domestic science, or physiology and hygiene be the centers of correlation? These questions will be answered according to our interest in these subjects. I do not think it wise to decide as yet as to which shall predominate. We shall have to experiment further before deciding. But correlate we should. This will increase the efficiency of nature-study.

I have presented the chief aims and principles of method that govern the construction of nature-study courses. Nature presents such an embarrassment of riches that we cannot possibly take all. We must ruthlessly exclude the larger part. The basis of selection must be found in the time allowance and in the principles discussed in this paper.

INSECTS IN THE COURSE OF STUDY

By L. S. HAWKINS, CORTLAND NORMAL SCHOOL AND CORNELL UNIVERSITY

Certainly no group of living animals is found in greater abundance or more generally distributed in our country than are the insects. They swarm everywhere on land and in the water. They are easily watched, readily caught, and full of interest. Many of the insects are of great economic importance and come close to the life of the child. It is from the child's standpoint that we need to approach the study of these active creatures.

Children six or seven years old are interested in color and form as masses rather than details and so their natural classifications are based on broad lines. They are first of all actively interested in getting acquainted with a great number of individuals and are indifferent to any but the most striking habits or relationships. Size is comparative in their minds. Each insect is compared in size with some other. General color and striking markings form the basis for color ideas. The following chart shows an organization of the work based on the natural interest of the child:

Grades 1 and 2	Grades 3 and 4	Grades 5 and 6
A. Size B. Color (including striking special markings). C. Form	A. B. & C. Same as in first group for new insects D. Life History. 1. Changes in form 2. Changes in habit E. Function of parts	A. B. C. & D. Same as group two if new E. Importance of Insects 1. Beneficial forms 2. Harmful forms 3. Doubtful forms F. Means of control of insect pests 1. Parasites 2. Predaceous forms 3. Poison 4. Smothering

The main aim in the first and second year should be to secure the recognition of a number of forms. The ideas of size, color, and form should be directed to this end. The following list is suggested as some of the adult forms to be recognized:

Cabbage butterfly	Water boatmen	Blue bottle fly
Monarch butterfly	Back swimmers	Horse fly
Luna moth	June beetle	Grasshopper
Codling moth	Squash bugs	Locust
Cecropia moth	Dragon fly	Cricket
Promethea moth	Bumble bee	Mosquito
Polyphemus moth	Hornet	Elm leaf beetle
Caddis fly	Ant	Plant lice
May fly	Potato beetle	
Water striders	Lady bird beetle	

In the third and fourth year the work of getting acquainted with new forms should be continued. More attention may now well be given to body parts and their use. Life histories should be studied. Especial attention should be given to changes in form and habit. The following three forms are advised for life history work: (1) A land form with incomplete metamorphosis; (2) A land form with complete metamorphosis; (3) A form with aquatic larvae. Make a study of the larva when first hatched or secured and feed it on the material on which it was feeding when secured. If the aquatic form is a dragonfly or damselfly, it will need live minnows or other aquatic forms for food. The dragonfly and damselfly are not so good for life history work as are the may-flies which transform much more quickly. Feed the may-flies upon algae (frog's spit or frog's spawn as they are commonly called). The breathing of the dragonfly larvae may be shown by putting one in a shallow dish (or saucer) of water and putting the tip of a copying pencil in the water near the posterior of the abdomen. The breathing of the grasshopper may be readily observed if one be put under a glass jar for a few minutes. If a dragonfly larvae be put in a dish of water for two or three days without food and then a live minnow or other small aquatic larvae be put in the water, his method of feeding may be readily observed. If a grasshopper be shut up in a cage for a few days without food or drink and then a few fresh blades of grass and a few drops of water be put on the bottom of the cage, he will usually demonstrate his methods of eating and drinking.

In observing the dragonfly larva it may be noticed that he makes some rapid movements in the water that could not come from swimming with his thin legs. Put him in a dish and barely cover him with water, disturb him with a pencil or pin. If the posterior of the abdomen is near the surface of the water at times when he is starting, the explanation of his rapid movements will be obvious.

The above experiments are mentioned not so much for the valuable information that may come from the working of them out as for the stimulus and means of finding out things for themselves that may be suggested to the children. A boy eight or nine years old is a natural investigator and needs only to have his lines of investigation started for him.

In the fifth and sixth years, the work of recognition and life histories should be continued in taking up the economic phases of insect life. Hodge's "Nature Study and Life" has plenty of suggestions for this work. A study of insecticides may well be based on the following points: (1) Chemical constituents; (2) The kinds of plants on which it may be or may not be used; (3) The feeding habits of the insect pest.

A PRACTICAL POINT IN THE STUDY OF THE TYPHOID OR FILTH FLY

C. F. HODGE, Clark University

In dealing with any enemy, insect, fungus, bird or mammal, the first requisite is to learn the whole life story and thus be able to attack at the most vulnerable point. With the mosquitoes, if every household in a town knows the life history and does its part in preventing breeding in stagnant water on the premises, it is really little trouble or expense to do away with the pests entirely. Great progress has been made in the last five years in the control of these annoying and dangerous insects; but every member of a community must do his part. One ignorant or careless household may bring to naught the best efforts of a whole neighborhood.

The next insect to receive similar attention also belongs to the two-winged flies, the Diptera, and was formerly called the "house fly". Dr. Howard has rechristened it the "typhoid fly" and Dr. Styles, illustrious for his work with the hookworm, offers the appropriate name, "filth fly," for the pest. It breeds in filth, feeds on filth, it carries not only typhoid, but every filth disease, and it smears and specks and covers with filth everything it touches. Filth fly is certainly a name that fits.

Up to the present our solutions of the filth fly problem have been laborious, expensive, ineffectual and generally disagreeable. Its main feature has consisted in shutting ourselves up in prison behind "bars" of fly screen, leaving the enemy in possession of the great out-of-doors. For years I have thought that it is the flies that ought to be put behind the "bars" designed especially for them, and not ourselves.

A present solution of the problem takes for granted that all windows and doors shall be screened, as before, and adds the unliftable burden of removing all filth at frequent intervals, or of storing it in fly-tight pits. I have just returned from a journey of several hundred miles, chiefly through the farming sections of the Empire State. The hundreds of barnyards along the road, with huge piles—in August—which looked as if a load had not been hauled out of them since the barns were built, made the above look like an arm-chair solution of the problem. Of course, under any decent system of farming all this material ought to have been put into the ground early in the spring; but even with that done and all the barnyard accumulations plowed under weekly, or even daily during the summer, how about the miles on miles of gutters, pastures, the city dumps, and necessary compost heaps in connection with every well-ordered suburban garden? Even if all filth in which flies breed were properly cleaned out of a city and used for fertilizer on the farms surrounding it, would many of the eggs and maggots already developing in it be killed in the operation?

I have no word to say against keeping premises intelligently clean, but we must have fertilizer in large quantities and compost for our farms and gardens, and it has seemed to me that the breeding places can not be for the filth fly the effective point of attack.

We need to know much more about the biology of the adult insect, its favorite foods, its needs for water, its habits in seeking shelter, the length of life and number of eggs and the distance it flies or migrates from its breeding places. But what little we do know indicates to me that the strategic point of attack is the adult fly. We have long been working on this theory, unintelligently and ineffectively, with sticky or poisonous fly paper and traps; but these means have only been employed to kill the few flies that gained entrance to our houses. Carry the war into Africa; develop these means of attack seriously and effectively in the out-of-doors, and I fully believe that there would be no filth flies to go back to the compost heaps and barnyards to lay their eggs.

We were dining out on the porch, with the bobwhites, meadowlarks, robins and bobolinks for orchestra, and our guest laid down his fork and, looking carefully around the table, inquired: "Is this place bewitched? How is it you can eat outdoors this way and not have any flies? I was out to Miss ——'s only the other day and she tried to have dinner out under the apple trees and the flies were so thick you couldn't see the food on the table. You would think that she, being a teacher in the normal school, would be intelligent about such things, but she didn't seem to know that there were any flies around and sat and talked and ate, flies and all. I simply pretended to eat. Every mouthful gagged me. But how is this? How do you manage it? Why aren't the flies as thick out here?"

"I guess there are flies enough here," I replied. "Just look at those traps. Only you see we have turned the tables on them —put them in prison and let ourselves out. Those traps were emptied and baited twice this morning, the flies being singed and fed to the birds, and every fly that has come to the house for food or drink today has gone straight into one of those traps and staid there."

For one home to do this, makes it, of course, a running fight. Still it is not so bad. The flies make excellent chick and bob-white feed, so the more that come the better. It would be no more trouble to catch a peck than a pint, if we had suitable out-door traps. The traps we can buy are little trifling affairs, like those shown in the picture, made of wire which rusts out quickly and with bait dish so small that the flies suck it dry ten times a day, if they are numerous. For outdoor use we need a larger trap made of serviceable wire and with a bait tray six inches in diameter and a half inch deep, which will hold a respectable amount of selected table scraps and will not need to be filled more than once a day. Flies seek their food entirely by smell, and in order to attract them, we must use enough bait to give off a goodly volume of odor, or they will go to the kitchen windows where the enticing odors are stronger.

Many other outdoor traps can be devised on the same principle, viz., that a fly will crawl in to food anyway it can and then in leaving will crawl or fly up toward the light. With a little screen wire and some thin wooden slats a kitchen window screen may be converted into a fly trap which will catch every fly that seeks entrance, and the whole contents of the kitchen then becomes the bait. Another device, which the writer has tried, is to transform the garbage can into a huge fly trap. The cover is generally loose enough to be pushed over to the sunny side where it may be lifted a crack with a bit of chip so that the flies can crawl up and into the can. Now, by cutting a hole in the center of the top and setting a trap like that shown in the figure over the hole, every fly that visits the garbage is caught.

Carrying the war still further into Africa, for very little the window or windows of a stable cellar or manure pit may be screened with a crack at the top of the window so arranged that every fly that either attempts to enter or leave the place crawls into a trap. By converting the window screens of a stable where horses and cows are kept into fly traps, we might, along with the filth fly, do away with that fiendishly bloodthirsty pest of all animals, the stable fly. These insects inflict upon the brute life of the country more torment by a hundred fold than all the animal suffering caused by man.

I have been working along the above lines only casually as I have had a few minutes now and then, but I have done enough to be convinced that any country home—a half mile away from its nearest ignorant neighbor—or any town or city could completely exterminate the filth fly by intelligent and co-operative effort during the months of April and May of any year.

For the isolated home the only condition necessary is intelligence enough to keep the traps baited and set until the *very last pair of flies* which emerge from the manure about the place have been caught. Then there will be no more to go back to the barnyards to breed the millions that form the summer broods. A generation of flies may go from egg to egg in ten days; and it has been estimated that if all the progeny of a pair were to find food and all live, the inhabitants of a city could not extricate themselves from under the mass of maggots and flies that would develop. It is to get awake to a vivid realization of what this last, or first, pair can do in the way of breeding filth flies that is the whole battle. And everybody must be awake to it. The year this awakening occurs will be the last year a filth fly is seen in the country where it happens.

Of course, there are other methods besides trapping of dealing with flies. Of the various poisons, probably formalin—a teaspoonful to a teacup of water—is the best. The victims could not be used as chick or bird food, and they might prove poisonous to birds, if the method were generally used out of doors. I have tried it enough to prove that it may do good work. A big bottle filled with the mixture and inverted in a saucer, the whole mounted in the most likely place in a stable, ought to prove effective in dry, hot weather, if no other water is accessible, and it might be sweetened or mixed with milk or other foods to make it more attractive.

Possibly someone, fortunately situated, can try this experiment more thoroughly and report results in The Review.

This article is in no sense complete and is intended to be merely a message from one corner of the battlefield, suggestive of a line of attack that looks encouraging. The fight can only go one way. The verdict against the filth fly is: *"Murder in the first degree"*. And in bulk of crime it is the most murderous animal in the world. Let is be generally known that wherever filth flies are there is filth and the likelihood of disease, and that no clean people will buy food in filthy, fly-besmeared stores or feel at home in fly-filled houses, and we will soon begin to live in a decently clean country. I wish also to stimulate invention toward making effective out-of-doors fly traps; and also experiments with different baits. If anyone can get ten traps, each one baited with different material, and at night find *all* the flies in *one* trap, I would be glad to know what bait was used in that trap.

And, finally, let me ask: Has any farm home or any town or community solved this problem of making and keeping itself flyless? If so, may we not have the story of how it was done told in The Nature Study Review?

THE COURSE OF STUDY IN NATURE-STUDY FOR RURAL SCHOOLS*

By CHARLES McINTOSH, County Superintendent, Monticello, Piatt Co. Ill.

Anyone who attempts to prepare a course of study for use in our public schools should take into consideration the conditions under which that course is to be applied. It is possible to have a course which presents splendid material that is well organized and logically arranged, and yet be an absolute failure so far as securing results are concerned.

It is perhaps reasonable to suppose that the county superintendents who spend about one-half of their time in visiting country schools, who have a knowledge gained from recent experience of the conditions under which the country schools operate, should know something of the characteristics of a course that would be usable and helpful in our country schools. It was on the supposition, I presume, that I could say something worth while on this phase of the subject, that I have been asked to take this number on the program. It is the only phase of the subject that I shall attempt to consider. I am very willing to leave the selection of material to those who are making a special study of agriculture, who have an intimate acquaintance with the body of knowledge that is included under the term, and who are better able to select from the mass of material that which is most suitable to be presented to our boys and girls in the grades.

The only concern of the county superintendent is to have this material so organized and arranged that it can be of greatest service to our country schools.

There are two distinct views held by educators as to what should be the nature of a course of study. Some hold that the course should be made out only in the most general terms, covering the larger topics and showing the ground to be covered in a term or in a year, leaving the teacher to fill in the outline, to select the material which she thinks is best suited to the needs of her class, and holding her only for the larger results secured. Such an outline does not in any sense hamper the teacher, it does not destroy her individuality, it does not prevent her from using her power of initiative, but leaves her free to adapt her instruction and method of procedure to her class.

Others hold that the course should be more specific—that it should show not only what is to be done in a year or a term, but what should be done each month. It should show what material

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is available under each general topic, what important facts and principles are involved, the general order in which they should be taken up, the method of attack and the results which should be secured, and should show all of this in a very definite and specific manner.

Which of these plans is best depends on the conditions under which it is to be used.

If the teacher has the right attitude towards her work, has full and well-organized knowledge of the subject-matter to be taught and has the power to distinguish the basal and fundamental facts from those which are merely interesting and incidental, and has the help of an educational expert to aid her with her difficulties, the outline made out in very general terms is perhaps the best. If the teacher's knowledge of the subject-matter is limited, if she has not the power surely to select the important and fundamental facts and to distinguish them from the merely interesting and incidental, if she has had little experience in dealing with children and hardly knows what results she should secure, if the supervision is very inadequate, there is no question, I think, but that the more definite and specific the course the better will be the results secured. Under these conditions, in a very true sense, the maker of the course becomes the teacher of the pupils. The selection of the material and its order of presentation to the pupil is made by a competent, rather than an incompetent person, and the energies of the pupil are likely to be well directed. I know that some object to this, claiming that it hampers the teacher, destroys her power of initiative, and makes her imitative, but from the pupil's standpoint I am inclined to think that good imitation is better than very poor initiative.

Now it is this latter condition that obtains in our country schools. A comparatively large number of country schools are taught by inexperienced, untrained teachers. I do not know the per cent in other counties, but in our county about 30 per cent of our country schools are taught by beginners each year, and this has been the condition for several years, and perhaps not more than 30 per cent are taught by teachers of several years' successful experience. I presume that something of the same conditions exist in the other counties of the state. The task before these teachers is not an easy one. Some have never attended a country school. Many have had little or no professional training; they are to teach boys and girls of all ages from the beginners to the second year in the high school; they are the teacher, the superintendent and the janitor. Possibly they go three or four miles night and morning to teach the school. The county superintendent has urged them to make daily preparation for every lesson. If she has thirty recitations per day, the time that she can give to the preparation of any one of them is limited. Even if the teacher has the ability, and the material at hand, she has not the time to work up lessons in agriculture each day, and especially so when in many communities even yet this work is regarded as the frills rather than the essentials of school work.

I think that every county superintendent will bear testimony to the fact that the more definitely he can point out to his rural teachers and pupils what he wants done, the more nearly does he come to getting it done, and the more indefinite the plans and assignment, the poorer are the results secured.

I think we are securing the best results in orthography in our county this year that we have ever secured. The work in this subject in our state course is outlined with considerable definiteness. As perhaps most of you know, there are a number of Latin roots to be learned each month, a number of affixes, some rules of spelling or punctuation, in addition to the spelling of words that occur in the lessons of the month. Two of our experienced rural teachers went through the work of the year, analyzed and defined several words that contained the roots and affixes to be studied each month, stated and illustrated the rules of pronunciation, and made a careful selection of from 200 to 400 words from the lessons of each month. This work was all arranged and printed and a copy furnished to each teacher and advanced pupil. The material was selected by competent persons who took plenty of time to make the selection, and the assignments were worth while. The selection was not left to be made in a haphazard or careless manner by a very busy or indifferent teacher. The teacher and the pupil knew definitely what was expected of them; they did not have to use much time and energy to find the material, but could spend this time and energy in mastering the material before them, and so far better and more tangible results were secured.

I find that the same thing is true in the other branches, and I try to point out to our rural teachers and advanced pupils as definitely as I can what I want done.

I feel sure that this applies with equal force to the subject of agriculture. I think one reason why more and better work in agriculture has not been done in our schools, is because the matter was just a little hazy in the minds of us all. No one seemed to know exactly what should be done, or what results could reasonably be expected, or even to have a very clearly thought out method of attack. If this was the condition with those who were most interested in agriculture and most keenly alive to its possibilities, what must we think of the matter as viewed by the busy rural teacher who had thirty other classes to hear and plan for? She would have been very willing to do something if she knew what to do. We must admit that there is some virtue in the contention of the hard-headed farmer that he does not care to have his sons taught agriculture by the pink-faced schoolma'rm who has lived in town all her life. To be usable and helpful in our country schools, the outline must be worked out with considerable fulness and definiteness, showing what to do, what experiments to perform, and what is to be gained by the work. It should be such an outline, in fact, as can be placed in the hands of a bright farmer boy in the seventh or eighth grade and worked out almost independently of the teacher, she being a sort of classmate and working with him in this particular branch.

You will note that in practically every case where anything worth while in agriculture has been accomplished, a definite problem has been presented to the children. The corn-growing contest is an example. In many cases, the boys were furnished the seed, and definite rules of procedure were given them. The farm boys are not afraid of work; many of the rural teachers are energetic and ambitious and will do much work that is really valuable if they have proper guidance and direction. I realize, of course, the danger there is in the carefully worked out outline, that the outline may be followed mechanically, and in an improper spirit. I realize that the important thing in this, as well as in much else that is done in school, is the spirit in which it is done. We are coming to feel that the real test of our work in the school is the sort of emotional attitude the pupils assume toward the work. We assume, I think, that the purpose of the teaching of agriculture is to have the child get a love for nature and country life, and to open his mind to the opportunities for pleasing and profitable study throughout life to be found in the things and operations connected with agriculture. I know that the teacher's attitude towards this work counts for much. The material may be well organized, the general method all right, and the teacher make the work ineffective. To be effective, the teacher must use the material that is at hand, that is interesting to children and that has a valuable significance. I know that it will not be easy to get a series of outlines that will fit into any conditions in our state, but I think that two or three type studies can be worked out that would be a great help to a very large number of the teachers and pupils of our state.

I think that more attention should be paid to nature-study in the grades below the seventh. We have some good work along this line in our fourth-year geography, but the scope should be extended. If the right sort of work were done in grades I to VI, I think the pupils would come to the seventh grade, not only with a keener interest in the study of agriculture, and a larger capacity for observation, but with a greater knowledge of nature and her laws which he would be able to bring to bear upon the problems he would face in that grade. I think that this nature-study must deal largely with the common things of the farm and the home, the roadside and the school, with a view to developing capacities of observation and stimulating a lively interest in the phenomena of nature and the discovery of nature's laws. This nature-study is not properly study in its initial stages. It is observation; it is seeing. It leads to thinking, to reasoning, to comprehension of principles. It then becomes study and may be classed as elementary instruction in agriculture, so that the change from nature-study to agriculture is a gradual one.

Since the materials are necessarily restricted to those which are afforded by the particular environment, a course in this work must be flexible, suggesting possibilties rather than giving rigid prescriptions.

If pupils have this nature-study work in the grades I to VI, they will be ready for something more definite in agriculture in the seventh and eighth grades. Some of our teachers have the feeling that the work in our state course is rather scrappy and disconnected. This is necessarily so, when no systematic work in nature-study has been done in the grades below. With this in the course, the work in the seventh and eighth grades could well be organized around a few larger units, and definite outlines made to meet specific needs. If one course were made out on corn, it would fit admirably into the conditions in many districts in our state, and the work for the entire year could be on corn. Some time could be given to a study of soils, not as separate study, but in its relation to corn; some could be given to a study of plant foods in its relation to corn; some time to the production of seed in a plant, the organs of reproduction, the function of the pollen, cross-pollination, and methods used by corn breeders to get better seed corn; some time could be given to corn enemies, which might lead into entomology, but studying each in its relation to corn. It seems to me that this would tend to unify the work, and to furnish a motive for the study of some of these other things which pupils often find uninteresting. Another course might be made out on farm animals, the horse, the dairy cow, the beef cow, the hog, poultry, etc. Another course which would be of interest to those who do not raise corn extensively might deal with forests or with horticulture, so that almost any rural community would be able to find some line that would fit into its local conditions. As I see it, it doesn't make so much difference what work in agriculture is done, so long as it is done in a careful, thoughtful manner, and it is carried as far as the pupil is able to carry it under the conditions prevailing. One of our best rural teachers came to me last fall and said that he should like to spend all the time he could give to agriculture during the year on corn, and asked to be excused from the other work in agriculture. I questioned him to see what he had in mind. He thought that if his boys did careful, thoughtful work on one thing, it would be better than to do merely surface work on several things. I told him to go ahead. He spent some time on scoring corn, and the boys performed some independent experiments. I have here three short papers written by his pupils as a part of our central work, and I should like to read them to see if you think the work was worth while.

MY EXPERIMENT WITH CORN

I got 100 grains of corn out of what we are going to plant. I took one grain from each ear until I got 100. I put cotton on a plate and then put sand on top of the cotton and then planted my corn. I kept the corn wet and kept a plate over the soil so it would not dry out so quickly. I put the plate under the base-burner and in four days from the time I planted the corn it was all sprouted. This experiment shows that the corn will do to plant.

I went out to the crib and put some corn in a sack and it weighed 20 pounds, and in a week it weighed 17 pounds. The next time I weighed the corn it weighed the same as it did before. The next week it weighed the same. The next week I weighed the corn it weighed 16 pounds. While I was doing this experiment this corn was kept in a dry place. The loss in pounds was 4 and the loss in per cent. was 20. This experiment was to find out when was the best time to shell your corn—in the fall or in the summer. I think the best time is to shell your corn in the fall.

ORVILLE E. BOROYER,
Age 14, Eighth Grade, Independent School.

WHAT I THINK IS A GOOD EAR OF CORN

I think to have a good ear of corn the ear should be about 9½ inches long to 10 inches long, and it should have a circumference of about 6¾ to 7 inches. The ear should be about the same diameter at the butt as it is at the tip.

The butt of the ear should have kernels well over it, and when the shank is broken out there should be a deep hollow. The tips should not be pointed, but egg-shaped and the kernels should be all over the tip, so none of the cob would be in sight.

The rows on the ear should run straight up and down the length of the ear; the rows should have a very narrow space between them and the kernels should have a space between them at the cob so the air could circulate through the ear and dry it.

The kernels of an ear of corn should be deep and wedge-shaped and well filled out at the germ end, and I also think that the kernels should be dented at the top. This shows the corn is not run out.

The per cent. of corn to the cob should be from 85 to 88. I think the corn should be ripe, sound and dry and the corn germ should be strong and large.

LEON KELLY,
Age 12, Eighth Grade, Independent School.

HOW I SHOULD SELECT SEED CORN

I should go out in October and mark the ears that I would want; then when I went to husk corn, I would pick them.

I should select the ears from stalks that were standing straight and had firm roots, for if the stalk is standing it is not so hard to husk, and the ear is not so liable to rot as it would if it were on the ground.

I should select ears from stalks which bore two ears, because the University has found out that two ears can be raised on a stalk as easy as one, and if this can be done it will double the corn crop.

I should select ears hanging on a stalk about 3 feet from the ground, because it would be easier to husk, and would also help to keep it from blowing down.

I should not select seed corn from a hill occupied by one stalk or from a hill where there are a number of missing hills around it, because the seed might be injured.

I should select the ears that are hanging down, so that the rain would not beat down into the ear and rot it.

I should select the hard ears and they should be large and well filled out at the tip.

CHARLES HICKMAN,
Age 14, Eighth Grade, Independent School.
LEWIS BOWYER, Teacher.

The teacher thought it was worth while and feels sure that when these boys commence to raise corn for themselves they will have a more thoughtful attitude towards their work, and will raise better crops because of this special work they have done in school.

I have talked with a number of our experienced rural teachers and they are unanimous in their belief that if the work were organized around some crop of great importance to the community, and related things studied in connection with that crop, the work would be more unified and better results secured.

There is a need for printed matter on this work, written on the level of seventh and eighth-grade boys. Much of what is in print has not been written from that standpoint and is difficult for pupils to read.

I am inclined to think that the time has come when we should put the formal study of agriculture from a good text-book into the two years' higher course (first and second year high school) for our country schools. The body of facts which properly belong under this head are being better organized all the time, and I think could well be made the basis for study. Out of the 75 pupils taking the central examination in the higher work in our country and village schools this year, 37 were boys, and if this same proportion is found in other counties, the presence of this branch in the course for the higher work would be fully justified. The thoughtful farmers are appreciating the importance of this work as never before, and I think will welcome agricultural work that has real significance in our schools. It is now up to us to get this sort of work for the children.

THE DEPARTMENT OF SCIENCE EDUCATION OF THE N. E. A.: THE BOSTON MEETING

By B. M. DAVIS (President for the Department for 1910)

The forty-eighth annual convention of the National Education Association was held at Boston, July 2-8, 1910. There were over 17,000 registrations, but the actual attendance must have been several thousand greater. Many distinguished speakers, including President Taft, made addresses. The Department of Science Education gave three programs.

The subject of the first meeting was "Science Instruction in the Small High Schools". The speakers were H. L. Terry, State High School Inspector of Wisconsin, and H. G. Russell, Superintendent of Schools of Beardstown, Illinois. The general discussion was led by G. R. Twiss, High School Visitor of Ohio State University. The first speaker, after stating that high school pupils of country schools are fully as able to do good work as those of city schools, and that country high schools should have their work accepted on its merits rather than upon the completion of a prescribed course, suggested improvement along the following lines:

"First—Through the appreciation of a distinct aim to bring the student into a knowledge and appreciation of the natural phenomena about him, and to give him the power to recognize and deal with these phenomena under new or unusual forms in an intelligent and systematic manner.

Second—Teachers must be trained in such a way that they can take advantage of the local conditions in which they happen to be teaching.

Third—Decided improvement can be made in the matter of correlation and sequence of the different subjects of the course.

The present movement toward a line of agricultural work in connection with literary courses in the country schools is a very commendable one, though in some localities some other industrial occupation would be better. Such courses give the needed opportunity for practical application of the subject-matter of science to daily life, and cannot fail to react with beneficial effect upon the entire school course."

Supt. Russell proposed as the basis for science education in high schools, or as the test of success, the following:

"First—Greater efficiency in the performance of common service. Service is the test of man's worth and his only badge of superiority. People have come to consider education as a thing that will help them to better their condition and to live fuller lives. In answer to a demand for greater efficiency the high school came into existence and its function is to fit for life and not for college; however, its course of study may be so shaped as to do both. It is not a secondary nor a preparatory institution, but a primary means to directly serve the public needs. It must lend itself to the things with which man has to do; it must help him to solve his vital problems, and as man has to do with material things and his problems are largely material, the school must deal more thoroughly with material things.

Second—A more complete and practical development of the economic and social forces of the community and a keener appreciation of the importance of the same.

Third—A correct and practical blending of industrial and cultural education. There is no antagonism between these two ideals in education; it takes both to make a complete and well educated man. The high school is the common ground on which these two ideals can be brought into a practical and harmonious working unit."

At this meeting W. U. Clifford, head of the Commerce Department of the Southern High School of Philadelphia, made a report as chairman of a committee on "The United States Government Materials That are Usable in Secondary Education". He gave information as to the best means of securing the various documents, pamphlets and photographs published by the government and as to the scope of these publications. Dr. Helen Putnam, of Providence, R. I., introduced a resolution regarding janitors of schools and their relation to health of pupils and teachers. The resolution as adopted is as follows:

"Inasmuch as sanitation of school premises is a large factor in health and education of children, be it

Resolved: That the National Education Association recommends that training in the principles and methods of sanitary care of school premises be required of all janitors and superintendents of janitors; that provision be made for giving such instruction; and that where their appointments are through civil service examination it shall include examination in this subject. Be it also

Resolved: That a committee of five, to contain at least two specialists in sanitation, be appointed by the incoming president of the National Education Association to present at the next annual meeting of the Association outlines of courses for janitors and superintendents of janitors in principles and methods of sanitary care of school premises and plans for instituting such instruction."

A committee was appointed to lay this resolution before the committee on resolutions of the N. E. A.

The second meeting of the department was held jointly with the Departments of Secondary and of Agricultural and Rural Education. The subject for discussion was "The Practical Aspects of Science in Secondary Education with Special Reference to the Introduction of Materials from Agriculture, Household Arts. Technical Industries, etc." W. R. Hart, Professor of Agricultural Education in the Agricultural College, Amherst, Mass., presented the pedagogical viewpoint; W. J. V. Osterhout, of the Department of Botany, Harvard University, presented the scientific viewpoint; physics was discussed by William Orr, Deputy State Commissioner of Education for Massachusetts; chemistry, Joseph S. Mills, High School of Commerce, New York; botany, S. B. McCready, Ontario Agricultural College, Guelph, Ont.; zoology, Chester Mathewson, Brooklyn Normal School; physiology, Louis Mulbach, head of high school biological instruction, Detroit; physical geography, E. M. Lehnerts, University of Minnesota, Minneapolis. The report on college entrance credit for graduates of high schools teaching agriculture was presented by A. B. Graham of Ohio State University, Columbus.

Professor Hart urged the desirability of teaching science in practical ways, instead of subjecting beginners to the methods employed on well-seasoned students. He asked for more emphasis on vocational science. Professor Osterhout criticised teaching by those with only book knowledge and said that the introduction of agricultural and household arts materials would help solve the problem. Mr. Orr said that physics instruction should emphasize topics most pertinent to the activities of the given locality. Mr. Mills told of the difficulties of teaching chemistry. Mr. McCready urged teaching botany with a view to preparation for life's work. Mr. Mathewson was another speaker who urged the practical training. Mr. Mulbach said that, in physiology, nature problems and useful applications will prevail in future teaching. Preparation for life was the key-note of the entire discussion. Space will not permit a complete review of the meeting. The following synopsis of C. S. Mathewson's paper on Zoology will indicate the character of the discussions throughout the meeting:

"The history of the teaching of zoology in American secondary schools shows four well-defined epochs. The earliest was the old natural history taught from books. The second was the one inaugurated by Huxley and Martin—the paramount consideration with them being 'training' and 'discipline'. It is their method which has most strongly impressed the teachers of the present day. In the early part of the present century there was a reaction toward the old natural history with emphasis on habits, life histories and classification as against details of structure, especially internal structure. This last can scarcely be said to have resulted in a widespread reform. The outlines of courses of the best high schools of the present day show the persistency of the idea of training advocated by Huxley and Martin.

"We have now entered upon the fourth epoch, one in which we recognize a strong and widespread popular demand for a more intimate relation between all school work and the life of the pupils. In our zoology courses this has had two important results: (1) The simplification and unification of first-year high school biology; (2) the making of the work more practical from the standpoint of every-day life.

"In constructing secondary courses in response to this demand, great difficulties have been met, for there is no substantial agreement as to just what we mean by practical as applied to a particular group of pupils in a particular high school science.

"A critical examination of courses of study shows that the phases of zoology receiving the most attention in accordance with this most recent demand are the following:

I. Micro-organisms and their relation to health and disease.

II. The conservation of natural resources.

   1. Mammals—Game laws; mammals most important to man; mammalian products; study of some typical industries based on mammalian products, *e. g.*, tanning, sheep ranching, production of milk, etc.
   2. Birds—Protection; game laws—origin and object; birds most useful to man; bird products; birds in relation to agriculture.
   3. Fish—Useful fish and their protection; spawning and its significance; fish hatcheries; the United States Fish Commission.
   4. Shell Fish—Life history and habits; protection; processes involved in gathering and shipping them.
   5. Crustacea—Same as outlined for shell fish.

III. Insects—Useful kinds; harmful kinds.

IV. Animal breeding.

V. Economic form of Amphibia and reptiles.

VI. Sex Education—Care of animals for their young; relation of 1 to the process of reproduction; correlation of the study of the propagation of fish with the same process in other animals; correlation of the process of reproduction in man with facts learned in 1, 2 and 3."

The third meeting was a round-table conference on "Some Relations of High School Science Departments to Other Parts of a School System". Two phases of this subject were taken up. The first, on the "Relation of Science Departments of Secondary Schools to Elementary Teachers", was introduced by C. H. Robison of the State Normal School, Montclair, N. J. The fact that many of the teachers in the elementary schools are being recruited from pupils and graduates of high schools, together with the direct help that high school departments of science may give to the elementary teachers in a school system that has nature-study on its program, makes the high school science instruction doubly important. It cannot do its best service by following the conventional types of instruction. The following is a brief abstract of Mr. Robison's paper:

"With many of the 500,000 common school teachers leaving the profession every year, evidently the graduates among the 72,000 normal school students and the 955,000 high school students together could scarcely supply the deficiency, supposing every high school graduate became a teacher. Most city teachers are graduates of high schools; while many in the country are not, numbers have attended high schools one or two years. Facts so important as to be used in the grades surely deserve a place in high school science. When graduates entering normal schools do not know maples from elms or robins from English sparrows, biology or the administration of the high school is remiss. The curative effect of oxygen and the germicidal effect of sunlight and heat are fit subjects in cities for both nature-study in the grades and science in the high school. The rural phase of the tree problem is concerned rather with timber and fruit trees. The robin, on the economic side, is rivaled by the hawk. "Boil the water" gives way to "Don't pollute the well". The study of agriculture in rural high schools is greatly stimulating interest in nature and is preparing teachers to give it proper attention in rural elementary schools. Two years ago 250 secondary schools taught agriculture; one year ago, 500; this year the number has again probably doubled; 6,000 students were studying agriculture in 188 of these high schools with an enrollment of 16,000, drawn from over half a million people; 4,000 of these students came from farms. It is estimated that over 2,000 of the students in these high schools will later teach in the rural schools of their neighborhoods."

The discussion following this paper was led by State Supt. E. C. Bishop of Nebraska.

The second phase of the subject on "Practical Aspects of Biologic Science in School Administration; The Problem of Janitor Service", was taken up by Dr. Helen C. Putnam, Providence, R. I., who spoke not only from her professional interest in the matter, but from a recent personal examination of the janitor service in the leading public and normal schools of some fifteen states. She pointed out the inconsistency of teaching sanitation, relation of dust and dirt to disease, care of the body, importance of good ventilation, etc., in classroom and in laboratory when in the building itself all the recognized rules of sanitation and ventilation were ignored in the janitor service. A synopsis of her paper is as follows:

"Janitors are half of the problems of hygiene, backward children and school fatigue.

"School temperatures between 70° and 80° in winter create popular demand for overheated houses, public buildings and conveyances; dusty, heavy air trains for badly ventilated homes and shops—notwithstanding recitations to the contrary.

"Health habits educate more than health maxims.

"Overheating, dust and foul air invite dullness, headache, catarrh, adenoid conditions, bronchitis, 'colds', tuberculosis. The highest death rate from tuberculosis in any profession is among teachers in this country and Canada. It is not so in Europe where both homes and schools are cooler. England requires a school temperature of 60°. A few of our schools require 65° to 68°. Some teachers insist on their rooms being disconnected from the heating system in order to use their windows when necessary, heat from corridors being ample.

"We have 'fresh-air rooms' for delicate children and others, with rapid gain in health and ability. We have 'systems' at the other extreme which sift city air (screens are soon loaded with dirt), wash it (washings are a muddy stream), heat, humidify, and send it to rooms where automatic regulators control. In thirty-two rooms visited I found twenty-seven 'regulators' 'out of order', as was evidently the ventilation; but 'the system forbids opening windows'.

"No good homemaker has the dirty floors and atmosphere with which we shut up children and instructors. A few schools are clean and wholesome. To make all so, means insistence on trained caretakers, stopping the smoke nuisance, better made and cared-for streets. We have also lessons to learn from fresh-air schools.

"There is no greater need in 'vocational', 'continuation' or trade schools than classes for janitors of schools, apartment houses, theaters, office buildings, Pullman porters, train and street-car conductors, hotel managers.

"Some janitors have engineer's licenses. No schools require them to have training in principles and methods of sanitary care of school premises, although their salaries are often larger than teachers'. School laws should secure trained caretakers."

The Department at this convention took on a new lease of life. The activities at the Denver meeting of the directors of the Association, which contemplated the fusion of the Department of Science Education, was rescinded. The wisdom of the second action of the directors will be conceded by all who are interested in elementary and secondary science instruction. It would be especially unfortunate at this time to have the Department abolished when so many readjustments seem to be demanded of secondary instruction and when elementary instruction or nature-study is being put on a practical working basis. George A. Cowen, Roxbury High School, Boston, Mass., was elected president of the Department for the ensuing year. It is likely that the next convention of the N. E. A. will be held at San Francisco, Cal.

EDITORIALS

Annual Meeting

Of going to meeting and conventions there is no end. There are few teachers who have never gone or been tempted to go to the summer meeting of the N. E. A. There are retively few, however, in the elementary schools who are accustomed to attend the annual meeting of the American Association for the Advancement of Science, held during Holiday Week, or, as it is generally known to many, "Convocation Week". The American Nature-Study Society holds its annual meeting at this time in connection with the A. A. A. S. The place of the next meeting is Minneapolis, Minn. Members of the American Nature-Study Society of that city and vicinity are planning a most cordial reception to the Society and will not be satisfied with anything other than a large attendance from members throughout the country. The officers and council of the American Nature-Study Society generally are members of the American Association and without doubt the majority of them will be present.

It is hoped that many of our members will be attracted to the Minneapolis meeting. The many sections of the A. A. A. S. and the large number of affiliated societies which meet with it, fill the week with most attractive programs. One who aims to follow the latest developments in science and scientific education can ill afford to miss these meetings. The general revival of interest in nature-study throughout the country leads us to hope that at Minneapolis we shall have the largest attendance yet recorded at any meeting of the American Nature-Study Society. Further details will appear in the November issue.

The Problem of the Rural Church

The country life movement has now progressed until its further advance will be irresistible. Economic conditions in the country have greatly improved; the hardships of farming have been eliminated, and a better day is dawning for the child in the rural school. The next point of attack must be the country church. The rural clergy are even now awaking to the seriousness of present conditons, and organizations will soon be in the field with the one aim to correct the evils which now beset the country church. It is not our intention here to point out what these evils are, but it should be evident that he who is to be a successful pastor to rural people must not only be sympathetic with their spiritual aspirations, but must be intelligent upon those matters of every day concern which are essential to the material well-being of the community which he serves. He must be alert to agricultural affairs, and agricultural nature-study will be his starting point.

ON THE FLY

The following timely editorial appeared in the July Ladies Home Journal and is here reprinted by permission of the publishers:

A fly's favorite food is what the human being discards and revolts at: garbage, animal and human excrement, and every form of decaying matter. Its favorite haunt is in the manure-heap and the garbage pail. It walks over this mess, and with its feet and legs laden with what stick to them it comes into our houses and walks on our food, in our milk and on the tender skin of a baby. It has been estimated that a fly just back from its favorite haunts, at the height of the summer, carries on its feet more dangerous germs than have ever been found in a single drop of the worst city milk. By this very simple means the fly was found last summer in New York City to have been the direct cause of thousands of fatal cases of dysentery, cholera infantum and typhoid fever with babies. For a long time it was believed that hot weather was responsible for the deaths of so many infants during summer: we know better. Undoubtedly the heat, and all that goes with it, is disastrous to a good many children, but the fly is now recognized as a far greater and more serious factor, second only, even if it be that, to polluted water or milk.

The fly can be got rid of. This fact was proved in England, where, fifty years ago, flies were a nuisance and as great a danger as they are now in America. Today, broadly speaking, England is so thoroughly rid of flies that the English rarely screen their houses. How did the English do it? Just as we must do it: by each family keeping its house clean. Screens will keep flies out of a house and fly-paper will kill them. But neither gets the cause. There is only one way to do away with flies, and that is to keep clean the places where they breed and love to feed.

Manure-heaps of horses and cattle should be kept in covered pits, bins or fly-proof closets, and stables and pens must be kept clean of manure.

Outside lavatories should be kept clean and all excrement covered up or drenched with poisons.

Kitchen refuse should be placed in closed, cleanly kept garbage cans.

All decaying matter should be buried or burned.

All receptacles, such as cuspidors, should be kept clean.

Until we are clean ourselves we cannot keep healthy, and until we keep our houses clean we cannot keep away the flies.

If there are flies around or in your house either you or your neighbor is careless with regard to absolute cleanliness. And until the flies are got rid of, as they can be with care and watchfulness, a positive danger to your own health and the health of your wife and children confronts you.

NATURE-STUDY NEWS

PROF. M. A. BIGELOW finished his work in England about the first of June, leaving for Paris and the Alps. After a month's rest in the mountains he resumed his studies. He reports that the Nature-Study Union, under the direction of Mr. Turner, is doing excellent work in England.

THE CHILDREN OF THE CITY BEAUTIFUL CLUB, of the Louisville, Ky., Normal School, celebrated May Day by hanging May baskets on the door knobs of the Children's Free Hospital of that city. They also left cut flowers and potted plants throughout the building. Thirty-one children carrying roses, iris, syringas and honey-suckle and dressed in holiday attire, cheered the hearts of the inmates. Nature-study teachers in other cities will find a very commendable suggestion here.

THE AMERICAN CIVIC ASSOCIATION is leading a crusade against the typhoid-fly, formerly and euphemistically known as the house-fly. With the battle-cry "The Typhoid-Fly must go", it is asking for contributions to be sent to William B. Holland, Treasurer of the American Civic Association, Washington, D. C.

IN TEACHERS COLLEGE, ST. LOUIS, MO., Prof. J. A. Drushel gave two summer courses in botany, taking his classes into the field for nearly half of the exercises. The plan has proved most successful, and the teacher-students are enthused to undertake work with children covering a similar field.

THE OUTDOOR ART DEPARTMENT OF THE NASHVILLE ART ASSOCIATION held a flower exhibit during mid-May, the announcement of which was made in a very attractively illustrated pamphlet. Mrs. Alex Caldwell is chairman of the Outdoor Art Asscoiation and Miss Mary Ewing secretary of the association.

THE FIRST ANNUAL SESSION OF THE BOYS' STATE FAIR SCHOOL will be held on the State Fair grounds, Springfield, Illinois, from September 30 to October 8, 1910. Each county may send two boys—one to represent rural schools and one the city schools of the county. The boys are selected by competitive test and are to be instructed daily by members of the faculty of the College of Agriculture of the State University. They are to take accurate records and to report to their home schools, county Farmers' Institute and their local papers. The school will be thoroughly organized and the boys will receive close supervision in all details. Principal Frank D. Thomson, of the Springfield High School, is Director, and Prof. Fred L. Charles, of the University of Illinois, First Assistant Director.

By Sending A Self-Addressed, Stamped Envelope to the office of the Secretary of the A. N.-S. S., Urbana, Ill., teachers may learn of aquarium material to be had for the cost of sending. This material will be furnished by a gentleman interested in nature-study, with purely unselfish motives. Ask before freezing time.

The Chicago Section of the A. N.-S. S. held its first Saturday excursion of the year on September 24, making a visit to Vaughan's Nursery and Seed Farm. The members took their lunch and coffee was served on the grounds.

The Organization Meeting of the St. Louis Section of the A. N.-S. S. was held September 10. At this meeting thirty-three new members joined. The membership being over 100, the section is entitled to a directorship in the council of the Society. The officers elected are: Louis Dougan, Principal Shaw School, President; J. A. Drushel, Teachers' College, Director; Elyse Crecelius, Librarian Teachers' College, Secretary-Treasurer; and W. J. Stevens, Principal Field School, and Bessie Rice, Teacher Carondelet School, additional members of Executive Committee. The rapid growth of interest in nature-study and in the work and aims of the A. N.-S. S. in St. Louis has been due in the main to the enthusiasm and earnest work of Prof. J. A. Drushel, ably assisted by some of the principals in the elementary schools. With the many members of the Society throughout the state, this places Missouri third in the list of states in membership in the A. N.-S. S., Illinois being first, New York second and California fourth.

The Good Work of the California Branch of the A. N.-S. S. continues, many new members joining with the opening of the new year. The headquarters are Berkeley, Cal., and the prime movers are E. B. Babcock and C. A. Stebbins of the faculty of the College of Agriculture.

Prof. C. F. Hodge, of Clark University, gave an address before the Conservation Congress at St. Paul, on "Conservation of Bird Life in the United States".

Miss Emilie Yunker, of the Louisville Normal School, Chairman of the School Garden Committee of the Womans' Outdoor Art League of that city, spent the summer in Europe making a special study of school gardens in France, Switzerland and Germany. Some report of her trip will appear soon in the Nature-Study Review.

The College of Agriculture of the University of California has issued an attractive announcement of the farmers short courses to be given at the University farm, Davis, California, September 26 to November 23. Several different courses are offered.

The Country Teachers' Association of Illinois held its third annual meeting at Normal, Ill., July 14-16. A strong program was given and a marked rural school uplift will result from this large attendance. Among the speakers were State Supt. Blair, the presidents of the state normal schools, county superintendents, rural teachers, and representatives from the College of Agriculture, the Grange and the State Highway Commission. Speakers from outside the state were Dean L. H. Bailey, of Cornell, Pres. K. L. Butterfield, of Amherst, Prof. Ernest Burnham, of the State Normal School, aKlamazoo, Mich. Much of the inspiration of the meeting came from Miss Mabel Carney, of Cheney, Wash., formerly of the Western Illinois State Normal, Macomb, Ill.

Plans were made to call a general conference of rural workers next year. Miss Mertis B. Whitaker, Chestnut, Ill., was elected president for the ensuing year.

The Graduate School of Agriculture met at Ames Iowa, July 4-29. At a conference on Secondary School Agriculture on the evening of July 27 the following program was given: Place of Agriculture in Secondary Schools (Prof. G. F. Warren, Cornell Univ.); Growth of Agricultural Education in the United States (D. J. Crosby, U. S. Dept. of Agriculture); Training of Teachers to give Instruction in Agriculture in Elementary and Secondary Schools (Prof. B. M. Davis, Miami Univ.).

The "Big Freeze", which affected so materially the vegetation of the upper Mississippi valley in April, interested many observers to note the manner in which the trees would recover from the injury done them. Several members of the American

Nature-Study Society have written to the editor of the Review giving their observations. All orchard crops north of southern Illinois were a total loss. Forest and shade trees generally recovered, although many, through the entire season, gave ample evidence of the damage done them. Bird life did not seem to be noticably affected.

THE FIFTEENTH SERIES OF SATURDAY AFTERNOON WALKS in the forests, fields, hills and valleys about Chicago was very successfully conducted during the late spring and summer. The points visited were Starved Rock, north branch Chicago River, Forest Arden, Upper Thorn Creek and Palos Park.

PROF HERBERT BROWNELL, of the State Normal School Peru, Neb., has accepted a call to the professorship of theory and practice of teaching the physical sciences and superintendency of the training school of the Teachers' College of the University of Nebraska.

THE BOARD OF EDUCATION OF THE CITY AND COUNTY OF SAN FRANCISCO has appropriated $5,000 to be used for the installation of school gardens next year.

A CONFERENCE OF AGRICULTURAL EDUCATORS AND RURAL SOCIAL WORKERS was held August 9th to 12th in connection with, the Summer School of the Massachusetts Agricultural College. Four days were devoted with profit to the topics of Agricultural Organization, Agricultural Co-operation, The Range of Agricultural Education, The Re-organized Twentieth Century School, Rural Social and Religious Progress ,The Church and the Y. M. C. A. in Community Building, Civic Betterment, A Better Country Town, and Organization and Co-operation for Rural Progress.

THE NEW YORK CITY SECTION of the American Nature-Study Society held a meeting May 28 at Children's Museum, Brooklyn. Prof. F. L. Holtz reviewed the year's progress and spoke of local conditions. Miss Anna Gallup spoke of the function of the museum in relation to the schools, illustrating her remarks with lantern slides. After the lecture Miss Gallup conducted the company about the museum.

NOTES ON BOOKS AND PERIODICALS

The Ohio Agricultural Experiment Station (Wooster, Ohio) has issued a timely circular (No. 101) on "Illustrative Exhibits at State and County Fairs". It is well illustrated and will prove suggestive to teachers interested in display of school work in agricultural nature-study.

A new **Course of Study in Nature-Study** has been prepared for the Chicago schools. The outline is very brief, merely suggesting the topics and phases to be emphasized.

State Supt. E. C. Bishop, of Nebraska, has just issued an excellent illustrated bulletin on Domestic Science, giving practical directions for sewing and cooking, for the Nebraska Boys' and Girls' Club. With the bulletin are sent materials for work in sewing. With Supt. Bishop, the Department of Farmers' Institutes of the University of Nebraska issues an agricultural education bulletin for the Nebraska Boys' and Girls' Club on "Some Common Weeds and Insects of Nebraska Corn Fields and Potato Patches". The bulletin is copiously illustrated and will be of material assistance to teachers.

An admirable new edition of State Supt. F. G. Blair's bulletin on **One-Room Country Schools in Illinois** has just appeared. The original pamphlet has been much enlarged and better illustrated, giving suggestions concerning daily program, seating, heating, ventilation, improvement of school grounds, general matters of hygiene, and the like. It is the work, in large part, of Asst. State Supt. U. J. Hoffman. Another bulletin prepared by the state department is the **Corn Day Annual** for the elementary Schools of Illinois, giving detailed suggestions for the celebration of Corn Day, appointed by the State Superintendent for November 4.

The Fly-Aways and Other Seed Travelers. By Francis M. Fultz. Public School Publishing Co., Bloomington, Ill. 1909. Pp. 186. Price, by mail, 60c.

This timely nature-study book is a supplementary reader intended for third or fourth grade. It wisely avoids the errors of personification and baby talk into which so many of earlier nature books for primary grades have fallen. The matter is sane and put into interesting form. Illustrations are excellent.

The Study of Corn. By Vernon M. Shoesmith. Orange Judd Co., New York, 1910. Pp. 94. Price, 50c.

This is a handy manual dealing concretely with the types and varieties of corn, judging and selection, testing, etc. The author considers the exclusive use of the score card in corn study objectionable, and therefore gives many suggestions supplementary to the score card. An excellent feature is the treatment of the field selection of corn.

BOOKS RECEIVED

GINN AND COMPANY.

Soil Fertility and Permanent Agriculture. By C. G. Hopkins.
Types and Breeds of Farm Animals. By Chas. S. Plumb.
Nature Study and Life. By C. F. Hodge.
Laboratory Botany. By William N. Clute.
Agriculture for Beginners. By Burkett, Stevens and Hill.
The Body and Its Defenses. By Frances Gulick Jewett.
Civics and Health. By Wm. H. Allen.
An Elementary Study of Chemistry. By Wm. McPherson and Wm. E. Henderson.
Frye's First Steps in Geography. By Alexis Everett Frye.
Frye's Grammar School Geography (Illinois Edition). By Alexis Everett Frye.

AMERICAN BOOK COMPANY.

Human Body and Health (Elementary). By Alvin Davison.
Nature-Study by Grades; Teachers' Book for Primary Grades. By Horace H. Cummings.
Nature Study by Grades: A Textbook for Lower Grammar Grades. By Horace H. Cummings.
Nature Study by Grades; A Textbook for Higher Grammar Grades. By Horace H. Cummings.
A Boy on a Farm. By Jacob A. Abbott.
The First Year Nature Study Reader. By Sarah Powers Bradish.
Nature Studies on the Farm. By Chas. A. Keffer.
Ten Common Trees. By Susan Stokes.
Outdoor Studies. By James G. Needham.
Our Birds and Their Nestlings. By Margaret Coulson Walker.
First Principles of Agriculture. By Goff & Mayne.
Practical Agriculture. By John W. Wilkinson.

THE MACMILLAN COMPANY.

The Elements of Hygiene. By Isabell McIsaac.
A Health Primer. By Walter Moore Coleman.
Physiology for Beginners. By Walter Moore Coleman.
Lessons in Hygiene Physiology. By Walter Moore Coleman.

THE PUBLIC-SCHOOL PUBLISHING COMPANY. Bloomington, Ill.

Out of Door Studies in Geography, Part I., Ice and Water Erosion. A Study of the Upper Mississippi Region. By F. M. Fultz.
Out of Door Studies in Geography, Part II, The Formation of Mountain Ranges, A Study of the Sierra Nevada. By F. M. Fultz.

D. C. HEATH & COMPANY.

Health Studies. By E. B. Hoag, M. D.

SCRIBNERS.

Agriculture for Common Schools. By Fisher & Cotton.
The Teacher and the School. By Chauncey P. Colgrove.

STAFFORD PUBLISHING COMPANY, Marion, Ill.

The Redemption of Arthur True; A Rural School Story. By Arnold Bratton.

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Gallon dusters. ½-gal. duster. Canister.

These are thoroughly well made implements, *with very fine openings*, allowing
e economical and even distribution of Slug Shot over Potatoes, Cabbage, Turnips,
adishes, Beans, Melons, Cucumbers, Currant or Gooseberry bushes, Parsnips or
rawberries. Canisters are sold filled with SLUG SHOT; large dusters are empty.

BENJAMIN HAMMOND, FISHKILL-ON-HUDSON, N. Y.

THE

NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

OFFICIAL ORGAN OF

AMERICAN NATURE-STUDY SOCIETY

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CONTENTS

HARVEST NUMBER

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Children of Louisville, Ky., Normal School Removing Injurious Caterpillars From Flower Borders. Specimens Are Placed In Breeding Cages for Further Study of Habits and Life History.

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VOL. 6 NOVEMBER, 1910 No. 8

AMERICAN NATURE-STUDY SOCIETY

ANNUAL MEETING. The fourth annual meeting of the Society will be held Friday, December 30, 1910, at Minneapolis, in connection with the meeting of the American Association for the Advancement of Science. Two sessions will be held. Detailed announcement of program, etc., will appear in the December issue.

NOMINATIONS FOR OFFICERS, 1911. As provided by the constitution, the Council has made the following nominations for officers to be elected at the annual meeting:

For president—B. M. Davis (Ohio); M. A. Bigelow (N. Y.).

For vice-presidents (vote for five)—D. J. Crosby (Wash., D. C.); F. L. Stevens (N. C.) B. M. Davis (Ohio); S. Coulter (Ind.); G. H. Trafton (N. J.); F. L. Holtz (N. Y.); H. W. Fairbanks (Calif.).

For directors (vote for five)—J. Dearness (Ontario); Anna B. Comstock (N. Y.); Ruth Marshall (Ill.); O. W. Caldwell (Ill.); I. N. Mitchell (Wis.); E. B. Babcock (Calif.); M. A. Bigelow (N. Y.).

Members who do not attend the meeting may mail their ballots to the Secretary, at Urbana, Illinois, before December 15. Seal ballot in envelope marked "For Officers, 1911".

OFFICERS HOLDING OVER. The following officers elected in 1910 hold over for another year:

Directors—L. H. Bailey (N. Y.); C. F. Hodge (Mass.); C. H. Robison (N. Y.); S. C. Schmucker (Pa.); Delia I. Griffin (Vt.); Alice R. Northrop (N. Y. City section); Grant Smith (Chicago section); J. A. Drushel (St. Louis section).

Secretary-Editor—Fred L. Charles, Urbana, Ill.

THE USES OF THE SCHOOL GARDEN HARVEST

By LAURA E. WOODWARD, Supervisor of Nature-Study and School Gardening, City Training School, Trenton, N. J.

The school garden as a source of material for nature study, botany and drawing has proved a valuable asset to teacher and pupils. But when the products of this garden can be made to contribute to a definite end which is a logical outgrowth not otherwise obtained, its value is greatly increased.

For some years, one of our city schools has carried out the plan of having each grade plant in the school garden certain seeds not planted by any other grade in the school. The kindergartens plant pumpkin seeds in the spring and the products are harvested the following autumn when the planters reach the first grade.

One year three small pumpkins survived the vicissitudes of summer, and in the autumn supplied a young first grade assistant with material for pies which were brought to school, cut into one hundred pieces and distributed to that number of children belonging to the two first-year classes. The occasion was made a genuine celebration and, in addition to other lessons, many little points in etiquette were incidentally given by the versatile teacher in charge.

Last year the kindergarten again planted pumpkin seeds, and when autumn came there were eight fine pumpkins on the vines. The school was to have a fair just before Thanksgiving; so it was decided to ask some friends to donate the making of the pumpkins into pies in order that they might be sold at the fair. This was done and five dollars were added to the proceeds of the occasion.

The first grade class has always been able to plant and gather radishes in abundance before the end of the school term. The second grade has always been able to reap a good quantity of lettuce. Last year, besides furnishing material for a number of informal lunches and a generous supply to each of the eighty members of the grade, these two classes assisted in brightening the tables of some more formal occasions of the school. Last March the third grade studied the growth and development of peas planted in sawdust. But in order to see them mature under normal conditions, two eighteen foot rows were planted in the garden the latter part of April. In June, the class gathered a crop much larger and better than the highest expectations. This

THE KINDERGARDEN HARVEST
GATHERING PEAS FOR THE LUNCHEON

THE FIRST GRADE RADISH HARVEST
SEVENTH GRADE EXPERIMENTERS

crop was taken to the school kitchen where the children shelled the peas, cooked them and served them with crackers, and radishes and lettuce furnished by the first and second grades. The principal and two class teachers were invited as guests of the occasion, and each and every one decided that an abundant and satisfying luncheon had been served.

The fourth grade as their problem study the cereal grains. This topic fits into their studies of foods in physiology and the commercial products of the United States in geography. Each spring the question comes up as to the best grain to plant in the school garden. Last spring, after much discussion, it was decided to plant pop-corn. The children brought sample ears—seven kinds. These were tested and the best planted. The crop was well cared for until the close of school, and, although it was then neglected, quite a good yield was obtained from it.

One year the corn was not tested and the effect was very evident. Much of the corn had to be replanted three times before a satisfactory growth could be obtained in the various hills. Last spring the class profited by the failure of the previous year.

The culmination of this corn planting comes in a Thanksgiving celebration held by the class when it reaches the fifth grade. Last year for several days previous to that occasion, time was given in class periods to the preparation of a number of essays and other exercises relating in various ways to corn. The following program was given before the assembled school:

1. Meaning of the Word "Corn"
2. Discovery of Indian Corn by Europeans
3. Legend of Mondamin
4. How the Indians Cultivated the Corn
5. Methods Used by Indians for Preparing Corn
6. Modern Uses of Corn
7. Corn as Our National Flower
8. "The Corn Song": Whittier

Frederick Leroy Sargent's book, "Corn Plants: Their Uses and Ways of Life," was used as a reference in the preparation of several of the above numbers.

After the celebration, the corn gathered from the garden was popped and each member of the class received a portion which, although not satisfying in quantity, was most gratifying in quality.

Last spring, following a suggestion given in the Nature-Study Review, the seventh grade tested the planting of radishes with and without the use of fertilizers. The girls of the class had complained that they did not get enough of the garden work to do; consequently, some of them were given charge of the radish planting. Each of the six girls chosen for the work planted a row both in the fertilized and the unfertilized plot. Just one month to the day after the planting, the girls, anxious to see results, began to pull up the radishes. It was found that in that short time, in the fertilized plot, all but one of the six varieties showed a good crop ready for gathering. The unfertilized portion had not matured any of the varieties equal to the other plot, and even the single longer-maturing variety showed a marked increase in size in the fertilized plot.

From year to year the result, and consequently, a satisfactory culmination to the school garden effort, varies. But the aim is to have each class look forward to a completion of the particular garden problem they are attempting to express, and through it all to obtain a glimpse of the depth and breadth of meaning expressed in a seed.

TO MAKE LEAF PRINTS

By MARY EDGHILL, STUDENT IN BROOKLYN TRAINING SCHOOL FOR TEACHERS

Butter a piece of paper very thinly on both sides. Rub off the butter, leaving the paper merely translucent, and then hold it over a candle flame until it becomes entirely black. Now place your leaf right side down on the black sheet, cover with a piece of paper, and rub so that the black will come off on your leaf. After this, place the leaf on a sheet of drawing paper, covering as before, and again rub, being careful not to shift the position of the leaf, and the impression of the leaf will come off on the drawing paper.

POTATOES AND OATS AS NATURE-STUDY TOPICS

By ALICE JEAN PATTERSON, Illinois State Normal University, Normal, Ill.

While different teachers may advance different ideas as to the purpose of nature-study in the public schools, all probably agree that no matter what method may be employed, or what material used nature-study must mean the putting forth of effort to find out some of nature's truths. Naturally it should lead children to interpret more correctly than they otherwise would do, life and natural phenomena. It should foster initiative and independence, lead to a recognition of laws and principles, an appreciation of the working together of natural objects and forces, and something of man's work in controlling these forces.

While wild nature has contributions of her own to make toward the realization of the above ends, nothing can quite take the place of the hand to hand contact that comes with the rearing of plants. This is work in which the children participate with both mind and hand. It brings with it the joy of achievement the pleasure that comes with the getting of tangible results. It is this that makes the school garden of special significance in a nature-study course.

Instead of attempting to discuss in a general way the various contributions that a school garden may make to the nature-study course I shall simply tell some of the things we have tried to do with two very commonplace plants.

POTATOES

For several years the children of the fourth grade and the members of the nature-study classes of the Normal department have made a special study of potatoes. Last year the boys of the eighth grade, also, did some work in potato culture.

With some of the classes the work began in the fall when the potatoes were harvested. The students noticed that some hills gave a far better yield than others and the problem presented itself, whether or not the selection of "seed potatoes" from plants producing a number of good sized potatoes would tend to increase the yield.

The matter was looked up and it was found that some French experimenters had succeeded in making considerable improvement in productiveness by careful selection of seed tubers. On the other hand some American experimenters have found that small potatoes may be used several years without apparent

THE FIRST POTATO INTRODUCED INTO EUROPE. FROM CLUSIUS' WATER-COLOR OF 1588. (AFTER E. ROZE.)
(CUT LOANED BY AGRONOMY DEPT., UNIV. OF ILLINOIS)

detriment to the crop. Others, however, claim that there is probably some advantage in selecting the tubers from the most productive hills. The class decided that the safest plan was to select the best tubers to save for next year's planting.

I may add that this fall we have selected our seed tubers with greater care than ever before. We have also saved some small, inferior tubers. We are planning to make a test next year to see whether there will be any difference in yield between the selected tubers and the small ones.

After the seed tubers were selected came the storing for the winter. A study of conditions best suited to keep potatoes was made and a cool, dry, dark place decided upon. In lieu of a root cellar we had the tubers buried in a well-drained spot in the garden.

The work was resumed in the early spring. For our indoor lessons we had some of the tubers that had been buried, some that had been left in a rather warm cellar, and others that had been kept in a warm, light room all winter.

The first problem that came up for solution was whether or not this that we call a seed potato is really a seed. The pupils recalled the study of flowers and the forming of seeds that they had had the fall before and decided that the potato is not a seed. What then is it? Some suggested that it might be a root.

The tubers were examined and the eyes found. There was no difficulty in determining that the eyes were buds, for on the potatoes that had been kept in the cellar, sprouts or shoots were growing from them. The pupils found that the buds were arranged in regular spirals around the tubers, and that they were much more numerous and smaller at one end of the potato than at the other. The stem or stem-scar was found opposite the smaller buds. We now had names for the potato, stem-end and bud-end.

The pupils were asked to hold the tuber by the stem-end, and think what it would resemble if it were stretched out many times its length but having its width reduced proportionately. The reply came without hesitancy: "It would look like a stem with buds on it."

This helped the pupils to see that the potato is a thick, fleshy stem, and since it grows in the ground we cay call it an underground stem. They were told that this kind of underground stem is called a tuber. The point was now brought out that we were using, not a seed but an underground stem to propagate new plants.

A cross section was made of the tuber, and the different structures noted. The pupils found the covering, the dark line, which they were told corresponded to the woody part of a tree stem, and the mass of white material in the center. What was this substance? The children scraped two or three potatoes and placed the pulp in glasses of water, stirring it thoroughly. These were set aside. The next day a layer of white showed in the bottom of each glass. All the pulp and water were drained off, boiling water was poured over the white mass and we had a third of a glassful of quite respectable laundry starch. The older students made the iodine test for starch.

What value was the starch to the potato, was the next problem. The potatoes that had been left in a light, warm room during the winter were now examined. They had vigorous upright shoots more than half an inch in diameter with a number of leaves well developed. The tubers were shriveled and wrinkled. It seemed evident that some of the contents had been used in the growth of the shoots. But the pupils questioned, would the same thing happen if the tubers were planted in the ground. This problem was solved later in the term when a few plants were removed from the ground and the seed piece studied. In some cases nothing was left but the peeling with a little liquid inside. Other pieces were only partially used up.

The study of the tuber was followed by preparation for planting. Numerous questions had to be settled; the depth of planting, the distance apart of the rows, and of the hills, and whether whole tubers, or parts should be planted.

The fourth grade children decided to plant the main part of their plot with pieces containing two eyes. However, they wished to see whether different sized pieces might produce different yields. They planted four hills with whole, half, and quarter potatoes, respectively, and four with mere bits of peelings each containing a single eye. When they harvested their crop and weighed the yields they found that the half potatoes gave the best results, the quarters next, and the one eye pieces were the poorest of all.

The eighth grade boys and members of the nature-study classes of the Normal department carried on a number of interesting experiments. They had studied fungi the fall before and had noted among other fungous diseases the potato scab. The question came up as to whether anything could be done to prevent the germination of the scab spores.

The use of formalin was suggested. Some of the tubers were placed in a weak solution of formalin, one table spoonful to a gallon of water. They were allowed to stand in this a few hours, then were drained out and cut for planting. Three rows were planted with the treated tubers, and three others with the same variety untreated. When the crop was harvested we found a number of scabby potatoes in the untreated rows while those grown from the treated tubers were wholly free from scab.

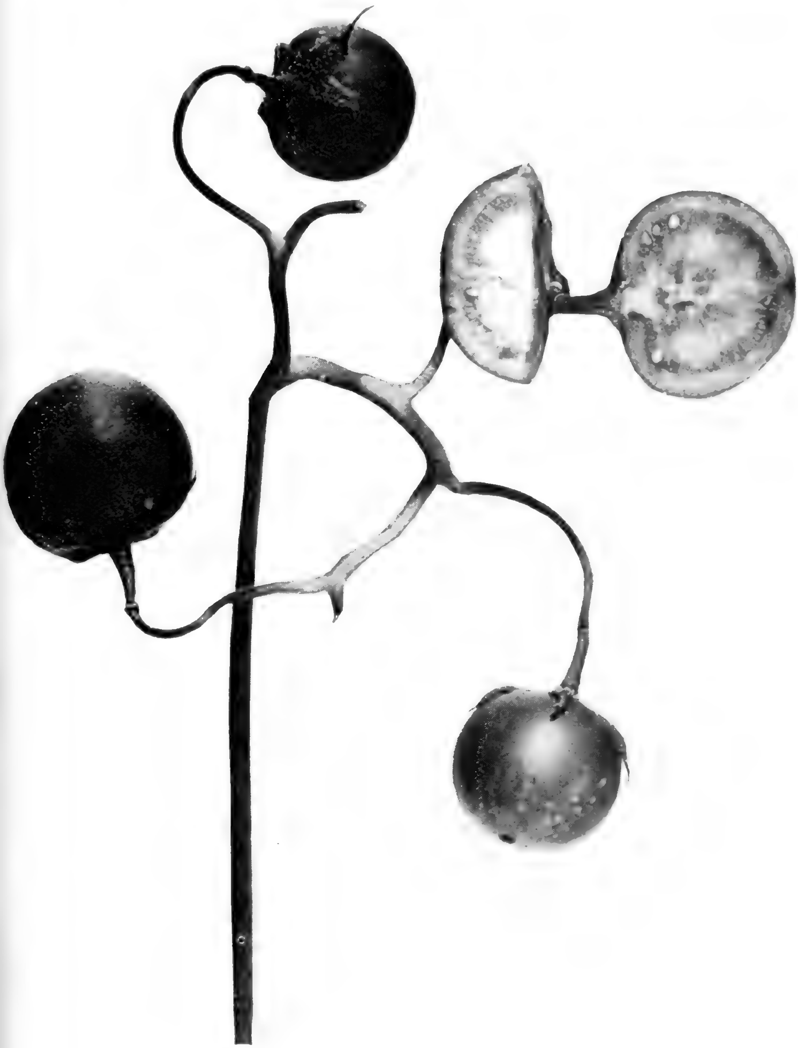
An experiment was undertaken to test different varieties, first as to which seemed best adapted to our conditions of soil and climate, and second, which showed superior cooking qualities. Four varieties were chosen, one very early, two that matured about the middle of the summer, and one late variety. The harvest showed that neither the very early, nor the late yielded as well as the other two. The test of flavor and other cooking qualities was made by the domestic science department.

Another experiment was made to determine which would produce the greater yield,—stem ends or bud ends. The plants from the bud ends appeared above the ground almost a week before the others. When the potatoes were dug, in spite of our expectations, the stem ends produced the greater yield. The class decided that the record should be kept, and the experiment continued several years before a final decision should be made.

The effect that cultivation may have upon the potato crop was tested. Four rows were planted with the same kind of potatoes. Two of the rows were given ordinary cultivation. The other two were cultivated twice before the potatoes appeared above the ground, and frequently enough afterward to keep a good soil mulch constantly on the surface. There was a marked difference in the appearance of the plants during the summer. The cultivated rows remained green and vigorous almost two weeks after the others had become yellow and had ceased to work. The cultivated rows yielded not only more potatoes than the other rows, but much larger ones.

The question of other methods of propagating potatoes than by tubers was discussed. Few of the pupils had ever seen the potato fruit or ball. Some seeds were procured and one student undertook the work of raising potato plants from these. She planted the seeds in small shallow flats in the greenhouse.

Later she transferred the young plants to small pots, and finally in the latter part of May set them out in the garden. The little plants showed considerable variation from the start. Some produced a few small tubers and died about the middle of the summer. Others remained vigorous until late in the fall. Some



POTATO FRUIT, NATURAL SIZE.
(CUT LOANED BY AGRONOMY DEPT., UNIV. OF ILLINOIS.)

produced as many as twenty small tubers. Altogether there were five different varieties. These little potatoes have been carefully stored for the winter. We shall plant them next spring to determine whether any of them will produce potatoes that are worth raising.

This experiment led to a study of the history of the wild potato; how it was found by the early explorers in South America and Mexico; how it was taken to Spain and England and then back to America; how little by little it has been improved by cultivation and selection until it has become one of the most important food products of the civilized world.

In connection with the potato we had some interesting studies of the Colorado potato beetle, and of the ladybug that preys upon this pest.

OATS

Oats were studied by the eighth grade boys and the nature-study classes of the Normal department. The work began in March with a study of the grains. We had procured two kinds of choice seed oats, the Swedish Select and the Kherson. A number of students who lived on farms had brought from home small samples of seed oats.

The different grains were compared as to color, shape and size; and the characteristics of different varieties noted. They were also compared with grains of wheat and differences observed.

This was followed by a test for seed purity. Each student weighed a small sample of oats, then spread the grains out on a sheet of white paper. All foreign bodies, chaff, straw, weed seed, as well as light-weight grains were separated from the good seeds. The seeds were then weighed and the percent of purity calculated.

The usual germination test was made to determine the vitality of the seed. Ten students selected from the same sample ten grains each. While they were doing this two other members of the class put some moist sand in a plate. The hundred grains were then placed on the sand and pressed slightly into it. Another plate was turned over this one in order to prevent the evaporation of moisture. The other samples were treated in the same manner.

The plates were examined after three days, when it was found that in some cases almost all the grains had sprouted; in others not more than half had begun to germinate. The oats that we were to use in our garden plots showed that ninety-eight and ninety-nine percent respectively had germinated.

Different methods of planting were discussed, and the class decided to plant in drills rather than broadcast. A laboratory experiment helped to determine the proper depth to plant. In a glass jar filled with garden soil, oats were planted at various depths. It was found that those two inches and less below the surface germinated more quickly, and made a more rapid growth than the others. This, combined with the knowledge gained from reading reports of experiment stations, led to the decision to plant less than two inches deep.

We had four plots twenty-five feet square, and two twelve and a half by twenty-five feet. Kherson oats was planted on one of the twenty-five foot plots and Swedish on the other to determine the difference in yields of these two varieties.

On the other plots experiments were made to test the value of treating seed for smut. One plot was planted with seed treated with a weak solution of formalin. To treat the seed we put it into a gunny sack and then dipped it into the solution allowing it to remain ten minutes. We then spread it out to dry and planted it the next day. Another plot was planted with the same kind of seed untreated.

One-half of the fifty-foot plot was planted with seed that had been placed for a few moments in water heated to one hundred and twenty-five degrees, Fahrenheit. The other half with the same seed untreated.

After the plants began to appear above the ground they were observed from time to time and habits of growth noted. When the oats were about three inches high the weather turned suddenly cold, the temperature falling three or four degrees below freezing. The oats were watched with considerable interest to see whether or not they were able to stand the low temperature. The students were surprised to find that there was little effect; some of the leaf tips were browned a trifle, that was all.

This observation led to a study of the history of the oats and the kind of climate in which it thrives best. Some interesting data were collected. It was found that the importance of oats as a crop is greatest in northern regions; that some of the best varieties, in fact the two we were using, had originated in

Sweden and Russia; and that in warm climates a winter variety is used almost exclusively.

The work was carried over into the summer term of school, which made it possible to follow out the entire life history of the plant. When the plants began to blossom the position of the flowering stems was observed and the number on one plant counted. The kind of flower cluster, the spreading panicle, was studied and compared with the side oats, a few of which we had growing in the garden. It was also compared with the spike of wheat. A few ambitious students looked into the flower for the essential organs and were delighted with what they found, especially with the dainty, feathery pistils.

The difference in the two varieties of oats was studied with interest. The Kherson ripened its grain and was ready for harvest ten days before the Swedish; while the latter was fully nine inches higher than the former. The difference in yield, however, as shown by weight, was slight.

The experiments for smut worked beautifully. The plots were carefully examined and not a single smut head was found in the plot whose seed was treated with formalin. On the other hand the smut heads were numerous in the untreated plot. The difference in yield amounted to ten bushels per acre.

The life history of the oats smut was studied briefly in this connection in order that the students might understand how treating the seed before planting could prevent the appearance of smut on the heads of the oats.

The place of oats as a farm crop was given some time, its value in the rotation of crops, the use of the straw and stubble, and the food value of the grain.

Altogether the lessons afforded by these two familiar plants, we believe, were worth while from an educative standpoint as well as a practical one.

THE N. E. A. SCHOOL GARDEN LUNCHEON

By ELLEN EDDY SHAW

A unique feature of the N. E. A., was a school garden luncheon. This does not sound unique. It would seem a very easy matter to procure in the vicinity of Boston children's garden products sufficient to provide a luncheon. But for the West, South and Canada to send material in condition to use sounds impossible. But it actually happened. And these more remote places sent in their vegetables and flowers in generous quantities and in usable shape.

The idea of this banquet came originally from The National Home Economics Association with Mrs. Ellen Richards acting for the association, and from the National Committee of Agricultural Education, represented by Prof. E. E. Balcomb of Providence Normal School. They felt that such a luncheon was a compliment fitting for the garden children of America to pay to their friend and big brother the Department of Agriculture. This department was represented at the luncheon by Hon. Willet Hays and Mr. Dick J. Crosby.

The entire affair was a bit hurriedly gotten up. Letters were sent oût here and there to states, to cities, to associations and schools asking that the children send in their products. And in spite of the difficulties of transportation, the response was good.

I wish you had seen the big box of vegetables, with its ice packing all about it, which came from Missouri. North Carolina sent about everything one could imagine, from eggs to honey. Canada's response is a story all by itself. The McDonald Institute of Ontario and The Rittenhouse School of Jordan Harbour were the representative schools from this section. When their boxes were unpacked the first thing to be seen was the British flag. This was straightway put up on a wall of the luncheon room in the place of honor. Such small fruit as they sent,—currants, gooseberries and strawberries! I wonder why we don't try more of that sort of gardening.

A list of the contributing states and the menu of the luncheon may be of interest to many. The states were California, Kansas, Missouri, Massachusetts, Maine, New York, Nebraska, Oklahoma, Pennsylvania, Rhode Island and South Carolina, also Canada.

LUNCHEON

Boston Laboratory Kitchen, Tomato Bouillon
Wafers
Penn. radishes N. Y. pickles
Salmon sandwiches with Mass. and R. I. lettuce
Kansas green beans Peas a la Northampton
Vegetable salad—School Garden Medley
Missouri, California, Canada, New York, Maine
South Carolina jelly Corn muffins, North Andover
Strawberries, Fitchburgh and Canada grown
Oklahoma cakes Ice cream
Southern fruit punch Iced tea
Coffee

It was a charming room in the Institute of Technology where this luncheon was held. A long low room with the walls decorated, partly with flowers and fruits and partly with the picture exhibits of garden work. Providence and Newport, R. I.; Springfield, North Adams and Groton, Massachusetts; and The School Garden Association of New York were the picture exhibitors.

There were long tables used as serving tables and on these were the individual nosegays of bachelor's buttons sent by the Wellesley Farms garden. Then a large round table groaned with the exhibit of vegetables, and fruits both raw and canned. Another table contained preserves and jellies made by children from their own products. Another interesting feature was an exhibit of products, pictures and a garden dairy from a lad in Groton, Massachusetts. Mrs. Richards presided over the luncheon in such a way that one felt he was in a charming old New England home with an equally charming hostess.

If other meetings had not followed, we all would have lingered the entire afternoon talking of the work and of its future. Mr. Hays spoke of the sympathy and interest of the department of agriculture; Mr. Kirk told of his work in Kansas; Mr. Kilpatrick explained the New York Garden movement of which he is the head, and so it went on. We all wonder what is to come next. Is this great interest in garden work to merely dissipate itself in show and flourish or are we going on to better, steadier work? It would seem as if the Department of Agriculture was the one to outline, to plan, to put into motion more and more of this work. This department is surely the pace setter, the inspiration, the court of appeal in agricultural affairs. It would seem to be the official school garden foundation head. It has done much already in distribution of seed and in printing of helpful matter. Are we not ready to take our pace from such a national authority? Personal aggrandizement falls in the back ground before a movement for the general uplift of the children of our land.

WEEDS

By PROF. FREDERICK L. HOLTZ, Brooklyn Training School for Teachers

Teachers, very properly, depend chiefly upon the showy flowers, such as roses, violets, sunflowers, for their botanical material for nature lessons. The great aesthetic interest in these flowers makes them especially desirable. Weeds, on the other hand, are generally considered unworthy of notice. This, however, is a mistake.

It is difficult to distinguish between "flower" and "weed". The terms are simply relative. With few exceptions, weeds are flowering plants. Some of them have pretty, showy flowers; for

AN OLD FARMYARD ABANDONED TO THE WEEDS

example, dandelion, daisy, thistle. Even the less conspicuous have flowers which are remarkably interesting as to their structure and adaptation, and some of these, when closely examined, are very beautiful. At any rate, weeds have their element of beauty, if not in their flowers, then in their leaves or the general aspect of the whole plant. It is good to teach children to see this beauty. Many weeds furnish excellent material for the art work.

What is a weed? Opinions differ. It all depends upon how they affect us. Every botanist or plant collector while botanizing has been asked by farmers and others, "What are you collecting them *weeds* for?" To such people almost any *useless* plant is a weed, even goldenrod and wild aster being included.

If we paraphrase the old definition of dirt, as matter out of place, we get a good definition of weed—*a plant out of place.* The double poppy is a beautiful flower in any place. But one year this plant sprang up all over my garden, among the pansies, the carrots and potatoes. I considered it and treated it exactly as any other weed, and hoed it up. I have seen a cornfield in newly-broken bottom-land in which the wild grape climbed over the cornstalks. The farmer must have considered it out of its proper place, and a "pesky" weed. The word "weed" generally suggests something disagreeable. If a plant causes us annoyance or pain directly, or troubles us indirectly by injuring our cattle or our crops, it is a weed.

Most weeds are objectionable because they interfere with the success of our crops. And it is these field and garden weeds that should chiefly be studied in nature-study. In school gardening this makes a very practical topic.

Pupils should be taught to recognize and name the commoner weeds, to know something about their life history, and the chief methods of eradication. Many of them are very convenient and suitable for teaching about life of plants in general.

The common broad-leaved plantain is one of the best to show children the bad effects of weeds. Its leaves lie in a rosette on the ground, thereby effectually shading to death any hapless plant that may be near it and not able to outgrow its enemy. This is the chief reason why it is undesirable on lawns. Grass is very sensitive to shading and needs all the light it can get. If a board is left for a week in one place on the lawn, the grass turns a sickly yellow or white, and in time it would die from the shading. The plantain has the same effect. It thrives best in damp, heavy soil, in shady situations, where the grass already has, at best, only a precarious existence. In a comparatively short time the grass may be replaced by the weed. Plantain is a coarse, hardy plant—a characteristic of most weeds—capable of enduring much abuse, such as clipping with a lawn mower, being stepped on, etc. The most vital part, the root and stem and terminal bud, are in the ground or very close to it, and thus protected from serious injury. If the large leaves are cut off, others spring up from the bud. The hardiness and ease of dispersal of the plantain is shown by its almost universal occurrence in north temperate latitude.

Cultivated flowers and crops are usually exotics or delicate varieties of once wild and hardy species. They need man's aid in the competition for light and food with the coarser weeds.

Weeds or their seeds often contaminate field crops, necessitating troublesome methods of separation. Wheat, clover, and grass seeds are generally thus mixed. Clover sometimes contains as much as forty or fifty per cent of weed seed. Oats have been found mixed with five per cent of mustard. Hay is often ruined by squirrel-tail grass.

COCKLEBUR BURDOCK

TRAMPS THAT "HOOK" A RIDE

Some weeds are poisonous to man and beast. The notorious loco weed of the Western plains has killed many horses, sheep and cattle. Jamestown (Jimson) weed grows very commonly in city lots and country yards. It is a member of the nightshade family. Children are sometimes killed by eating the seeds. Poison ivy may be classed with weeds in this study. It is an almost universal pest in this country. Children should be taught to recognize and avoid it, though some are immune. Nettle, with its prickly hairs which contain a burning acid, is another weed to be avoided. Most of us who have gone barefoot or played ball on sandy fields have had experience with the vicious sandbur, whose burs are beset with the sharpest of spines which have a way of insinuating themselves where not wanted.

As a rule, the burs are not painfully injurious, but bothersome. The coarse, unsightly burdock, cocklebur, beggar-ticks, etc., cling to our clothing. They get into the hair and wool of animals. Horses' manes and tails are often badly matted with them. The wool of sheep has to be especially combed for burs before it is spun. Longhaired dogs are greatly hampered by burs in their coats and feet. The shorthaired pointer is better adapted to bur-filled jungles than the setter.

SEED PODS OF VELVET LEAF
(KNOWN ALSO AS BUTTER PRINT OR PIE MARKER.)

One reason for the success of many weeds in the competitive struggle for existence is that they are provided with excellent devices for seed dispersal —elastic, throwing stems with open pods (butter-print, mallein), parachutes (dandelion, thistle), wings and floats (sorrel), tumbleweeds (Russian "thistle"), burs (burdock, cocklebur). They make excellent material for studying the dissemination of plants.

Weeds are found in neglected back yards, vacant lots, roadsides, railroad tracks, fence rows, fields and pastures, where they have been blown by the wind or carried by man and other animals.

Many weeds now growing in this country are not native plants, but were introduced in one way or another. Some, no doubt, through natural agencies, but many were brought here by man; sometimes intentionally (dandelion, chicory, field daisy, purslane) for beauty or for some real or fancied usefulness. Others, again, have been unintentionally introduced with the seed of useful foreign plants, with packing material, ship ballast, etc. Many of these weeds, like human immigrants to America, find conditions so favorable, as compared with what they were used to in the old country, that they have thrived far more luxuriantly here than there, and have spread far and wide.

The rapidity with which weeds, especially the wind-blown sorts, take possession of the land is astounding, and constitutes a serious menace to farmers. It is only a few years ago that the Russian "thistle" was imported with seed wheat and flax into the Middle West, and now it is to be found over most of the Mississippi Valley and even beyond. On account of their annoying or harmful character legislation has been passed against weeds in practically all of the states, which looks to the prevention of their introduction in the first place, or, if already introduced or native, to their checking or extermination. There are in most cities and towns ordinances requiring the destruction of weeds in the streets and lots, but this is chiefly for aesthetic reasons.

On farms the weed laws look to more practical ends. The wicked neighbor, in the old story, went over into his neighbor's field and sowed tares. The careless farmer who does not keep his own fields free from tares can do his neighbors a great deal of mischief.

Yellow mustard, Canada thistle, field daisy and Russian "thistle" are among the most offending weeds. Perhaps no other plant so well illustrates the difference between the practical and the aesthetic points of view as the field daisy or white-weed. Farmers look upon its spread with disgust, while the amateur flower lover and the poet think it a charming flower.

There is no universal rule for the extermination of weeds. Different methods must be used for different classes. The Farmers' Bulletin, No. 28, gives a very large list of weeds with the special methods best suited for the destruction of each kind. This bulletin may be had for the asking. Apply to the Department of Agriculture, Washington, D. C.

If weeds are not too numerous, the best way to get rid of them is by hand pulling or weeding. The best time to do this is after a rain when the ground is soft and allows the roots to come out easily. A weed hook, a sort of small rake, is sometimes employed for this purpose. Hand weeding is the only method possible in crops sown broadcast, and in working in the crops sown in rows or drills.

Isolated weeds in lawns, etc., may be removed by using a knife or spud (a small, slender spade), and cutting the roots. Plantain, burdock, sweet clover, dandelion and other tap-rooted weeds are best treated in this way.

The same thing is done when weeds are hoed. A hoe should be sharpened so as to cut the roots. Hoeing is best done on a warm, sunny day, for then the weeds will dry and be killed before they will take root again, which some, like purslane and quack-grass, especially, are apt to do in wet weather. It is a good plan to rake up the weeds immediately after hoeing, to let them dry.

Machine cultivators work on the hoe plan. They are used in larger fields for working between the rows of the crops, as in potato and corn fields, truck gardens and nurseries.

Weeding, either by pulling or hoeing, should be done early, a soon as the real crop is large enough to be distinguished from the weeds. If left too late, the roots of the crop are injured by pulling up the long weed roots or by the disturbance with the hoe. Also crops grown too long among the weeds become spindling and pale, and are apt to suffer from the sun when the weeds are removed.

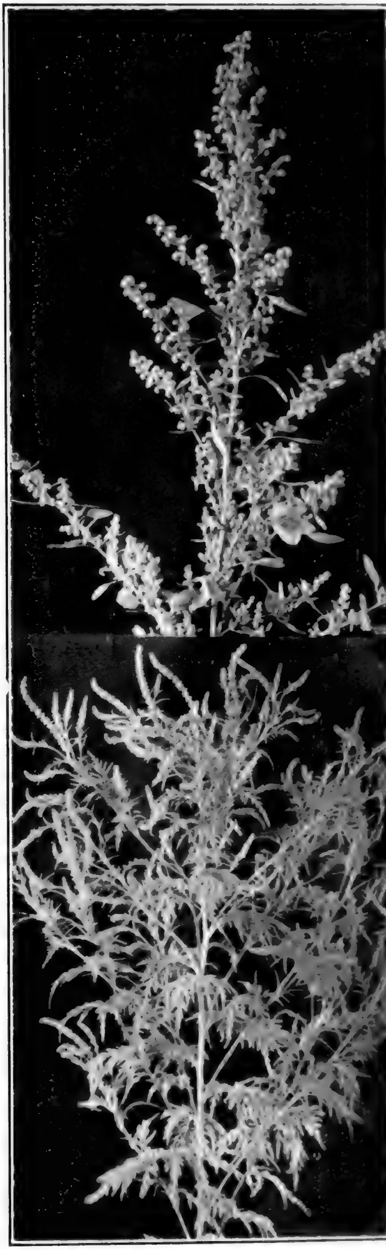
Poisons have been applied to exterminate weeds. This, of course, is apt to injure the crop. A common method of treating dandelion, plantain, thistle, etc., is to pour a drop or so of some corrosive acid, gasoline, kerosene, or other chemical on the crown of the plant. Common salt, copper sulphate and even arsenical salts are used on weeds. In tennis courts and other places where no crop is raised such poisoning is permissible and very effective. The tracks of trolley and steam railroads and ordinary roads are often sprayed with crude oil or other preparations, both to lay the dust and to kill the weeds.

The method of treatment of weeds depends upon their life habits. Many weeds, such as foxtail, pigeon grass, pigweed, purslane, ragweed, etc., are annuals. By effectually keeping them down before they go to seed they will be got rid of. Farmers sometimes plow their hay fields early to prevent the seeding of the early maturing weeds. The grass continues to grow, and in haying time the farmer gets another chance at the second growth of weeds. Grain fields are sometimes mowed and sacrificed when very badly contaminated with noxious growth.

In towns, mowing is the most general method of destrowing the weeds of neglected lots and roadsides.

Sometimes annual weeds are plowed under to kill them. The thistle, burdock, mullein, wild carrot, etc., are biennials. They produce a flat rosette of leaves the first summer. The next season the tall, seed-bearing stalks are formed. Such biennials are checked by not letting any of them come to seed and by repeated and thorough hoeing.

Still another class of weeds are the perennials, which do not depend upon seeds for dispersal, but propagate from the root or root stalks and runners. In this class are the field daisy, Canada thistle, milkweed, quackgrass, etc. Merely cutting off the tops of these does no good, unless done many times till the roots are starved to death. They must be cut off below the ground, uprooted, poisoned or smothered.



LAMBS QUARTER
RAGWEED
(TWO OF THE MOST COMMON OFFENDERS)

Quackgrass, which has tough rootstalks, which will quickly renew the growth if only a single joint is left in the ground, is perhaps the most difficult of all weeds to eradicate. Whole farms are ruined by it when it once gets a hold. To kill it requires eternal vigilance and effort. The ground must be thoroughly cleared of the rootstalks. This is done by weeding, cultivating, plowing and harrowing, and then raking carefully the exposed rootstalks, drying and burning them. Small patches can be poisoned, or they may be covered thickly with straw for a season. Repeated very deep plowing under is also recommended.

Sometimes after plowing under a crop of weeds, the new growth is prevented by sowing a heavy crop of broad-leaved plants, such as turnips, beans, or peas, which by having a start, shade the weeds to death.

After a successful campaign with weeds in a garden or field the laborer may have to begin all over again, if he uses too fresh manure for fertilizing. Manure is very apt to contain weed seeds, these not having been affected by the alimentary canal. Manure from pig-sties is particularly bad in this respect. Manure should be well rotted before being applied.

All this weeding adds considerably to the work of the gardener and farmer. There is this offset, however, that one cultivation for the removal of weeds is often a blessing in disguise, in that it loosens the soil and makes a surface mulch that prevents the soil moisture from evaporating so rapidly. If it were not for the weeds, the farmer might not cultivate so assiduously. It is like the story of the man who, about to depart this life, devised his vineyard upon his sons, with the advice that if they dug well in it they would find a treasure. They dug much, but found no coin. The vineyard, however, yielded a plentiful harvest as a result of the digging.

Charles D. Warner, in his charming little book, "My Summer in a Garden", which every lover of gardening should read, has much to say, in a humorous vein, about weeds, especially "pusley" and quackgrass (which he compares to original sin on account of the way it constantly creeps out). He moralizes on the subject in an entertaining way.

Weeds as plants out of place are a great nuisance. But they have their good points. One should give the devil his due. As shown above, weeds are interesting and often beautiful. Some of them have, are supposed to have, medicinal value. Some, such as the dandelion, lambs'-quarters, purslane, and even burdock, are eaten as greens. These and many others are good forage for animals.

Weeds sometimes grow luxuriantly in places where little else could grow, thus clothing in verdure bare, unsightly spots. They are usually the first to reclothe barren areas and often prepare and render fit for cultivation the poorer soils, by loosening them with their roots and by adding in their decay the necessary vegetable mold.

They are the advance guard of Nature in the reclamation of land once tilled, but abandoned. They invade the fallow fields and garden from the roadsides, and encroach upon the very doorstep of the deserted homestead, and for a season or so grow triumphantly.

In the shadow of their foliage tender tree seedlings spring up, which later by their shade subdue the weeds. This interesting succession of vegetation is readily observed in any abandoned field.

The Central Association of Science and Mathematics Teachers will hold its annual meeting at Cleveland, Ohio, on November 25th and 26th, 1910.

Valuable reports of committees will be made and papers given in biology, chemistry, earth science, mathematics and physics. Addresses will be given by such men as Harvey W. Wiley of Washington, D. C.; Dayton C. Miller of Cleveland; David Eugene Smith of New York; J. F. Gilbert of Illinois; Mark Jefferson of Ypsilanti, etc. The program contains the names of forty-one speakers, brought together from eight states.

Full information regarding the program, place of meeting, hotels, railroad rates, etc., may be obtained by addressing the Secretary, James F. Millis, 330 Webster Ave., Chicago, Illinois.

The Chicago Nature-Study Club (section of the A. N.-S. S.) enjoyed on September 24, a most successful field trip to Western Springs, a suburb of Chicago, visiting Vaughan's nursery and green-houses. Every courtesy and consideration was shown them; grafting and budding were demonstrated and details explained. Although rain fell freely, seventy members made the trip. Many more would have gone had the day been pleasant.

Emily C. Westberg,
President.

EDITORIAL

This is the season of state and county fairs, institutes, corn carnivals, and similar educational festivals of the harvest time.

A Possible Evil: Prize Contests

During the last decade the boys of the entire country have been enlisted in the movement for better crops, and in many states this has taken the form of prize contests in corn growing. Often the awards reach extravagant sums. We have learned of several instances where, in a town or city of very modest size, a total of $700 or more has been offered for the various exhibits of corn and other crops grown by individuals of the locality and for exhibits of cooking and sewing by mothers and daughters. While much good has come from the forces stimulted into activity through these means, an excessively large sum offered, for example, for the "best ten ears of corn grown by a boy under fifteen years of age", frequently drawn out the bad as well as the good in the boy. Ten, twenty-five or fifty dollars in cash, offered under circumstances which allow dishonesty, is sufficient to tempt the honor of almost any youth. It is a simple matter to pick ten ears from his father's best field of corn. It is still simpler to have father do both the growing and the picking. Uncle's assistance may be called in; likewise, uncle's corn. There is often no check on such strivings toward glory and coin. While more modest prizes under careful supervision may do much good, we venture the assertion that the council of the American Nature-Study Society could devise a far better means of spending a portion of the funds when they run into the hundreds of dollars.

As we approach the close of the year, we request our members to indicate as promptly as possible their intention of renewing

Renewal of Membership

their membership, and it will facilitate matters of record if members will attend to it before the first of January. To new members joining (or new subscriptions received) before January 1, the December (1910) issue will be sent free.

NATURE-STUDY NEWS

The Many Friends of Mr. William Dutcher, President of the National Association of Audubon Societies, have planned to establish a fund known as "The Mary Dutcher Memorial", in memory of his only daughter, who was closely associated with him in his fight for the preservation of wild birds. It is planned to raise $10,000, the interest of which will be devoted to the work of the Audubon Association. Contributions should be sent to W. W. Grant, Treasurer, 140 Nassau Street, New York.

A Trip to Wolf Lake. Wolf Lake is a small, shallow lake just beyond the outskirts of Chicago. It is reached by the Hammond and Whiting electric cars.

Here the South Side Section of the Chicago Nature-Study Club went for the purpose of studying and collecting water plants and animals to fill aquaria. They were amply repaid, for the water was teeming with a large variety of insects, hiding among the lilypads, elodea, spirogyra, and water milfoil and other water plants.

was engaged to teach at five selected gardens.

Darting to and from were the little shining whirligig beetles, diving beetles and shrimps or "soft jelly bugs", as a lad living in the vicinity called them. His curiosity and interest were aroused and he asked if he might "fish". He soon learned the names of many insects.

There were damsel and dragon fly larvae, hydras, grant water bugs, diving beetle larvae, water scorpions, back-swimmers, water boatmen, craw-fish, young frogs, etc. Snails also were found,—the flat coiled shell Planorbis, and right and left handed shells.

There were boats for those who cared to fish for clams.

Land animals and plants were plentiful. Asters and gentians were found.

Luella S. Roesch,
Sec.-Treas.

The Teachers of New York City were recently invited to inspect a number of school gardens. The School Garden Association reports a successful year. They were provided with funds by private parties, and with these an experienced gardener

The St. Louis Section now numbers 150 members, and is receiving new applications almost daily. Two of the elementary school principals most active in the work are Mr. Lewis H. Dougan, Shaw School, and Mr. W. J. Stevens, Field School.

PASSENGER PIGEON INVESTIGATION

By C. F. HODGE, Clark University, Worchester, Mass., Aug. 15, 1910

None of the awards have been won as yet. In all I must have received nearly 100 reports of pigeon nestings. These have been *bona fide* reports of people who have thought that they had the real wild, or passenger, pigeon and have nothing to do with the several thousands of letters of inquiry. On receipt of a report, I mail the leaflet practically asking my informant if he is "$5.00 sure?" Generally I get the reply: "I beg your pardon, my birds, I find, are mourning doves". A number of very insistent reports have come from the Far West and some have been sent in from Brazil, Chili and Argentina. All the Pacific coast findings have proved to be band-tailed pigeons or other Pacific species. The work of this season, I think, definitely settles all the newspaper stories about the passenger pigeon having been driven west and to the effect that it is now living in large numbers in the mountains or on various Pacific islands. Professor Whitman, whose co-operation has been of incalculable value to me from the beginning, writes that he has had the best collectors in South America working for him and that "There is not a scrap of evidence so far for the occurrence of our pigeon in South America".

This narrows the problem down to eastern North America, the known range of the species. Here Ontario has been the storm center, with New York State a close second throughout the season. A good deal of evidence of pigeons seen in Pennsylvania during the season has also been received. After some of the Ontario reports, possibly the most encouraging report from anywhere in the United States comes from Pennsylvania. My informant claims to have located two flocks of pigeons in the heavy timber and that he found two nests in the same tree. He did not know of the rewards at the time. After casually telling of his find he learned of the rewards and, on revisiting the place, found the nests deserted. I have written him requesting that he send me the nests, but my letter has been returned unopened, and I am now trying to reach him at another address. There are two (one just owned up to mourning doves) similar cases in Ontario now being followed up by local ornithologists.

The season's experiences form a sickeningly funny commentary of our education and our general knowledge of American natural history.

I have had a report of a nest from the heart of Boston, and of one from a man at *"Bloom & Co., Clothiers"*, cor. 67th St.

and 2nd Ave., N. Y. City. "Many nests in plain sight in the cornices of the buildings. They must be the birds you want. I am sure they are wild pigeons and that nobody feeds them around here." Another letter asks how much I would pay for a rabbit with a long tail.

One evening a frantic report came in by telephone from Waltham, Mass. The man agreed to pay $5 and all expenses if the birds did not prove to be passenger pigeons. I immediately telephoned Dr. Field of the Massachusetts Commission of Fisheries and Game and he dropped all his other work to go over to Waltham and look up the matter personally. The man took him into some woods, but was unable to show him either birds or nests of any kind.

One morning's mail brought me a letter from central New York containing a postal money order for $5. One nest was described as in a maple about 10 feet from the ground, and there was another nest in a large willow at least 25 feet up. The letter said that the squabs were ready to fly and that I must come quick, if I wished to find them in the nest. I pictured the edge of a woods with maple trees and a brook (willows). Telegraphing my informant to meet the 7:40 train the next morning, I rode all night, without sleeper, on account of numerous changes, and stepped into his buggy as the train pulled into Cazenovia, N. Y. We drove two miles, found the nest—empty—in the maple tree—one of a row planted along the public highway, about 10 feet high, as stated; also the nest in the willow—a lone line tree between pasture fields, not more than about 12 feet from the ground. The man wrote me that he had not heard the birds "coo", "like mourning doves". We found the squabs in the pasture near the nest, heard the old birds "coo", caught the first train for Worcester, and I was home that evening. They were mourning doves, of course. The man had written that there were two squabs in the nest, and I was strongly tempted to quote Professor Whitman to him to the effect that the passenger pigeon never lays but one egg to a clutch, and return his $5. He would have been $5 in pocket, I would have saved myself twice that amount and a hard journey, but possibly neither of us would have been quite as well satisfied.

Only yesterday I looked up another case that looked most encouraging near Albany, N. Y. My informant was a sportsman physician of prominence. He was sure he knew a passenger pigeon when he saw one. Had hunted them with his father years ago. He had a few weeks before expressed a deserted nest to me which he claimed to be that of a passenger pigeon and which looked good—apparently large for mourning dove, and built of coarse twigs and rootlets. The location of this nest was described as in brush overhanging a brook, about five feet above the water. The doctor had not known of the rewards until the young birds had flown. He also described another nest in a white oak near by, which was "fully 20 feet from the ground". He gave the impression that these nests were in heavy timber along a swampy brook. I found the brook fringed with a few alders and other brush and with a few scattering trees along its course, with clean, open pasture land on one side and grain fields on the other—absolutely typical mourning-dove habitat. The nest in the oak was about 10 feet from the ground, and a mourning dove was sitting on two recently hatched squabs. We approached within six feet and drew the branch down so that we could almost reach the nest before the old bird left it. There was the little bird, scarcely more than half the size of the passenger pigeon, and as plain as day, the black spot under the ear. It did seem, as I went away, that a little common sense and intelligence might have saved me an expensive journey and a day of very precious time, but I am not complaining.

Despite all discouragements and disappointments we may feel that the season's work has not been in vain. The country has been awakened to the problem and educated in a way that ought to insure the location of nesting colonies of the pigeons next year, if any still exist. I had hoped to close the investigation this season either by the discovery of the birds or by failure decisive enough to lay the subject finally to rest. I shall ask all the men who have offered awards to continue them for next season, and we will hope that some school boy, or girl, may locate a pair or colony of the pigeons next spring.

The above has not dealt with the many encouraging and favorable reports, many of them from reliable men, of pigeons seen during the season. I shall try to have these all mapped and tabulated for the December number of The Review. While we have not succeeded in locating any undisturbed nests, I do think it quite probable that we have found the pigeons in Pennsylvania, New York and Ontario, and it is this fact that warrants continuing the search for nesting birds another year.

Not the least valuable result of this first season's work is the practical demonstration for the whole country that no mistakes will be made in the identification of the species and that absolutely nothing but the location of nesting passenger pigeons will secure any of the awards. Many thousands of the colored plates of pigeon and mourning dove—both Mr. Reed's leaflet and the Audubon Society plates—have been distributed and literally millions of notices have appeared in the newspapers. The plan has been proved to work to perfection. The only hitch has been in the case of men—or women—who have more money than sense and rather enjoy losing $5 on an interesting bluff.

Theodore Roosevelt has expressed his interest in the work and his desire to join the confirming party, if certain that the nesting pigeons have been discovered.

MR. F. W. HOWE went last month from the Office of Experiment Stations, U. S. Dept. of Agriculture, to Albany, N. Y., as State Supervisor of Agricultural Education. This is a new position created by the legislature last winter.

MR. FREDERICK LOESER, of the Frederick Loeser Co. (Department Store, Brooklyn), has made the offer to supply free to every child of the Brooklyn schools who asks for one next Arbor Day, a catalpa tree for street planting.

MR. J. F. NORWALD, of Upsala, Sweden, High School, who has a royal traveling scholarship, is at present visiting schools and colleges in this country, studying high school science teaching and nature-study in the grades.

PROF. M. A. BIGELOW, of Teachers College, Columbia University, has returned from his period of study abroad.

NOTES ON BOOKS AND PERIODICALS

"Seeds of Michigan Weeds" is the topic of Bulletin 250, Michigan State Agricultural Experiment Station, Division of Botany, (East Lansing, Mich.). That the bulletin is prepared by W. J. Beal is warrant of its excellence. It is an admirable production, describing and illustrating seeds of a very large number of more or less common weeds. Printed on a good quality of paper, the press work is excellent. All teachers who see it will recognize its usefulness.

"Rural School Efficiency in Kalamazoo County, Michigan," is the topic of a forty-page pamphlet prepared by Prof. Ernest Burnham, in charge of the Rural School Department of the State Normal School, Kalamazoo, Michigan. It is published by the State Superintendent of Public Instruction. It represents a very careful and intensive study of a local area and will be especially useful to students and supervisors of rural schools.

The Red Man (formerly The Indian Craftsman) is an extremely creditable monthly magazine by Indians issued from the Carlisle Indian Press, U. S. Indian School, Carlisle, Pa. As the publication states, it is "a magazine not only about Indians, but mainly for Indians". Mechanically, it is a most creditable piece of work and will compare favorably with any publication in this country. The mechanical work is executed by apprentice-students under the direction of the Instructor in Printing. The borders, initial letters, headings, cover pages, etc., are the work of the Native Indian Art Department. The subject matter is dignified and interesting.

School and Home Gardening is the subject of Bulletin No. 31 (1910) of the Bureau of Education, Philippine Islands. (Address Frank R. White, Director of Education, Manila. It prepares the way for the introduction to agricultural nature-study in the Philippine Islands, and gardening as herein outlined is prescribed for all elementary schools in the Islands. Admirably concrete and specific directions are given for the selection of site, fencing, planning the garden, choosing plants, keeping records, transplanting, disposition of products, culture of the common garden vegetables, decorative planting, etc. School and home interests are joined,—even to the extent that teachers should be required to inspect home gardens and report on them. This must be recognized as a part of the regular school work.

Prevailing conditions are accepted and control the teaching plan. Home made tools are urged. The local tool is the crowbar. In some provinces the gardens are tended wholly with a sharpened stick and watered by use of pieces of hollow bamboo. Individual ownership of garden plots is advocated. The bulletin is appropriately illustrated and will be found useful by all teachers interested in the school garden idea.

The Public School and the Prevention of Tuberculosis is the title of a paper by J. S. Lankford, M. D., (San Antonio, Texas, printed in the Texas State Journal of Medicine, March, 1910, and reprinted by the author. Dr. Lankford is an earnest advocate of the enlistment of school children in public health movements. In this paper, in addition to practical suggestions for school instruction against tuberculosis, he describes the great educational campaign against the mosquito as a disease carrier, conducted several years ago by the school children of San Antonio under his direction. The finest kind of nature-study is outlined here by Dr. Lankford.

The Rose Society (Benjamin Hammond, Secretary, Fishkill-on-Hudson, N. Y.) in its fifth annual Bulletin presents an attractive report of its meeting and exhibition, including papers on rose culture, etc.

The Landscape Beautiful. By Frank A. Waugh. Orange Judd Co., N. Y. Pp. 336. $2.00 net.

This is an artistic production on the part of both author and publisher. The "Program of Essays" includes such chapter topics as "On the Relation of Landscape to Life", "On the Ministry of Trees", "On the Weather", "On the Art Which Mends Nature", "On the Ownership of Scenery", and others of equal suggestiveness. The author knows landscapes and makes us appreciate them with him from his many points of view. The book is generously illustrated from photographs of unusual merit contributed by members of the Postal Photographic Club. Printing and binding are beautifully done, in keeping with the character of the text, and suggesting the use of the volume as a gift book. The last chapter, "Suggesting Some Practical Applications", gives detailed outlines for the use of teachers, based on the author's experience in organized landscape lessons for the schools. The book is a contribution to the literature of nature-study and of art.

F. L. C.

Wilderness Pets at Camp Buckshaw. By Edward Breck. Houghton Mifflin Company, Boston, 1910. Pp. 240. $1.50 net.

Those in whom the race instinct for domesticiation of wild animals still lingers—and their numbers is legion—will be interested in this new book of pets, which tells the story of bear, moose, gull, loon and other friends invited in from the wild. The chapters are well written, and there is every evidence that the author is both a naturalist and essayist. The illustrations are admirable and the volume is in every way attractive. Young and old will enjoy it.

The Teacher and the School. By Chauncey P. Colgrove. Charles Scribner's Sons, N. Y., 1910. Pp. 406.

More than ever before, the "loving guild of teachers" is taking up the serious study of its professional problems and endeavoring to make genuine scientific advance. Either as cause or effect, or as both, we note an increasing number of books dealing with the various phases of educational effort. The author of this book is the head of the Department of Professional Instruction in the Iowa State Teachers College. He addresses those who aspire "to become good teachers, and always better teachers". The aim of this volume is not technical, but practical, and the book is already recognized as a useful contribution to the literature of education.

Methods of Attracting Birds. By Gilbert H. Trafton. Houghton Mifflin Co., Boston, 1910. Pp. 171. $1.25 net.

Birds are probably the most attractive of all our wild creatures. They have coaxed many a person into field and woods who had hitherto never responded to any of nature's appeals,—but here is a book which gives us full directions for bringing the birds to our very doors and windows. The author, who is the Supervisor of Nature-Study in the schools of Passaic, New Jersey, has long been prominent in the nature-study field, and this volume represents his especial interest. It will be of particular service to teachers, as the author has had much experience in encouraging and directing school children to make genuine invitation to feathered friends. The work is thorough, the material concrete, the illustrations appropriate. The chapter headings are: "The Need and Value of Attracting Birds"; "Nesting-Houses"; "Attracting the Winter Birds"; "Drinking- and Bathing-Fountains"; "Planting Trees, Shrubs, and Vines"; "Bird-Protection in Schools"; "Bird Photography". An index is a useful feature.

BOOKS RECEIVED

SILVER, BURDETT AND COMPANY.

Sociology, Its Simpler Teachings and Applications. By James Quayle Dealey.

ALLYN AND BACON.

The Principles of Chemistry. By Brownlee, Hancock, Fuller, Sohon, Whitsit.

FERGUSON PUBLISHING COMPANY, Sherman, Texas.

Elementary Principles of Agriculture: A Textbook for the Common Schools. By Ferguson & Lewis.

LONGMANS, GREEN AND COMPANY.

Elementary Chemistry. By Hollis Godfrey.

HENRY HOLT AND COMPANY.

Principles of Physiology and Hygiene. By George Wells Fitz, M. D.
Botany for High Schools. By G. F. Atkinson.
Physiology of Man. By Anne Moore, Ph. D.

D. APPLETON AND COMPANY.

An Introduction to Agriculture. By A. A. Upham .

ORANGE JUDD COMPANY.

The Landscape Beautiful. By Frank A. Waugh.
The Study of Corn. By Vernon M. Shoesmith.

BLAKISTON'S SON & COMPANY.

Elementary Zoology. By T. W. Galloway.
Field Zoology. By Lottie E. Crary.

EDUCATION PUBLISHING COMPANY.

Stories of Rocks and Minerals. By H. W. Fairbanks.
Stories of Our Mother Earth. By H. W. Fairbanks.

HOUGHTON MIFFLIN COMPANY.

Wilderness Pets at Camp Buckshaw. By Edward Breck.
Home Geography for Primary Grades. By H. W. Fairbanks
Methods of Attracting Birds. By Gilbert H. Trafton.

AMERICAN BOOK COMPANY.

Birds Throughout the Year. By Albert Field Gilmore.

THE MACMILLAN COMPANY.

Diseases of Economic Plants. By Stevens and Hall.

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THE

NATURE-STUDY REVIEW

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OFFICIAL ORGAN OF

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THE
NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

VOL. 6 DECEMBER, 1910 NO. 9

AMERICAN NATURE-STUDY SOCIETY
FOURTH ANNUAL MEETING, DECEMBER 30, 1910

The fourth annual meeting of the A. N.-S. S. will be held Friday, December 30, 1910, at Minneapolis, Minnesota, in connection with the meeting of the American Association for the Advancement of Science and the many affiliated societies which convene with it. It is hoped that the attractions thus offered, together with the nature-study interest of the twin cities, will serve to draw the largest attendance in the history of the society. The place of meeting is Room 308, Folwell Hall, University of Minnesota. Two sessions will be held.

PROGRAM

9:15 A. M., Friday, December 30. Room 308, Folwell Hall

Topic: "The School Garden as a Nature-Study Laboratory"
9:15-10:00—"The Work in Minneapolis and St. Paul" (Illustrated)
10:00-10:30—Business—including election of officers
10:30-11:00—"The South Chicago School and Home Garden Work" (Illustrated)
11:00-11:15—"School Garden and Greenhouse Work in St. Louis" (Illustrated)
11:15-11:45—Discussion of the general topic

2:00 P. M., Friday, December 30. Room 308, Folwell Hall

Topic: "Natural History Museums in Relation to Nature-Study Instruction"
2:00-2:15—"The University of Chicago, School of Education, Plan," I. B. Meyers
2:15-2:45—"The St. Louis Plan" (Illustrated), J. A. Drushel
2:45-3:00—Discussion
Topic: "The Organization of Nature-Study"
3:00-3:30—"Our Present-day Outlook into the Teaching of Nature-Study," I. B. Meyers
3:30-3:45—"The Standardization of Nature-Study," Fred L. Charles

3:45-4:15—"The Organization of the Course in Elementary Science for the Grades," Otis W. Caldwell

4:15-4:30—Discussion

Adjournment

None of the formal papers will occupy more than the alotted time, and some of them may be shorter. Members are asked to come prepared to contribute to the discussion of the various topics.

NOMINATIONS FOR OFFICERS FOR 1911

As provided by the constitution, the Council has made the following nominations for officers to be elected at the annual meeting:

For president—B. M. Davis (Ohio); M. A. Bigelow (N. Y.).

For vice-presidents (vote for five)—D. J. Crosby (Wash., D. C.); F. L. Stevens (N. C.); B. M. Davis (Ohio); S. Coulter (Ind.); G. H. Trafton (N. J.); F. L. Holtz, (N. Y.); H. W. Fairbanks (Calif.).

For directors (vote for five)—J. Dearness (Ontario); Anna B. Comstock (N. Y.); Ruth Marshall (Ill.); O. W. Caldwell (Ill.); I. N. Mitchell (Wis.); E. B. Babcock (Calif.); M. A. Bigelow (N. Y.).

As announced in the November issue, members unable to attend the meeting have the privilege of mailing their ballots, before December 15, to the Secretary, American Nature-Study Society, Urbana, Illinois. Seal ballot in envelope marked "For Officers, 1911."

THE NATURE-STUDY REVIEW

For the year 1911 the Nature-Study Review (official organ of the A. N.-S. S.) will continue the publication of *special teaching numbers*, a plan which has met with general approval during the year now closing.

The NATURE-STUDY CLUB OF CHICAGO is planning a notable rally for the first annual meeting of the club. The year has been a successful one, with several enthusiastic meetings and excursions of each of the three sections of the club. The annual meeting will be held in February at some easily accessible hall, probably the Art Museum, and a fine program is in preparation. A big attendance is looked for and a corresponding increase in membership.

THE WEATHER AS NATURE-STUDY

By JOHN DEARNESS, Normal School, London, Canada

It is difficult to name a subject better suited to heuristic study than weather. In the latitudes of nearly the whole extent of the United States and the settled parts of Canada there is a constant easterly procession of pressure waves modified by various and continually varying local influences affording opportunity for observation and comparison of daily, sometimes hourly, changes in the motion, temperature, density and humidity of the atmosphere.

Most subjects have their appropriate seasons—some are best studied in winter, others should be taken in summer—but weather is always with us. Some topics require material that can be obtained only in the city, others what is easily accessible only in the country, but weather is everywhere. Some lessons have to be taught by observation in the narrower sense of the term, others by experiment, but weather lessons lend themselves to treatment by both methods. Certain nature studies are selected on account of their training value, others because they are strictly utilitarian; weather study admirably exercises the observing and reasoning powers, and skill in predicting changes will often prove highly useful. Whenever two or three are gathered together, though they discuss nothing else they comment upon the weather. Who is too young, when is one too old, to take an interest in rain and shine, in heat and frost, in storm and rainbow? No grade in school is too young to observe certain phenomena of wind, temperature and cloudiness; and no grade too advanced to profit by examination of the train of causes and effects exhibited in any week of changeful weather. The subject can be studied by the nature method indoors or outdoors, at school or at home, with or without scientific apparatus. In short, it is suited to all classes, all seasons, all places.

It is needless to say that there are different ways in which weather as a subject of study may be treated. A convenient one, even though the regular time for nature-study be, say, the last half-hour of the forenoon, is to require the observations to be made during the morning walk to the schoolroom and the reasoning and expression to be done in the first few minutes after the opening exercises. The last two, or all the stages, may be assigned to individuals or groups of pupils in turn, or all the class may observe and report for a fortnight or longer and again resume the study after the lapse of a month, more or less. The records may be made in sentences or in prescribed tables, each pupil who can write making and keeping his own, or they may be scheduled on the blackboard or wall chart as coöperatively agreed upon.

Equipment in the way of instruments for measuring temperature, pressure, etc., will vary in different schools in number as well as in value, in cost from two or three dollars to as many hundreds, but good work may be done in the absence of any instrumental equipment; and indeed whether there be instruments or not the inexperienced observers should express their observations in "adjectives" rather than in exact numerical relations. The terms "very cold," "cold," "cool," "temperate," "warm," etc., used properly by the child to express his sensations of temperature are more educative than if he stepped to a thermometer and reported the "standing of the mercury." It is an important pedagogical rule that he should learn the significance of readings upon the various instruments by approaching them with judgments expressed in "adjectives" and later by estimated readings formed directly from observation of the phenomena.

Experience has shown that a class of children in the primary grade has enjoyably and profitably used the following schedule, although many teachers might prefer it in simpler form for

Date	Hour	Temperature	Wind		Clouds		Precipitation		Special Observations	Probabilities
			Direction	Velocity	Kind	Amount	Kind	Amount		

beginners. Against the objection that the terms used in the headings are too technical and difficult, it may be said that if they are used judiciously at first the children soon come to understand them and employ them correctly themselves.

Suppose the schedule has been ruled on the blackboard. Immediately after the opening exercises the teacher will conduct a class discussion of the entry to be made in each column. It may be agreed that the temperature is *very cold;* the direction of the wind, *northwest,*—its velocity, *hardly any;* the kind of clouds, *high and thin,*—the amount, *all over the sky;* rain-fall or snow-fall, *none;* special observation, *sun-dogs last night;* probabilities, *warmer tomorrow.* "Why do you think it will probably be warmer?" "Because the last time we had high, thin clouds all over the sky they became thicker and it got warmer and turned to snow." (The italicized words are the ones which should be written in the columns.)

It need not be discussed whether such words and phrases are sufficiently exact and appropriate. At first the language will be less scientific even than the examples quoted, but with experience, under right guidance, the learners will make satisfactory progress in the use of right terms. The effort to get the appropriate term tends to clarify the judgment. Every teacher must have observed the pleasure it affords children to use new words, especially when they are long ones.

For intermediate grades a column may be added for atmospheric pressure. This should be preceded by an elementary study of buoyancy and of the physical relations of water vapor and dry air. The observation is made upon smoke from a chimney and may be recorded in a phrase or by a drawing of a curl of smoke showing its relation to the line of the chimney-top. Without understanding the reason, children may infer from repeated observation that rain is indicated by falling smoke. It is a question whether it is worth while introducing the observation before the observers are capable of understanding in some measuse the reasons for the phenomena.

In a school moderately well equipped with meteorological instruments, the higher grade pupils may profitably make individual records of:

I. Date
   Hour

II. Temperature
 (a) Dry-bulb thermometer
 (b) Wet-bulb thermometer
 (c) Maximum since previous reading
 (d) Minimum since previous reading
III. Humidity
 (a) Difference between dry and wet bulbs
 (b) Dew-point
 (c) Saturation percentage
IV. Pressure
V. Wind
 (a) Direction
 (b) Velocity
VI. Cloudiness
 (a) Kind
 (b) Amount
VII. Precipitation
 (a) Kind
 (b) Quantity
 (c) Duration
VIII. Dew
 Hoarfrost
IX. Sunshine
 (a) Hours of daylight
 (b) Intensity
X. Remarks—unusual phenomena
XI. Probabilities

TEMPERATURE AND HUMIDITY. For the junior grades the adjectives "very hot," "hot," "warm," "temperate," "cool," "cold," "very cold," may be used. For other reasons than for use in nature lessons every schoolroom should have a thermometer. An additional one with exposed bulb which may be covered with cotton batting, dipped in water and swung around in the air or kept stationary with the free end of the cotton immersed in a bottle of water, will serve for a wet-bulb. Tables can be obtained from the meteorological stations giving formulae and ratios for working out the dew-point and the percentage of saturation. Maximum and minimum thermometers which may either be combined, as in Six's pattern, or separate—for nature-study I prefer the latter—must be purchased. Dealers in greenhouse or poultry supplies usually carry a stock of cheap hygrometers and thermometers of all kinds.

PRESSURE. The smoking chimney has already been referred to. The barometer should be introduced as soon as the pupils can be brought to understand its principle and action. For the study under discussion, one made in the schoolroom with a glass tube about thirty-two inches long, three-eighths to a quarter of an inch in diameter, and about a dollar's worth of mercury, is preferable to the expensive instrument made at a factory. The open end of the tube may rest in a bottle of mercury,—the tube itself maintained in the erect position by two or three tape-straps holding it against the framing of a window. The graduation may be a ruling in inches and eighths or tenths, or metric, as preferred, on a strip of paper placed on the board behind the glass tube. It is not important that the scale be placed exactly at the right height since it is the rising and falling of the column, and rate of change rather than its absolute length, which are noteworthy. Barometric observations should be discussed in connection with those made upon the ascent of smoke, the altitude of birds and insects in flight, the reported feelings of rheumatic people, the poise of certain tree-leaves, etc.

ATMOSPHERIC MOVEMENTS. The direction of the wind is easily inferred from its effect upon clouds, smoke, dust, and tree-branches, and these should be observed even when a vane is visible. It is not diffcult to make a good wind-vane from two thin boards, 6"x24", joined at their ends at an angle of 22 degrees, and poised to revolve on a central cross-piece where it can catch the wind in every direction.

The velocity of the wind may be very well expressed in adjectives, those in common use being:

Calm—Imperceptible movement.

Light—Moving leaves of trees,—1 to 5 miles an hour.

Moderate—Moving slender branches,—6 to 10 miles an hour.

Brisk—Moving large branches, raising dust in the road,—12 to 18 miles an hour.

High—Swaying trees, raising loose objects, as twigs,—20 to 30 miles an hour.

Gale—Breaking branches, loosening old fence-boards, difficult to walk against,—45 to 60 miles an hour.

Hurricane or Tornado—Sweeping everything before it,—80 to 200 miles per hour.

Directions for making a simple anemometer are given in a pamphlet to be had from the Department of Agriculture, Washington, D. C.

Cloudiness. The four simple forms of cloud are called respectively: *cirrus*—high, thin, feathery, fish-scale, flaky, veil-like; *stratus*—layers, stratified, or even banked with long horizontal edges on the lower side; *cumulus*—mound-like, flat-based fleeces, thunder-heads, the mountains of cloud-land; *nimbus*—shedding rain or snow. These terms are combined—*cirro-stratus, strato-cumulus, etc.*— to describe mixed or transitional forms. In weather-predicting, each kind has its own significance, but this is not the same in all parts of the country.

The amount, that is the proportion of the visible sky, covered with clouds is approximated and reported in quarters or tenths.

After the start is well made, cloud study becomes more and more interesting. Do not be too easily discouraged at first.

Precipitation. Kinds of precipitation are rain, snow, hail, and sleet. The quantity may be reported in adjectives, as "light," "moderate," "heavy,"—or in inches if one has a rain gauge. A funnel ten square inches in area at the mouth set in a tube of one square inch in cross section inserted in a piece of ordinary conducting pipe a foot or fifteen inches long closed at the lower end, makes a cheap and serviceable rain gauge. The inch-tube may overflow at the top into the conducting pipe or through a perforation near the top. Snow may be caught in an oblong box and depth in inches measured, or it may be melted and measured in the rain gauge, taking into account the area of the catching vessel.

Sunshine or Insolation. Once a week is frequent enough to make entries in this subdivision. The hours from sunrise to sunset may be reported from the almanac, but preferably from observation. To measure intensity use an insolator at twelve o'clock noon. To make it, obtain a wooden tile with square or oblong cross-section, or remove the ends from a wooden or pasteboard box. Poise it on a horizontal surface in such position that the sun's rays will pass through it parallel to the sides of the box. The ratio of the area of the cross-section of the box to that of the illuminated surface within the sharp-lined shadow cast by the walls of the box is a measure of the intensity of the sunshine as compared with vertical insolation.

A useful exercise is making a "curve" of intensity with measurements taken at each hour from 9:00 A. M. until 4:00 P. M.

UNUSUAL PHENOMENA. These will include coronas, fogs, rainbows, auroras, mirages, hailstorms, first snow-falls, floods, etc.

PROBABILITIES. Speculating on the effects of observed conditions taken in connection with the use of the daily weather-maps opens a field that would require another chapter to review.

THE USE OF WEATHER MAPS AS SOURCE MATERIALS

By C. H. ROBISON, Department of Nature-Study and Geography, State Normal School, Upper Montclair, New Jersey

If a public school is favored with a daily Weather Bureau service, the maps are too often looked upon by the pupils as a thing of mystery, and by the teacher as so much rubbish when two days old. The best kind of laboratory work can be done with these maps by pupils long before they can make any sense out of the treatment of the topic, weather, as found in many of the grammar school geographies.

These maps should be saved for future use. When a large number have been accumulated, they may be culled over, the representative ones picked out to show well developed "highs" and "lows" respectively, and the others used to show progressive weather changes through a short series of consecutive days. These representative maps might form the basis of several lessons. Thus, one or two days should be given up to simple explanations of the facts that air occupies space and exerts some pressure—upwards as well as downwards. The demonstration of these facts calls for nothing more elaborate than a dish, a fruit jar, a tumbler, and a straight lamp chimney.

The first lesson with the weather maps may well confine itself to a discovery, from examination of the maps, of the fact that the winds of a general storm travel about the center contrary to the direction of the hands of the clock; and that the currents tend inward rather than outward. There should be a map for each two pupils.

This lesson might well be separated from the second lesson on the weather maps by a demonstration of the convection of air currents by means of the time honored but effective apparatus consisting of two lamp chimneys standing over perforations in the lid of a box, and a candle burning in one chimney to draw the smoke from burning smudge held over the other one. This will clear up the mystery of the attraction of the winds to the center, even though it does not explain the rotary motion. Water poured through a funnel or escaping through the exit of a stationary wash basin illustrates this movement (in a downward fashion) though not explaining it either.

A second examination of the weather maps will furnish a good occasion to call attention especially to the winds flowing from the south toward the center of the low, and to the decided northward trend of the heat lines in the same general region.

The region precipitation might be taken up in the same or in a closely succeeding lesson. Weather-map studies will probably be made in the winter months. The lows are more decided then, the sequence of cold waves is more noticeable than at any other time, while blizzards always arouse attention. Then Feburary and March bring in those peculiarly elongated isobars, the "troughs" with the frequent tornadoes in their southeastern quadrant. If a number of maps have been accumulated through several years, with the tornadoes marked on them in blue pencil, as reported by the press, the series will have especial meaning if brought out when some notable storm devastation is described by the newspapers.

After a thorough study of the lows, less time will be necessary to grasp the essential features of the highs.

Reference was made earlier to series of maps showing the eastward movement of storms. This should be accompanied by a discussion of the relation of trades to anti-trades, the lag of the former and the drag of the latter, how the anti-trades serve to pull the cyclonic disturbances eastward. Probably the effect of the rotation of the earth in causing these is the least understood by the teachers themselves of the many misunderstood points of mathematical and meteorological geography. If the question of rotation and its effects be the starting point, it is probably dull to the last degree. However, if it is a last resort to account for conditions we all know and recognize as highly important in our every-day lives, it takes on an added interest.

The United States Department of Agriculture has just issued as Separate 505 the article in the 1909 Yearbook on "How Farmers May Utilize the Special Warnings of the Weather Bureau."

WEATHER RECORDS IN THE LOWER GRADES

By FRED L. CHARLES, University of Illinois

Continuous weather study throughout the eight grades may develop into a routine, but there is much that can be done each year without repetition or monotony. In the primary grades with which the writer has had to do, the pupils have learned the cardinal points, direction of winds, forms of water as affected by heat or "cold", nature and movements of clouds, simple reading and interpretation of the thermometer, identification of north star, dipper, Orion and the milky way, phases of the moon, variation in shadow length (noon angle), sunset point and length of day, and the panorama of the seasons as characterized by familiar nature phenomena and the dependent activities of men.

A simple and satisfactory primary weather record consists of a cardboard wall chart (22 x 28) upon which is ruled in large squares the calendar form for the month, with ample margin allowing a design and quotation appropriate to the month and chosen by the class. In opening exercises or in the nature-study period a child places in the square for the day a disc of colored paper—yellow for clear (sunny), gray for cloudy, purple for rainy and sprinkled with "diamond dust" for snowfall. Later, if desired, observations may be made twice daily, using half circles when the weather has changed at noon, thus dealing with fractional parts. When wind direction has been mastered, it may be represented by a red paper arrow placed upon the day's circle and flying with the wind. If the chart hangs upon the north wall, and is laid flat when the arrow is applied, the mapping of the direction will be easy and natural. A wind striking the east window will carry the arrow across the chart from right to left, etc., and the direction scheme will soon become automatic. North will doubtless be associated with cold, the sunny south with warmth, and the prevailing wind will soon become apparent. This chart work may be continued throughout the entire first year, serving to fix the days of the week, the name and character of the month, the seasons, holidays and birthdays.

A step in advance is the construction of an individual weather record which at first may consist of a ruled form, one inch by five, allowing an inch square for each of the five school days of the week. The "kind of day"—clear, cloudy, rainy or snowy—may be indicated by colored crayon (using color key as on wall chart) or the adjective may be written in the space for the day. The flying arrow indicates the wind, as on the wall chart, or the direction of the wind (named, of course, from its source) may be written.

The reading of the thermometer is easily acquired by pupils who can "count to one hundred". An alcohol thermometer with the liquid brightly colored is preferable to a mercury tube, and a large instrument with large degree spaces—such as is often employed for advertising purposes—has evident advantages for work with children. Relative terms may be used at first, but for a short time only, to characterize the height of the column; and the Fahrenheit scale is developed upon the blackboard, the pupils representing thereon the position of the mercury for the day. A still better plan is to prepare a large cardboard panel on which a thermometer bulb and scale are pictured, the bulb being colored red and the scale black. A strip of red "baby ribbon" representing the column, disappears through a slit in the bulb and is attached behind the cardboard to a white strip which passes through a slit at the upper end of the scale where, attached to the red piece, it completes an endless bi-colored belt which can be adjusted daily by the pupil to picture the temperature reading for the day. The white ribbon is "invisible" upon the scale, and the end of the red ribbon indicates the top of the column. This device is easily manipulated and is useful in drilling the class upon the reading of the instrument. A few observations, in winter time, suffice to fix in the mind the freezing point and the temperature suitable for the room. The increased temperature due to the entrance of a number of warm human bodies into the room is a point of interest and affords an approach to studies of ventilation, body temperature, "warm-blooded" and "cold-blooded" animals, hiberation, and related topics.

By picturing a series of five thermometers upon a common horizontal scale drawn across the board, representing the readings for five consecutive days, and then drawing a line connecting the tops of the columns, a picture of the temperature for the week (temperature curve) is developed. The writer has conducted this exercise with a third grade class with the result that in a twenty-minute lesson every pupil quickly grasped the idea of the graph and eagerly interpreted different types of temperature curve drawn without any supporting scale. Thus, from a horizontal line is read "a day in which the thermometer stayed the same all the time," while a curve indicating a mid-day maxi-

WEATHER BOOK

For the week of

....

Prepared by

....

....................................School

.......................Grade

....................................Instructor

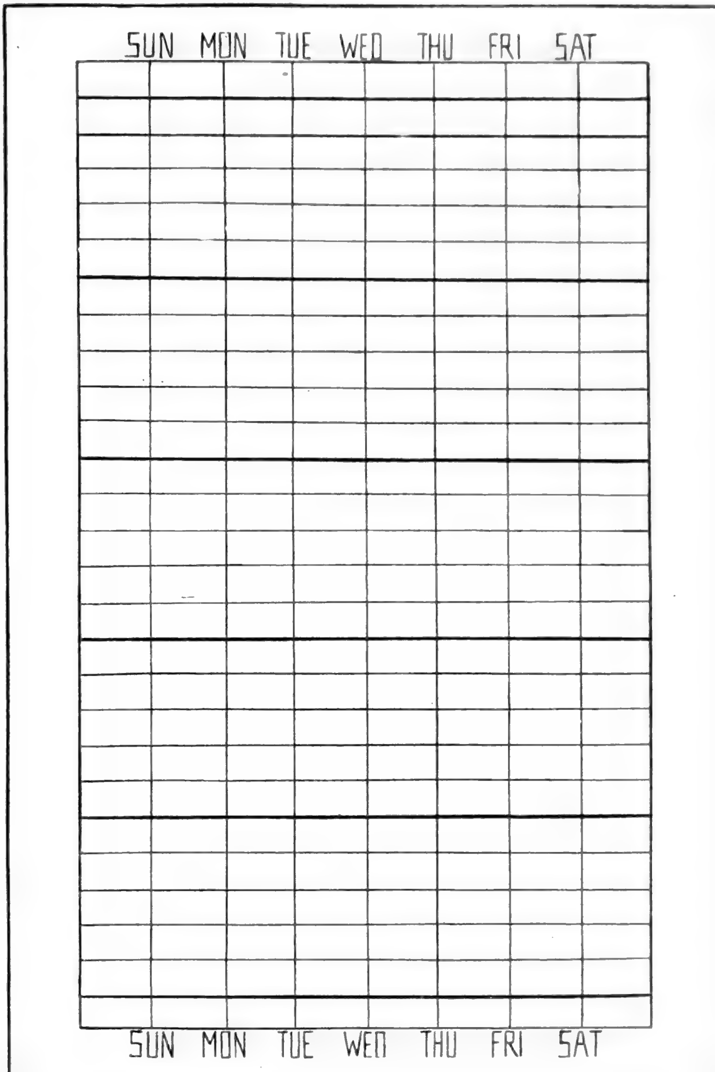
DAY	TEMP	WIND	KIND OF DAY	LENGTH OF DAY HOURS	MINUTES	NOON SHADOW	
SUN							
MON							
TUE							
WED							
THU							
FRI							
SAT							

............Clear Days ....Cloudy Days

............Rainy Days ....Snowy Days

Prevailing Wind ....

Increase—Decrease in Day's Length......................



Warmest Day ....

Coldest Day ....

Pleasantest Day ....

Hour of Observation ....

Nature Notes

SUNDAY

MONDAY

TUESDAY

WEDNESDAY

THURSDAY

FRIDAY

SATURDAY

SUGGESTIONS: Use this book in fourth and fifth grades. On first page make picture illustrating the week's weather or some feature of the nature-study work and below it write an appropriate quotation. Correlate drawing, literature, number and language with the science. Record data each day, but draw entire curve only on Monday of succeeding week; take record Saturday and Sunday at home. Devote nature-study hour on Monday to this book. Use ink if possible. Under "Nature Notes" record observations of birds, insects, trees, flowers, dew, frost, moon, stars, etc. At end of month bind the four books together with appropriate cover.

mum signifies a day that "got warmer all the time until noon and then it got colder all the rest of the day." When the elements of the graph have been mastered by individual practice in plotting curves from original data, a printed weather blank for the week may be given to each pupil, on which data are recorded daily, while the summary and graph are made out on the following Monday. Classes in fourth and fifth grades will profit from such records maintained for one or more months,—not too long, and preferably in the winter, when outdoor studies are less insistent. The average temperature for the week is a desirable datum where mathematical advancement allows.

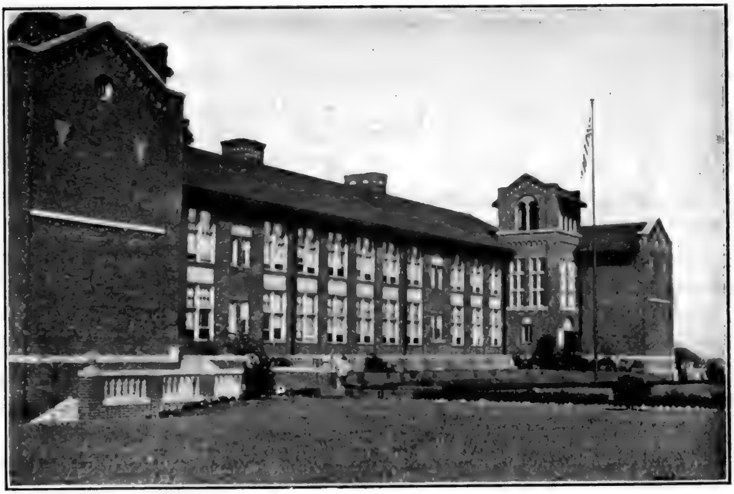
A "weekly weather book" form prepared and used by the writer is given on the four preceding pages. Directions for its use are found on the fourth page. A more detailed "monthly weather book" involving additional observations, including barometer readings, is used in the upper grades.

AT THE NATURE-STUDY CONFERENCE held at the University of Illinois last spring, Prof. C. S. VanDeusen, of Bradley Polytechnic Institute, Peoria, presented his coöperative plan for introducing manual training into the one-teacher rural schools. Briefly, his proposition is that twenty-five schools shall combine to employ a supervisor who shall plan the course, provide material, have general care of the equipment, provide typewritten instructions, and personally direct the work, visiting each school once a week, at the rate of five schools daily, allowing one hour for travel between schools. The estimated cost per school is $60.00. "I believe," says Mr. VanDeusen, "the farmers would pay that much in order that their colts might become better horses, and I also believe they will do that much in order that their boys may become better men." Where consolidation is out of the question, this coöperative plan distributes simple equipment among many schools and transports the supervisor instead of the pupils. Mr. VanDeusen exhibited the model equipment which he has devised, and at the conclusion of the conference he presented it, in the name of his institution, to the rural equipment museum of the department of Agricultural Education of the University of Illinois.

APPLIED GARDEN LESSONS IN A CITY SCHOOL

By LEWIS M. DOUGAN, Principal Shaw Public School, St. Louis, Mo.

If the reader would get the significance as well as the facts of the garden work in the Shaw School, let him imagine a superb new building on a five-acre site overlooking in the distance a half-dozen smoke-belching factories for the manufacture of clay and iron products; nearer by, the small houses of the workers in these industries, many of them not long since from Italy or Sicily. Let him fancy miles of unpaved and unsewered streets intersecting the district, and on every hand vacant lots waiting for other civic improvements to catch up with those of our progressive Board of Education. Meanwhile let these lots be overgrown with the flora of the waste place, a tangle of bidens, goosefoots, amaranths and cockle-burs. In striking contrast, let there be within the district boundaries the beauty spot of the city,



SHAW PUBLIC SCHOOL, ST. LOUIS, MO.

the Missouri Botanical Garden, and within easy walking distance, the two largest and most beautiful parks in the city—lands almost unknown to some people in the district. Let most of the rich black soil be scraped from the site, and in the yellow subsoil thus exposed let shrubs and trees be planted in the park-like design. How to develop this large school site and make it help to fit for life the children of this semi-foreign, semi-rural community—this has been our problem.

Our plan has been during the past year to use garden lessons (1) to stimulate interest in the school and greater regard for school property by creating a sense of proprietorship, (2) to beautify the grounds so that they may become an example for the neighborhood, (3) to teach the children how to beautify their own homes by cultivating neglected bits of ground, (4) to develop such a taste for garden work as may make it an avocation in later years.

Last October the head gardener for the Board of Education supplied us with plants enough to fill a four-foot window-box for each room. With the study and care of these we began. Then when the cannas and salvias were removed from the large beds in front of the building, we began out of doors. The gardener supplied us with tulip and hyacinth bulbs sufficient to fill the vacant space and furnish work for the entire two hundred children in our second grade. An indoor lesson illustrated with diagrams on the structure of the bulbs, the correct position for planting and depth for covering, was given in each room. The diagram of the bed was put on the board exactly as laid out on the ground and under the teacher's direction the children did the planting. Bulbs lent themselves well to the instruction of little children in planting—downward growth of root and upward growth of stem—and each child, with a wooden label, marked his own for future care and observation. Some upper grade boys hauled manure to mulch and fertilize half of one bed. The other remaining uncovered, all had good opportunity to compare the spring growth on the two halves. Besides, it was good for the two sets of boys to be brought into coöperation.

During the winter our privet hedge was frozen to the ground, and when spring came and the buds started below, a class of fourth-grade boys with their jackknives cut out all the dead twigs, besides clearing away the rubbish. A little later a group of eighth-grade boys, with the help of a man assigned by the head gardener to have general care of the grounds for the summer, cut and hauled sods to cover a spot as large as a schoolroom. This spot, in the angle between two walks, had, because of poor soil and much tramping, utterly refused to grow grass. Now it is a beauty spot and scarcely a foot has stepped on it this fall.

When Arbor Day came, our seventh and eighth grades planted new groups of shrubbery partly furnished by the Board's gardener and partly donated by the Missouri Botanical Garden. They also replenished the older groups where shrubs had died.

This taught not only the method of planting but something of landscape design. Several shrubs and trees of their own digging and contribution were planted by other pupils, and this fall we plan to dig and plant a group of native trees as a basis for a wild garden. But the best exercise of all was the cutting out of docks and plaintain with knives and the pulling out of peppergrass and shepherd's purse by the roots. Practically the whole school took part and now they not only know those weeds and one way to get rid of them, but they know them no more in the lawn (at least for one season). Incidentally, too, they have learned the difference between annuals and biennials. Shortly afterward, a class of girls planted two dozen dahlias and assumed the care of them after a lesson had been given indoors comparing potatoes,

FIRST GRADE CLASS GATHERING PEAS FROM VEGETABLE GARDEN
SHAW SCHOOL, ST. LOUIS, MO.

dahlias, bulbs, and other underground parts. Just now, October 12, with most vegetation fading, the dahlias are still blooming and the foliage is fresh and green.

Both vegetable and flower seeds furnished by the U. S. Dept. of Agriculture were distributed to the pupils in the lower grades with explicit directions how to plant the seeds and care for the growing plants. This fall we have had oral and written reports on the success attending their efforts. We feel sure that some of the seed was wasted: we feel equally sure that some brought forth several fold.

Our vegetable garden work has consisted almost entirely of class exercises in planting and cultivating the more easily grown crops, such as radishes, turnips, beets, tomatoes and corn. The soil has been lumpy, ill-drained and subject to erosion from the paved playground above, and we have had some of the "bad luck" of the poor farmer on a poor farm. The children have, however, seen the erosion prevented for the future and are learning how to drain and improve the soil. The leaves and clippings from the lawn are piled to rot and make humus which will next spring be incorporated with the soil. On one patch we planted corn. This we cut October 1st, and now the ground is green with rye to be turned under next spring. A typical exercise is shown in the accompanying photograph. First-grade children are picking string beans under the teacher's direction, while those standing up are collecting the pickings in standard half-bushel measures. The beans are then taken to the schoolroom where the quart, peck, half-bushel and bushel are taught in regular course, and each child measures out and takes home a quart for himself. The next day, problems involving these measures, the market price of beans and the numbers taught in the current work of the class are given by the teacher. Throughout the school we have made a study of weeds with reference to the good or harm they do and the best methods of eradication. We are now making collections for comparison with the farm and garden seeds which they resemble. Besides, we make frequent excursions to the Botanical Garden to observe there many things impracticable for us to grow.

Of gardening in individual plots, or of growing the more difficult vegetables, we have as yet done but little. Being a part of a big city system, we must be governed by the course of study which prescribes but one period per week for nature-study in all its branches. We have, therefore, done much of our work out of school hours, and shall continue the plan. As for results, we have improved the grounds and taught the children something of a sense of proprietorship in them. The English language, too, is coming in for increased respect. For any appreciable effect on the homes, we shall need more than one year. For ourselves, we have learned that garden work needs to be graded with reference to the mental as well as the physical capacity of the child. Provided with the small hoes, rakes and shovels such as we use, the children of the primary grades can easily do all the work of growing beets, turnips, radishes, lettuce, string beans. For certain crops like potatoes, tomatoes, cabbages, celery, cucumbers, and all crops subject to disease or insect pest or requiring special treatment, greater maturity is required. We are convinced that the pupil who has eight years of experience with well adjusted and supervised garden work will emerge with a fair knowledge of the principles of gardening and, accordingly as he chooses, an avocation or a vocation.

AUTUMN OBSERVATIONS ON THE ENGLISH SPARROW

By PHOEBE BRANDENBURG, Student in the Brooklyn Training School for Teachers

(EDITOR'S NOTE: This manuscript was not written for publication but was submitted by the instructor as an instance of what an amateur observer may do.)

One day I passed a church, one whole side of which is covered with Japanese ivy. A whole community of sparrows with a population of about three hundred live here. The leaves of the ivy had fallen off. I attempted counting the nests, mere bunches of straw stuck between the branches, upon the window-sills, or under the iron coping. There were at least two hundred.

I should never have thought to look for sparrows on the side of the building unless I had been attracted by their great noise. I have become acquainted with the sparrows' voices most disagreeably. They live near our house in a tall maple tree. In the mornings their voices are more efficient than an alarm clock in waking me. I tried to distinguish between the songs of males, females and young. The males have a harsh, tyrranical voice, as if they were ordering their households around; the females have a subdued, gossipy chatter; and the younger birds have a high-pitched chirp. The females sing very little; they seem to sing in the small intervals when the males are getting their breath.

I could distinguish between males, females, and young by their appearance. The males are more darkly colored; they have a black spot on the throat, the sides of the head are chestnut. The females are less brightly colored; the sides of the head and the breast are a light gray. The young can be distinguished by the bright plumage that has not been soiled by the dust of the streets, and the immature downy plumage on the breast and head.

The sparrows build their nests in the queerest places. I visited Prospect Park one day. I found a forsaken nest in a low rhododendron bush. Some visitor must have stuck a piece of paper on a twig, because a small piece of it was still hanging. Behind the paper, a sparrow had built a nest. It was simply a heap of straw placed upon a lump of mud struck in the crotch. There is also a shelter in the Park built with a circular thatched roof. Many sparrows have their nests here. They are simply deep holes in the thatch behind the strong beams. The gardeners have a very busy time repairing the roof. There is a pigeon house on our roof that is raised about a foot from the ground. Under this sparrows have built a nest. It is very unsightly, only a heap of mud with grass strewn on top. During a quarrel the straw was pushed off the mud, but the sparrows were too lazy to put it back again.

This is a convenient nest for the sparrows for they can feed on the ground corn, hemp-seed, and wheat that is fed to the pigeons. I sometimes feed them with bread crumbs, oatmeal, and barley. I attracted twenty-five birds at one time. Great numbers of sparrows visit the pigeon-house in the morning when the pigeons are fed. They eat so voraciously that there is hardly anything left for the pigeons.

The sparrows are great soldiers. They can be combined into a formidable army by a good leader. They did this once when I set the pan of hemp-seed on the ground while the pigeons gathered round.

The sparrows are fearless and impudent, afraid of nothing. They grab the corn from the pigeon's very mouth, although he is more than three times their size. I wanted to test how tame the sparrows are. They flew into the pan I was holding in my hand, but would not eat from my hand, although I stood very still and made no noise.

As I said before, the sparrow is afraid of nothing. When a car comes along the sparrow waits until he is only a foot from the fender before he flies away. I noticed a milkman's horse eating his oats one morning. The bag was nearly empty; the horse was so impatient because he could not reach the oats that he kicked. But there were sparrows under his feet eating the dropped oats. There is an old lady on our street who puts out part of a loaf of rye bread on the curb every morning for the sparrows. One morning a hungry cat breakfasted on the bread. One poor sparrow could not stand it. He flew up to a limb on the tree overhead, swooped down and snatched up a crump from under the cat's nose.

Sparrows are not as a rule quarrelsome except about the matter of food. One morning as I was feeding the pigeons I dropped a piece of bread about as large as the head of the sparrow which picked it up. He started to fly away when sparrow No. 2 intercepted him and tried to snatch it out of his mouth. Sparrow No. 2 swelled up to twice his size; his head and tail were erect. Every feather seemed to stand erect. His notes were high and shrill. The two sparrows flew after each other round and round in a ring, and then flew away until I could no longer see them. There was a very queer thing about this quarrel. A great many sparrows hopped around watching the prize-fight and cheering in the shrillest voices. Some of them were almost screeches.

EDITORIAL

Retrospect and Prospect

With the ending of 1910 the American Nature-Study Society is three years old. Through the energy and disinterested service of workers from Massachusetts to California the society has had a very successful year and has now the largest membership in its history. We trust that all who have joined our ranks during the last twelve months will remain with us. We believe that identification with the A. N.-S. S. will henceforth bring even larger returns than heretofore. We anticipate increased growth, solidarity and usefulness.

In closing Volume VI of the Nature-Study Review we complete its first year of publication since the transfer of its headquarters from New York to Illinois. By the terms of the constitution, the editor is chosen for a term of two years. The present policy of meeting, so far as possible, the practical demands of the individual elementary school teacher will be continued, while at the same time the journal will endeavor to function as a clearing house for matters of nature-study pedagogy and as a source of information concerning the progress of the movement and the activities of prominent workers. The editor expresses his gratitude to those who have so ably advised and assisted him, and bespeaks for the society and the Review that continued coöperation which is indispensable to genuine progress.

The Parent and Nature-Study

The biological view in education will be recognized as a prominent factor in the impending redirection of the elementary school curriculum. The animality of the human infant demands consideration as truly as—even more than—his spirituality. Physical needs are at first uppermost, and, contrary to common educational practice, they do not vanish with the introduction of the child to the schoolroom. His ante-academic days are essentially—save for the unfortunate denizens of congested cities—a six years' course in nature-study. Little brother to the birds and bees, playmate with flower and tree, romping with canine chum, his instincts find their setting most largely in the natural world. His attitudes are modified by contact with human companions and in these formative experiences the parent, directly and indirectly, exerts tremendous influence. Race-old native interest in following the activities of a harmless insect may give way to life-long fear through the suggestion of a companion child whose misguided parent has instilled a horror of those innocent creatures which do not figure in a classical education. Response to aesthetic forms is either encouraged or impaired before the age of formal schooling. Educative opportunities, without number, that make for future scientific attitude or attainment, present themselves to observing parents both before and after the school assumes its part in shaping development.

It should be apparent that the home can in no wise coöperate with the school to greater advantage than in promoting the foundations of nature-study. In its forthcoming volume the Nature-Study Review will present a series of articles which will assume, although not formally, the nature of a parents' department. Scientific elements in home activities and the nature interests of infancy and childhood will be considered from the point of view of elementary education. If we succeed in stimulating or guiding any educative effort in conservation of these precious early years the reward will be sufficient.

While entrance into this field has been under advisement for some time, we are prompted in part by the passing of one whose nature love and mother love combined to determine the activities and mold the career of another. Lives in which self is least in service can never die, and when the life finds its setting in the handiwork of the Creator the uplift is incalculable.

NOTES FROM OUR SECTIONS

St. Louis, Missouri. On October 8, the St. Louis Section of the A. N.-S. S. made a field trip to Chain of Rocks. About one hundred attended. The day was especially fitting for a tramp. While splendid opportunity for botanizing was at hand, the main feature was the physiography. A mile or so beyond Chain of Rocks a creek offered a fine example of glacial out-croppings and was full of geodes. All along the tramp the country was studied.

Our membership has been growing until we now number one hundred sixty members. All of them seem enthusiastic, for these field trips have been both valuable and enjoyable. Systematically planned as they are beforehand, there is a definite study all along the route.

On October 29, about fifty teachers made the Meramec Highlands trip. The objects were a study of autumn colors, work of frost, seed dispersal, and late blooming plants. Incidentally we covered also the physiography of a portion of that region.

An extension course offered by Mr. Drushel gives three hours in the field with the class every Saturday, the weather permitting. The title of this course is "Physiography of the St. Louis Area."

Elyse C. Crecelius, Secretary.

Chicago, Illinois. After a long and restful vacation and after the work in our schools was well under way, activities in the Chicago Nature-Study Club were resumed.

On September 24, as noted in the November issue of The Nature-Study Review, the club took its first field trip of the season, visiting Vaughan's nurseries and greenhouses at Western Springs. Since then the South Side Section has had three field trips: October 8, Roby, Indiana; October 22, Dune Park, Indiana; October 29, Fort Sheridan, Illinois. The West Side Section reports two field trips: October 15, Des Plaines River; November 12, Dune Park, Indiana. The North Side Section spent October 29 in tramping through the ravines in the vicinity of Glencoe, Illinois, and November 12, in walking through the Des Plaines River valley from Park Ridge to Des Plaines. At the latter place Dr. and Mrs. C. A. Earle entertained the section, serving a luncheon.

On both trips we have endeavored to recognize trees without their foliage, and inasmuch as the trips have been where oaks are plentiful, our energies have been bent in trying to distinguish the different species of *Quercus*. Mosses are also receiving attention.

December 13th, at the same place, Dr. Otis W. Caldwell, president of the American Nature-Study Society, will give an illustrated lecture for the members and friends of the North Side Section.

The club has had a number of accessions this fall, with the West Side Section leading in this respect.

EMILY C. WESTBERG, Secretary-Treasurer.

ROCKFORD, ILLINOIS. THE ROCKFORD NATURE-STUDY SOCIETY has enrolled nearly ninety names, twenty-two of whom are members of the national society. All members pay a tax of twenty-five cents for carrying on the work. The interest evinced last spring when the society was organized has been maintained in the meetings this fall. General meetings are held once a month. At the September meeting, the program was on the sphinx moths, and was led by the secretary-treasurer, Miss Genevieve Rice. At the October meeting, Dr. Matildo Castro, of Rockford College, gave a talk on mushrooms. The November meeting will have for its subject aquaria and vivaria,—the making, stocking and care, with demonstration material in the College biological laboratory.

Three sections have been organized. Mr. A. C. Norris, of the high school, is leader of the section in agriculture; he is organizing the work in school gardens. The plant study section, under the leadership of Miss Mary Knowlton, will study trees during the next few months. The bird study section, Miss Rice leader, expects to do some practical work in winter feeding of birds, besides the study of migrations. All of the sections include field work in their programs.

RUTH MARSHALL, *President.*

BERKELEY, CALIFFORNIA. In the approaching session of the California Teachers' Association, the nature-study section has been allowed two half-day sessions. For these the following programs have been arranged:

WEDNESDAY, DECEMBER 28, 1910

NATURE-STUDY

9:30—Address, Chairman E. B. Babcock

9:45—"What School and Home Gardens Have Done for Cleveland," G. H. McCollum, Supt. Cleveland Home Gardening Association

10:30—Discussion, "What Gardening Has Done for My School," Miss M. Magner, Mrs. Beatrice Wilmans

11:00—Annual Meeting California Branch of the American Nature-Study Society

Regular Order: (a) Reading of minutes; (b) report of secretary-treasurer; (c) admission of new members; (d) election of officers

Special Order: (a) Election of delegate to serve as a Director of the American Nature-Study Society (providing there are one hundred members in the California Branch by this date); (b) discussion of our relations to the national society.

THURSDAY, DECEMBER 29, 1910

AGRICULTURE

9:30—"Agriculture in City Schools," Dr. N. L. Gardner, Head of Biology, Department, Los Angeles Polytechnic High School

Discussion, J. A. Imrie

10:15—"Supervision of Agriculture Among Rural Schools," Miss Claire A. Healy, Teacher of Agriculture, Salinas High School

Discussion, C. A. Stebbins

11:00—"What Should be the Relation of Nature-Study and Agriculture in the Elementary School to High School Agriculture? What are the Aims of Each?" General Discussion led by Dr. Leroy Anderson, College of Agriculture, University of California.

E. B. BABCOCK, *President.*

CALIFORNIA ITEMS

In appointing JOHN W. WILKINSON SUPERVISOR OF AGRICULTURE AND HORTICULTURE in the San Diego city schools, the Board of Education seems to have made a fortunate choice. Superintendent McKinnon is encouraged over the outlook for this new feature of the work. An admirably definite and progressive plan for the garden work in each of the grammar schools and the organization of a boys' and girls' agricultural club in each school are two steps toward success already taken by Supervisor Wilkinson. San Diego is the first and only city in California to have a supervisor of agriculture.

THE CITY OF LOS ANGELES has also taken an important step in the direction of introducing agriculture, school gardens on a larger scale, and better nature-study, by the appointment of a special committee of four members of the teaching force for the express purpose of introducing garden work into every school in the city, and beginning the study of agriculture in the grammar grades in a rational manner.

AGRICULTURAL EDUCATION is to be given a separate section meeting in the Southern California Teachers' Association, which meets in Los Angeles the third week in December.

AGRICULTURE AS A SCHOOL SUBJECT has been introduced into the grammar grades of all schools in the ten counties of southern California. All this means a more urgent need for adequate instruction in nature-study in the primary grades, but many school people do not seem to realize this. The mere selection of a good text on agriculture is not sufficient to insure to our boys and girls the full benefit which the study of agriculture should bring to them. The State Superintendent of Public Instruction is about to issue a special circular calling attention to this important matter.

BOOKS RECEIVED

GINN AND COMPANY.
Domesticated Animals and Plants. By Eugene Davenport.
HENRY HOLT AND COMPANY.
Hardy Plants for Cottage Gardens. By Helen R. Albee.
The Prince and his Ants. By Luigi Bertelli Vamba.
Translated by S. F. Woodruff. Edited by Vernon L. Kellogg.
D. C. HEATH AND COMPANY.
Farm Friends and Farm Foes. By Clarence M. Weed.
STURGIS AND WALTON COMPANY.
Children's Gardens for Pleasure, Health and Education. By Henry G. Parsons.

SCHOOL SCIENCE AND MATHEMATICS