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# NATURE-STUDY REVIEW

Devoted Primarily to all Scientific Studies of Nature in Elementary Schools

Vol. 10 No. 1
Whole No. 79

OFFICIAL ORGAN OF THE AMERICAN NATURE STUDY SOCIETY

JANUARY 1914



CONTENTS

Nature-Study and the Teaching of Elementary Agriculture . . . 1
Extracts from the President's address
The Election of Officers . . . . . . 6
Astronomy as Nature-Study . . . . . 7
E. A. Fath
Physical Nature-Study II . . . . . . 9
W. T. Skilling
The Lay of the Land . . . . . . . . . 14
J. G. Needham
Poultry Work. Edwin H. Scott . . . . 19
Baking Buns as Nature-Study . . . . 22
John Dearness
Some Students' Work . . . . . . . . 24
Furnished by Gilbert H. Trafton
Should School Gardens Survive? . . 30
Arthur D. Cromwell
Editorial . . . . . . . . . . . . . . 32
News and Notes . . . . . . . . . . . 35
Book Reviews . . . . . . . . . . . . 41

Published Monthly except June, July and August at Ithaca, N. Y.

$1.00 a VOLUME (9 Nos)

Elliot R. Downing, Editor
The University of Chicago The School of Education
Chicago, Ill.

15 Cents COPY

Entered as second-class matter at the Postoffice at Ithaca, N. Y., under the Act of March 3, 1879.

# INDEX

# THE NATURE-STUDY REVIEW

Volume X, 1914

ELLIOT R. DOWNING
SECRETARY-EDITOR
THE UNIVERSITY OF CHICAGO
THE SCHOOL OF EDUCATION

PUBLISHED BY THE
COMSTOCK PUBLISHING CO.
ITHACA, N. Y.

23914

# INDEX TO VOLUME X, 1914

The December number is not included in this index

Jan., pp. 1-43; Feb., pp. 45-77; Mar., pp. 79-117; April, pp. 119-159; May, pp. 161-202; Sept., pp. 203-252; Oct., pp. 253-290; Nov., pp. 291-332; Dec., pp. 333-380.

(Names of contributors are printed in small capitals. Abbreviated titles of books reviewed are in quotation marks.)


Agriculture, Elementary, 271
"Agriculture, Elementary," William L. Nida, 251
Agriculture, Reading Course in, 36
"Agriculture, Sixty Lessons in," Buffum and Deaver, 250
Agriculture, Teaching of Elementary, 1
"Agriculture through the Home and School Garden, The Principles of," C. A. Stebbins, 72
Agriculture, where it may be Studied, 35
American Nature-Study Society, Officers 1914, 6; Michigan Section Meeting, 37; New York City Section, 40, 376; Rockford, Ill. Section, Officers, 375; St. Louis Section, Meeting and Officers, 326; Philadelphia Meeting, Program, 334
"Animal Communities in Temperate America," V. L. Shelford, 42
"Animal Ecology, Guide to the Study of," Charles C. Adams, 290
Animal Life in Prairie Ponds, 235
"Animals, The Infancy of," W. C. Pycraft, 116
Annual Meeting and Election, 291, 333
Aquarium and Snailery, An Evening with the, 315
Aquarium in a Tumbler, An, 320
Astronomy as Nature-Study, 7, 130
BAKER, F. C., An Evening with the Aquarium and Snailery, 315
Baking Buns as Nature-Study, 22
Bee Keeping in Iowa, Bulletin, 77
"Biology, Elementary, Plant, Animal and Human," James E. Peabody and Arthur E. Hunt, 74
"Biology, Introduction to," Maurice A. and Anna M. Bigelow, 73
Bird Pictures Free to Teachers, 155
Birds, Field Work on, 24
Book Reviews, 41, 69, 115, 158, 249, 289, 329, 377
"Botany, Elementary Studies in," John M. Coulter, 73
"Botany for Secondary Schools," L. H. Bailey, 42
"Botany Manual of Experimental," Frank O. Payne, 251
Caldwell, Otis W., Nature-Study Course of the Elementary School, 00
Cape May Summer School, The, 99
CARREL, ORA MAY, Elementary Science Course in Normal School, 253
"Chemistry of Plant and Animal Life," Harry Snyder, 252
"Childhood of the World," Edward Clodd, 378
COMSTOCK, ANNA BOTSFORD, Cricket Music, 204; Beginnings of Star Study, The, 45, 79; Editorial, 287; Exhibition of Rural School Work, The, 161; Nature-Study and the Teaching of Elementary Agriculture, 1; Seed Collections, 292; Study of the Hyacinth, A, 120
Cricket Music, 204
CROMWELL, ARTHUR D., Should School Gardens Survive?, 30
DAVIS, B. M., Studies of Commercial Fertilizers, 122; Studies of Commercial Fertilizers, Corrections, 188
DAWSON, JEAN, The Reformation of Mary Hogan, 189
DEARNESS, JOHN, Baking Buns as Nature-Study, 22
Downing, Elliot R., An Aquarium in a Tumbler, 320
Editorials, 32, 114, 152, 248, 287, 324, 335
EDWARDS, CHARLES LINCOLN, Los Angeles Nature-Study Exhibition, 263
Elementary Agriculture, 271
"Elementary Agriculture," William L. Nida, 251
"Elementary Entomology," E. Dwight Sanderson and C. F. Jackson, 117
Elementary Science Course in Normal School, 253
"Elementary Study of the Brain, Based on Dissections of the Brain of the Sheep," Eben W. Fiske, 76
EMERY, J. W., Some Experiments for the Garden, 281
EMBODY, G. C., The Horned Dace, 168

ENGLUND, HELMA A., Field Work on Birds, 24
"Evolution, The Meaning of," Samuel C. Schmucker, 71
"Fall of the Year, The," Dallas Lore Sharp. 329
FATH, E. A., Astronomy as a Nature-Study, 7, 130
"Feeble-Mindedness, Its Causes and Consequences," H. H. Goddard, 289
Flowers, Spring Wild, 174
"Flower Finder, The," George L. Walton, 158
"Fly, The Life of the," J. Henri Fabre, 159
Foreword (April), 119
Foreword, (September), 203
"Frog Culture for Profit," 330
"Fundamentals of Farming and Farm Life," Edwin J. Kyle and Alexander C. Ellis, 74
Garden, Some Experiments for the, 281
Gardens, See School Gardens
"Guide to the Study of Animal Ecology," Charles C. Adams, 290
HANKINSON, T. H., Animal Life in Prairie Ponds, 235
Hibernation Among Plants and Animals, 103
"History of the Land Mammals in the Western Hemisphere, A," William B. Scott, 115
HODGE, C. F., Preparation of Teachers for National, State, and Civic Biology, 294; Editorial, The Nature-Study Course, 335
Horned Dace, The, 168
"Hygiene of the School Child, The," Lewis M. Terman, 249
"Hygiene, School," Fletcher D. Dressler, 249
Hygienic Living, a Day's, 56
In the Children's Green House, 185
"Insect Studies, Some," 108
JOYCE, ALICE V., The Woodland School Garden, 61; School Gardening in Portland, Ore., 275
Lay of the Land, The, 14
"Learning and Doing," Edgar James Swift, 330
"Life, The Three Gifts of," Nellie M. Smith, 43
LILLIE, FLORENCE E., The Ways of Monarch Butterflies, 132
Los Angeles Nature-Study Exhibition, 263
"Manual of Experimental Botany," Frank O. Payne, 251
"Materials and Methods in High School Agriculture," William G. Hummell and Bertha R. Hummell, 250
MAXWELL, MARY, Nature Calendar, 28
Michigan Nature-Study and School Garden Ass'n Report of, 37
MILLER, E. A., School Gardening in the South, 243
"Modern Problems of Biology," Chas. Sedwick Minot, 41
"Mother Nature and Her Fairies," Hugh Findlay, 158
Mourning Doves, The, 260
Nature Articles in Recent Magazines, 46, 202; in January Magazines, 69; in Current Magazines, 157
"Nature Play," 327
Nature-Study, Astronomy as a, 7; Baking Buns as, 22; and the Teacher, 213; and the Teaching of Elementary Science, 1; Course of Study, 335; Exhibition, Los Los Angeles, 263; in Art, 207; Course of the School of Observation and Practice, Philadelphia Normal for Girls, 337; Course of the Elementary Schools, 358; in Parks, 210; Oregon, Course of Study in, 368; Physical for the Elementary Grades, 9
Nature-Study Society, see American Nature-Study Society,
Need of Purposeful Observation in Nature-Study, G. H. Trafton, 324
NEEDHAM, JAMES G., The Lay of the Land, 14; Outdoor Equipment, 94
NELSON, N. E., Nature-Study in City Parks, 210
Nests of Some Common Birds, The, 137
News and Notes, 35, 69, 154, 326, 374
"Next Generation, The" F. G. Jewett, 379
NOLAN, A. W., Elementary Agriculture, 271; Story of a Kernel of Corn, 307
Officers, American Nature-Study Society, 6
Outdoor Equipment, 94
Out of Doors in Doors, 223
Oregon Course of Study in Nature-Study, 368
PASSOLT, KATE M., The School Gardens of Saginaw, 53
PATTERSON, ALICE JEAN, Some Insect Studies, 108
Physical Nature-Study for the Elementary School, 9

"Physics of the Household," C. J. Lynde, 378
"Plant Life and Plant Uses," John Gaylord Coulter, 73
Poultry work at the Georgia Normal and Industrial College, 19
Preparation of Teachers for National, State, and Civic Biology, 294
Preparing Normal Students to Teach about Birds, 84
PRUESER, SARAH V., The Mourning Doves, 260
Rare Deformity in a Painted Turtle, A, 218
Reformation of Mary Hogan, The, 189
REYNOLDS, HELEN M., Out of Doors in Doors, 223
ROBISON, C. H., Nature-Study in Art, 207
"Rocky Mountain Flowers," F. E. and E. S. Clements, 329
"Rural Schools, The Work of the," J. D. Eggleston and Robert W.' Bruere, 69
Rural School Work, The Exhibition of, 161
St. Louis Section Meeting and Officers, 326
SALTON, NELLIE STONE, In the Children's Green House, 185
School Gardening in the South, 243
School Gardening, Teachers Course in, 69
School Gardening in Portland, Ore., 275
School Gardens of Saginaw, The, 53
School Gardens, Should they Survive? 30
School Garden, The Woodland, 61
"School Hygiene," Fletcher D. Dresslar, 249
"School and Home Gardens," W. H. D. Meier, 75
School Journeys, 154
SCOTT, EDWIN H., Poultry Work, 19
Seed Collections, 292
SELL, E. S., Should School Gardens be Made to Show Financial Gains?, 273
SHINN, HAROLD B., Hibernation among Plants and Animals, 103
Shively, Adeline F., Nature-Study Course of the School of Observation and Practice, Phila. Normal School for Girls, 00
Should School Gardens be Made to Show Financial Gains?, 273
SHUFELDT, R. W., A Rare Deformity in a Painted Turtle, 218; Use of Material by Young Nature-Study Students, 49
"Sixty Lessons in Agriculture," Buffum and Deaver, 250
SKILLING, WILLIAM T., Physical Nature-Study for the Elementary School, 9
Some Experiments for the Garden, 281
Some Students' Work, 24
"Spring of the Year, The," Dallas Lore Sharp, 329
Spring Wild Flowers, 174
Star Study, The Beginning of, 45, 79
STEBBINS, C. A., A Day's Hygienic Living, 56
Story of a Kernel of Corn, The, 307
Studies of Commercial Fertilizers, 122
Studies of Commercial Fertilizers, Corrections, 188
Study of the Hyacinth, A, 120
"Suburban Garden Guide, The," Parker T. Barnes, 76
"Summer," Dallas Lore Sharp, 329
Supervising a Community Garden, 65
TRAFTON, GILBERT H., Editorial, 324 Preparing Normal Students to Teach about Birds, 84
Use of Material by Young Nature-Study Students, 49
VOADEN, JOHN, Nature-Study and the Teacher, 213
WAGER, RALPH E., The Nests of Some Common Birds, 137; Spring Wild Flowers, 174
"Water Reptiles of the Past and Present," S. W. Williston, 377
WATERS, ELIZABETH M., Supervising a Community Garden, 65
Ways of Monarch Butterflies, The, 132
Wheat Rust, Samples, 153
"Winter," Dallas Lore Sharp, 329
Woodland School Garden, The, 61
WOODWARD, LAURA E., The Cape May Summer School, 99
"Zoology, Introduction to," Rosalie Lulham, 43

# THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

**Important** Please note date of expiration of your subscription on the label of the wrapper. Subscriptions must be paid in advance to comply with postal requirements. Subscriptions and advertisements should be sent to *The Comstock Publishing Co., Ithaca, N. Y.* Manuscripts for Publication and Books to be Reviewed should be sent to the Editor.

VOL. 10 JANUARY, 1914 NO. 1


## Nature-Study and the Teaching of Elementary Agriculture

Extracts from Annual Address by President of American Nature-Study Society

There is an educational wave sweeping over this country,—that of teaching agriculture in the elementary schools. This sometimes takes the form of children's gardens and sometimes the raising of special crops for prizes or for market. Whether this wave will have its ebb and leave naught but ooze over our educational system or whether it keeps on at steady flow depends on how fundamental is the teaching. A thumb-rule method of raising corn and tomatoes or of planting a garden will never hold fast agriculture in the educational curriculum. This for two reasons: First, because it soon palls upon the pupil. After he has done it once or twice he then loses interest because it is an old story. Second, because it has the value of what in college parlance is called "a stunt" rather than a matter of fundamental interest. Thumb-rule gardening, corn, potato or tomato growing will never induce the army of youth to be satisfied with the tillage of land.

The only way to make this movement of permanent value is to ground it in nature-study, because in nature-study the child finds the answer to the "why" of agriculture; and the following up of this "why" broadens out in so many directions that there is no chance of the agricultural processes becoming an old story. There is enough of nature-study connected with every crop to keep up interest for an indefinite period.

The reason why the new agriculture is getting such a hold upon our country is, because, for many years the Experiment Stations have been working out the why and how, and the new agriculture is no longer a thumb-rule industry, but is worthy the best thought and training of a man. It seems strange that with this fact so prominently before us, it should have been so neglected in much of our teaching of elementary agriculture, for what the Experiment Stations are doing for the farmers, nature-study does for the child.

Let us consider just how and why nature-study adds permanency of value and interest to elementary agriculture. Take first the soil, that "sepulcher and the resurrection of all life" as "Uncle John" Spencer reverently called it. There is a series of most interesting lessons on the soil makers, the soil carriers and the kinds of soil; and by the time the child of ten or twelve has mastered these lessons he is far more fit to judge soils than is many a so-called practical farmer. And meanwhile he is getting an interest and a respect for the soil which is the first requisite of a good farmer; faith in soil without knowledge is a broken reed on which to lean. Knowledge of the kind of soil is the first step to the right treatment of it to set free and supplement the plant food which is there. And there are experiments in growing plants on the different soils without and with supplementary food materials that are as interesting to the child as a continued story. Related with this is developed the story of getting the soil ready for receiving the seed. The reason for breaking up the soil into as fine particles as possible is a nature-study story that should be demonstrated before every child gardener by growing seeds in a glass jar so that the efforts of the rootlets to reach the soil may be a part of his practical, personal knowledge.

In the testing of seed comes another experimental lesson, a rather advanced lesson, which must lead the child to think why some seeds are better than others. The growth of the young plant first from the "lunch in the seed put up by the mother plant" and the use of the cotyledons can never be understood until made the subject of consecutive nature-study lessons.

The form of roots, their growth and function, is especially adapted for nature-study of the garden. Commonly in school gardening the children understand but little of the root systems of their various vegetables. From the brace roots and the shallow root system of the corn to the tap root of the cabbage and the crown tubers of beets and turnips there are numerous illustrations to show that roots not only search the soil for food and moisture for the plant but help to hold it in place and that they may act as storehouses for food. Also each species of plant has its own tricks of stem for holding out leaves to the light besides carrying sap to the leaves for maturing food and back to place of growth, and they also are storehouses for food, as in the underground stems of the potato.

The leaf story affords many lessons that should finally reveal to the child something of the mystery and miracle of the bud, the unfolding, and the expanded leaf. And there is a lesson to show that leaves manufacture food for the plant and that they must have sunlight to help them. "A starch factory run by sunshine power and never working over time" is what "Uncle John" called the leaf.

The flowering plants of a child's garden of but a few square feet afford nature-study lessons of the greatest variety and interest. Why flowers occur at all, the way they occur, their growth from bud to bloom, their hidden ovules, their wide-cast pollen, their colors, their nectar, their tricks for securing cross-fertilization, and finally the growth of the seed within the fading flower, and the perfection and distribution of the seeds are questions to which each species of plant gives different answers. Thus it can never be an old story but one of infinite variety and keen interest.

In the study of the fertilization of flowers we have the first step toward a knowledge of plant breeding. And, if they will only learn to utilize it, the instructors in sex hygiene have here a sane and impersonal beginning for their instruction. We have known boys who selected seed corn in competitions who had not the faintest idea that the ear bore the pistillate flowers of the plant or that the tassels produced the pollen; and we have known farmer boys who came to the University who had never understood why their sweet corn mixed with the field corn if the two were planted near each other. Once a personal attempt to teach a very intellectual farm lad that each kernel was an ovule and each thread of silk a style, resulted in such a distrust of our teaching on his part that he started an investigation for himself and was filled with amazement when convinced of these facts.

The weeds are most important subjects for nature-study. Each one needs to be studied from seed planted to seed perfected, and there should be lessons in recognizing the seeds and especially the seedlings of garden weeds and weeds planted with crops. Whether a weed is an annual with special adaptations for sowing its seeds where they will find congenial soil in which to grow the following year, or whether it is a biennial with special provision for lasting over winter, or whether it is a perennial that once planted remains for years to fight for space, its history should be studied from beginning to end and once for all, so whenever it is seen it may be understood and dealt with intelligently and effectually. And where in all nature can we find a greater variety of habit to illustrate plant growth than we find in studying the purslane with its shallow roots and water-tank leaves, burdock with its tap root and great flimsy basal leaves that shade down and out all vegetation in its neighborhood, and the Canada thistle with its tenacious rootstocks and prickly armor! In fact, the whole study of seed distribution concerns us most practically when carried on in connection with weeds.

The story of the insect pests must be worked out through nature-study if they are to be dealt with in any effectual way. And right here there is enough material to last during all of the grades in which nature is taught and "then some." Each insect that is found in the garden should be studied from egg to adult and all its mysterious incarnations made plain. The facts thus ascertained should show whether it is a foe, a friend, or simply a chance visitor. Similar studies should be made of mice, rabbits, or any other animals that may visit and make havoc among our planted crops.

With the birds that find quarters near our gardens we have another line of lessons branching in many directions and full of fascination. The song sparrow, chippy, junco, robin, bluebird, catbird, yellow warbler, phoebe, oriole, hummingbird, all visit our gardens for various purposes of their own, and every phase of their lives should be well known by observation to the young gardener.

But nowhere else, perhaps, is nature-study more needed in elementary agriculture than when concerned with the live stock of the farm. The characteristics of each species should be studied from the standpoint of its development in a wild state; for only by this means can be made plain the reasons for its desirable or undesirable qualities.

The chicken, turkey, guinea, duck and goose, each can tell its own ancient, racial history to the one who is observant and thinks about what he sees. Take, for instance, the turkey with its wild instincts and but partially domesticated habits; or take the duck—and merely as an example—its webbed feet on short legs, set wide apart and far back which thus make such efficient oars when the duck is in its native element, but which make its movements on land so awkward and waddling. Neither of these birds can be understood or taken care of with the fullest intelligence, unless the student has an understanding of their development in the great battle of the survival of the fittest.

The same is true of cattle and, especially, cogent of that acme of nervous instincts,—the horse. At least half of the men who drive horses throughout our country are totally unfit for it; and it is simply an excruciating experience to witness their brutal ignorance in this capacity. When the young farmer realizes that through countless ages the horse's ancestors escaped their enemies by shying and by keen watchfulness and by being able to kick and bite and to be ever and always on the alert for surprises, he has gotten far along in understanding how to meet these propensities, in a sensible and humane manner. But perhaps the pig has suffered most of all by association with man—not even the Indian, brutalized by the white man's fire-water, makes a more lamentable case than does the naturally neat pig in the incomparable filthy sty where it is imprisoned by ignorant man.

There certainly can be no real intelligence in caring for the domestic animals until their natures and development are understood; and this is all in the realm of nature-study.

The young farmer grounded in nature-study is prepared to meet intelligently almost any situation that is likely to occur; but without this he is doing his work blindly and hazardously; he is a gambler although he may not know it, for he places his stakes upon results without understanding causes.

What are all the agricultural scientists in this broad land doing for the farmer? They are simply working out nature-study lessons for him; and in proportion to his knowledge and understanding of nature he is able to avail himself of their results. The reason that the great work of Experiment Stations is even yet appreciated and utilized by only a small proportion of the farmers of the United States is because nature's ways are, as yet, mysterious to those who till the soil.

To teach a child that there is a why for every fact in nature, to train his observation to an acuteness in detecting facts, to train his mind to work out what seems unfathomable, to give him the confidence of his own powers in dealing with nature, and to give him courage to attack any problem that requires investigation,—this is what nature-study does.

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The election of officers resulted as follows: Anna B. Comstock, New York, *president. Vice-presidents:* M. A. Bigelow, New York; Otis W. Caldwell, Illinois; B. M. Davis, Ohio; B. M. McCready, Ontario; C. A. Stebbins, California. *Directors:* E. E. Balcomb, N. C. (1); L. H. Bailey, N. Y. (2); Ora M. Carrel, Mich. (1); Anna Clark, N. Y. (1); John A. Dearness, Ont. (2); J. A. Drushel, Mo. (2); C. F. Hodge, Ore. (2); Alice J. Patterson, Ill. (1); Susan B. Sipe, D. C. (1); Grant Smith, Ill. (1); W. J. Stevens, Mo. (3); G. Straubenmueller, N. Y. (3); Gilbert H. Trafton, Minn. (2).

Those whose names are followed by (1) will hold office for one year more. Those indicated by (2) were elected this time and hold office for two years. The persons whose names are followed by (3) are representatives of local societies.

Elliot, R. Downing, *Secretary-Editor.*

## Astronomy as a Nature-Study

E. A. Fath

We pity the person who does not love the birds and the flowers, who is oblivious of the beauties of the sunset, who cannot see the forces of nature working incessantly in the blowing of the winds and the running of the waters but what must be our feeling toward the one who gazes with unseeing eye on the beauties of the star-spangled heavens, who sees in the moon only a brilliant disk which his grandfather used to predict changes in the weather, or who sits before the winter fire and sees only the blaze and cannot trace it back to its origin in the great sun itself? The primary object in Nature-Study, if I understand it aright, is the broadening of the whole nature of the child by giving him a sympathetic knowledge of his surroundings. He is taught botany, zoology and geology, but, so far as I have been able to learn, astronomy, the oldest and most all-embracing of the sciences, is hardly touched upon. The one subject which alone will disclose the beauty, the vastness and the grandeur of the physical universe is neglected.

There are several reasons for this state of affairs but the primary one I believe to be a misconception on the part of the teachers themselves. In speaking to them about astronomy the most common remark is "I would like to know something about the sun, moon and stars but, you know, I was never very good in mathematics and of course it is impossible to learn anything about astronomy without knowing a great deal about that subject." This idea that a knowledge of advanced mathematics is prerequisite to an understanding of even elementary astronomy is so deep-rooted that thousands have lost the pleasure of knowing something about the "friendly stars" because of it. As a matter of fact no more mathematics is required to study elementary astronomy than to study the simple facts of botany or even geography. We take it for granted that all children should learn certain facts about our planet by studying maps of its surface but we do not trouble them with the more or less complicated mathematical basis of map making. In the same way they can learn some of the interesting facts about the great universe in which we live without having their minds filled with the mathematical relations of those facts. A map of the sky is as easy to read as the map of a country and the constellations are as easily learned as the states of the union. If, by means of these few brief articles, it will be possible to slay this mathematical monster a real service will be rendered to astronomy. Furthermore, if some of my readers can be induced to try this science as a Nature-Study, then some of the present generation of children will come into their own by having the entire physical universe to think about instead of merely this small globe on whose surface we live.

The study of astronomy has a very distinct value in any scheme of education. For one thing, it develops the powers of observation. No one who will note the diurnal rotation of the sky, the movement of the moon and planets among the stars, etc., will fail to find his powers of observation strengthened. In the second place the study of astronomy will aid in the development of the imagination. Thus, for example, in trying to picture such simple things as the relative sizes of earth and sun, the annual revolution of the former about the latter, the revolution of the moon about the earth, etc., the imagination is brought into play continuously. This also applies to the constellations and the myths connected with them. There are the mighty Hercules, Perseus and Andromeda, the good ship Argo and many others connected with the lore of the ancients. Thirdly, the reasoning powers are brought into play in explaining such elementary matters as the phases of the moon, why the sun is high in summer and low in winter, the seasons, eclipses and the like. The various faculties mentioned are of course all used to a greater or less degree in considering any one of these subjects and since they are the principal ones developed by all nature-study it must be admitted that astronomy meets the main requirements.

One of the most serious difficulties in the way of having astronomy taught in our schools lies in the fact that so few teachers know anything about it. In a subsequent article we shall consider the preparation necessary for the teacher and suggest simple courses of reading which will give some insight into the mysteries of the starry realms. Another difficulty arises because of the necessity of carrying on certain observations such as constellation study after dark. This difficulty, however, is less real than might appear at first sight and suggestions will be offered on teaching the constellations by blackboard work in the daytime and having the children do their night work at home. If it proves impracticable to do constellation work in this way there are still many interesting observations which can be made in the daytime on the positions of sun and moon. The lack of a telescope is another difficulty but a field glass or even an opera glass will bring out many things which are beyond the limits of naked-eye vision. It will thus be seen that something can be done with practically no equipment beyond a pair of eyes and a desire to know.

## Physical Nature-Study for the Elementary School

WM. T. SKILLING
State Normal School, San Diego, Cal.

### CHAPTER II
(Astronomy)

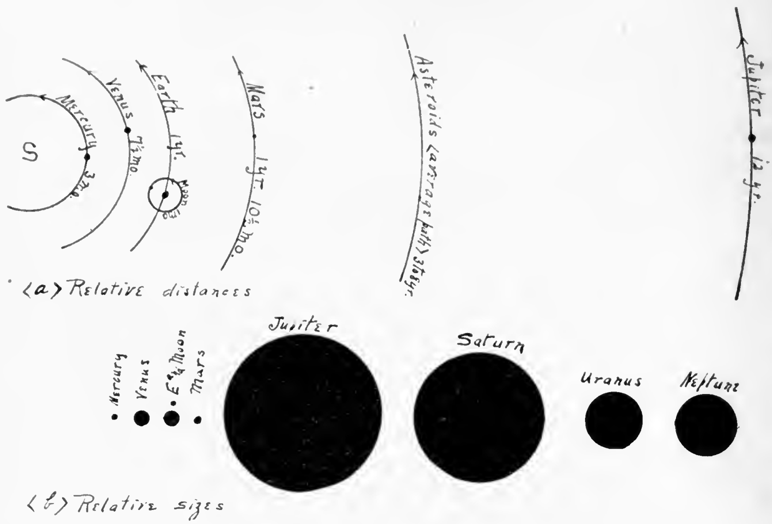
One of the earliest topics of education was astronomy. While as yet little was known of the true nature of man's immediate surroundings the far away realm of star-land had been explored by the observant eyes of early civilizations aided in some degree by rude measuring instruments. The constellations were charted and names were given to the brighter stars. The motions of the planets or "wandering stars" were observed and elaborate theories constructed to account for their vagaries.

While modern chemistry was still in the alchemic stage, astronomy was being evolved from astrology. More than a hundred years before Harvey discovered the circulation of blood, Copernicus announced the true theory in regard to the circulation of the solar system about the sun.

Arguing from the premise that education of the child should proceed in the order of the development of the race we find a reason for placing elementary astronomy early in the child's curriculum.

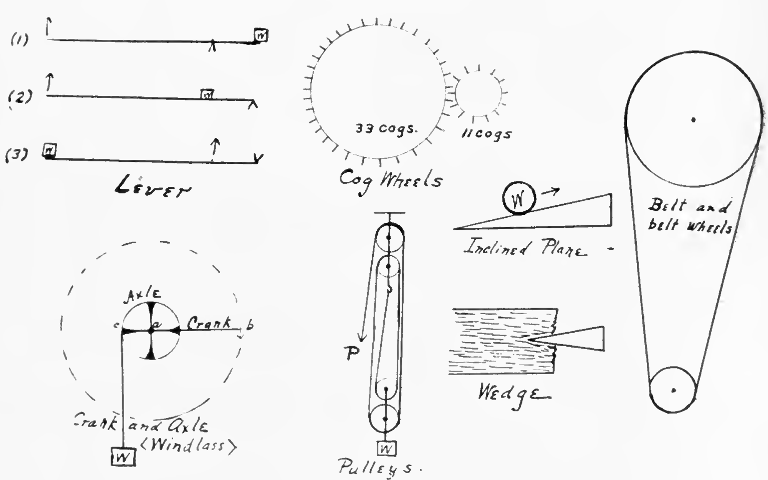
A more cogent reason for doing so is found in the vital interest which children take in the subject.

Much of the information could be given in the literature work in the form of stories of those who have developed the subject. Some of it should co-ordinate with geography. But the natural place for it is the nature-study class. There is sufficient demand and opportunity for observation to make this a legitimate nature-study subject.



S
Mercury 3 mo.
Venus 7½ mo.
Earth 1 yr.
Mars 1 yr. 10½ mo.
Jupiter 12 yr.
(a) Relative distances
Mercury
Venus
Earth Moon
Mars
Jupiter
Saturn
Uranus
Neptune
(b) Relative sizes


FIG. 1



(1)
(2)
(3)
W
Lever
33 cogs.
11 cogs
Cog Wheels
Belt and belt wheels
Inclined Plane
Axle
Crank
a
b
c
P
Crank and Axle (Windlass)
Pulleys.
Wedge


FIG. 2

Astronomy may seem at first thought too difficult a science from which to draw material to be used in nature-study. Very naturally a teacher untrained in astronomy will feel that a subject so vast and intricate is more fitted for the college student than the elementary pupil. But this science which has been studied from the infancy of the race is full of inspiration and stimulus for the infant mind today.

The first step to take in order to lead the child's mind out beyond the earth is to give him an idea of the solar system. Illustrations are needful to this end; verbal descriptions will not suffice.

The simplest illustration is the blackboard drawing. No diagram can be made to represent correctly all the relationships of size and distance. Like a raised map, it is intended to be suggestive rather than accurate as to scale. Different diagrams should be used to represent different facts.

For example, the relative distances of the planets is shown thus:

Place at one end of the blackboard a dot for the sun. A dot five inches from this will represent Mercury. Venus is shown by a dot eight and one-half inches from the sun, the earth twelve inches, Mars one foot nine inches, the Asteroids two feet nine inches, Jupiter five feet, Saturn nine and one-half feet, Uranus 19 feet and Neptune 30 feet. (Fig. 1).

Circles cut from paper and pasted on the blackboard give at a glance relative sizes of planets.

The following are convenient diameters: Mercury three-eighths inches, Venus one inch, Earth one inch, Mars one-half inch, Jupiter eleven inches, Saturn nine inches, Uranus four inches, Neptune four inches. (Fig. 1).

A most instructive model of the solar system is easily constructed from croquet balls suspended by cords as pictured in Fig. 2. "S" the sun is made stationary by an attachment to the floor. "E" and "P" revolve about "S", the suspension cord twisting to allow motion. "M" the moon is carried around the sun with "E", about which it revolves several times making several months to the year. The ball "P" may represent any planet and may swing out farther from the sun than the earth or the reverse.

One of the most important observations to be made by pupils is with the sun board shown in Fig. 3. A discussion of the seasons is based upon a series of readings showing the apparent

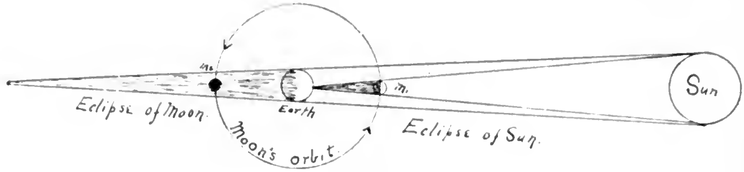



FIG. 3

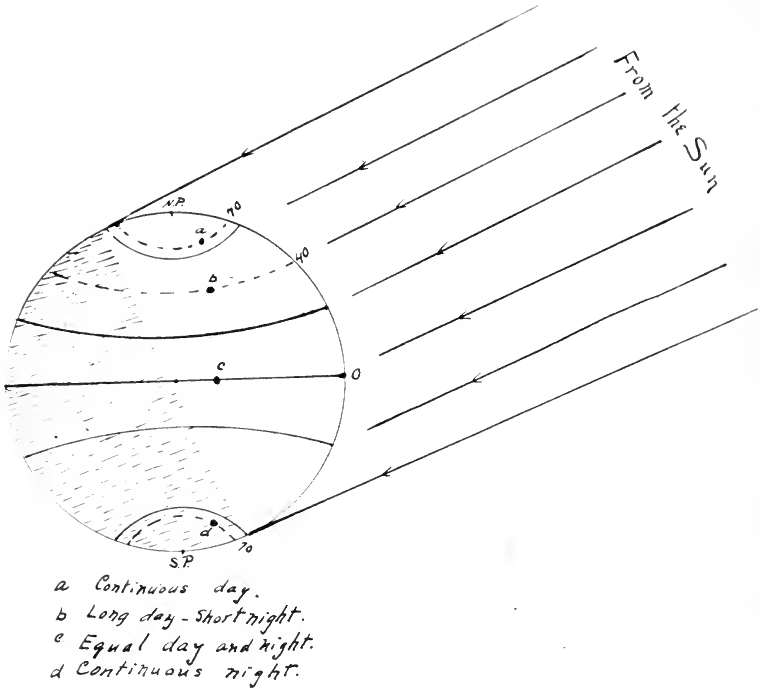



FIG. 4

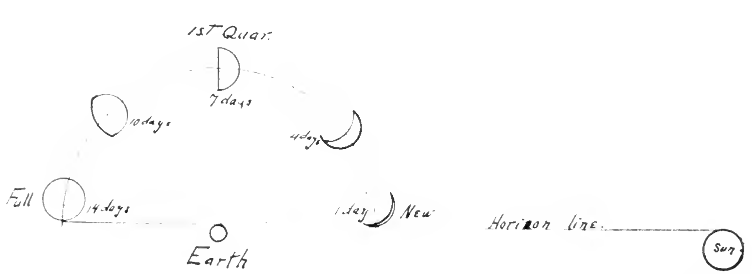



FIG. 5

motion of the sun, north and south. The shadow of a nail driven in one corner of the board shifts about one-third of a degree daily on the circle.

A globe turned in the sunshine as shown in Fig. 4 illustrates the reason for various lengths of day and night in different latitudes. Chalk marks at a, b, c and d are seen to have a longer or shorter passage through daylight (or to remain wholly in darkness or wholly in light during the entire revolution).

Length of day during any one season can be represented by giving the axis of the globe the proper tilt.

In the study of the moon have the pupils draw a "progressive diagram" of its phases as shown in Fig. 5. Each night soon after sunset for two weeks the moon's position in the sky and its phase should be observed and represented in the drawing. Little explanation will then be necessary to make clear the reason for change of phase.

Kodak pictures such as shown in Fig. 6 lend interest to the work.

FIG. 6

FIG. 7

The subject of eclipses both lunar and solar can be made intelligible by the use of a single diagram as shown in Fig. 7. A few simple experiments with a light and shadows will help to make such a diagram better understood.

The teacher who wishes to make use of astronomy as a basis for nature-study work should become familiar with some text book in the subject, not too large and written in a popular style. A too technical book will discourage by the mass of detail given which, fortunately, is out of place in a nature-study course.

No reference has been made to the use of a telescope and it is by no means essential. If some one in the community possesses an instrument which could be made available for use of the school it would greatly increase interest in the subject.

## The Lay of the Land

James G. Needham

Chief of all land laws is the law of gravity.

The solid crust of the earth is overspread with a thin film of loose materials that collectively we call the soil. How thin a film it is as compared with the great mass of the earth! Yet it is the abode and the source of sustenance of all the life of the land. It enfolds and nourishes the roots of all the trees and herbage. It clothes itself with ever-renewing verdure. On it we live and move. From it we draw our sustenance. We usually mean this thin top layer when we speak of the land.

This film of soil covers the rocky earth-crust with great irregularity as to distribution and depth; for its materials are derived in the main from the weathering of the rocks. Alternating frost and sun have broken them to fragments; attrition and chemical action have progressively reduced the fragments to dust; wind and flood have mixed them and mingled with them the products of life and decay. Sun and frost and rain and wind and life and decay act intermittently but gravity operates all the time. Weathering and gravity are the great factors in the modeling of the landscape. While weathering gleans the basic soil materials from the solid rock, gravity disposes of them: removes them almost as fast as formed from the vertical face of the cliff: lets them lie on the level summit: sweeps them down the slope: spreads them out over the flood plain, making level fields; or carries them far away with the rushing flood to dump them into the bottom of the sea, where, removed from light and air, they are lost to our use.

Thus the rugged and geologically ancient outlines of topography are softened by erosion and overspread by a mantle of productive soil. Erosion rounds off the sharp edges of the headlands; silting fills the low places; delta building covers the shores about the mouths of streams; everywhere as time runs on, sinuous lines replace the sharp angles, and verdure replaces the gray pristine desolation

Let us go to some good point of outlook, some hill-top or housetop or tower, and view the topography of our own neighborhood, to see how the land lies. We will let our eyes wander slowly from the near-by fields upward to the summit of the distant hills, and downward to the level of the valley; we will follow the stream that meanders across the valley floor, back to its more turbulent tributaries, and on to the little brooks that run among the hills. Upland and lowland levels, and intervening slopes:—these are the natural divisions of the land; and their boundaries are all laid down by gravity. Water runs down hill, and loosened soil materials move ever with it. They may glide unnoticed as tiny films of sediment trickling between the clods of the fields; or they may move in great masses of earth and stone as a landslide, scarring the face of the steep slope; but ever, with the aid of water, they move to lower levels, and slowly the form of the hill is changed. Flood plains broaden: valleys are filled; the slope grows gentler; and the upland plains are narrowed by invading rills.

Outspread before us as we look abroad over the landscape, with its levels of checkered fields, its patched and pie-bald hills, its willow-bordered streams and reedy swales, is this blanket of soil, which seems so permanent, yet which is forever shifting to lower levels.

Water, descending, follows the lines of least resistance. Hence, from every high point, slopes fall away in all directions. Some are turned southward toward the sun, and are outspread in fields that are warm and dry; others face the north, and receive the sun's rays more obliquely, and are shadowy, moist, and cool. Some are exposed to the sweep of the prevailing wintry winds; others are sheltered therefrom. Some are high and dry; others are low and moist.

Nature has her own crops, suited to each situation; sedges where it is wet; grasses where it is dry; spike-nard in the shade; clovers in the sun. None of them alone (as we raise plants) nor in rectangular fields, but each commingled with others of like requirements, and each distributed according to conditions of soil, moisture and exposure. One may see how nature disposes them by comparing the life in wet marsh and dry upland; or that of sunny and shaded sides of a wooded glen.

Under natural conditions the soil of the gentler slopes remains in comparative rest, for it is held together by a net-work of roots of living plants; these never (except under the plow) let go all at once. One dies here and there, now and then, and adds its contribution of humus to the topmost soil layer. Under natural management, the fields are permanently occupied and never exhausted. The richness of the soil is ever increasing. The stirring of the top soil enormously accelerates erosion. Our four-square fields and cross-lot tillage are well enough on the upland and low-land levels where conditions are fairly uniform and the loosened topsoil cannot slip away into the stream; but among the hills, they need to be adapted to suit the conditions found on the steeper slopes. To plow a fertile slope in furrows that run up and down its face is to invite the storm waters into prepared channels that they may carry the soil away. Too often the surveyor's lines take no account of the true boundaries of nature's fields, and the plowman knows not the existence of a law of gravity. Many a green hillside, fit to raise permanent crops in perpetuity, has been cleared and plowed and wasted in hardly more time than was necessary to kill the roots of the native vegetation. Fortunate is our outlook if the hills round about us are not scarred with fields that bear silent testimony to such abuse—fields that are gullied and barren, with their once rich top soil, the patrimony of the ages washed away,.

It is no small part of the glory of many charming inland valleys that is contributed by the noble woods that climb the side of its bordering steeps. The clearing of such land should never be allowed; for rightly managed, it will go on raising trees forever (and probably there is no better use for it), and the scenic beauty, the restfulness and charm which it contributes to the landscape is a valuable public asset. Steep slopes may be tilled permanently if the tiller of the soil will take a hint from nature and regard the law of gravity—if he will run his culture lines horizontally, break the slope with terraces, and hold the front of these with permanent plantings. Some of the most beautiful landscapes of the old world are found among terraced hills that have been cultivated for centuries. But the simpler method of holding the soil together by untilled crops—pastures and tree crops—is probably more suited to American conditions.

Fortunate is our outlook, also, if in the midst of thriving farms and forested hills, there be left a little bit of land here and there that has not been too much "improved." A bit of wildwood, where the brush is not cut nor the swamp drained—a place, preferably near the school, where the native life of the land may be found—a sanctuary for the wild birds and all the other wild things, plants and animals, to which the youth of the rising generations may go in order to see what the native life of his native land was like. The wild things are rapidly vanishing. Where would one find even now a bit of the rich unaltered wild prairie that once overspread the interior of this continent, with its tall, waving grasses and all its wealth of wild flowers?

The landscape belongs to all. Its smiling slopes, or their forlorn tatters, affect the public weal. Men have attained to profitable co-operation in many lines of enterprise. May the time come when they will be able to co-operate in organizing for their best use all features of the larger units of their environment; when they will preserve for public use the things that meet the common social needs; when they will begin to correct the ills that grow out of arbitrary and artificial boundaries, by following the lines of nature; when they will learn to put all fields to their best use, securing productiveness, convenience and beauty.

## Study 17. The Natural Fields of the Farm

For the purposes of this study a somewhat diversified area should be selected, including bottomlands, large or small, bordering hills and level uplands, traversed by little streams. A map should be provided, showing soil types and all principal topographic and cultural features.

The tools needed will be a pocket compass for taking directions, and a 100-ft. line, a hand level, and a surveyor's rod for measuring gradients.

**The program** of work will consist in:

1. A trip across the uplands, slopes and flood plains, observing their exposure and measuring their gradients. Natural adaptations to particular crops, and to choice sites for burrows for particular animals, should be noted.

2. A comparison of the life and conditions in sunny and shaded slopes of a wooded ravine.

**The record** of this study may consist in:

1. The map with the natural fields roughly marked out in part—*i.e.*, the areas that are much alike in soil, gradient, exposure, etc., and that are, therefore, adapted to onekind of crop. Mark direction of slope and percentage of grade (roughly determined by measuring the descent per hundred feet with level, line, and rod at some average place) in each field. Mark also on the map the direction of the prevailing wind of the season that is most trying to vegetation.

2. A summary statement as to relative area of each exposure; also the maximum gradient found under cultivation, and the condition of its soil.

3. A comparison in word or diagram of the two sides of a wooded ravine having an East and West direction, as to, (a) tall plants, (b) undergrowth plants, (c) moisture, (d) accumulation of humus.

NOTE.—The foregoing is a sample lesson from Professor Needham's field course on the Natural History of the Farm now being given to Freshmen in Cornell University.—EDITOR.

# Poultry Work at the Georgia Normal and Industrial College, Milledgeville, Ga.

Edwin H. Scott

One of the recent tendencies in education has been in the direction of teaching boys and girls subjects more closely akin to their life work.

One of the newer courses at the Georgia Normal and Industrial College illustrates that trend very clearly.

Two years ago the subject of poultry raising was offered to the members of the senior class under the direction of a young woman trained in two of our best agricultural colleges and who subsequently conducted a poultry farm of her own.

Ten incubators and brooders of various makes were purchased, houses and yards were built and the course was started.

A selection was made of four breeds namely the White Leghorn, White Wyandotte, Buff Orpington, and Light Brahma.

From the very beginning our aim was to make the course thoroughly practical. Therefore, all phases of the work, except the cleaning of the brooders and houses, were performed by the girls.

As a result of this, many and varied were the experiences of teacher and chickens. The brooder and incubator lamps would smoke—then the girl whose job it was at that particular time to run the said machine must stop and clean it out.

If the reader has ever been in a similar position and known how hard and dirty is the work involved in taking apart and cleaning a lamp—your sympathy will go out to the girl—and to the chickens.

However, it took surprisingly few lessons of this kind to cause the machines to be more carefully adjusted and the smoking cease.

The students ran an incubator, a brooder, took care of setting hens, chicks, and yards of laying hens.

All food was weighed, mixed, accurate records of all kinds kept, and cost of the various operations reckoned.

From a hap-hazzard, happy-go-lucky method of doing the work usual in many homes it was brought down to as nearly a scientific problem as possible.

Last year several thousand chickens of various kinds were raised. Many of them eaten later by the girls themselves in the college dormitory and hundreds of dozens of eggs obtained for use in the incubators and kitchens.

The question rises in problems of this kind as to the purpose of the course—whether we were to raise chickens for show or to use them as any school uses a laboratory. In the latter case—where untrained students have control of the stock and machines we cannot expect ideal results. In spite of this fact, however, very fair hatches were brought off and less than the average number of chicks died during brooding period.

The results of such work as this cannot be clearly seen for a number of years. In actual class work we have about one hundred and forty girls a year. This represents not only our senior class but also as many others as the equipment will allow to elect the work.

The chickens are used in our training school classes for study with the young children in their nature work.

It has been found out that a number of girls after leaving college have continued the work in other schools. One girl for instance bought a small pen of chickens for her school—used all the eggs she needed in their domestic science work, sold sufficient to pay the expenses for feed and at the end of the school year the children sold the hens for enough to pay their original cost.

The use of poultry in the rural schools as a type of animal study should be a very valuable practice.

The scientific methods of care, feeding, and breeding of all stock are much alike. The advantage of poultry being that the school's plant can be cheaply equipped and easily cared for.

Probably a value as great as the one just suggested, however, lies in the fact that many families living in the country and in small communities, as do the majority of people in Georgia, will keep chickens in order to reduce the cost of living. These girls are then being prepared well along this line for their future life in the school and home and we look in the not distant future to see many of them happier and more prosperous with this added stimulus of a good hobby.

# Baking Buns as Nature-Study

JOHN DEARNESS

Looking through the so-called nature-study articles in the educational magazines one cannot fail to notice the wide differences in the aim, matter and methods of different writers. Here a contributor thinks that children following directions for skeletonizing a leaf and "blue-printing" its veins are doing nature-study; while there another would occupy the nature-study period with making labeled sketches of the larger organs of some pickled grasshoppers; and a third shows what an almost unlimited amount of nature-study knowledge can be concentred around a currant bun by going into the history of the flour and fruit, the yeast and salt, the fuel and utensils concerned in its production. Now I beg to submit that if any of these can properly be called nature-study then there should be another term invented to apply to the child's heuristic treatment of the problems arising out of his environment and experience. Lessons on leaves, insects and buns or any other classes of objects, either natural or artificial, may be wholly wanting in the quality of observing and doing to find out. Has the mere communication of information about objects or phenomena in nature, illustrated by pictures or even by the objects themselves, any quality of the genuine nature-study lesson? The question is asked for the sake of argument that may help to define the aim and consequently the method. If, as is often alleged, nature-study is method rather than matter then why is not the investigational study of the building of a child's home as real nature-study as the study of the building of a robin's nest,—the study of a child's clothing as that of a robin's feathers?

I try to get my students to regard nature-study as a means and the chief means of training the child to investigate efficiently his environment and experience with the definite purpose of increasing his usefulness or happiness or both. The knowledge that may be gained and the skill that may be acquired are merely incidental; the power to get knowledge at first hand and the strengthening of wholesome interests are the main objects. The child becomes an interested investigator who, stimulated by intelligent questioning and directing, not by telling, observes the leaf unfolding from the bud, or the grasshopper eating, grasping, leaping in the open field or in the school-room cage. From this point of view even baking currant-buns can be made the matter of good "nature-study."

The history of the wheat plant, and of the yeast-plant, the story of procuring fuel and producing cooking utensils can be related in any school but bun-making can be treated as nature-study only where children can have opportunity to observe the process. Granted that a teacher who knows his class can enjoy such experience what is wrong with the assignment of a nature-study lesson in the following manner? "Next week I wish each and all of you to observe the making of a pan of currant-buns. Note the articles that are used; the order in which they are mixed."

"Try to find out by experiment what difference it makes if the salt is left out; if the yeast is omitted. Should the salt be added before the yeast, or is it better to put it in afterwards? Is the salt added dry or dissolved?"

"What changes take place with the kneading? Does the dough increase in volume after it enters the oven? How can you tell when it is baked enough?"

"Seek the privilege of making some buns yourself or at least of helping to make them as much as you are given the chance."

"Next Friday please remember to bring to school a bun that you have made, or helped to make or seen made. Prepare to tell its story and to answer the questions about it that you may be asked by me or by your fellow-pupils."

Investigational lessons like this may be based upon the experiences of the farm, of the garden, of the household. When conducted along the lines of observing, doing, trying to find out with the expectation of being asked "how" and "why" at every turn the pupils are deriving the results of genuine nature-study training, and the teacher may reasonably expect such training to promote their usefulness and happiness.

## Some Students' Work

Here follow two sets of observations by Normal School students on a couple of phases of nature work. They are suggestive at least of the sort of work that is actually being done in preparing teachers to do nature work in the grades.

### Field Work on Birds

Helma A. Englund

#### Song Sparrow

I Identification character.
  1 Size—About same size as English Sparrow.
  2 Color—brown.
  3 Method of flight.

  Song
    a Varied.
    b Soft.
    c Musical.
    d High pitch.
    e Resting.

#### House Wren

  1 Size—smaller than English Sparrow.
  2 Color—brown.

II General habits.
  1 Song.
    a Varied.
    b Soft.
    c Musical.
    d High pitch.
    e Location—tree.

#### Nut Hatch

  1 Size—about size of Sparrow.
    Color—grayish black, black cap.
  Song—Just a call, no song.
  Location—In a tree.

### Chipping Sparrow

1 Size of Sparrow.
Color—brown, white bars on wings.
Song
a Monotonous.
b Soft.
c Musical.
d High pitch.
e

### Flicker

1 Larger than a robin.
2 Red on top head, speckled; black and white on throat, yellow under wings.
II Song
Monotonous.
Unmusical.
Low.
Nest in hollow of telephone pole.

### Cow Bird

1 Same size as sparrow.
2 Color—bluish black.
II Song
Call. Spreads wings when sings.
Location—limb.

### Red Headed Woodpecker

Size—Size of robin.
2 Red head and white wings, white markings on breast.
II Song
Monotonous
Loud.
Unmusical.
Flight—
Location—Nest in a telephone post.

### Grosbeak

1 Size—Sparrow.
2 Color—Rose breast.

II General habits
  1 Song
    a Varied.
    b Musical.
    c Loud.
    d High.
    e Tree.

### Bobolink

1 Size of a robin, a little smaller.
2 White head and tail.
II Song
  a Varied.
  b Loud.
  c Musical.
  d High pitch.
  Sings as it flies.

### Goldfinch

1 Smaller than sparrow.
2 Yellow body, black cap.
II Song
  a Varied.
  b Soft.
  c Musical.
  d High
  e Located in a shrub.

### Maryland Yellow Throat

1 Smaller than sparrow.
2 Yellow breast.
II Song
  a Varied.

### Barn Swallow

1 Larger than a sparrow.
2 Color—metallic blue, forked tail.
II Song
  Twitter.

### Long Billed Marsh Wren

1 Smaller than Sparrow.

2 Color—Reddish, white streaks on head.

II Song

a Not varied.

Like a rattle.

Flight—up and down.

### Meadow Lark

Larger than a robin.

Color—brownish, yellow breast, black crescent.

II Song

a Varied.

b Loud.

c Musical.

d High.

### Summary

*Week ending Apr. 1, 1913.*

1. Weather: First part—rainy; last part—warm and sunny.
2. Chief characteristic—returning birds.

*Week ending Apr. 7, 1913.*

1. Weather
2. Chief characteristics—returning birds, soft maple and poplar in blossom.

*Week ending Apr. 14.*

1. Weather—snow and rain until Thursday, Friday cloudy, Saturday and Sunday warm and sunny.
2. Chief characteristics—returning birds, a few wild flowers, grass getting green, one instance seen of working in garden.

*Week ending Apr. 21.*

1. Weather—warm and sunny all week.
2. Characteristics—more birds, Elms in blossom, lilac leaves out, garden making, raking of yards.

*Week ending Apr. 28.*

1. Weather—Hot and windy Monday to Wednesday, rain Wednesday and Thursday, cool Friday and Saturday, frost Saturday night and Sunday.

# NATURE CALENDAR KEPT BY MARY MAXWELL, 1913

**BIRDS**

| Name | Date |
|---|---|
| Robin | Mar. 18 |
| Meadow Lark | Apr. 5 |
| Crow | Mar. 13 |
| Bluejay | Apr. 4 |
| Catbird | Apr. 4 |
| Kinglet | Apr. 6 |
| Martin | Apr. 4 |
| Mourning Dove | Apr. 13 |
| Prairie Chicken | Apr. 20 |
| Phoebe | Apr. 9 |
| Cow Bird | Apr. 18 |
| Flicker | Apr. 18 |
| Wren | Apr. 28 |
| Brown Thrasher | Apr. 30 |
| Chipping Sparrow | Apr. 30 |
| Vesper Sparrow | Apr. 30 |
| Grosbeak | May 7 |
| Wood Thrush | May 7 |
| Cow Bird | May 7 |
| Wilson Thrush | May 7 |
| Chimney Swift | May 7 |
| Chewink | May 7 |
| Bob White | May 6 |
| Bank Swallow | May 1 |
| Yellow Warbler | May 14 |
| Song Sparrow | May 14 |
| Oriole | May 14 |
| Creeping Warbler | May 14 |
| Gull | May 14 |
| Bobolink | May 14 |
| Wood Thrush | May 14 |
| Red Headed Woodpecker | May 23 |
| Black Poll Warbler | May 23 |
| Nashville Warbler | May 23 |
| Yellow Palm Warbler | May 23 |
| Chestnut-sided Warbler | May 23 |
| Chebec | May 23 |

**FLOWERS**

| Name | First Flower | Last Flower |
|---|---|---|
| Anemone | Apr. 10 | May 5 |
| Hypatica | Apr. 13 | May 14 |
| Blood root | Apr. 16 | May 14 |
| Pasque flower | Apr. 6 | Apr. 30 |
| Dog tooth violet | Apr. 21 | May 14 |
| Violets | Apr. 28 | |
| Buttercup | Apr. 28 | |
| Marsh marigold | Apr. 28 | |
| Dandelion | Apr. 26 | |
| Jack-in-pulpit | May 4 | |
| Cowslip | May 4 | |
| Dutchmans breeches | May 4 | |
| Wild parsnip | May 14 | |
| Columbine | May 14 | |
| Bellwort | May 14 | |
| Wild Phlox | May 20 | |
| Bishop's Cap | May 14 | |
| Yellow violet | May 14 | |
| Wild Sweet Williams | May 30 | |
| Lady Slipper | May 27 | |

**TREES AND SHRUBS**

| Name | Leafing | Blossom |
|---|---|---|
| P. Willow | | Mar. 18 |
| Soft Maple | Apr. 25 | Apr. 6 |
| Lilacs | Apr. 19 | |
| Box Elder | Apr. 27 | Apr. 20 |
| White Poplar | May 3 | Apr. 26 |
| Ash | Apr. 27 | |
| Flowering Currant | Apr. 26 | Apr. 26 |
| Wild Cherry | Apr. 25 | Apr. 25 |
| Plum | Apr. 27 | Apr. 27 |
| Willow | Apr. 27 | |
| Lilac | Apr. 24 | May 18 |
| Gooseberry | Apr. 26 | Apr. 28 |
| Currants | Apr. 26 | Apr. 28 |
| American elms | May 1 | Apr. 19 |
| Snowball | May 1 | May 25 |
| Woodbine | May 2 | |
| Sliver Maple | May 4 | |
| Silver Poplar | May 7 | |
| Cottonwood | May 4 | Apr. 20 |
| Balsam Poplar | May 4 | |
| June Berry | May 7 | May 7 |
| Red Oak | May 4 | May 4 |
| Apple trees | May 7 | May 7 |
| Mountain Ash | May 1 | May 23 |
| Butternut | May 7 | |
| Black Locust | May 18 | |
| Rock Elm | May 16 | |
| Burr Oak | May 16 | |
| Thorn Apple | May 7 | May 16 |
| Choke Berry | | May 16 |
| Basswood | May 9 | |
| White Oak | May 12 | May 10 |
| Hard Maple | May 12 | |
| Prickly Ash | May 10 | |
| Spirea | May 4 | May 29 |

**INSECTS**

| Name | Date |
|---|---|
| Gnats | Apr. 13 |
| Grasshoppers | Apr. 14 |
| Ladybug | Apr. 14 |
| Butterflies | Apr. 27 |
| Angleworms | May 1 |
| Fly | May 5 |
| Ants | May 14 |
| Mosquito | May 4 |
| Bees | May 24 |
| Cut worm | May 25 |
| Water strider | May 29 |
| Dragon fly | May 29 |
| Dragon fly nymph | May 29 |
| Damselfly nymph | May 29 |
| Whirligig beetle | May 29 |
| Backswimmer | May 29 |

**FARM ACTIVITIES**

| Name | Date |
|---|---|
| Working in garden | Apr. 6 |
| Planting gardens | Apr. 18–19 |
| Garden products growing | Apr. 27 |
| Sweet corn growing | May 23 |

**OTHER OBS.**

| Name | Date |
|---|---|
| Grass | Mar. 30 |
| Gopher | Apr. 13 |
| Raking yards | Apr. 14–19 |
| Yards green | |
| Mowing lawn | May 3 |
| Flicker making nest | Apr. 31 |
| Bank Swallows making nest | Apr. 30 |
| Robins nesting | May 23 |

2. Characteristics—More birds, soft maple, box elder, rose bushes, willows and mountain ash opened *leaves.*

Cotton wood and white poplar, and flowering currant, wild cherry, and box elder in *blossom. More wild flowers.* A few birds making nests.

*Week ending May 4.*

1. Weather—Hot and windy, rain Friday night.
2. Characteristics—Trees rapidly turned green. Birds beginning to nest. More wild flowers.

*Week ending May 11.*

1. Weather—first part cloudy and cold, last part sunny, but still cold.
2. Characteristics:
   - a More compact appearance of leafing of trees. Swelling of buds on four or five of the slower trees.
   - b Blossoming of a few shrubs.
   - c Nesting of birds.
   - d Return of many birds.
   - e More insects seen.
   - f Opening of many wild flowers.
   - g Seed formation on trees of earlier blossoming varieties.

*Week ending May 18.*

1. Weather—cold and rainy for most part.
2. Characteristics—Few late trees bursting buds. Some blossoming. Most birds nesting. Some returning still. End of early spring flowers.

*Week ending May 25.*

1. Weather—Cool and rainy.
2. Characteristics—Leaves on late trees as coffee tree, catalpa and rock elm. Many warblers not seen before.

*Week ending June 1.*

1. Weather—Very hot.
2. Characteristics—All trees leafed out. Mountain ash blossoms all dead. A few trees blossoming. Mosquitoes, gnats, etc., plentiful.

## Should School Gardens Survive?

By Arthur D. Cromwell
West Chester State Normal

There seems to be uneasiness in some quarters as to the survival of the school garden. Whether or not the school garden should survive depends upon what kind of a school garden it is. If the school garden is little more than a patch for the children to enjoy and an extra burden on the janitor, it should not survive. If the school garden is a plot with beautiful flowers grown by an unwilling janitor but flowers for which the school and especially the children get credit, the school garden should not survive. If the school garden is in the country and is a place where the children learn poorly what they would learn better by visiting a regular gardener's place, then the garden should be abandoned. If the garden is in the country and prevents the children taking an active part in the home garden or worse yet, from becoming active members of their state or the national Boys' or Girls' clubs, and there doing things on a larger and more scientific scale, then of course the school garden should not survive. But if the school garden is a place in town, kept by the children with no extra burdens on unwilling people, and if it furnishes an out-of-door-laboratory then it should survive and become an organic part of the school.

School gardens in town seem to be more popular than school gardens in the country and for a very good reason. In the country, children are very apt to learn incidentally all that the ordinary teacher can teach in a school garden. The growing of a radish to eat or of a dozen radishes to eat, is not worth while for the country child because double the number can be grown at home with half the work. A little patch of corn doomed to partial failure because of the limited chance for cross pollination is of course worse than useless in the country where a boy may take charge of an acre or more providing he wants to.

But there is a very promising field for the rural school garden though as yet there are few if any entering that field. That field is the field of plant breeding. Supposing instead of pulling up the first and best appearing radish, it is marked with a little stake and left to go to seed. Supposing this seed from the earliest and best radishes is multiplied until there is a sufficient quantity to make it worth while and then is distributed to the different families represented in the school, this makes a community interested in the school garden and it makes the work worth while for the country children.

Suppose again that the teacher gets permission and goes with the interested pupils into a near-by potato field, in September and there marks the hills with the most vigorous and blight resistant tops and suppose she follows this up at seeding time and has the hills forked out and saves seed from hills with six or more good sized and good shaped potatoes in each. Suppose she plants these in the school garden, has them well cared for and then distributes seed from all but those hills that she needs for the next year, this is worth while and makes the school garden a place of perennial interest. Or again, suppose she selects the best heads from blight and rust resistant plants in the wheat or oat field and multiplies them in the school garden, this may make the garden well worth while. She may have the pupils in one grade breed radishes, in another grade lettuce, in another grade some other garden vegetable and then the boys in the upper grades breed the grains while the girls breed flowers or take a hand in breeding an improved garden vegetable from the demands of the kitchen for better flavor, more nutrition or more attractive appearance. There is danger of untrained teachers in their enthusiasm for something new, wasting much time and deadening interest in scientific agriculture by doing things that are not worth doing. Of course there is great need that the rural school help give the country child his racial heritage. There is a demand that the country child be made conscious of and be given tact and skill in handling or applying laws and principles but these may be taught to the child who spends most of his time on the farm, without the means of the school garden. The laws of averages, of variation, of mutation, of the survival of the fittest, of natural selection, of capillarity, of conservation of soil moisture, of like tends to beget like, and others are a part of the child's racial heritage which he should be given so far as he can assimilate them so that they may become the basis for his reasoning in later life. Now, if the school garden helps to make these clear, in so far it should survive as a school device for teaching. But I believe that in plant breeding is to be found the great function of the school garden in the country. We are far behind Europe in plant breeding and correspondingly behind in average yields. We need a plant breeder in every district and perhaps one for each farm crop grown. In parts of France, we are told, they have the best garden vegetables in the world. And in these parts where no government money has been given for years except to schools maintaining school gardens, we learn that the girls spend one hour or more each week as a part of their Domestic Science work in the garden or testing the cooking qualities of vegetables from the breeding plots.

## Editorial

There has just appeared from the press of Warwick & York of Baltimore, Md., a new number (No. 11) in their series of Educational Monographs that is deserving of editorial notice. It is of importance to all teachers and gratifying to nature teachers who have been harping on the value of the "nature-study method" these many years. This is on "Inductive Versus Deductive Methods of teaching; An Experimental Research by W. H. Winch ($1.25).

Five schools in England were selected for the experiments, representing different social classes. In all a hundred and ninety-two children were tested including both boys and girls ranging in age from eight to fifteen years. The tests were based on the facility with which children acquired, retained and used geometrical conceptions and definitions. A preliminary test was in each case conducted somewhat as follows: Several squares, triangles, oblongs and diameters of circles were drawn upon the blackboard and labelled as such. These varied in position and dimensions. The children, who had previously had no instruction in geometry, were then asked to write, from their observation of these figures, definitions of a square, a triangle, etc. The papers were scored on the basis of the points correctly noted minus the bad errors made. Thus, in the language of replies, a triangle is (1) a shape, figure or drawing (2) with sides or lines. (3) There are three of these (4). It has corner and (5) there are three such. A pupil noting all these points in his definition would make a perfect score unless in addition he made some bad error. If, for instance, he were to add that the three lines are equal that would subtract from his perfect score. On the basis of this preliminary test the pupils, who were a homogeneous group socially in each school, were divided into two groups A and B, an equal number in each group, alike in ability and similar in age. These groups A and B were taught the definitions. Group A was taught deductively. The definition was written out on the board, such as a triangle is a figure with three sides and three angles. With this were drawn several triangles to illustrate the definition. Pupils were asked to learn this definition in the customary memoriten way, and similarly the others.

Group B was taught inductively. Thus in learning to define the diameter of a circle "Pointing to all diameters drawn, the teacher says: 'What can we say about all these?' The answer 'lines' will be received. He can then ask the question: 'What is the diameter of a circle?' He will be answered, if he choose his questionée well: 'A diameter of a circle is a line.' He draws a curved line on the blackboard but not within one of the circles, and asks 'Is that a diameter of a circle?' He is answered 'No, because it is not on a straight line.' He draws a straight line, still outside the circle, and asks: 'Is that right?' The answer comes: 'No, because it's not in a circle.' 'What is a diameter of a circle?' If he chooses a child's answer,—as he should, from among the least proficient of the class, he will be answered: 'A diameter of a circle is a straight line inside a circle.' He accepts the answer and draws a straight line in a circle which neither passes through the center nor touches the circumference or either extremity. He again asks: 'Is that right?' " And so on until the correct definition has been developed. Repetition of it is avoided.

When the instruction of the two groups has thus been accomplished the pupils were asked *first:* To immediately write definitions in response to the questions, what is a square? A triangle, etc. *Second:* A week later—to write these same definitions. *Third:* A month later—to do likewise. Finally, some new geometrical shapes were drawn upon the board, rhombuses, trapeziums, rhomboids, etc., and these same pupils were asked to make definitions for themselves and write them out. In other words they were to do new work similar to that on which they had been drilled.

"The main problems were two in number. In the first place, an attempt was made to discover which of the two methods(inductive or deductive) gave the better results when the children were tested on *precisely what they had been taught or had learned.* In the second place, an endeavor was made to find out which of the two methods gave the better results when the children were tested on *new material.*

The answer to the first of these two questions was not the same in all of the five schools tested. In three of them, two of the three boys' schools and one of the two girls' schools, the conclusion was unambiguously in favor of the deductive and memoriten method. This was the case with the younger and less proficient boys and girls. . . In two classes, the oldest class of boys and the oldest class of girls who did the work, the inductive method was just as successful as the 'deductive' even for the purpose of exact reproduction immediately afterward. . . On the whole, the tests of deferred reproduction gave the same comparative results as those of immediate reproduction. The importance of this consideration in testing school methods *where exact reproduction is required* is obvious.

The answer to the second of the two main issues was the same in all of the five schools tested. The children who were taught 'inductively' did better work than those taught 'deductively' in every case when they were required *to apply themselves to new material.*

## News and Notes

WHERE AGRICULTURE MAY BE STUDIED. Nineteen States now require that an examination in agriculture be passed before a teacher may obtain his certificate, according to the bulletin (No. 7) just issued by the Department of Agriculture entitled, "Agricultural Training Courses for Employed Teachers." This is an indication of the impetus that has recently been given to agricultural education all over the country. In the two years ending March, 1912, the number of institutions giving courses in agriculture increased at a rate of more than 76 a month, and the total number grew from 863 to 2575.

Now that 19 States require, by law, the teaching of agriculture in the common schools, the demand for teachers of the subject is constantly growing. Normal schools, therefore, are introducing courses of agriculture, and many agricultural colleges are offering special lines of work to meet this demand. Still, there are hardly enough teachers for the secondary schools and the special schools of agriculture. It has been the object of the Office of Experiment Stations to discover, by investigation, just how teachers already employed may acquire the training required to enable them to teach the elementary phases of agriculture.

Without doubt the most popular, as well as the most efficient means of giving this training is the summer course offered by a college or normal school. The instruction is usually of a high class, and adequate equipment and apparatus for laboratory and field work are usually available.

There are also special short courses in agriculture offered in some institutions during the regular school session, usually the spring term. For instance, the Agricultural and Mechanical College of North Carolina, holds a special "May School" for teachers, at which agriculture is taught. Afternoon, evening and Saturday classes in agriculture during the regular school year are offered at Columbia University, in New York City.

The study of agriculture by correspondence has grown rapidly in favor during the last few years. The expense incident to a correspondence course is usually small; but this method has its disadvantage, as there is considerable danger of the students getting incorrect ideas on the more complex questions which arise. There are at present, however, throughout the United States and its territories, about 25 State institutions and five private schools in which some regularly established correspondence work may be done along this line. Many of the courses in the State institutions are free to residents of the State, except for the cost of text books and postage. The highest fee charged by a State school is $5 for one course.

Reading classes are also offered by several State agricultural colleges which do not conduct regular correspondence work. These courses are intended rather for farmers and farmers' housewives than for teachers, although teachers are encouraged to enroll as well. These reading courses are offered at the following institutions:

University of Arizona, Tucson, Arizona; Michigan Agricultural College, East Lansing, Michigan; New Hampshire College, Durham, N. H.; Cornell University, State College of Agriculture, Ithaca, N. Y.; State University, College of Agriculture, Columbus, Ohio.

### Free Reading Course in Agriculture Offered by the Department

The new bulletin announces that the Department of Agriculture has prepared several reading courses of its own free publications for those who might desire an agricultural reading course, but who have not the time to seek out their own material or might wish to avoid the expense of purchasing the books.

The lists of reading for this work have been compiled in view of the great increase in demand for agricultural training in the past three years. They will enable all who have the inclination and any spare time to follow out a thorough course, the publications being supplied for nothing by the Department. If the free publications listed in these courses should become exhausted, they may generally be obtained by purchase for a small sum from the Superintendent of Documents, Government Printing Office, Washington, D. C.

There are eight courses offered, which cover thoroughly the subjects treated. They are as follows:

1. Agronomy
2. Animal Husbandry
3. Horticulture
4. Forestry
5. Agricultural Engineering
6. Agricultural Technology
7. Agricultural Economics
8. Agricultural Education

As a sample of what these courses contain, the following is a list of the bulletins given under the heading "Animal Husbandry":

ANIMAL HUSBANDRY

| Topic | Title | Department's Farmers' Bulletin Number or Yearbook |
|---|---|---|
| Bees | Bees | 447 |
| Birds | Some Common Birds | 54 |
| | Some Common Game, Aquatic, and Rapacious Birds in Their Relation to Man | 497 |
| | Fifty Common Birds of Farm and and Orchard | 513 |
| | Does it pay the Farmer to Protect Birds? | Yearbook Sept. 443 |
| Cattle | The Dairy Herd | 55 |
| | Breeds of Dairy Cattle | 106 |
| | Tuberculosis | 473 |
| Hogs | Pig Management | 205 |
| | Hog Cholera | 379 |
| Sheep | Raising Sheep for Mutton | 96 |
| Poultry | Standard Varieties of Chickens | 51 |
| | Ducks and Geese | 64 |
| | Turkeys | 200 |
| | The Guinea Fowl | 234 |
| | Poultry Management | 287 |
| Feeds and feeding | The Feeding of Farm Animals | 22 |
| | Sheep Feeding | 79 |
| | Principles of Horse Feeding | 170 |

Besides outlining these courses, the new bulletin contains lists of institutions maintaining courses in agriculture in summer sessions, extension courses, and correspondence courses.

Additional copies of this publication may be procured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at five cents per copy.

## REPORT OF THE 1913 MEETING OF THE MICHIGAN NATURE-STUDY AND SCHOOL GARDEN ASSOCIATION

A most interesting meeting of the Michigan Nature Study and School Garden Association was held at Ann Arbor, October 31st, 1913 as a Round Table of the Michigan State Teachers' Association.

At this meeting Miss Kate M. Passolt of Saginaw gave a report of work done in school gardening in the public schools of Saginaw (Enclosed).

Miss Nora Matthews of Grand Rapids gave a similar report illustrated with stereopticon slides showing various garden activities carried on by the school children of Grand Rapids. Among the slides shown were gardens of kindergarten children, of primary and grammar grade pupils and of high school students. Miss Matthews called attention to the excellent work done in a number of schools where there have been gardens for a number of years. Although there is no supervisor each school works out its own problems and there is much good work done in both school and home garden work.

Dr. Caldwell of the University of Chicago gave a short talk emphasizing the value of garden work.

An election of officers followed, Dr. LeRoy Harvey of the Western State Normal being elected president and Lou I. Sigler of Buchanan School, Grand Rapids, secretary.

Lou I. Sigler, Secretary.

Mrs. Anna B. Comstock gave a course of lectures at the Kindergarten Training School in Grand Rapids, Mich., the first week in November and lectured also before the Grand Rapids Nature-Study Society Thursday evening, November 6. On Friday evening the Nature-Study Society and the Kindergarten Association tendered a reception in her honor.

The following excerpt from a letter is interesting.

Miss Louise Klein Miller was in our city (Grand Rapids, Mich.) a week giving a series of garden lectures that proved very helpful. This was the last week in September. Having a garden and being greatly interested in the work, we planned to entertain her in our school building.

In co-operation with the Mothers' Club the teachers gave a luncheon for Miss Miller and nearly all the vegetables used, at the luncheon were grown in our school garden. The mothers took the vegetables home and then brought them to the school and served the luncheon. We had tomato soup made from our own tomatoes, stuffed green peppers, radishes, beets and our meat platter was garnished by our own parsley.

The school house was decorated with our own school grown flowers, of which we had quantities, and the flowers on the tables were arranged by one of the mothers.

Place cards with appropraite nature quotations were painted by our sixth and 7th grade pupils from flowers gathered in the garden. Miss Miller expressed herself as greatly delighted. Several members of our Board of Education, the Superintendent, Assistant Superintendent, and a few principals were present.

Last spring we had a fair under the auspices of our Mothers' Club. Booths were erected, by the fathers, all around the assembly hall. The prettiest booth was the central one at which our hyacinths and tulips and daffodils raised by us last winter were sold. We realized between $15 and $20 from the sale of these bulbs. Some of this money was used to purchase bulbs for this winter and each child in our school has already planted a bulb. They are in the trench ready for winter growing.

We realized $33.50 at the West Michigan fair this fall, nearly $20 of this amount being in direct competition with many others.

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*Nature and Culture* has changed its name. It is now *The Blue-Bird.* It is published monthly as the Ohio Audubon monthly. Eugene Swope is editor, No. 4 W. Seventh Street, Cincinnati, O.

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Three interesting pamphlets are on the editor's desk this week. "Directions for Field Studies in Agricultural Nature-Study" by Gilbert H. Trafton, Mankato, Minn. "A Course in Physical Nature-Study for the Elementary School" by Wm. T. Skilling, San Diego, Cal. and "Butterflies and Moths in the Vicinity of Evansville, Ind." This latter the inscription says "has been prepared by teachers who realize the satisfaction to be derived from helping boys and girls to know and enjoy the wonders of the world around them.

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There comes to the editor's desk with regularity, the *Wilson Bulletin*, a quarterly bulletin of ornithology. It is published at Oberlin, Ohio, and it is the official organ of the Wilson Ornithological Club. The last number, No. 3, Volume 25, bears date of September, 1913. This bulletin is always interesting and contains each quarter, a number of well illustrated articles that are of interest to bird lovers. This September number contains two long articles of special interest, one on the Home Life of the Glossy

Ibis, and the other on the Olive Backed Thrush at his Summer Home.

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The New York City Section of the American Nature-Study Society met at Teachers College, Columbia University, Saturday, November 14. The following officers were elected: President, Ellen Eddy Shaw, Instructor Brooklyn Botanical Garden, editor Garden Magazine; vice-president, Grace Greenleaf Lyman, New York Training School for Teachers; secretary-treasurer, Charlotte E. Lee, School for the Deaf; executive committee, Dr. Chester Matheson, Brooklyn Training School for Teachers, Grace Stewart, Clifton School, New York City.

Dr. Ira S. Wile, member of the Board of Education, addressed the section upon "The New Course of Study in Nature-Study and Hygiene." He spoke in part as follows: Nature-study should be chiefly human nature-study. It should be related to life and closely related to hygiene. The study of the cockroach is of more importance to the city child than the study of the cecropia. Birds which protect trees should be studied; poisonous plants are of more importance than the crocus.

Nature-study whose chief function is passive observation is entitled to little time. Observational differences between two forms such as color this and color that have little value. These are discriminations for the adult mind. The child only asks what can I do with this?

The essentials of growth, respiration, nourishment as found in plants and animals form a harmonious course. Such a course should contribute to health, human welfare, success.

ANNA M. CLARK.

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## Nature Articles in December Magazines

*Garden Magazine*—Curious History of the Cinnamon Vine, S. T. Homans.

*Harpers*—Australian By-paths, Norman Duncan.

*Illustrated London News*—Dec. 6, Courtship of Birds.
Dec. 13, The Leaping Salmon.

*Outing*—The Truth about Fox Farming, Clarence Birdseye.

*Popular Science Monthly*—The Forests and Forestry of Germany, W. R. Larzenby.

*Scribners*—Life History of the African Buffalo, Giant Eland and Common Eland, Theodore Roosevelt.

## Exchange Department

For the convenience of readers who may have native materials for exchange or who want to make inquiries, opportunity will be given here each month for the publication of such exchanges. The cost will be twenty-five cents for twenty-five words or less and a cent a word for additional words—merely enough to cover the expense incurred. Send exchanges *with remittance* directly to the publishers.

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## Book Reviews

MODERN PROBLEMS OF BIOLOGY. Lectures delivered at the University of Jena, Dec. 1912. Charles Sedgwick Minot, pp. ix + 124.

Professor Minot was exchange professor when these six lectures were delivered. Their titles are 1. The New Cell Doctrine. 2. Cytomorphosis. 3. The Doctrine of Immortality. 4. The Development of Death. 5. The Determination of Sex and 6. The Notion of Life.

"The living substance is more important to biologists than its tendency to form cells. Hence we consider the chief problem of biology to be the investigation of the structure and chemical composition not of cells, but of the living substance." This is the new cell doctrine. Cells pass through a definite cycle of changes first an embryonic condition, second differentiation, third degeneration and finally death. This constitutes cytomorphosis. But certain cells never die. The reproductive cells multiply, dividing to become new cells but the stream of their protoplasm is continuous or immortal and this is the basis of heredity. The rest of the cells multiply with rapidity in embryonic life, pass through their successive stages, finally die. Thus rabbits may grow as much as 18% per day just after birth. But this rapidly drops so that within a month they are growing less than four per cent per day. They are already ageing rapidly. Minot believes that it is already proven that "sex rests on a physical basis which we recognize by differences in the proportion of chromatin in the cells of the male and female body." Finally he concludes that while "life is bound to matter . . . there always remains the possibility that consciousness cannot be explained mechanistically, that it is neither a condition of protoplasm, nor a special form of energy but something of its own kind, not comparable with anything else that we know and that it reveals itself by causing transformation of energy."

Animal Communities in Temperate America. Victor L. Shelford. pp. xiii+362. University of Chicago Press. $3.00.

Seldom does a book ostensibly so purely scientific in its purposes lend itself so admirably to the work of the nature-study teacher. Mr. Shelford ranks as one of the foremost American students of animal ecology. The book presents, as the title indicates, a series of studies of animal societies. The nature student goes, for instance, to a pond to collect. His zoology reference books tell him of the animals he secures but he must hunt out the information in a systematic treatise in which the animals he finds are scattered from protozoa to vertebrata. Now here is a discussion of the animals of the pond treated as such. Their relations, life conditions, reactions, habits, etc., are given. There are numerous figures that help at identification and an extended bibliography that makes it possible to get further authorities for determinations. There are taken up also communities of Lake Michigan, stream communities, communities of small lakes, beach communities, swamp associations, forest communities of various sorts and several chapters of general discussions. The book is an admirable presentation of the whole matter of animal associations in this middle west region and is to be strongly recommended as a very great aid in appreciative study of one's local environment.

Botany for Secondary Schools. L. H. Bailey. pp., xiv+ 465. The Macmillan Co. $1.25.

This is a revised edition of Bailey's Botany, an Elementary Text Book. The chapter titles are the same as in the earlier editions except that chapter x on pruning is new and chapters xi and xii on food absorption and elaboration have been expanded to make three chapters. The new chapter is xiv on Food Elaboration and Respiration. Three new chapters are added in Part II. xxxiii on Weeds, xxxiv on Crops and xxxv on the Forest.

Needless to say the text is a good one. The older text was a good botany and the revisions and additions improve it.

THE THREE GIFTS OF LIFE. Nellie M. Smith, p. xiv + 138. Dodd, Mead & Co.

This is an admirable presentation of the matter of sex-hygiene. The author is lecturer for the Society of Sanitary and Moral Prophylaxis of New York. Her book is written primarily for girls and presents the matter in an effective way yet with delicacy and tact. The three gifts are dependence. That is the plants gift. Instinct is the animals gift and choice, the third, is peculiarly human. "Women can do three things to help the race progress; seek the best in themselves, demand the best in men, and teach little children how to use their gift of choice."

INTRODUCTION TO ZOOLOGY. Rosalie Lulahm, London. Pages xiv + 437; figures 328, plates 6. Published by the Macmillan Publishing Company, New York, 1913. $1.60.

The author makes the assertion that this text is planned for use in the upper grades of secondary schools and for those preparing for University examinations. The subject matter concerns the life histories, life processes, habits and classification of animals from the Protozoa to and including the Insecta. Those who look with apprehension on the present trend in biology toward emphasizing the practical or applied side of it will welcome this text as this phase receives very little attention. There is no hesistancy in recommending the text to those who desire a technical treatise on the invertebrates.

C. W. F.

The Nature-Study Review,
Ithaca, N. Y.

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# NATURE-STUDY REVIEW

Devoted Primarily to all Scientific Studies of Nature in Elementary Schools

Vol. 10 No. 2
Whole No. 80

OFFICIAL ORGAN OF THE AMERICAN NATURE STUDY SOCIETY

FEBRUARY 1914

CONTENTS

The Beginning of Star Study.....45
Mrs. A. B. Comstock

Use of Material by Young Nature Students. R. W. Shufeldt.......49

The School Gardens of Saginaw..53
Kate M. Passolt

A Day's Hygienic Living.........56
C. A. Stebbins

The Woodlawn School Garden....61
Alice V. Joyce

Supervising a Community Garden 65
Elizabeth M. Waters

Nature Articles in January Magazines.........................69

News and Notes..................69

Book Reviews...................69

Published Monthly except June, July and August at Ithaca, N. Y.

$1.00 a VOLUME (9 Nos.)

Elliot R. Downing, Editor
The University of Chicago The School of Education
Chicago, Ill.

15 Cents copy

Entered as second-class matter at the Postoffice at Ithaca, N. Y., under the Act of March 3, 1879.

THE
NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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VOL. 10 FEBRUARY, 1914 No. 2

# The Beginning of Star Study

ANNA BOTSFORD COMSTOCK

The study of the stars has a great fascination for children but there have been difficulties attending the teaching of this study in the elementary schools. First of all, the teachers have found it impracticable to take their classes out at night. This difficulty, I am sure, may be easily met so far as the chief constellations are concerned by giving a demonstration on the blackboard, showing the forms of the constellations and by explaining in what part of the heavens they may be found at an early hour in the evening.

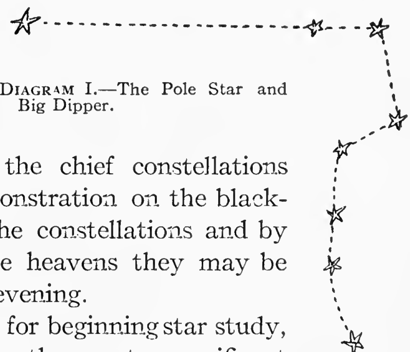


DIAGRAM I.—The Pole Star and Big Dipper.

February is a favorable time for beginning star study, for early in the evening Orion, the most magnificent of all the constellations, occupies the middle of the southern skies. The study should begin about the middle of the month when the moon rises late so that the stars are visible as soon as darkness falls.

The first study should be of the Polar constellations. The Big Dipper and its relation to the Pole Star forms naturally the earliest lesson. Place the accompanying diagram (No. 1) on the board. If the lesson is given at the middle of February, the Dipper will be seen at seven in the evening low down in the eastern sky with the handle extending down toward the horizon. The teacher should have made the observation previously so as to be sure of the exact location. During the following two or three days questions should be asked concerning what the pupils have seen of the Dipper. The drawing should be erased from the board and each pupil should make a drawing for himself of the Dipper and the Pole Star as remembered. And this drawing should not be accepted until the proper number of stars are placed for the bowl and the handle and the proper relation of the pointers to the Pole Star are indicated. The following questions should be asked to stimulate further observations:

1. Look at the Big Dipper at 6:30 in the evening and again at 8 or 8:30. Does it keep the same position in relation to the Pole Star?

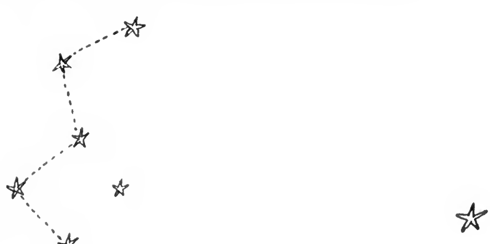
2. Is the Dipper moving up or down?

3. Do the pointers keep pointing toward the Pole Star?

4. Does the Dipper move around the Pole Star at night? If so, does it move in the same direction as the hands of the clock or in an opposite direction?

By answering these questions from observation, the pupils may be taught the following facts: The Big Dipper points with its "pointers" toward the Pole Star and to us seems to revolve around it each twenty-four hours, but this appearance is caused by the fact that we ourselves on the earth are revolving from west to east. It is a little more difficult to explain that because of the movement of the earth in its orbit the Big Dipper and all the other stars arrive at a certain point in our sky four minutes earlier each day or about two hours earlier each month. The explanation may be difficult to the pupils but the facts they should observe for themselves.

The next lesson should be on Cassiopeia's Chair and the same plan should be followed. Place Diagram No. 2 on the board, showing that the stars are placed to form an irregular W. Explain that it lies on the opposite side of the Pole Star from the Dipper,



Cassiopeia's Chair DIAGRAM II Pole Star

but at about the same distance from it. After two or three clear nights the following questions should be asked:

1. Make a diagram (No. 3) of the Chair, the Pole Star and the Dipper, showing how they are placed in the sky.

2. Does the Chair move around the Pole Star as does the Big Dipper? Why did the ancients name this constellation Cassiopeia's Chair?

After this the Little Dipper may be shown in the same way. The diagram is so long and wandering of the constellation, called The Dragon, that it is rather difficult to teach it in this manner. However, since the two stars in the Dragon's Tail lie near to the bowl of the Big Dipper and the Pole

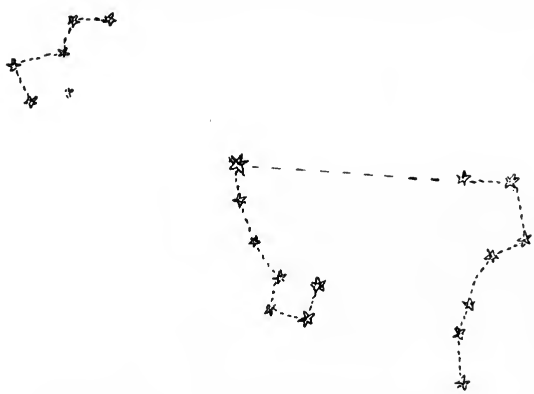


DIAGRAM III. Cassiopeia's Chair — Pole Star Little Dipper — Big Dipper

Star, perhaps the pupils may be able to work it out partially. However, it is not an especially important constellation.

The next lesson may be given on Orion. The diagram IV should be placed upon the board and proceed as before; the location of the constellation should be described, and the following observations should be called for:

1. How many stars in Orion's belt? How many in his sword? What is the color of the bright star above the belt? What is the name of this star? What is the color of the bright star at about equal distance below the belt? What is its name?

2. Read the story of the myths of Orion, the great hunter, and write an account of it.

After these studies have been made, the following questions should be asked:

1. Do the Big Dipper and Cassiopeia's Chair ever set?

2. Does Orion rise and set?

3. Why do not the Big Dipper and the Chair rise and set like Orion?

4. If you should stand at the North Pole where would the Pole Star appear in the skies?

5. If you were at the North Pole would any star seem to rise and set?

From this lesson the pupils should reason out for themselves the following facts. It is very important for us to know the Pole Star because the northern end of the earth's axis points toward it and it is, therefore, situated in the heavens almost directly above our North Pole. For those of us who live in the Northern Hemisphere the North Star never sets but is always to be seen. However, the North Star does not have any more to do with the axis of our earth than the figure on the blackboard has to do with the pointer; this star simply happens to lie in the direction toward which the northern end of the earth's axis points. In the southern skies there is no convenient star which lies directly above the South Pole, so there is no South Pole Star. The Pole Star cannot be seen from the Southern Hemisphere because of the curvature of the earth. But if we should start on a journey from Florida toward Baffin's Bay we should discover that each night the Pole Star would seem to be higher in the sky, and if we should succeed in reaching the North Pole, we should find the Pole Star directly over our heads. And none of the stars which we could see would rise or set but would move around us in circles parallel to the horizon.

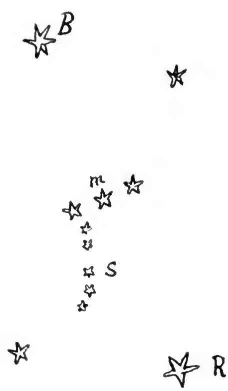



DIAGRAM IV
Orion
*B*–Betelgeuge
*R*–Rigel
*M*–Belt
*S*–Sword

Since the earth is a great magnet and since the poles of the magnet are almost coincident with the poles of the earth's axis the magnetic needle naturally points north and south. Thus it is that the North Star happens to be nearly in the direction toward which the northern end of the compass needle points.

In correlating the myths which have to do with the names of the constellations, the pupils should be made to understand that the ancients believed almost any kind of a story about their Gods. And since they saw these constellations in the skies night after night they naturally connected them with the stories of their Gods and Goddesses and thus gave them the names which we use to this day. Two interesting little books give these myths: "Storyland of the Stars" by Mary Pratt, American Book Company; "Stars in Song and Legend," Porter, Ginn and Company. For reference books for the teacher almost any standard astronomy like Todd's "New Astronomy," and the delightful volume by Miss Martin called "The Friendly Stars" published by Harper's, are excellent.

## Use of Material by Young Nature Students

By R. W. SHUFELDT

In this article it is my purpose to point out to young nature students, who aim to take a course in biology with the view of becoming professional zoölogists, the value of forming, early in life, the habit of making full notes upon all natural phenomena that may come under their observation; and, what is even more important, the saving of all material which might in any way prove to be of use in the future.

As a working biologist, this is a plan which I have followed for over forty years, and in the vast majority of instances it has been of the greatest possible advantage to me. It has occurred to me that some of my observations on the subject might prove to be of use to young naturalists.

In the course of my life, many thousands of instances have come to my notice where nature material, of every possible description and often of great value, has been wasted or thrown away by nature students and others, when it could, with a little foresight and care, have been utilized, frequently with the most advantageous results, either immediate or remote. Only a few days ago, a case of this kind was brought before me. I happened into a little bird-shop on Park Road, Washington, D. C., and in conversation with the proprietor he informed me that it was too bad I had not come in a few hours earlier, as a young man who collected in the vicinity had given him "Some kind of a *lizard*," which was so slimy and disagreeable that he had, upon its death, thrown it into the ash can, and the men had emptied the latter that morning. Upon investigation I found that the specimen was an amblystoma of the greatest rarity in this section, and one which I had never personally collected. In other words, it was the Large Spotted Salamander (*A. punctatum*, (L) Baird), a species becoming more or less rare everywhere. In fact, I do not believe I have ever seen a living one. It is an elegant representative of the genus, being of a rich, black color when adult, with a series of round, yellow spots of a brilliant, intense shade on each side of the back.

Now here was a specimen of a comparatively rare form in this section of the country, of which in so far as I am aware, we have no photographs from life. We know but little of its habits and structures, except what has been learned, in a general way, from a study of its allies. Finally, it is not well represented in museum collections. Yet this student allowed this opportunity to go by, when he could have made a positive contribution to our knowledge on all of the aforesaid points.

It is not difficult to make life-sized photographs of such animals, nor to color the prints true to nature afterwards. My method of doing this has been described in many publications which may be found in any general library in this country. Following this procedure, the specimen should be measured, weighed, and studied in other particulars, such as making a record of its external characters, as well as those of the buccal cavity and other apertures. Then it should be consigned to some preservative fluid of the proper kind, which will either preserve the specimen for all time, or until it is to be used for the purpose of making a complete scientific study of its morphology.

My present collection contains several hundred negatives of the class referred to above, and prints from nearly every one of them have, up to date, either been published or otherwise made scientific use of in the way of furthering biological science. If possible, I never allow any animal—invertebrates, fish, reptile, bird or mammal—to come into my hands without photographing it (natural size, if my cameras admit of it), and making such notes upon it as have been suggested in the foregoing paragraphs.

Here is another interesting case in my experience which well illustrates the advantage of making use of *all* the material which may come into one's hands. One day I received—only a month or so ago—from another bird-store man in Washington, a dead specimen of a species of marmoset. As it was not immediately convenient to compare the animal with museum or other material, with the view of identification, and taking it to be one of the ordinary little "cotton-head" monkeys of Brazil, this step was, for the time, postponed. However, rare or otherwise, I went at the material in my usual way; and after carefully examining its topographical anatomy, I placed the animal on its side, in such a position as to exhibit most of its characters, making a photograph of it nearly natural size. A reproduction of this photograph illustrates the present article. Having previously made measurements of total length, limbs, tail, etc., the hide was carefully removed; this was poisoned and made into a "flat skin." A complete skeleton of the specimen was obtained, labeled, and put away for future use. Observations were made upon the "soft anatomy" of the animal, which closed the record for that particular specimen. Later on, upon showing the photograph to Mr. Gerrit S. Miller, Jr., Curator in charge of the Division of Mammals of the U. S. National Museum, I was informed, much to my surprise, that my marmoset was a specimen of the very rare *Seniocebus meticulosus*, of Northern Colombia, of which it constituted the fourth example known to science. So rare is the form that Dr. D. G. Elliot, in his recent and elegant three-volume work on "A Review of the Primates" (Monograph American Museum of Natural History, 1912), awards this species the colored frontispiece of volume one, the same having been made by Mr. Fuertes. My "flat skin" now forms a part of the collection of mammals of the United States National Museum; the skeleton is in my private collection and will be described later on. Dr. Elliot has already given us figures of the skull in his work. Thus it will be seen that nothing is lost by making records *of all material* that comes into one's work-shop.

FIG. I. *Seniocebus meticulosus*. Greatly reduced.—By the author.

For the purpose of coloring photographs of specimens of any kind—botanical or zoölogical—I use the Japanese aniline colors which come on the pages of a little book and are readily dissolved for use. My method with examples of this class of work have recently been published in the most artistic manner in *The Photographic Times* of New York City (August, 1913). The specimens used here were the heads of a Toucan and a Mino bird, and in photographing them I made the attempt to have the pictures appear as nearly life-like as possible. Then, too, one should color the photographs with the specimens before one and *prior* to any post-mortem changes taking place in the latter, during which the natural colors may become more or less changed. I think now that a slight change had taken place in the beak of the aforesaid Toucan, and as I reproduced it, it is somewhat darker than in life. One should be very careful about this, for erroneous ideas may be put into the minds of the readers, which is always very unfortunate and future rectification of them is difficult.

FIG II. A Cuban Parrot (*Amazona Cucocephala*). Reproduction of a photograph of the dead bird. Greatly reduced. By the author.

Often the dead bodies of your specimens may be posed in attitudes more or less life-like for the purposes of photographing them. When such results are successful, the pictures have an added interest and may frequently be employed in pictorial zoölogy with effect. They may likewise be colored, as pointed out above, and if the whole be well done, a portrait may be produced, which, in not a few particulars—as in the general contour of the form given, the topographical characters and so on—will be much nearer nature than many of the illustrations we see.

To illustrate this feature of my subject, I select from my collection a photograph I made last month of a dead parrot—one of the Brazilian species—which had come into my possession. This is reproduced here as Fig. 2. It gives a very good idea of this particular species, and will be still more effective when the photograph is correctly colored. Birds lend themselves better to this method of producing pictures than do mammals, many reptiles, and most fishes. However, there is a surprisingly large list of creatures which may be so used, and when we meet with them it is an advantage to resort to it, as an adjunct to our collection of animal records.

## The School Gardens of Saginaw

KATE M. PASSOLT

The school gardens of Saginaw were commenced in 1903, when the first one was established for the Longfellow School. Since then the gardens have increased in numbers until now each school on the East Side has one. The Federation of Women's clubs early saw the value of this movement and aided by supplying seeds for several years, and have hired a director during the vacation months for the last seven years.

Up to the year 1910 the gardens were cultivated on vacant lots which were either rented by the Board of Education, or whose use was donated by friends. Upon these lots no permanent improvements could be made. The garden sites were often changed and were becoming harder to secure, when our friend, the Hon. W. R. Burt, became interested. He purchased and presented to the Board of Education gardens near or adjacent to each of the schools, ranging in size from 65 x 140 feet to 117 x 240 feet. In addition Mr. Burt also caused shrubbery to be planted and had substantial fences erected around the gardens. In order to possess all necessary facilities, tool houses were erected at Mr. Burt's expenes, at six of the gardens, by the wood working classes of the Eleventh Grade. The permanent outlay for the gardens has been in the neighborhood of $10,000.

Gardening is a practical application of Nature Study which we have tried to teach. The aims in our garden work are three. First, to create in pupils a respect for the dignity of labor; second, to arouse within them the love for out door life; and thirdly, to give a knowledge of how to cultivate the common garden vegetables and flowers.

It was soon discovered that to secure efficiency in this work there must be a definite plan. A course of study in gardening was prepared which is now being followed. It aims that one new vegetable and one new flower seed be planted each successive year for six years. Following is a brief outline of the course:

First Grade: Vegetable seed, Bean—flower seed, Zinnia.

Second Grade: Vegetable seed, Beet—flower seed, California Poppy.

Third Grade: Vegetable seed, Lettuce—flower seed, Coreopsis or similar seed.

Fourth Grade: Vegetable seed, Cabbage.

Fifth Grade: Vegetable seed, Tomato.

Sixth Grade: Vegetable seed, Cauliflower.

These latter three grades choose their flower seed. With this required planting, pupils may choose any three seeds which they have previously planted for variety and review. Grades above the sixth work in the general or experimental gardens where are planted:

Grains—Wheat, Rye, Oats, Barley and Buckwheat.

Fibre plants—Hemp, Flax, Cotton.

Miscellaneous—Broom Corn, Popcorn, Herbs, Pepper, Eggplant, Salsify, Kale, Chard, Celery, Kohl Rabi, Sugar-beet, Melon, Squash, Pumpkin, Peanut, Potatoes.

Flowers—Aster, Castor-bean, Cosmos, Mignonette, Nasturtium, Petunia, Sun-flower, Candy-tuft, Marigold, Verbena, Coxcomb, Snap-dragon. An effort is being made to teach the pupils the use of vegetables not generally known, but which, besides having food value, give variety to the ordinary diet.

Most of the seeds are sent us by the Agricultural Department at Washington. The remainder are now purchased by the Board of Education.

Before and during the time of actual planting preparatory work is done by each grade.

First Grade—Recognize common seeds. Test seeds, care and use of tools, germination, furrow making and planting seeds, cultivation and thinning.

Second grade—Same as First Grade with this addition: Estimating amount of seed needed.

Third Grade—Same as two preceding grades with these additions: Making paths, garden diaries, recognize common harmful insects and method of destroying them, recognize common weeds and their distribution.

Fourth, Fifth and Sixth Grades—Same as preceeding grades with these additions: Experiments with different soils, transplanting. A few specimen plants are allowed to seed for studying in the fall. The fibre is taken off the fibre plants. Flour, etc., is made from the grains when harvested.

The manual training department correlates as much as possible with the garden work and has made plant labels, which are stenciled in the drawing classes, dibbers for transplanting, and cultivating sticks. Paper boxes are also made for transplanting from the hot bed.

School gardening begins around the first of May and employs about one hour of school time a week during May and June. In some schools all students participate, while in others, one, two or three grades take part. Each child is given a separate plot, averaging in size—four feet by five feet. A plot is reserved for experimental planting. The older pupils draw the plan of the garden to scale and then lay it out with tape line, cord, and stakes. Paths are made before general planting is begun by the boys above the third grade. Seeds requiring an early start are planted in a hot bed on the school garden in season to be available at planting time. Each school has a supply of hoes, rakes, spades, and cultivators. These are usually supplemented by tools from the homes if more than one grade is to work in the garden at once.

During the summer, children come to the garden early in the morning to cultivate and harvest upon dates set. They are under the direction of a supervisor who carries on the work begun in May. The pupils are allowed the fruits of their labors. Some sell the vegetables while others supply the home table.

The children are very generous and give of their plenty to worthy poor and charitable institutions. The Sweet School sent over five hundred bouquets to the hospitals. In the fall some of the vegetables are sold. The children take the responsibility of preparing and marketing and sell only on merit and at market prices. The largest garden has a credit of $53 from the sale of cauliflower, cabbage, beets, carrots, parsnips, tomatoes, salsify and peppers.

The proceeds have been used to help buy play apparatus, pictures, picture machines, Victors, casts, etc.

This fall an exhibit of the results of the city garden work was made at the Saginaw Rural School Fair. Practically everything in the vegetable kingdom was shown. It compared favorably with the rural exhibit and won several blue ribbons.

The school gardens have led many children to cultivate home gardens. In a report to the Superintendent it was found that 1305 children cultivated different kinds of vegetables and flowers at their homes. This practice, carried on from year to year becomes a habit, and the men and women of tomorrow will give more attention to home gardens than those of the present day. It will result in cheaper living by providing food and will assist in beautifying their home grounds. The influence of a beautiful home surrounded by a cultivated yard will go far toward counteracting many of the evil influences of the day. Some one has said that of all the people who love gardening, ninety-nine out of a hundred are good men and women. We are thus serving a useful moral purpose in encouraging the cultivation of vegetables and flower gardens by the pupils of our schools.

Saginaw, Michigan.
Longfellow School.

## A Day's Hygienic Living

C. A. Stebbins

The Mayfly spends several months in preparation for adulthood. Having reached this stage, in 24 hours it may fly to light, lay eggs, and die. It cannot sustain life as an adult because of rudimentary mouthparts.

Nature builds a poppy. She reaches into the Heavens for sunshine and air food. She stirs in a little warmth and soil food. A beautiful flower is the result. Seeds are produced and the plant dies.

Thus through every animal and through every plant nature demonstrates her great purpose, that the aim of all life is to produce new life, not only new life but more efficient life. This is the fundamental keynote in racial betterment yet we concern ourselves but little in teaching boys and girls how to live each day so as to become superior ancestors.

We grant that some attention is being given to the teaching of physiology but the premium is placed on technical knowledge not on better living. Recently the writer listened to a lesson on hygiene being taught by a young teacher. Among other topics for discussion was that of the cold bath in the morning. The writer took the class for five minutes. He asked a small girl to write on the board the arguments presented by the others for taking a cold morning bath. The board was covered. One concluded at once that it would be impossible to sustain life without a cold morning bath. The writer asked the children how many were taking such a bath. Not a hand was raised. Children will tell one that the teeth should be cleaned after each meal, that food should be chewed thoroughly and in the next breath, a strong one usually, one will see them racing toward the baseball field with a piece of bread and butter in one hand and a bat in the other.

The following score card of a hygienic day's living was planned by the writer in order that the emphasis might be laid on better living and not on technical knowledge. Each day the boys and girls and normal school students in public health score themselves on the basis of 100%. Each Monday the average for the week is given the instructor. The grade of the pupil and the student is materially determined by the ascending weekly reports.

## Score Card

| | | |
|---|---|---|
| Sleeping in the open screened from insects | | 5 |
| or | | |
| Bedroom windows wide open | | |
| Hair mattress | | 2 |
| Small pillow | | 1 |
| Bed clothing aired | | 2 |
| Clean linen | | 2 |
| Rise regularly at seven | | 3 |
| Light exercise | | 3 |
| Cold bath | | 5 |
| Care of hair (brush 75 times) | | 3 |
| Teeth cleaned (at least in morning and at night) | | 4 |
| Individual towel | | 2 |
| Glass of cold water | | 1 |
| Sing or play instrument | | 3 |
| Hygienic breakfast | | 5 |
| Attractive table | 1 | |
| Fruit, biscuits and honey | | |
| or | | |
| Cereal (well cooked), eggs, toast | | |
| or | | |
| Cheese, fruit and toast, milk | 2 | |
| No coffee | [illegible] | |

| | | |
|---|---|---|
| Rest 20 minutes | | 2 |
| Walk to school briskly | | 2 |
| Carry books at arm's length | | 1 |
| Best possible light at school | | 3 |
| One and one-half hour for lunch | | 3 |
| Hygienic lunch | | 5 |
| Soup, crackers, bread and honey or Fruit, bread and milk or Cold meat, bread, custard pudding | 2 | |
| Attractive table (flowers, etc.) | 1 | |
| Chew food thoroughly | 1 | |
| Eat moderately | 1 | |
| Rest 20 minutes | | 2 |
| Walk to school | | 2 |
| Two glasses of water during the afternoon | | 2 |
| Vigorous exercise (tennis, baseball, etc.) | | 5 |
| Rest 20 minutes before dinner | | 2 |
| Hygienic dinner | | 6 |
| Soup, roast, bread (two slices), raw vegetables, potatoes, custard, etc | 3 | |
| Combinations to avoid, two strong carbohydrates such as rice and macaroni; two proteids such as beans (dry) and meat or cheese and meat. Heavy carbohydrates and proteids at the same meal. Attractive table | 1 | |
| No coffee | 2 | |
| Rest 20 minutes | | 2 |
| Sing, play, read orally | | 2 |
| Study one hour | | 2 |
| Softened electric light | | 3 |
| Light exercises before retiring | | 3 |
| Retire regularly at 9:30 | | 4 |
| Glass of water before retiring | | 2 |
| Clean hands, face, and mouth before retiring | | 2 |
| Hygienic clothing and good posture through the day | | 2 |
| Hands and finger nails kept clean | | 2 |
| | | 100% |

Unsigned reports were given by the Public Health class one afternoon on the benefits of living by the score card for 12 weeks. A few of these reports follow:

### Hygiene and Health

"Have had no bad colds or sore throat since sleeping with the windows open and taking cold bath in the morning. I generally had at least one cold in the fall before. I feel more energetic when I take a cold bath than on the days when I do not take one. I have not been sick at all since I started the course. My eyes trouble me considerably because I have to study so much, but they are not as bad as they used to be since I have been more careful of the light."

---

"I think the greatest good I have received from the score-card work has been that I have had fewer colds this winter than any previous winter. I have had one or two colds but they were not severe and did not last long. I think taking a cold bath regularly every morning has helped the most.

"Another advance is that I have stopped drinking coffee and I find that I am not as nervous as I used to be. I think the gain has been general rather than specific."

---

"By following the score-card I have taken more care as to what and when I eat my food and I try to eat food that contains nourishment and not eat too many carbohydrates for the amount of proteids. I chew my food better, don't drink water at or right after meals and I find that I am not troubled with indigestion.

"I have no trouble with my eyes since I don't study any more than necessary. My whole system is in a better condition than it ever has been. I don't feel sleepy and sluggish like I did before I began exercising night and morning and taking a cold bath."

---

"Since I have been living up to the score card I have not had a cold or headache and have gained five pounds.

"A cold bath seems to make a person feel fresh and comfortable just after getting up.

"Before I used the score card pimples used to break out on my face and body but they don't now."

---

"I think the score card has helped me. As I haven't had so many colds; headache only two or three times; while during the time that I drank coffee I had headaches at least twice a week. I really think I feel better in general.

"I also take more exercise now and make it a point to get more fresh moving air.

"I have been eating a great deal more hygienically and know that also is a cause of the absence of headaches.

"I do not feel nearly so tired as the consequence of having more fresh air. Rather feel rested upon rising."

---

"Previous to my attempt to live up to the score card I was bothered occasionally with headaches which I think were due to over-eating but I can truthfully say that I have not had a headache this term.

"I used to lie in bed and read at night even though I knew it was injurious to my eyes but I have had it so impressed upon me this term that I am thinking of the injury it is doing my eyes rather than the reading matter, so I refrain from it all together. I have not noticed any change in my eyes but reasoning allows me to know they are not being weakened at least.

"I have stopped drinking coffee mornings and notice that I do not feel drowsy and languid as I did prior to the change."

---

"Since sleeping outside I have not felt tired and wornout in the morning as when sleeping indoors. I have had fewer colds this winter than usual and not as severe ones nor do they last as long as usual. No sore throat has been noticed yet. I have had but few headaches and those have been much less severe than formerly. The cold bath in the morning has seemed to tone my whole system to better and more vigorous working order for I feel far more energetic and do not tire so easily as formerly.

"My appetite for breakfast is greater this winter than last due perhaps to exercise and earlier and more regular rising and glass of cold water in the morning. Carrying books at arms length is less tiring than other ways."

---

"My general physical condition is more healthful than in many years. The morning and evening exercises seem particularly beneficial to me. The cold water baths seem to harden me to the cold. I always feel so warm after taking them. Since I have been massaging my hair it has become very oily and has grown surprisingly. I find that regularity in rising and retiring is also much more hygienic for my system. I have decided that my appetite was needlessly and harmfully too large, and have felt better since I have decreased it. I think vigorous exercise would be beneficial but I cannot get the time at present. Mental hygiene and rests after meals have apparently proved of great benefit. I have not had a cold till the present time this winter."

---

The tone of the class in public health has been materially raised mentally and physically during the passed 20 weeks of "score card" living.

## The Woodlawn School Garden

Portland, Oregon

EUGENE, Oregon, Dec. 15, 1913.

My Dear Mr. Downing:

Enclosed is an article that describes a most excellent line of work in school gardening. The garden is all that Miss Joyce claims for it and a great deal more. We ought to hear from it again next year.

With seasons greetings,

Sincerely yours,

C. F. HODGES.

During the year of 1913, a new era has been developed in the history of the Woodlawn School Garden. In the beginning of the year, the principal, teachers, parents, and janitor began the plans for a successful garden and the spirit of enthusiasm was heartily endorsed by the pupils.

To have a better garden than the one of 1912 (which already had won a national reputation) was not the chief aim, but to apply new plans, profit by former mistakes, and add new experiments seemed to be the stimulus which resulted in a decision from the throngs who visited it that its improvement had been marvelous.

The boys of the Manual Training Department constructed a fence on the north, west and south sides, the east side bordering the Vancouver car line was not enclosed, so that the view of the garden might be appreciated by the many passengers who daily passed on the cars.

Each teacher was given a section where each pupil in her room might have an individual plot, the primary grades 5 ft. x 8 ft., the intermediate and grammar grades a plot 8 ft. x 10 ft. As there were 585 individual gardens, to see the children busily employed, happy in outdoor sunshine, was a sight which enlisted many interested friends to help promote the School Garden movement.

FIG. 1. The Woodlawn School Gardens, 1913, Portland, Oregon.
2½ acre tract. 585 individual gardens.

FIG. 2. Harvesting the crop, Woodlawn School Garden, Portland, Oregon.

The central diamond retained its fountain of the previous years, and was surrounded by cannas and gladiolas. The diamond design was planted in red coleus bordered with white alyssum above the green sod of its sides.

In the four triangles which completed the central design were scarlet geraniums bordered with coleus and white alyssum above the sod, in beautiful harmony with the diamond.

The ninth grade introduced the experiments with fertilizers. A plot was planted in rows of spinach, lettuce, beets, potatoes, cauliflower and cabbage, crossing rows in which were lime, nitrate, phosphate and absence of fertilizer to demonstrate the result of each upon the stalk, root, and leaf growth of plants.

The eighth grade planted and cared for the north side of the garden which was planted in sweet peas and castor beans.

The seventh grade, the west side which was planted with 172 different varieties of dahlias, cosmos, Shirley poppies and pinks.

The girls of the seventh and sixth grade collected plants for an "Old Fashioned Flower Garden" where the plants which older persons enjoy migth be appreciated.

The boys of the fifth and sixth grades took great interest in their industrial garden where 60 varieties of grains, lentils and forage plants were carefully planted, labeled, and their growth studied. The harvested grains were stored as material for class study during the winter terms of school. A collection of seeds was made and carefully labeled for class room study.

The Exchange Garden proved valuable. When a pupil thinned the individual plot, the surplus plants were transplanted or carefully "stored" in the "Exchange Garden," and any one bringing plants to the Exchange Garden might take some which were desired, and by special permission from the principal or teachers, many plants were distributed from it when pupils had none to exchange. This proved a valuable demonstration of practical economy, as many plants which otherwise might have been destroyed were taken to the home gardens of the pupils.

The fourth grades cared for the plot on west side of entrance, which was planted in Canterbury-bells, bordered with coleus and pansies. The plot on the east side of entrance was planted in petunias, bordered with purple lobelia.

The second and third grade planted three of the garden sections in dahlias—72 choice varieties, and were happy when awarded a first prize for a school collection at the Annual Dahlia Show.

The first grades were happy in a pansy border which they planted along both sides of the main path through their section.

On the last day of school, the garden was used as a place for a reception to the many visitors who attended the "Pet Show," where benches for the various pets had been arranged on the east side of the garden.

FIG. 3. Sand Garden for Kindergarten Visitors, Woodlawn School Garden, Portland, Oregon.

A Fall and Winter garden has been planned as an experiment and promises unrivaled success.

There were no prizes offered by the members of the Woodlawn Advisory Committee. The desire to excel was a loyalty to their school. The principal and teachers are pleased to say that no expense for supervision was needed. The work was done voluntarily during hours not assigned as school hours.

The Woodlawn School won first prize in the Portland School Garden Contest for the best garden in size of 100 ft. by 100 ft. or more, also the cup given by the O. W. R. & N. Co. for the best school garden, scored as follows:

| | |
|---|---|
| Largest average size vegetables | 20 |
| Largest variety | 20 |
| Quantity | 20 |
| Quality | 20 |
| General character | 10 |
| Best story of how the garden was planted and results secured | 10 |

The school was awarded permanently, the Oregonian Challenge Cup, which must be won two years in succession.

For the younger brothers and sisters of the children, a sand garden was provided where they might play while the one in charge was working in his or her garden.

## Supervising a Community Garden in Summer

ELIZABETH M. WATERS

McCOSH SCHOOL, Chicago, Sept. 5, 1913.

Mr. Grant Smith,
Chicago Normal College.

Dear Sir:

Our school garden was in charge of Miss Elizabeth Waters during the summer vacation and her management of it has been so successful that I am writing to ask if you cannot give her some credit or honor points for her many hours of work day after day during the whole vacation.

The garden has been beautiful and bounteous and has produced several crops owing to her skillful care. Miss Waters has organized the children, met them almost daily, amused them and interested them, photographed them and given the faithful a picnic at the end. No one could have done more, and we appreciate the Normal's co-operation. I am writing this without Miss Water's knowledge.

(Signed) I. M. PAHLMAN,
Principal.

Last June when Dr. Grant Smith who has charge of the Home and Community Garden work of the Chicago Normal College asked for students to assist certain Chicago schools in summer gardening, I offered my services to the children of the James McCosh School. The school is situated in a good residential district. The children are kept off the lawns and the lawns are kept for ornamental purposes only.

The garden was planted in two vacant lots across the street from the school. Early in the Spring the boys had secured the use of an old carriage horse and, after much difficulty, prepared the rather sandy soil for planting. The boys also built a fence of iron wire which they made fast to a strong wooden framework.

They had an unsteady gate at the front. The ground was laid out in beds, two for each room. These beds were built rather higher than the paths which crossed each other at right angles. The built-up beds were perhaps not very suitable for such sandy soil, but all that was done before my arrival on the scene. Early in the Spring, as a part of the school work, the children of each room had planted their seeds, and by June they had a plentiful supply of flowers and vegetables.

During the last two weeks in June the principal and two of the eighth grade teachers had me meet all the children who wished to help in the garden during the summer. We had about one hundred pupils from the upper grades, who were willing to help. We divided them into six groups, one for each day. We put more in each group than we wanted because we knew that some would fail to come. We arranged to have the Monday group come on Tuesday the next week,—*et cetera*, for we did not wish to interfere every week with special duties which some of the children might have on certain days. The plan was to have the children come at eight o'clock in the morning and to work in the garden for one hour; but, as it transpired, they seldom left before ten or half past ten. Coming at eight, they would not be tired out when they arrived, nor their day be badly broken up, and they would not have to work in the sun during the hottest hours.

The first week I spent in getting acquainted with the children and the garden. At this time I planned to keep an honor roll of those who came most often to the garden. This plan was very successful. At the end of the vacation we had on our roll thirty children who had come once every week. Many of the children came two or three times a week. One little girl who was away two weeks of the summer came to the garden twenty-three times. We always had more girls than boys.

The first week when fifteen or sixteen children came every day we gave the garden a very thorough weeding. Two children weeded a bed together, and each pair wanted to have the best looking bed. Every little weeder had his own basket to put the weeds in. This arrangement saved the extra labor of raking the weeds up afterward.

At first the water question was troublesome. We had a good long hose but all the children wanted to use it at the same time or on the same morning, and as a result the garden was benefitted very little. To adjust this difficulty we played a game—"Think of the number." I would tell one of the children a number and the others would take turns in guessing it. The one who guessed the nearest was allowed to water first and so on. So four children watered each morning, but no one was allowed to guess the second time until all had had an opportunity to water. It was not necessary to spend much time in games as a motive for coming to the garden, but I can see that in a different kind of neighborhood this feature might be of great value in attracting the children.

In addition to cultivated grasses, potatoes, peanuts, corn, tomatoes and flowers, we had three crops each of lettuce and radishes and two of beans. One day when our first crop of beans was ready to pick a man came to the fence and offered to buy a quart of them. Although we had not planted the garden to make money, I determined to sell some of the vegetables, because otherwise much would go to waste after the children took home what was needed there. Some of the boys in particular were very anxious to sell lettuce and radishes. On our first selling day two small boys sold twenty cents' worth of vegetables, but they wanted to keep the money. I thought this would not do, but I told them they might have the same commission as the small boy in the neighborhood, who worked for a huckster, received; namely, one cent on every five. They agreed that this rate was fair, but still they did not seem willing to return the money. I did not ask them to give it to me, but said that they might keep it until September and return it to the teacher. The next day, when I arrived at the garden, I found a small boy waiting with a large basket, a knift, and some twine. He told me he intended to make at least thirty cents that day. This amount seemed a good deal at the commission we agreed to; but he explained that he was going to work hard because he wanted money with which to fix his wagon. Howard and Leonard, my boys of the day before had spent their money for ice cream cones. In all we sold three dollars' worth of vegetables. We used the money to buy fresh seeds and to have pictures of the children and the garden taken. We took the pictures because the children wished it. They enjoy comparing the pictures to see the growth of the garden.

We had some trouble about the children taking vegetables. They had planted the garden and they could not see why they should not take vegetables any time they happened to want them.

Taking the vegetables was all very well when some one was there to keep the children from trampling on the lettuce and radishes and from pulling up the young beets and throwing them away. The children had to be taught how to select material for pulling. When they understood the matter, those who helped in the garden took vegetables only when I was there. However, there were some outsiders who took vegetables. I stopped this practice in part by requesting the policeman, while in the hearing of boys whom I had reason to suspect had stolen our big pumpkin, to take home any boys he found prowling around the garden. Needless to say the boys spread the news that I had complained, and the garden was left in comparative peace.

After discussion of some of these ideas with those who are interested in furthering this kind of work, it seems to me that putting the work on an industrial basis is valuable for several reasons. For example, if we set as a standard for themes, that they be correct enough to pass muster with the editor of a magazine, it is not too high a standard that the gardening be done so well and so systematically that it shall yield a profit. And it is wiser that the children should not have all the profit, but that they learn to share the profits. Furthermore, getting some pin money in this way lessens the temptation to steal in order to get it. Among other things, estimating the commission gives real practice in percentage.

During the summer the children came on the average of six or seven a day. Sometimes we had more, sometimes fewer. Toward the end the children began to drop off. Then I began to talk of a picnic. For the last week we had ten or twelve children present every day. The last Friday before school opened we had our picnic. For luncheon we ate our own tomatoes and cucumbers, and our sandwiches were filled with our own lettuce. Before we came home the children had planned their garden for next year.

Chicago Normal College.

## Articles Akin to Nature-Study in January Magazines

*American Review of Reviews*—Alaska, a Future Empire, E. H. Thomas.

*Cosmopolitan*—The Shadows and John Hatch, Chas. G. D. Roberts.

*Harpers*—Australian Bypaths, Norman Duncan.
A Sub-Arctic Island, Robert C. Murphy.

*Outing*—Climbing for Caribou, Edward Breck.
How to Snowshoe, Dustin White.

*Technical World*—Improving your Chance for Life, I. C. Walch.

## News and Notes

The Brooklyn Botanical Garden announces a most practical and attractive course for teachers in School Gardening under the general direction of Miss Ellen Eddy Shaw, who has conducted the Child's Garden page in the *Garden Magazine* with such success. There are nine courses announced, including Elementary Botany, Nature-Study, Soils and Agricultural Principles, Plant Propagation, Greenhouse Work, Fungus and Insect Pests, Children's Garden Practice, Fall Garden Work, Pedagogy of Botany and Practical Garden Work. Dr. Olive and Dr. Gager have charge of the Botany courses. The tuition for the entire course is fifteen dollars, which is very little considering the amount of instruction given.

## Book Reviews

*The Work of the Rural Schools*, J. D. Eggleston and Robert W. Bruerè, p. 9+ 287. Harper & Bros., $1.00.

No previous book, in the reviewer's estimation, has given so vivid an idea of the reconstruction that is going on in the rural schools as does this one. The authors have been in close touch with a number of the active field workers in this important movement, both by personal acquaintance and by correspondence. The pages are replete with individual experiences and excerpts from letters that make the reader feel the glow of contagious enthusiasm and impart to him the joy of achievement. The brief introduction shows with apt statistics that the days of the pioneer, the land farmer, and the exploiter are passing; the husbandman is due, the man who knows the science of cultivation, of farm management and the art of marketing. It is the task of the rural school to produce him. Chapter II deals with "The Community Survey." This is not a discussion of how it should be done but a tale of how it is done with abundant data from actual surveys. Chapter III, on "The Health of the Children," urges medical inspection in rural schools. The next chapter discusses "School Government and the Course of Study." It suggests a survey of the mental abilities of the pupils, of their social attitudes and management by a measure of self government." "The best schools are basing their entire discipline and instruction upon the unformulated social wisdom which the children bring with them to the school." Methods at the Experimental Rural School at Rock Hill, S. C. are described as the principle just stated is receiving a thorough test there. The Widening Outlook, Chap. V, gives a number of instances in which domestic science and elementary agriculture have been added to the rural curriculum. Chapters VI and VII are on "Demonstration Woik" and are among the best in the book. Then follow chapters on The School Plant; Neglected Factors; Consolidation; Transportation; The Teacher, the Citizen Maker; First Aid; The Country Superintendent; The State Superintendent.

The book is crammed full of information. It is pervaded by a sane philosophy of life. It has many admirable bits for the nature study enthusiast. Here is such a passage: "A nine-year-old boy came into the school room ten minutes late.

'Why are you late, Sammie?'

'I saw a water-dog in the branch as I came along and I wanted to catch him and bring him with me.'

'Did you catch him?'

'Yes ma'am' he replied with shining eyes 'and here he is'!

In a moment the school was grouped around Samuel, and all the children were watching the water dog. The program was changed that day as it often was in that school. But there were some interesting things well said and well written; there were some related facts brought out. A beautiful opportunity and a quick appreciation of it."

One wishes all schools were like the Rock Hill School where "there are days when the entire school goes out into the woods and fields to gather specimens for the museum and to observe wild nature; days when similar excursions are made to see what rivers are, and lakes and hills and valleys, or to study the relics of local history."

Withal it is an exceedingly quotable book and it is a temptation to add more of the pithy passages. Perhaps this is enough to make the reader ready to spend his dollar and buy the book. It will be a wise buy even for the impoverished pedagogue.

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*The Meaning of Evolution*, Samuel C. Schmucker, p. 298. The Mac Millan Co., $1.25.

This is an eminently successful attempt to express in simple language the meaning of evolution, to state the proofs and to outline some of the theories that attempt to account for the process. The author has an attractive and vivid style that makes the book easy reading. Still one must come to the book, it seems to the reviewer, with a fairly good fund of accurate notions of plants and animals if the book prove wholly intelligible. There are few illustrations so that an author must be very apt at word painting to give the reader correct ideas of the objects under discussion.

Chapter I is historical, dealing with Evolution before Darwin. The next one is biographical with Darwin as its chief subject. Then comes a discussion of the factors involved in Darwinism. Adaptation for the Individual and for the Species next receive consideration. Just why these two chapters are introduced is not clear. The author says as their beginning "As between design in the universe in the usual sense of the word, and a purely accidental connection of events in the universe, there can be no doubt as to the choice. The truth is far better expressed by the word design than by the chaos which is the alternative idea in the average mind." The numerous cases of adaptation described may illuminate this thesis; there is no serious attempt to prove it. Chapters VI and VII are on the Life of the Past and How the Mammals Developed, proofs of evolution, respectively, from paleontology and embryology. The next chapter takes up in detail the fossil evidence of the evolution of the horse. Chapter IX discusses evolution theories since Darwin. Chapter X is on Eugenics: its caption is the Future Evolution of Man. The last chapter, entitled Science and the Book, presents a Christian viewpoint of Evolution in its relation to the Bible. The book is reverent and religious throughout as well as scientific—a juxtaposition of often conflicting attitudes for which there is no other justification than the authors faith that "There is no difference between God's revelation of Himself, as we have it in the Bible, and God's revelation of Himself in nature. The better we know the Bible and the better we know nature the clearer this will be to us." Perhaps there can be no more adequate justification.

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*The Principles of Agriculture through the Home and School Garden*, by C. A. Stebbins, pages xxviii+ 380. The MacMillan Co., 1913. $1.00.

Agriculture is now one of the required subjects in the rural schools of many states. Text books on the subject have multiplied very rapidly during the past few years, in most instances a new work coming out with little to justify its appearance. This, however, can not be said of the text under consideration. Mr. Stebbins' book is a departure from the old methods which consist of memorizing and reciting from the text. We believe it marks the beginning of a new era in the teaching of agriculture in our rural schools. While the arrangement of subject-matter is good, it is the method of presentation, the "do-something" spirit of the book which warrants the above statement. Each chapter is begun with a list of exercises or experiments to be performed by the children in the school room or school garden. Then follows a discussion of the principles demonstrated by the experiments and a list of questions about the same. The chapter closes with a list of "Home Studies" through which "the children are led to see the method used by the farmer in utilizing these principles for his benefit thus getting in touch with community life." The experiments are well chosen, each one demonstrating a definite and important principle in agriculture. They are "simple and easily conclusive even to the limited powers and experiences of children. The apparatus is limited and inexpensive."

Of the forty-one chapters in the book, four are devoted to soil studies, seven to parts of plants and their function, five to seeds and plant propagation, two to care of plants, and three to beauty and convenience in the home and school. The other chapters are as follows: The Garden, Harvesting and Marketing, An

Agricultural Club, Weeds, Insects, Birds, Plant Diseases, Trees, Sweet Pea, Cow, Corn, Weather, Potatoes, Poultry, Cotton, Sugar Beets, Public Health, and The Mosquito and House Fly. The author has included in his work some excellent lessons in civics, sanitation, landscape gardening, rural economy and other subjects not usually discussed in a text book on agriculture for grade pupils. The following experiments will serve to illustrate the above statement: "Touch the fingers to gelatin medium in a petri dish" (after having performed exercises in the preparation of the medium and methods of obtaining bacteria cultures) "cover and set aside; wash the fingers and touch another gelatine preparation." "Prepare two flat-sided bottles with gelatine culture medium. Catch a house fly and let it walk over the culture medium in one of them. Observe results each day." Better lessons in sanitation than the above are seldom met with. Lessons of this type are full of life and meaning to the child as well as of great practical value. These are most welcome innovations in the subject of agriculture. We regret that the author neglects to speak of the horse a discussion of which would have been of equal, if not of greater value than the treatment of the sweet pea to which he devotes nine pages. Scientists may object to such questions as, "Why does the female mosquito lay hundreds of eggs and the hen so few?" on the ground that it will tend to teleological reasoning by the pupil but we believe that insistence on the part of scientists that only exact facts be presented to grade pupils is not only unreasonable but not conducive to the best interests of education.

The book will be suggestive to the wide-awake teacher of many topics and exercises purely local and which therefore could not be included in the book. It contains many fine tables, outlines, and score cards and is well illustrated with one hundred and ninety-nine figures.—V. Lantis.

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*Plant Life and Plant Uses*, John Gaylord Coulter, pp. xvi+464, The American Book Co., $1.20.

*Elementary Studies in Botany*, John M. Coulter, pp. ix+461, D. Appleton, $1.30.

*Introduction to Biology*, Maurice A. and Anna M. Bigelow, pp. ix+424, The MacMillan Co., $1.10.

*Elementary Biology, Plant, Animal, Human*, James E. Peabody and Arthur E. Hunt, pp. xxi+ 170+194+228, MacMillan, $1.25.

*High School Agriculture*, D. D. Maine and K. L. Hatch, 432 pp., The American Book Co., $1.00.

*Fundamentals of Farming and Farm Life*, Edwin J. Kyle and Alexander C. Ellis, pp. xxxii+ 557, Chas Scribner's Sons, $1.10.

These six books which happen to come to the reviewer's table simultaneously are interesting representatives of various tendencies in the presentation of biological materials to high school students. In the preface of the first named book, the author states his notion that "it is believed that such general study of plants as is presented herewith should precede the study of agriculture, but it is doubted whether such study of plants as is required of all students should be primarily a study of agriculture," and again "Forestry, Plant Breeding, Weeds, Plant Enemies and Disease, Plant Culture, Decorative Plants, and Economic Bacteria are topics which are discussed where such discussion seems pertinent to the general theme, but special chapters are not devoted to these topics."

In the Elementary Studies in Botany the first part of the book—289 pages—is devoted to practically the same subject matter as was found in Coulter's Plant Studies. Part Two—the remainder of the book—is on Plants in Cultivation and deals with the economic plants. There are chapters here on Plant Breeding, Forestry, etc. Needless to say the style of the book is exceedingly attractive, the material is wisely selected, and is presented in a simple and lucid way.

Bigelow's Introduction to Biology is a blend in the same volume of Botany, Zoology, and Human Physiology. It is a fairly successful blend. The work starts with the plant as a living thing, discusses plant physiology, then takes up a study of insects as the introduction to animal biology; the vertebrates are studied, the frog being the type, and an attempt is made to center the study around the *work* of the animal's organs. This course leads on to a discussion of human physiology. The treatment of personal hygiene in the eleventh chapter is concise and of course in only thirty-odd pages cannot be very thorough. Organisms and Health, the Economic Relations of Organisms, both Plant and Animal Reproduction, make up the rest of the work.

It certainly seems a much more unified text than that of Peabody and Hunt, in which the division between plant, animal and human physiology is more marked. In this text considerable space is devoted to laboratory directions.

The last two texts, those on agriculture, are attempts to present a good deal the same sort of material as is found in the preceding ones with agricultural interests as the unifying theme; thus in Maine and Hatch's High School Agriculture, Botany is treated in Chapter 3 as Agricultural Botany, and a great deal of the preceding chapters on Plant Food and Fertilizers is material that many botanies use. The same thing may be said of Chapter 4 on Economic Plants. Chapter 6 is largely on Insects. The chapters on farm animals deal, of course, with the vertebrates, but largely with the external features and characteristics of the various farm breeds.

Kyle and Ellis have written their book with the avowed intention of keeping its subject matter within the bounds of children's interests and making the presentation conform to the dictates of proper pedagogy. At the same time they aspire to prepare children for living intelligently and happily as well as profitably on the farm. The subject matter is about the same so far as the reviewer can see, as is found in other text books on the elements of agriculture.

It seems to be merely a question as to whether we shall teach botany and zoology from the standpoint of farm interests alone or shall teach botany and zoology with more or less of an economic flavor, or whether we shall relate our biology instruction primarily to the human mechanism, and here are six texts that illustrate these tendencies.

One would, without much difficulty, pick on John M. Coulter's Elementary Studies in Botany, Bigelow's Introduction to Biology, and Maines & Hatch's High School Agriculture as the better text in each pair for ordinary high school conditions.

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*School and Home Gardens,* W. H. D. Meier, p. v+ 318. Ginn & Company.

This is intended as a practical book of instructions for the preparation of the soil, planting and cultivation of the various plants, flowers, vegetables, shrubs, trees and vines that one might want to plant on the home grounds or the school yard. Successive chapters are devoted to the Window Garden, 4 p; Growing Bulbs in Glasses, 4p; Growing Plants in Pots, 19p; Window

Boxes, 3p; Hanging Baskets and Porch Boxes, 1p; Decorative Plants, 16p. Then on out-door gardening there are chapters on Bulbs, The Lawn, Plan of the Yard, Annuals, Perennial Borders, Flowering Plants, Wild Flowers, Native Ferns. Directions are given for planting shrubs, trees and vines with suggestions as to the best sorts. A special chapter is given to roses, one to shade trees and one to fruit trees. In a very similar series of chapters the vegetable garden receives treatment in a hundred and ten pages. The book is well illustrated, attractive and well made. The instructions are simple and explicit. Any person of intelligence should be able to get results with this book as a guide.

---

*The Suburban Garden Guide*, Parker Thayer Barnes, p. 147, The MacMillan Co., $0.50.

This is a big, small book. There is more information of just the sort you want in growing things than in most garden guides of more pretentious appearance. The Best Vegetables for the Home Garden, 16p; The Best Flowers, 18p; How and When to Spray, 36p; Fertilizing the Small Garden, 5p; are the subdivisions of the body of the book. The Appendix is about as extensive and includes a series of tables showing planting times and methods, formulas of sprays and methods of applying and directions for pruning. Throughout material is alphabetically arranged and there are numerous cross references. In discussing fertilizers directions as to amount to be used are always given in terms not only of the quantity per acre, but also per square yard, an innovation the back yard gardener will appreciate. There is a similar exactness and appreciation of the ordinary home gardener's difficulties at all points in the book. If you garden, this will be a well thumbed book, once possessed.

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*An Elementary Study of the Brain, Based on Dissections of the Brain of the Sheep*, Eben W. Fiske, p. 132, The MacMillan Co., $1.25.

Most volumes devoted to the anatomy of the brain are so complete and so technical as to be forbidding to any but the specialist. It is practically impossible to present in popular way any adequate notion of brain structure and the relation of parts. There must be a fairly extensive use of scientific terminology for it only can be sufficiently exact. This book makes the matter as simple as possible by presenting only the most important points, by excellent illustrations and by footnote explanations of all technical terms. The opening chapters on the phylogeny and otogeny of the brain are very readable and the final one, the summary, undertakes to make clear the method of operation of the brain. It, too, is exceptionally lucid. The body of the book deals with the chief anatomical feature of the brain, the location of external land marks, the main regions of the gray matter—both superficial and internal and the fibre-tracts of the interior. It is intended as a laboratory guide, though it will help any student to clearer notions of the brain even if the laboratory work is not done.

---

A timely and practical Bulletin on Bee Keeping in Iowa, written by Frank C. Pettet, State Inspector of Apiaries has just been issued, as a help in extension work, by the Iowa State College of Agriculture. It is especially helpful in that it gives statistics based on the experience of ten or more practical apiarists, giving the largest honey record for single colonies for a season, the average yield of an apiary for any good season and ten average annual yields for long periods of years.

Practical suggestions for beginning bee-keeping are given and directions for the management of apiaries and information about bee diseases and the laws relating to foul brood. The Bulletin is in all its twenty pages, sensible, conservative and useful.

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The Teaching of Nature-Study Number

# NATURE-STUDY REVIEW

Devoted Primarily to all Scientific Studies of Nature in Elementary Schools

Vol. 10 No. 3
Whole No. 81

OFFICIAL ORGAN OF THE AMERICAN NATURE STUDY SOCIETY

MARCH 1914



CONTENTS

The Beginning of Star Study II. . 79
Anna B. Comstock

Preparing Normal Students to Teach About Birds . . . . . . . . . . 84
Gilbert H. Trafton

Outdoor Equipment . . . . . . . . . . . . 94
James G. Needham

The Cape May Summer School. . 99
Laura E. Woodward

Hibernation Among Plants and Animals. Harold B. Shinn . . . . 103

Some Insect Studies. . . . . . . . . . . . 108
Alice Jean Patterson

Editorial . . . . . . . . . . . . . . . . . . . . . . 114

Published Monthly except June, July and August at Ithaca, N. Y.

$1.00 a VOLUME (9 Nos.)

Elliot R. Downing, Editor
The University of Chicago The School of Education
Chicago, Ill

15 Cents copy

Entered as second-class matter at the Postoffice at Ithaca, N. Y., under the Act of March 3, 1879.

# THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

**Important** Please note date of expiration of your subscription on the label of the wrapper. Subscriptions must be paid in advance to comply with postal requirements. Subscriptions and advertisements should be sent to *The Comstock Publishing Co., Ithaca, N. Y.* Manuscripts for Publication and Books to be Reviewed should be sent to the Editor.

VOL. 10 MARCH, 1914 No. 3


## The Beginning of Star Study II

ANNA BOTSFORD COMSTOCK

Although the stars are so far away from us we have learned many things about them, and after the pupils have become familiar with the Polar Constellations and Orion, as outlined in the preceding number of THE NATURE-STUDY REVIEW, it would be well to give them some idea of what a star really is. An informal talk should cover the following points:

The scientists have three ways of finding out facts about the stars; first, through the telescope, second, through the wonderful instrument, the spectroscope, which can only be understood after we study physics, and third, by mathematical calculations. Through these agencies we know that every shining star is a great fiery sun, and we may well believe that many of these suns have worlds like our earth revolving about them, but a little world like ours we could not see if it were revolving about even the nearest star.

It is very hard for us to comprehend how far away from us is the nearest star, but astronomers have been able to measure the distance from us to many stars, and this distance is so great that it can only be reckoned at the rate at which light travels, which is 186,400 miles per second or about six trillions of miles per year and this distance is called a *light-year*. It requires light about eight minutes to reach our earth from the sun, but it requires more than four years for light to reach us from the nearest star. Most of the stars are so far away that we cannot measure the distance from them to us, but it is interesting to know that the light from the Pole Star which reaches our eyes in cloudless nights may have started on its journey almost fifty years ago, while the light that reaches us from the interesting little group of stars called the Pleiades, may have started on its journey before Columbus started on his great voyage.

The stars seem always to us to keep their own place in the heavens, but they are all moving through space just as our sun and its family are doing. However, the stars are so far away that although one may move a million miles a day we would need to make observations upon it for years to detect that it had moved at all. We know that our sun and its planets are moving through space at the rate of about 800 miles per minute.

Stars also have their youth, middle age and old age. When they are young they are composed of thin gases and shine white or blue; as they mature the gases condense and they shine yellow, like our sun; when the gases become still more condensed they shine red, like Betelgeuze in Orion, which is a very, very old star, and after a time, more years than we can even think about, these stars grow cold and dark and become invisible to us. The spectroscope shows us that there are many of these vast dead suns, with their fires out, whirling through space.

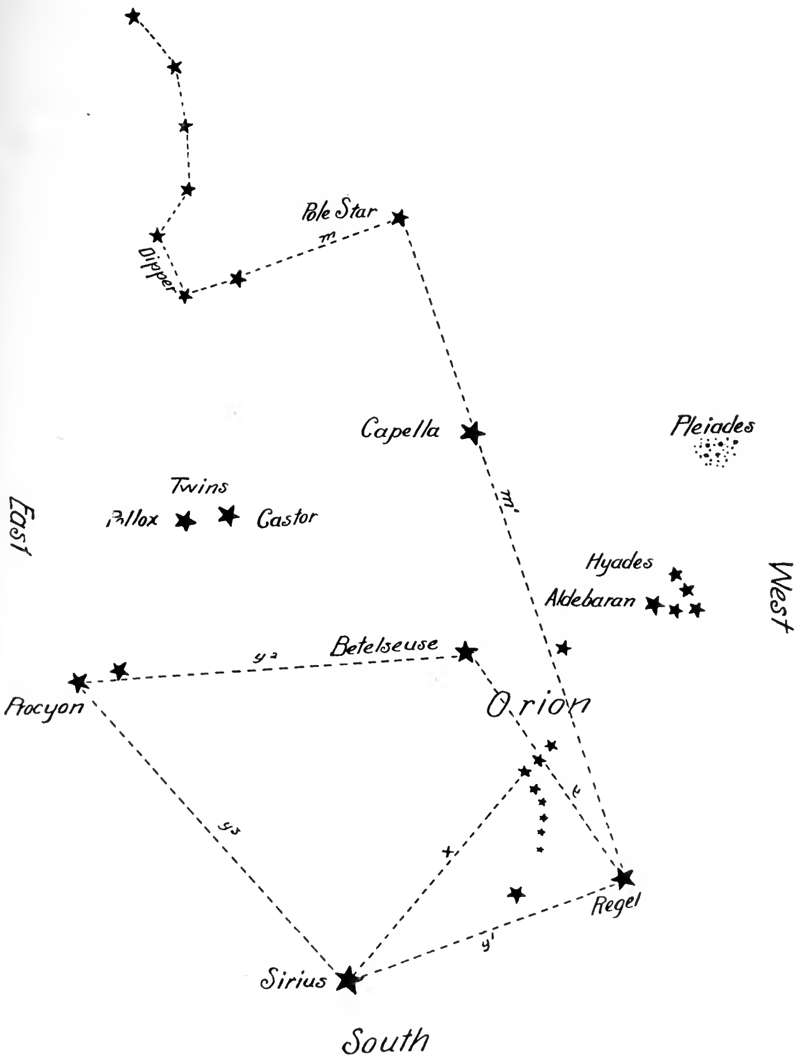
If any of us with especially good eyes were to travel from the Northern to the Southern Polar region, we would be able to see between six and seven thousand stars, although never more than about two thousand at one time. With the aid of the telescope about eight hundred thousand stars have been discovered. But during recent years the skies have been photographed, and thus we have record of about thirty million stars. We usually regard the Milky Way as a band of light across the heavens, but it is really made up of millions of stars so far away that we cannot see them at all. We can only see the light that comes from them.

Before the following lessons are given, the pupils should be instructed how to draw an imaginary line straight from one star to another and to perceive the angle which two lines make when they meet in a certain star. An ordinary ruler, or what is even better, a postal card or other stiff paper with right-angled corners, may be used by holding it between the eyes and the stars to be connected and thus make certain that the imaginary line is straight.

Place the diagram as given on the blackboard, but do not add the connecting lines until needed to enable the pupils to find the different stars to be studied. If possible let the blackboard stand so that its edge labelled " East " extends toward the east.

ALDEBARAN (AL–DEB′–A–RAN AND THE HYADES (HI′–A–DEEZ).

Above Orion, and almost in a line with the stars of his belt, is a beautiful rosy star. It is as red as Betelgeuze and it forms the end of the lower arm of a V-shaped constellation composed of it and four other stars. This is Aldebaran and the constellation is




The Constellations of Orion, with the Dog Stars, the Twins, Capella, the Hyades and the Pleiades may be seen in the southwestern portion of the sky during the last half of March, in the early evening.

called the Hyades. These form a part of the head of the constellation called by the ancients, Taurus, the Bull. Aldebaran is the fiery eye of the mad bull. This beautiful rosy Aldebaran is a comparatively near neighbor of ours, since it takes light only 32 years to pass from it to us. It is much larger than our sun for it gives off about 45 times as much light.

### The Pleiades (Plee–i–dees)

Up in the western sky about as far beyond Aldebaran as Aldebaran is beyond the belt of Orion is a little misty group of stars which seems always to have attracted the attention of people during all the ages. This constellation is called the Pleiades. Most eyes are only sufficient strong to count six stars in this group. Through a glass nine stars may be distinguished. In studying this constellation we can realize better than in any other the wonders which photography have performed in revealing stars which we cannot see. Sky photography shows us that there are more than three thousand stars in this little constellation; and astronomers believe that it is a great star system now being developed. These stars which look so close together to us are so far apart that our own sun and all its planets could roll between them unnoticed. It requires several years for light to travel from one of these stars in the Pleiades to another, and the whole constellation is so far away from us that we cannot estimate the distance, but we know that it takes light several hundred years to reach us from them. The following question should be asked:

How many stars can you see in the Pleiades?

How many stars can you see in the Hyades? Make a sketch of the Hyades showing Aldebaran.

### The Two Dog Stars

Make a map of Orion on the board and extend the line X through the belt toward the horizon. This line will reach a very brilliant star, which is the Big Dog Star, Sirius. Then draw lines $yy^1$ joining Betelgeuse, Rigel and Sirius and complete the kite shaped figure by lines $y^2$ $y^3$ which will meet in Procyon, the Little Dog Star. The following questions should be asked after the pupils have observed these two stars.

Which rises first, Orion or Sirius? What color is Sirius? Why is Sirius called the Big Dog Star?

Is the Little Dog Star nearer to the Pole Star than Sirius? Which is brighter, the Great Dog Star or the Little Dog Star? Why is Procyon called the Little Dog Star?

Sirius is the most beautiful of all the stars in our skies, for it shines with ever changing colors, blue, rosy or white. Sirius is a comparatively young star and has a diameter about 14 times as great as that of our own sun. It is eight and one-half light years away from us. Perhaps no star of our skies is so celebrated in ancient and modern literature as Sirius. Homer mentions it and it has had a place in the poetry of the ages.

Procyon, the Little Dog Star, probably earned its name because it trots up the eastern skies just a little ahead of the Great Dog Star, quite like a little dog in habits. It gives out eight times as much light as our sun and is only ten light years away from us. Its companion or twin star, Capella, is not so brilliant.

Ask the pupils to join a line m, drawn through the pointers of the Dipper to the Pole Star and another line m, at right angles to this extending from the Pole Star to Rigel. About half way between the Pole Star and Orion this line will pass through a brilliant star which is called Capella. The following questions may be asked:

What color is Capella? How does this show that it is the same age as our sun? Is Capella as near the Pole Star as the Big Dipper? Is it near enough so that it never sets? Can you see the shield-shaped constellation of five stars of which Capella is a part? What is the name of this constellation?

Capella comes very near belonging to the Polar constellations since it is below the horizon only about four hours out of the twenty-four. It is bright yellow which shows that it is about the same composition and age as our own sun. However, it gives off 120 times as much light as our sun. It is 40 light years away from us. During the evenings of March and April, Capella in its shield-shaped constellation, which is called Auriga is a very noticeable feature high up in the western sky.

## The Heavenly Twins

Above the Little Dog Star with its twin and in a region of the sky where there are very few bright stars are a pair of twin stars which are very noticeable. These stars will naturally be discovered when finding Capella. To this brilliant pair of stars the ancients gave the name of the twins, Castor and Pollux. These were two beautiful twin boys who loved each other so much that after they were dead they were placed in the skies where they could always be near each other. Pollux is the brighter of the two and is the more southward in situation. It is a yellow star and supposed to be in the same stage of development as our sun, while Castor is white and, therefore, according to the ages of stars is young. The following question should be answered by the pupils from observation:

How can you tell the Heavenly Twins from the Little Dog Star and its companion? Which pair are brightest in the sky? Which of the twins is the brightest star?

For further study of the constellations use "Whittaker' Planisphere"; to find the Stars see "The Friendly Stars"—by Martin; for description see "The Hand Book of Nature Study"; Comstock.

## Preparing Normal Students to Teach Children About Birds

Gilbert H. Trafton

The Normal School, in pursuance of its function to prepare teachers, should give its students a knowledge of four factors essential to good teaching: first, of the subject matter to be taught; second, of the child; third, of the method by which this subject matter is to be made a part of the child's experience; and fourth a knowledge of a much broader field of the subject matter than just that which is to be taught the child. In sympathy with these general aims of the Normal School, each department of the school will naturally seek to accomplish as many of these aims as circumstances permit. In the course in Agricultural Nature-Study, with a part of which this article is to deal, little opportunity is offered for the direct study of children, but a conscious effort is made to present something of each of the other three fields.

The work with birds as carried on here at the Mankato Normal School may be divided into the following groups:

I. Laboratory work.

II. Field trips.

III. Class discussions.
   A. Subject matter.
   B. Methods of teaching.
      1. What to teach.
      2. How to teach.
         *a.* Lesson plans.
         *b.* Observation and discussion of actual teaching.
         *c.* General suggestions.

One of the chief purposes of the laboratory work is to enable the students to identify the common birds.

The equipment for this work consists of bird skins, mounted specimens, nests and eggs, of about one hundred birds, and samples of bird nesting boxes sold by various firms, including six companies in this country and one in Germany.

Each student is supplied with a copy of Reed's Guide to the Land Birds, and with a chart of about 150 common birds of Minn. On this chart the permanent residents are first listed, and for each bird is given; date of nesting, field marks, birds with which confused, and its occurrence, whether common, uncommon or rare.

Next follows a list of the winter residents, for which the same points are given as for the permanent residents, except the nesting date, and in addition are given the date of arrival in the fall and the date of departure in the spring.

Following this is a list of the summer residents and transient visitants arranged in the order in which they arrive in the spring. Below is a sample of the points given for the summer residents.

| Name of Bird | Date of arrival | Date of nesting | Date of leaving | Field Marks | Confused with |
|---|---|---|---|---|---|
| Robin-c | Mch. 8 | Apr. 28 | Nov. 11 | Breast | Chewink |
| Bluebird-c | Mch. 16 | Apr. 16 | Oct. 31 | Breast, back | Indigo bird, bluejay |
| Yellow Warbler-c | Apr. 28 | May 24 | Sep. 10 | Breast, back | Goldfinch |

For the transient visitants the date of nesting is omitted and the dates of arrival and departure in the spring and fall are given.

The following directions are given the students to guide them in their study.

BIRDS

I. Study of Birds for the Purpose of Identification.

For each bird studied record the following:

1. Name. (Find by using the key, pictures and descriptions in "Reed's Guide to the Land Birds.")

2. Occurrence and kind (From bird chart)
3. Dates of arrival and departure. (From chart)
4. Size. Compared with the English sparrow ($6\frac{1}{3}$ inches), or the robin (10 inches). Also record the length in inches.
5. Field marks. (From chart and skins)
6. With what birds confused; how distinguished. (Chart and skins)
7. Economic status. (From food chart)
8. Nest and eggs. (From collection)

A. The nest.

Of what composed outside? With what lined? Shape, depth and width in inches. (Both inside and outside)

B. The eggs

Color and size. (In inches—two dimensions)

C. Date of nesting. (from chart)

II. Comparison of nesting houses.

1. Note the differences as regards:

*a.* material of which made; *b.* size of entrance hole; *c.* size of house; *d.* method of fastening; *e.* covering or roof; *f.* perch.

2. Note the general characters in which nearly all agree as regards:

*a.* shape of hole; *b.* location of hole; *c.* shape of house; *d.* projection of roof.

The following is offered as optional when time permits.

III. Study of the structure of Birds.

A. The bills of birds.

Compare the various kinds of bills and make a drawing of each type. The following are suggested; a duck, heron, sandpiper, hawk, owl, woodpecker, flycatcher, swallow, vireo, warbler, creeper, thrush.

B. The legs and toes of birds.

Compare the various kinds of legs and toes and draw each type. The following are suggested; a duck, heron, sandpiper, hawk, kingfisher, woodpecker, swallow, sparrow.

IV. Classification of birds. (Bird families)

Study a number of birds belonging to the same family and determine the characteristics in which they agree. The following families are suggested; hawks, owls, woodpeckers, flycatchers, sparrows, swallows, vireos, warblers.

V. Economic Value of Birds.
   A. Value of adult birds. (From food chart)
   B. Value of nestlings. (From data furnished)

The students are taught how to find the name of unknown birds by use of the key and colored pictures. Some of the points in the first outline are answered from a study of bird skins and some from the chart of Minn. birds. For determining the economic status of each bird, the members of the class are furnished with a food chart of our common birds based on the reports of the Bureau of Biological Survey. The facts regarding their food habits are arranged under the following headings:

| To Bird's Credit | | | | To Bird's Discredit. | | | |
|---|---|---|---|---|---|---|---|
| Insect pests | Mammal pests | Weed seeds | Total credit | Grain | Fruit | Poultry | Total discredit |

The data are given in percent of the total food.

At the close of the laboratory studies a test is given on the number of birds which the students can identify.

During the Spring and Summer terms special attention is given to the field work. Preceding these trips laboratory studies are made of the birds in the order of their arrival in the spring, as previously explained. The purpose of the field trips is two-fold; to identify the birds in the field, and to make some study of the activities of birds. A field glass is furnished for each three or four students. Arrangements are usually made so that most of these trips are taken in the early morning or late afternoon.

The following directions are given the students to guide their observations.

Purpose: To study birds so as to be able to name them and to appreciate some of their interesting habits.

For each bird studied record observations regarding the following points. Copy in your notebook the complete outline for each bird, and if all the points are not observed on one trip, fill them in at some later trip.

I. Points to aid in identification.
   1. Size. (Compare with robin or English sparrow.)
   2. Chief color markings and their location.
   3. Method of flight.
   4. Other noticeable features.

II. General habits.
  1. Song.
    a. Varied or monotonous.
    a. Loud or soft.
    c. Musical or unmusical.
    d. High or low pitch.
    e. Location of bird when song is given.
  2. Nesting habits.
    a. Location of nest.
    b. Phase of nesting in which engaged.
    c. Date.
  3. Habitat.

Last summer a special study was made of a pair of house wrens which were nesting in a box on the writer's grounds. The class was divided into ten sections and the activities of the wrens were watched from sunrise to sunset, each section watching for an hour and a half. Records were kept of the number of times the young were fed, whether by male or female, and as far as possible, of the kind of food brought.

As a part of a spring nature calendar kept by all the class, is included a bird calendar showing the dates of first arrivals, and in the weekly summary is recorded a list of the birds nesting and of birds with young.

As optional studies, students may make continued observations on some nesting birds which can be easily observed.

In the class discussions, special attention is paid to the following topics: Economic value of birds, esthetic value, bird habits, methods of studying birds, bird enemies, bird protection, and methods of attracting birds. For the study of these topics the library is supplied with most of the standard books on birds and with the bulletins published by the Bureau of Biological Survey.

The school is equipped with large collection of lantern slides of which frequent use is made to illustrate the various topics.

Each student makes an exhaustive library study of some one bird and uses a map of United States to show its breeding range and its winter range.

In connection with each large topic discussed by the class, a few students are assigned to make special reports on some particular phase of the subject which the remainder of the class have not time to look up.

In the discussion of the teaching aspect, special attention is given to the preparation of lesson plans, in which some bird topic is chosen and a lesson planned for a particular grade and a particular season of the year. These are carefully discussed in the class.

The following sample plan shows the outline used and suggests something of the various features which it is desired to bring out in connection with each heading.

I. Topic.

Building nesting houses for the wren.

II. Grade and season.

Fourth grade—early spring about the time that the wren is due to come back. (In S. E. Minn. Apl. 27.)

III. Materials

Collection of various kinds of wren houses, one with a nest in it, colored picture of wren.

IV. Giving the lesson.

A. Preparation.

1. Introducing the child's problem by relating to previous knowledge.

What birds have you seen this spring? Have any of them begun to make nests yet? How many know what this bird in the picture is? Have you seen it this spring? It may come any day now, so watch carefully for it. Why would you like to have this bird live in your yard this spring? In what sort of a place does it make its nest?

2. Stating the child's problem.

Let us see what kind of a house we should make so as to get a pair of wrens to nest in our yard this spring.

B. Development.

| Outline. | Questions and Observations |
|---|---|
| Materials. | What different kinds of materials do you find in these houses? Which do you think would be best? Why? |
| Size of house. | How can we tell how big to make the house? How much difference in size is there among these houses? |

| | |
|---|---|
| Shape of house. | What different kinds of shapes do you find among these houses? Do you think one is any better than the others? Why? |
| Size of hole. | How can we tell how big to make the hole? Take a ruler and measure the holes in these houses. |
| Location of hole. | Look at this house with the nest in it and see if you can tell where the hole ought to be bored. |
| Putting up house. | Where is the best place to put up a house? How shall we fasten it? When should it be put out? |
| Similarities. | In what ways are all these houses alike? These things we ought to notice specially when we make our houses. |

C. Summary.

Which one of these houses do you think a pair of wrens would like best ? Why?

D. Application.

How many think you can find a small box, or tin can, or some boards at home from which you can make a wren house? How many will make a house and bring it to school to show me and the class? I will get a camera and take a picture of the class with their wren houses in their hands. Then I shall expect you to bring your houses next Monday. After we take the picture, you can carry your houses home again and put them up.

Sometimes the class observes a lesson taught to children, either by the writer or by a teacher from the Training School. This lesson is carefully discussed at the next meeting of the class.

In addition to these features that deal with individual lessons there is a discussion of general suggestions on teaching, touching on correlation with literature and drawing, uses of colored plates, study of nests, reports of children's observations, calendars, attracting birds, and field work.

An outline of bird study for the grades is prepared, divided first according to the age of the children into primary, intermediate and grammar grades; and then each of these is divided according to seasons into fall, winter, and spring work.

When the students do their practice teaching in the Training School, some of them teach nature-study. Here the suggestions, previously given in the course in the Normal School, are put into actual practice. Plans are made by the students for each lesson, criticized by the instructor, and returned before the lesson is taught. Observation of these lessons on the part of the instructor or critic teachers furnishes further opportunity of giving aid to the practice teachers.

Most of the bird work is done in the spring term. Abundant use is made of colored pictures, both of the separate plates published by the Audubon Society, and of charts in which several pictures are grouped on the same sheet.

Following is the outline of bird study as carried out in the Training School

### PRIMARY GRADES

#### *Winter*

##### GRADE 3

Holiday Studies.

Christmas dinner for the birds.

- *a.* What kind of Christmas gifts do birds like?
- *b.* What kind of birds will come to the feast? (Use Christmas tree)

#### *Spring*

##### GRADE 1

The returning birds.

- *a.* Bird calendar.
- *b.* Bird walks.
- *c.* Special study of robin, bluebird, and bank swallow.

##### GRADE 2

The returning birds.

- *a.* Bird calendar.
- *b.* Bird walks.
- *c.* Special study of red-winged blackbird, Baltimore Oriole, and chimney swift.

##### GRADE 3

The returning birds.

- *a.* Bird calendar.
- *b.* Bird walks.
- *c.* Special study of house wren, scarlet tanager and rose-breasted grosbeak.
- *d.* Building bird houses for wren.

## INTERMEDIATE GRADES

### *Winter*

#### GRADE 5

Our winter bird friends.

*a*. Study of common winter birds, such as chickadee, nuthatch, woodpecker, blue jay, snowflake.
*b*. What they do for us.
*c*. What we can do for them in the winter.

### *Spring*

#### GRADE 4

*a*. Calendar.
*b*. Special study of birds of the dooryard and shade trees of Mankato, such as English sparrow, robin, bluebird, chipping sparrow, Baltimore oriole, yellow warbler.
c. Building nesting houses for the wren.

#### GRADE 5

*a*. Special study of birds of the air, such as rough-winged swallow, bank swallow, purple martin, chimney swift, barn swallow, night hawk.
*b*. Building nesting houses for the bluebird and wren.
*c*. Nests of birds.

#### GRADE 6

*a*. Study of birds of the slough, such as red-winged blackbird, kingfisher, bobolink, marsh wren, and of birds of meadows and fields, such as horned lark, bobwhite, goldfinch, song sparrow, meadow lark, vesper sparrow, field sparrow, flicker, cowbird, indigo bunting.
*b*. Bird songs.
*c*. Drinking fountains for the birds.
*d*. Bird enemies and bird protection; Audubon Societies; state and federal laws.

## GRAMMAR GRADES

### *Spring*

#### GRADE 7

Bird friends of the garden and orchard.

*a.* Special study of these birds, such as catbird, chickadee, cuckoo, kingbird, nuthatch, phoebe, brown thrasher, wood thrush, cedar waxwing, woodpeckers, grosbeak, robin, wren, bluebird, Baltimore oriole,

*b.* Attracting bird friends to the yard and garden.

#### GRADE 8

Bird friends of our trees and forests.

*a.* Special study of birds of the woods, such as warblers, vireos, woodpeckers, thrushes, flycatchers.

*b.* Economic value of birds; work of Bureau of Biological Survey.

*c.* State and national laws protecting birds.

*d.* Government reservations for birds.

Last spring the children contributed sufficient money to buy a martin house, a bluebird house, and a wren house, which were put on the school grounds. The martin house was so delayed in shipment that it was too late for it to be occupied when it finally arrived. The bluebird and wren house were both occupied by wrens.

This fall there was erected on the school grounds a feeding house similar in construction to the one used by Baron von Berlepsch in Germany, but more rustic in appearance and without the glass sides. The different grades of children in the intermediate and grammar departments take turns in keeping this supplied with food.

The kindergarten and primary departments have charge of a feeding car, which runs on a wire extending from a window of the building to a neighboring tree.

Plans are being made to construct a bird fountain upon the school grounds.

*State Normal School, Mankato, Minn.*

## Outdoor Equipment

JAMES G. NEEDHAM

It is a part of the public duty of those who know the value of our natural endowment to protect and preserve some portion of it wherever possible, and to put it to educational use. We, as a people, have had the American soil in our keeping for only a few generations; and yet we have well nigh extinguished its native life over large areas. It is well to have fields and stock-pens, for we must be fed and clothed: but, it is well, also, to have something to show of the richness and resourcefulness of nature, for we must be educated.

Coming generations will need the wild things. Without seeing them, they will never understand the history of their own country. They will never know what things confronted their forefathers to baffle them: what things gave them succor and enabled them to live here and establish a new nation. They will want to know what the native life of their native land was like.

There is plenty of wild life of many sorts in America still, but it is getting farther and farther from the haunts of men and lost to its former use. The attention of youth is occupied more and more with artificialities. The wild places near at hand are made unclean, and then are shunned. Our necessary "improvements" are made with much unnecessary waste and heedless despoiling of the beauties of nature.

This is largely due to ignorance. That anything wild is worth saving has hardly occurred to the average citizen; that anything wild may be saved without hindering improvements is an idea foreign to his experience. For he has been filled with zeal to make the world over; to cut down all the woods and drain all the bogs, and fill all the ravines with rubbish; to reduce it all to a neat pattern of cement sidewalks, encircling lawns and cabbage patches.

In the cities where the pressure for room has been greatest and the destruction of native wild life completest, men have cried out for nature and for green things growing, and parks have been made. But the average park is a stretch of grass to be kept off from, and the best of parks are good and wholesome and inspiring and informing in proportion as they reproduce the wildwood.

So, before the last bits of wildwood near us have been destroyed, it is time to think of preserving some of them for the sake of those who shall come after us. This was not necessary in the days of the pioneer, but with rising land values and more intensive agriculture, the extermination of the wild life is proceeding at an ever accelerating rate. The rich life of the Illinois prairies is a memory. The streams in all our settled parts have been made barren and unclean. The swamps—nature's own sanctuaries—are being drained. In the better agricultural areas of America, we have almost reached that day of desolation when the possession of a natural grove, or of a wild-flower preserve, however small, is enough to give a farm distinction—to mark it as a home of culture.

Three things a naturalist should do for the public good. He should endeavor: (1) to prevent unnecessary and ill-considered destruction of natural beauty everywhere: (2) to aid nature in the restoration of beauty to waste places: (3) to make the bits of nature near at hand more serviceable in the education of the public.

**Saving the remnant.** It will not do for those who best know the esthetic and educational values of wild life to merely sit back lamenting when its extinction is threatened. When natural beauty spots are about to be ravaged and stocked with artificial gewgaws; when the public roadsides are to be shorn of their copses of flowering shrubbery, only to be made into weed patches; when flower decked ravines are to be turned into rat-hatcheries by filling them with garbage and rubbish; when sparkling streams are to be fouled with stinking slops and oils by the slovenliness of some streamside factory; when public groves are to be cleared without any intelligent supervision, merely to provide work for a public labor-gang in the slack season:- whenever these or any other such things, as are occuring daily all over the land, are about to be committed, it is the duty of the naturalist to speak out in protest. He should endeavor to enlist the enlightened public sentiment of his community, to have the esthetic and educational values of such places considered, ere they are destroyed. They are sure to be undervalued because they have cost the public nothing. In this they are like all true gifts of heaven.

In city communities, there are Audubon societies, and wildflower preservative societies, and civic improvement societies, and conservation societies, etc., that include in their membership the best brains and culture of the place; and the aid of such organizations is easily enlisted in such a cause. In any community there are those that love the beauty and freshness of unspoiled nature, and who will gladly use their influence toward saving something for future enjoyment. The first thing to be done is to see that those administering the public works in question are informed of the value of the wild things about to be destroyed. Often, it is necessary that they be informed of the very existence of such things. Next there is need of eternal vigilance.

**Improving waste places.** When necessary public works, however destructive of natural scenery, have been completed, then a little careful forethought for the use of the things nature freely offers, will make the place beautiful again. The naturalist should assist in planning their betterment. He of all people, should know what things are most available, and best suited to every use and situation.

Suppose a bridge is to be built. Everybody knows that an old bridge, settled in the midst of clumps of greenery and spanning a clear stream makes a beautiful picture. A new bridge looks otherwise: it rises starkly from a sea of mud, joins two new-born dump heaps. For, when a bridge is built, usually just enough money is appropriated to do the necessary excavating, to dispose of the dirt in the easiest way and to put up the bridge itself: nothing is available for restoring beauty to the place. What are the things needed for this? Willows by the waterside: filmy pale green small-leaved wild willows, to nestle in soft masses by the abutments: elms and sycamores to cover the rising slopes; or vines, if the dump be of broken stone: swamp iris or water shamrock to cover the bare mud—things that do not cost a cent for they may be found in nature's wild nurseries; things that will grow without any coddling, that need only proper planting—in short the things that grow wild in such places. These will restore the beauty of the place in the minimum of time, and with the least expense. In the course of years, nature, if not prevented, will restore these things herself: but the effect will be better, and the desired results will be attained much more quickly for a little intelligent aid.

So, roadsides, that are considered "finished" when a roadbed is secured, may be refurnished: level filled lands may be made fresh green meadows, instead of being allowed to become wildernesses of weeds: slopes disfigured with stumpage may be reforested. It should be the privilege of the naturalist to enlist public spirited folk in the promotion of such betterments. It will help the good name of his community.

The greater the number of people who can be got to participate in this work, the better it will be established in public opinion: the more children helping, the better its results will be insured against future vandalism. About schools and colleges, things should be planted, not solely for ornament, as at present, but for their educational usefulness as well.

**Making natural reserves servicable.** Education began in "fresh air schools". Country folk have always been wont to meet in groves for public exercises. The fresh air and the open sky, the majesty of the trees, and the freshness of the unspoiled verdure have irresistibly drawn them out of doors. With the revival of interest in field work, we are going out doors in companies again and taking some of our work with us.

It is not so easy now, as once it was, to find a spot prepared by nature for a gathering place. The requisite conditions are that all who come together shall be able to see and to hear and to sit comfortably while listening or working. A grassy bank under a tree, when dry enough, may meet these conditions. For many years a few great trunks of fallen trees in the Renwick woods at Ithaca served as meeting places for classes in biological field work. But places better suited to the needs of classes may easily be arranged in the woods.

For more continuous use as an outdoor class room, "The Covert," at Ithaca was made. A natural hollow in the woods, over-arched and shaded by trees, was fitted with seats of flat field-stones, arranged in semi-circles. Aisles were left for passing and paths were made for entrance and exit. At the center a massive table, with a slate slab for a top, was built of hollow tile and plastered. A door was set in the back of its hollow base, and its interior is used for the storage of grass mats, between sessions. These mats are handed out for use by classes when the stones are damp and cold. "The Covert" is an excellent type of educational equipment that can be made in any woods. It is very substantial and permanent. It does not disfigure the woods (being hardly discernible from a distance of a few rods in any direction) and it is growing in beauty every year as its trees grow older, its paths become better turfed, and its surrounding plantings develop. It was made by a few weeks of labor on the part of two students, and it cost less than ten dollars for materials.

Gathering places for larger numbers may be made on the same general plan. The author once took a class in natural history out to a small grove and set the members studying the trees and the slopes with a view to locating and arranging therein, with the least possible disturbance to the wild wood, an outdoor auditorium for public addresses, concerts and sylvan plays. The result is a simply arranged natural amphitheater. The artificialities of the plan are such only as are necessary: comfortable seats, conveniently arranged, and a good stage. These are made of cement on ribbed metal lath, plastered on both sides and colored green or gray or brown. The sylvan picture round about is carefully preserved. The aisles are grass paths. Under the seats are beds of violets. Greensward masks the stage and low evergreens define front and rear stage entrances. A bank of tall evergreens furnishes a background at the rear of the stage. All around are trees for shade. A rising turf covered bank at the rear of the seats provides for overflow on great occasions, the limit of capacity being set by a bank of evergreens fronted with thorny barberry. Vines added for grace, and flowering trees and shrubs for color are used to fill surrounding niches. Thick walls of verdure round about exclude outside distractions. Grass paths of ample width, well defined by border plantings, give easy access, and invite pedestrians to keep off the other vegetation.

No community will long gather in such places without coming to feel an interest in the wild things. By the possession and use of such outdoor places, the public may be educated in the appreciation of nature

Editor's Note:—This is the concluding section of Professor Needham's forthcoming *Natural History of the Farm*, and it concludes his present series of articles in the Review.

# The Cape May Summer School

Laura E. Woodward

The first summer school in the state of New Jersey was founded in Cape May in 1907. To quote from the charter, "the purpose for which it is formed is that of promoting and encouraging the study of agriculture, industrial arts and science and organizing and establishing a school in which will be taught the theory and practice of agriculture, home economics, manual training, mechanical arts and trades.

Prior to 1907 many of the teachers of the state were without an opportunity for training to meet the growing demand made upon educators for more practical work in the public schools.

During the first year only ten teachers availed themselves of the opportunities offered by the school. The movement had not been sufficiently advertised for people in the state to realize such a school had come into existence within its borders. The second year there was a considerable awakening, and during the past summer of 1913, the members had so outgrown their quarters in the High School Building that the courses in Elementary Manual Arts were given in a spacious hotel in the neighborhood and the Physical Training classes were conducted in the school yard. The faculty was increased to twenty-five members, and notwithstanding the fact that three other summer schools were established that year in the state, the enrollment of teachers at Cape May headed the list.

As the school has grown its purposes have grown with it, and the number of courses offered has increased to meet the demand of any group of teachers, however small, for a subject that may be desired for certificates or for help in the entire range of industrial, professional, and special education.

Since the beginning, however, emphasis, has been placed on the practical rather than the academic side of school work. The motto of the school has been, "Not the thing made, but the power to make something." This power, which the teacher-student in the school was led to realize she possessed, was considered by the dean of the school as not really possessed by her until she had gone home and taught to some class or to someone else what she had learned so that her pupil in his turn could produce a similar product. When such evidence was presented, the summer school student was given a certificate showing that the courses taken had been completed. This unique feature of the school has caused each summer to possess a peculiar interest as the students of the previous year presented evidence of what their pupils had done during the intervening months. The difficulties overcome by many of the teachers of the state are lasting proof of their efficiency when helpful inspiration is given. As illustrations, in handwork, the use of native materials was encouraged for problems in dis-

Fig. 1.

tricts lacking the ordinary commercial supplies, with the result that beautiful baskets were woven by children, from grasses found in the home neighborhood; in elementary science and agriculture, the construction of home made apparatus was a feature; in gardening, photographs of successful gardens under extreme difficulties were presented; in sewing, bonnets made of coffee sacks were found to be artistic as well as useful; in woodwork many useful articles were made of lumber obtained from store boxes; and so on, every department contributing its quota of evidence of influence extending to every county in the state, through teachers, many of whom returned to the school for four successive terms.

The summer school itself has had difficulties to meet in carrying on its work, as great in some cases as those of its students. One of the difficulties confronting it was a suitable spot upon which to conduct a school garden for the short period the school was in session. The yard, not large in extent, is covered with cinders. No available vacant lots were near except a wilderness jungle which was obtained for the use of the school in 1909, no extra

Fig. 2.

charge being made for tin cans, ash heaps, dead tree stumps, weeds and other materials of similar value.

The same year it was decided that a group of colored children in the neighborhood should be taken as a "practice class" while the teacher-students in the Nature Study Class of the school would observe the results of their work and assist in the making of gardens as their time permitted. The result was that ten days after starting on the almost impossible looking lot, it really became "vacant" and ready for marking into plots. At the end of the four weeks' session, radishes were above the ground and other seeds were sprouting. During August of that year, the growing plants were cared for by the children's class, and in September the products were harvested by the half bushel basket, beans and radishes supplying the most abundant crops. Since then the lot has remained cleared and available for garden purposes. The ashes and other materials contributed before its transformation, seem to have added to its productivity rather than to have interfered with its success. The faithful workers of 1909 visit the school each year and proudly recall how they made their garden.

Fig. 3.

The school since its beginning has been under the management of the Department of Public Instruction of New Jersey, assisted by a local board of trustees in Cape May and supported pratically by state appropriations. Last summer it passed from under the original management and became one of the number of schools under full control of the state. The system of certification of work is thereby somewhat changed, but the spirit, which has dominated the school since its beginning, will be an influence in the state continuing as long as its students recall their busy but happy summers at Cape May.

*Carrol Robbins Training School,*
*Trenton, N. J.*

# Hibernation Among Plants and Animals

HAROLD B. SHINN

"'The north wind doth blow
And we shall have snow,
And what will Robin do then,
Poor thing?'

"And what will Muskrat do? and Chipmunk? and White foot? and little Chickadee? Poor things. Never fear. Robin has heard the trumpets of the north wind and is retreating leisurely toward the south, wise thing. Muskrat is building a warm winter lodge; Chipmunk has already dug his but and bin, and so far down under the stone wall that a month of zeros could not break in; Whitefoot, the woodmouse, has stored the hollow poplar stub full of acorns and has turned Robin's deserted nest, near by, into a cozy house; and Chickadee, dear thing, Nature herself looks after him. There are plenty of provisions for the hunting and a big piece of suet on my lilac bush. His clothes are warm, and he will hide his head under his wing in the elm tree hole when the north wind doth blow, and never mind the weather.

"———The woodchuck's is a curious shift, a case of Nature outdoing herself. Winter spreads far and fast, and Woodchuck, in in order to keep ahead out of danger, would need wings. But he wasn't given any. Must he perish then? Winter spreads far but goes not deep; down only about four feet; and Woodchuck, if he cannot escape overland, can, perhaps, *underland*. So down he goes *through* the winter, down into a mild and even temperature, five long feet away—but as far away from the snow and cold as Bobolink among the reeds of the distant Orinoco.

"Indeed, Woodchuck's is a farther journey and even more wonderful than Bobolink's for these five feet carry him beyond the bounds of time and space into the mysterious realm of sleep, of suspended life, to the very gates of death. That he will return with Bobolink, that he will come up alive with the spring out of this dark way is very strange, for he went in most meagrely prepared. He took nothing with him, apparently. The muskrat built him a house and under the spreading ice turned all the meadow into a well stocked cellar. The beaver built a dam, cut and anchored under water a plenty of green sticks near his lodge so that he, too, would be under water when ice formed, and have an abundance of tender bark at hand. Chipmunk spent half his summer laying up food near his underground nest. But Woodchuck simply digged him a hole, a grave, then ate until no particle more of fat could be got into his baggy hide, and then crawled into his tomb, gave up the ghost and waited the resurrection of the spring."

*Dallas Lore Sharp*

This quotation, read to classes of varying age, has been most enchanting, and it has inspired search a little farther into the phenomenon of hibernation among plants and animals.

There is no need to attemp the elaborate classification of sciences often given in reference books when we say, "The study of nature is two-fold, the study of the universe without the individual and an examination of the universe of reaction within." The first great interest awakens during the early years of *infancy* and continues throughout life. It often satisfies itself with just a speaking acquaintance with many things; indeed, it tends toward superficiality. The second interest entails the solution of profound problems, a delving into depths. Too often we find its students unable to appreciate the beauties of nature in the mass; a gorgeous sunset straightway becomes a large problem in the physics of light-rays, wave length, velocity, and refraction.

When one attempts to combine the two phases of nature-study, he awakens to a realization that he lives in a vast sea of external force whose waves come beating in upon him like those which run up on the shore, at times only ripples, at times a great surf. And so the life one lives is a resultant of the external forces of factors and the internal responses and reactions.

The special and general senses of animals produce more or less immediate reactions. To many men these are the only things worth living for; the pleasures of taste, of sound, of sight, these and others of the flesh measure the short and shallow span of life. But there are other and more powerful influences working upon us. Those great forces which we strive to control or counteract called heredity; those of atmospheric pressure, of humidity, of seasonal temperature, of ultra-violet light, all these and more which science is just coming to know produce internal responses and determine what we are. It is the purpose of this brief sketch to call attention to only the responses of animals and plants to cold.

Experiment upon organisms has shown that reduction of heat is the prime factor in determining the seasonal torpidity of the form; this occurs in both land and water life. Yet in very many instances seasonal inactivity has occurred through so many ages that it has become firmly implanted in the protoplasm and now is instinctive. It takes place even when specimen is kept in an artificial summer, as many of us have observed in school-room pets; for instance, turtles, crawfishes, and frogs.

Among animals hibernation, whether it be habitual and instinctive or merely a tropism, consummates the year's activity. In the spring the reproductive functions are dominant; they involve an almost endless series of physiological changes and the appearance of latent faculties of mind concerned with parenthood. During summer the spring's activities and faculties abate while growth and sobriety prevail. The provender of spring and early summer is rank and lush, and while it suffices well for daily need, it is not adapted to long storage.

For plants, spring is a season of rains and waxing sunshine. Growth is rapid and tissues are rich in simple carbohydrates, substances easy of solution, translocation, and temporary storage. At this time a period of intense cold or of unseasonable heat may prove fatal to vegetation, owing to the instability of material.

The waning summer is a period of dry heat; tissues harden and form more enduring compounds. Deposition of cellulose or the withdrawal of sap from new bark effects the formation of a thickened corky layer. There is less growth, less rapid translocation of material, until by the time frost sets nightly along the hillsides the plant world is ready for the long winter sleep, its hibernation. Spring flowers are fully formed but safe from rain and wind under waxen scale, or snug and warm in their feather bed, a chaffy bud.

Seed coats are heavy and even nut-hard. Carbohydrates are mostly cellulose, starch, the glycogen of fungi and the inulin of Compositae; they may be some form of sugar: fruit sugar (fructose) of fruit and bulb and cane sugar (sacchrose) of beet and cane are most abundant. These carbohydrates are almost insoluble and of high complexity. The fragrant, slightly soluble, volatile oils of spring have been oxidized into odorless and insoluble fixed oils and waxes, most abundant in external parts. They serve as storage material or they prevent evaporation from within or absorption from without. Their complexity of chemical make-up prevents the development of spores on the waxy surface of many fruits, bulbs, and buds, and to this is due the good keeping quality of our own winter stores.

Proteins exist as aleurone in seeds and tubers, gluten in cereal seeds, and globulin. With their contained nitrogen and phosphorous they form the essential basis of new protoplasm when growth is resumed next year.

Glucosides, another form of stored material, is exemplified in amygdalin,whose bitterness. as known in peach kernels, may be a protective device to check seed consumption by animals.

Because these hibernation supplies are so safe from change they would still be unchangeable in the spring; thus plants would meet the tragic fate of the sabre-toothed tiger, whose teeth grew so long that they came to hinder and prevent his feeding. The refractory molecules of wax and carbohydrate would be useless next season and locked away for all time were it not that far-seeing nature always provides at least one ferment which, next spring, activated by subtile changes of light and heat, will break down into usable form the material she has so carefully built up and stored away.

The story of fermentaton is told in part in the following table, which is an adaption from "General Chemistry of Enzymes" (Euler) and from "Introduction to Vegetable Physiology" (Green).

| *Hibernation Stores* | *Ferment* | *Product* |
|---|---|---|
| Cellulose | Cellulase | Maltose |
| Glycogen | Amylase | Fructose |
| Inulin | Inulinase | Fructose |
| Starch | Diastase | Maltose |
| Fructose | Zymase | |
| Sacchrose | Invertase | Glucose; fructose |
| Fats | Butyrase<br>Lipase | Fatty acid and Alcohol |
| Proteins | Vegetable pepsins, and trypsins | Vegetable peptones |
| Amygdalin | Glucosidase | Glucose or sugar and Cyanogen compound |

The delicate influences of autumn's changing light, heat and moisture in air and soil work wondrous marvels in plants; their silent operation we know only by their visible effects. The same subtle factors are at work upon animals and all unconsciously they respond. Many mountain dwellers seek lower valleys while northern forms, as the caribou, are seized with a *wanderlust* and take up their journey to warmer climates. Woodchuck roams through the orchard earlier in the afternoon and later in the morning, waddling like a duck. Burrowers extend their quarters and provide litter for the bed. Many insects, as plant-lice, change their mode of reproduction. Other insects, males or drones, fly out to die or are killed and removed from the nest so that returning spring may awaken only fertile females, the founders of new colonies.

In lakes and streams myriads of insects in immature stages leave the cold surface waters and seek more favorable conditions at lower depths. Frog and turtle and crawfish bury themselves in the mud . Fish undertake their fall "run". In old ocean many jellyfishes, their life work in one short summer done, decompose; other delicate surface-floating forms, taking on a new and more resistant guise, seem to disappear. The birds gather into noisy flocks for their southward migration or for the winter pasturing in some favorable spot where abound the concentrated foods of nut and fruit, of egg and dormant pupa. The plant's heavy seed coat in the animal is a double one of hair and fur or of feather and down. External fats conserve whatever internal warmth there may be and excess internal fat may be aggregated into definite fat bodies, *Corporo adiposa*.

The only definite calculation at hand which shows the preparation for hibernation compares two animals of similar diet, the hibernating striped spermophile or "gopher" and the non-hibernating squirrel. In the first the protein of muscle amounts to 30%, in the second to 20%; that of the frog is even higher, 40%. Summer pulse in the gopher is 200; winter pulse is 4 and each pulsation endures four seconds; amputation of a limb brings only a few oozing drops of blood. His summer respiration is 50 but that of winter is imperceptible; summer temperature is 105°and that of winter, 58°. In winter the blood is withdrawn from the chilled skin and is congested in the thorax. Hibernation, then, requires a goodly supply of stored food but the storehouse is only slowly drawn upon during the long winter sleep. Probably much of the supply is for the activity of early spring and the heavy drain of the little family.

In a general way, hibernation is a characteristic response of many temperate and frigid animals and of all such plants; it is even characteristic of arctic man, who, for days on end, sleeps in crowded hut of snow or turf and in his own enveloping fat. It is induced by a lowered temperature and aided by changes in food and by many minor forces. It may even be an hereditary trait which persist in spite of altered conditions.

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## Some Insect Studies

ALICE JEAN PATTERSON

The study of insects formed a portion of the work taken up last fall in a course in nature-study in our normal school. Most of the students taking the course had come directly from country schools and all of them expect sooner or later to return to rural districts to teach.

Altho these young people had spent their lives upon the farm they had a surprisingly slight acquaintance with insects, or in fact, with any other form of life with which they had been constantly surrounded since their childhood. It is true that they knew by sight a few species of insects and by hearsay a few more, but they had little knowledge of the habits and characteristics of even these few. To most of them all insects were "bugs", creatures to be avoided, or if they must be met, to be stepped upon or put out of existence in some other way.

The purpose of the study, therefore, was, (1), to awaken in these country boys and girls an abiding interest in insect life; (2), to help them to appreciate the fact that farmers need to know something of the characteristics and habits of insects, need to distinguish friends from foes before they can cope intelligently with these small creatures that invade their fields, orchards, and gardens; (3), to direct the study so that the students might gain some power in attacking simple problems and in finding answers in nature objects instead of books, some power in seeing, thinking, and judging independently; (4), to help them form some ideal towards which to work when they became teachers in rural schools.

In all of the work, both in the selection of material and in methods of presentation the purposes, especially the last one, were not lost sight of for a moment. I knew that in the short time we could give to the study it would be impossible for the students to make the acquaintance of many insects. What I hoped to do was to make them realize that they could use the insect life in the environment of their own schools in a way that would arouse a permanent interest on the part of their pupils as well as give the country children some valuable practical information.

The equipment for the study consisted of apparatus easily procured. The students made several terrariums out of pasteboard and wooden boxes. We had two larger ones that had been in use for several years. Besides these we used a number of pint and quart Mason jars, flower pots and lantern globes. Each student provided himself with a wide-mouthed, clear glass bottle or jelly glass. Altho most of our work was with living insects, we made two cyanide jars so that the students might learn how to kill and preserve specimens of special interest.

Our first study was the squash-bug. This was chosen; (1), because there was a large number of these insects on a squash vine that we had studied in the school garden; (2), because the insects were easily captured; (3), Because they showed several stages of development.

The first assignment was a field study, not a class excursion but individual observation by each student. I have found that much valuable field work may be done along all lines of nature study and elementary agriculture without the ordinary field trip under the guidance of a teacher. Of course the teacher must know the field before she sends forth the pupils. She must also indicate a few definite things to be found out, or problems to be solved. Indeed, I sometimes think that the individual study is often more worth while than the class work. At any rate there is a greater gain in independence of observation and conclusion and more freedom of expression. And why should this not be so? There is no good reason why pupils should not learn to read the great book of nature with the same intelligence that they use in gathering facts from the printed page in the library.

The students were asked to visit the garden twice during the day, once between the hours of eleven and three, and once early in the morning or late in the evening. They were to watch the squash bugs awhile, note what the insects were doing, and whether or not there was any difference in their movements and behavior during the two periods. They were, also, to place in the wide mouthed bottles at least three of the insects with a bit of leaf or stem and bring to class the next day.

The next day's recitation was given to reports and continued observation of the insects. This was the first time that most of the students had looked closely at an insect and the answers to their questions brought out just the kind of information that any student of insects should have. How does it eat?, resulted in an examination of the mouth and the finding of the long, piercing, sucking tube. Can they fly?, led to a study of the wings, the method of overlapping, the difference in texture between the fore and hinder portions of the outerwings, the more delicate inner wings, the hooking together of the outer and inner in flight.

By the time all the questions were answered the students had identified the body divisions—the antennae, the compound and simple eyes, the number of legs and wings, to what part of the body these are attached, and the segmented abdomen.

One student remarked, "My insects are not all alike. I found them together and I guess they are all squash bugs but two of them are smaller and not the same color as the other one. Are they young ones?"

This introduced the topic of the life history, growth and development. The students again visited the garden, collected specimens of all the different stages represented, compared the young with each other and with the adults, noting resemblances and differences. One boy was fortunate enough to find a cluster of egg shells on a withered leaf. We now had, besides the egg, four stages of the life history. The term, incomplete metamorphosis, was learned.

A large battery jar with a wire screen for a cover was arranged for the immature specimens. Pieces of the squash fruit and a leaf or two were placed in it for food. The class had the joy of seeing one after another of the immature insects change to adults leaving their cast off skins clinging to the leaves.

The question of how the squash bug spends the winter was left unsolved for a number of weeks. After the students had found a number of the adult insects on screens and windows, and in cracks and crevices, and when those kept in boxes in a cool place ceased to eat and crept down under leaves and became very stupid the conclusion was that they must winter in the adult stage.

Before we had finished the study of the squash bug a student announced that he had found a tree trunk completely covered with red and black insects that looked something like squashbugs. The class visited the tree and found hundreds of box elder bugs.

A brief study brought out the striking resemblance of the insects to the squash bugs. They had the same general shape of the body, the same kind of mouth, and wings, and the same life history series. The term, Hemiptera, the order to which these two insects belong, was given to the class.

We now took up the study of grasshoppers. Definite problems concerning habits, locomotion, and feeding were given for the students to solve in the field.

The reports of this work were most gratifying. The combination flight and jump, the habit of dropping to the ground and hiding among the grass stems, the special adaption of the hind legs for jumping, the folding of the inner wings were all discovered by the pupils without aid from the teacher.

The reports on the mouth were most interesting. The students were told, if they did not mind handling the insects, to hold a grasshopper in the left hand and with the right to place a blade of grass near the mouth and as the insect fed to try to discover the different parts of the mouth and their uses. All the parts except the maxillae were identified with the uses of the palps and the sidewise movement of the jaws. As the mouth was discussed in class the students had their insects in the bottle before them so the parts were observed again and the names labrum, labium, mandibles, and palps were learned.

The students had brought in several species of grasshoppers, all of which belonged to the family Acrididae or short horned. They now searched for relatives of these grasshoppers. We soon had several meadow grasshoppers, katydids, tree crickets and black crickets. One of the large terrariums was arranged with sod in one end for the short horned species, another with bottles to hold twigs and plants for the meadow grasshoppers and katydids.

The musical instruments of these insects proved very interesting. Perhaps the most enjoyable bit of observation was watching a common black cricket make its music. One of these little creatures confined in a bottle was accommodating enough to start chirping during a recitation period and every student had the opportunity to see how he did it.

Grasshopper eggs were obtained by placing the female insects in jars half full of garden soil. For the crickets, we used a lantern globe set in a flower pot filled with soil.

Cabbage plants and brussels sprouts afforded a rich field for investigation. The students were asked to bring in leaves with cabbage worms on them, to find out how these insects eat, how they move about and the number and arrangement of their feet.

The cabbage worms were brought in, but more than these. Some of the students brought leaves covered with aphids. Some of them had discovered that there were two kinds of "worms" or larvae, on the cabbage. These were examined in class and the differences noted. The largest individual of each species were placed in boxes and in less than a week we had the pupæ, the angular chrysalid, of the cabbage butterfly and the thin cocoon with the dark pupa of the cabbage moth.

"What is the difference between a moth and a butterfly," was asked? The question was answered in part by looking at mounted specimens of moths and butterflies.

Some eggs of the cabbage butterfly were found. The butterflies themselves were captured and studied; so we had all the stages in the life history of an insect having complete metamorphosis. This work was followed by a library lesson in which the students looked up methods of combating these insects.

The characteristics of the cabbage aphids, the type of moth, the kind of metamorphosis, etc., were discovered with little difficulty. A search for aphids on other plants was begun. Willow twigs were brought in covered with the insects, some winged individuals, some wingless, some true females and males. The white pine twigs showed not only all the different kinds of aphids but also the regular rows of eggs on the needles.

The most interesting study, however, was found on wild lettuce. Here was a real insect community, not only aphids, but two species of lady bird beetles, both the young and the adult, several ants, and two larvae of syrphus flies. It did not take long to discover that the lady birds and syrphus larvae were intent upon devouring the aphids, while the ants were feeding upon honey dew.

The lesson was followed by a study of the corn-root aphis, a very distructive pest in Illinois. The story of the life history with the relation of the small field ant to the aphis, and methods used in combating the insects were obtained from library references.

The ladybird beetles introduced us to a series of lessons on beneficial insects. We first studied predaceous types, ladybirds, lace wing flies, dragon flies, searcher beetles, robber flies, water beetle and hornets. In the meantime some one had brought into the laboratory, a larva of a tomato sphinx covered with cocoons of a species of microgaster. This was studied as a type of parasites. We went back to the cabbage leaves and found swollen bodies of aphids with round lids cut in the sides, the work of another parasite. We also found a few clusters of yellow cocoons belonging to another species of microgaster which destroys numbers of cabbage worms every year.

Besides the special insects chosen for study the students brought into the laboratory many more which they wished to know something about. Some of our most profitable lessons were based upon these specimens. I shall not soon forget the surprise and pleasure expressed by members of the class when they discovered that white grubs are the young of May beetles or June bugs which are so abundant in early summer. Larvae of moths and butterflies that were brought in were placed in terrariums or jars containing soil and fed until they changed to pupae. We have now several sphinxes, one imperial, a polyphemus, a cecropia, several tigers, and a swallow tail put away in the laboratory expecting to get the adults in the spring.

Toward the close of the term the students made a summary of their work based upon their observations, notes and readings. The following topics were used:

1. Group the insects you have studied into, (a) those that are harmful to crops of any kind, (b) those that may affect the health of the community (c) those that are beneficial, (d) those that are neither beneficial nor injurious.

2. Group together those that have complete metamorphosis, those that have incomplete metamorphosis.

4. Name the characteristics that are common to all the insects you have studied.

5. Winter habits, (a) Name those that pass the winter in the egg stage, (b) in the larva; (c) in the pupa; (d) in the adult.

6. List methods of combating insects; (a) those that have biting mouths (b) those that have piercing, sucking mouths.

The lists were taken up for discussion in class. Where there were differences of opinion the matter was looked up or referred to the teacher for the correct version. Altogether the results of the study were gratifying, not so much because of the facts gained, as because of the changed attitude of mind toward insects and the interest, even enthusiasm that was manifested as the work progressed.

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## Editorial

Nature-study has been in vogue now in many of the schools throughout the country for some considerable time. Its aims, methods and materials have been discussed in this magazine, in other magazines devoted to various phases of the teaching problem, and in book form. It takes a considerable time for any new view point to influence the whole body of teachers, especially when the teachers of the country are so constantly-changing a quantity. Nature study is given under a good many different captions. Sometimes it is known simply as "elementary science", sometimes it is called "school garden work", again it is designated "elementary agriculture". I do not mean to say that elementary agriculture and school gardening are always nature-study, nor even that nature-study itself is always nature-study. Yet it is coming to be fairly well understood that nature-study is a study of the object itself, and is such a study as will lead to an appreciation of what the commonplace environment signifies, to a love for out-door things and a keener sense of their beauty and perhaps above all it will develop ability to reason to correct conclusions on the basis of ones own observations. Various teachers will evaluate these several aims differently, and include others.

It would seem opportune to turn the attention of thoughtful teachers from a discussion of the aims and methods in nature-study which are now reasonably well defined to an attempt to determine in how far we are accomplishing what we set out to do. Grant that nature study should make pupils more appreciative of the beauty around them, more capable of correct inductive reasoning, does it do this? We have agreed for instance, that a study of English literature and composition should make pupils in the grades capable of using better English, both in oral and written expression. English teachers are attempting to formulate appropriate tests to measure the success of their work. Teachers of writing are trying to attain certain standards for judging their results. In arithmetic we have graded tests—an attempt to measure the children's accomplishments. Is it not time that the nature study teachers, especially those who are looking at the pedagogical values of the subject, the normal school and university instructors, is it not time that these began to devise ways and means of getting at some correct data regarding the actual things that nature-study does do for the child? It is to be hoped that we may think together along these lines and develop some satisfactory methods of determining in how far we are accomplishing the things which we hopefully set out to accomplish. Such data, in place of the vague assertions which are alone possible now, will satisfy the advocates of nature-study and effectually quell opposition.

## Book Reviews for March

*A History of the Land Mammals in the Western Hemisphere*, by William B. Scott, pp. XII plus 693. The Macmillan Co., $5.00

This book is dedicated to "my classmates, Henry Fairfield Osborne and Francis Spear, in token of forty years' unclouded friendship." In the preface is related how, one afternoon in June 1876, three Princeton undergraduates, lying under the trees on the canal bank, discussed a fossil-collecting expedition to the West and that then and there they determined to go and see these wonderful fossil remains for themselves. For Scott, the author of this book, and Osborne, the decision was momentous, for it determined their life work. It is interesting that simultaneously with the appearance of this book of Scott's, Osborne's book on The Age of Mammals in Europe, Asia and North America, is also appearing from the press of the same company.

The numerous expeditions for collecting fossils from our own western country have been so frequent and the material discovered so abundant, that many interesting histories of various great groups of animals in the comparatively recent rocks of our Bad Lands can be written with a fair degree of completeness. This book includes a great deal of this material, all that is really important and decisive. Here are reconstructed the ancestral lines of descent and here are figured the various animals that represent the more generalized precursors of the modern mammal inhabitants of our earth. It is impossible to write a book of this sort without including a good many technical terms and scientific names, in fact all of these old animals have no other names than scientific ones. It is not an easy book, therefore, for the uninitiated to read but if one has any interest whatever in matters of this sort, he will likely wade through the necessary scientific terminology in order to appreciate the very interesting stories that are related. The author is thoroughly familiar with his subject matter, writes in a clear style and presents a mass of facts well organized. The illustrations, of which there are over three hundred, are many of them by Bruce Horsfall, which is a guarantee of their scientific as well as their artistic value.

In addition to tracing the history of several of the great subdivisions of the mammals, there are discussions of several general matters. There is a chapter, five, on the geographical development of the Americas, chapter six is on the geographical distribution of mammals, and chapter seven is on successive mammallian faunas. This last chapter of over 90 pages is one that the general reader will appreciate as it gives a very excellent idea of the whole drift of the evolutionary movement in the mammal group. The last chapter, chapter 18, on modes of mammalian evolution, will be read by the general reader and the specialist with equal interest, for it is a statement of conclusions to which the author comes after his extensive study of fossil evidence. He believes that there are many striking instances of parallel development, that new species are usually formed through the similar and simultaneous movement of many individuals, rather than from a single individual or pair, that development has usually been divergent rather than convergent and that it has proceeded by reduction in the number of parts and the enlargment and specialization of those that are left. Finally he thinks that development among the mammals has been a remarkably direct and unswerving process. As to whether the process is a continuous or discontinuous one, he prefers to let specialists in other fields of paleontology decide where the evidence is clearer than it is among the fossil mammals.

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*The Infancy of Animals*, by W. C. Pycraft, pp. XIV plus 272, Henry Holt & Co. Price $1.75.

This book is an accumulation of facts related much after the manner of the older natural histories. There is no very marked attempt to discuss theories. At points, one could wish the theoretical discussion somewhat amplified, as in the discussion, for instance, of colors and coloration. It is pointed out that longitudinal stripes are characteristic of many young and that later these come to be broken up into spots and, by recombination, into vertical stripes, yet there is no discussion of the evolutionary significance, or possible interpretation of such changes. One of the best chapters dealing with material that the author is particularly well versed in, is the chapter on "Young Birds in the Nursery". It is filled with well authenticated instances of some remarkable performances among birds in the rearing of their young. All but two chapters, the last two, consisting of 32 pages, deal with the vertebrates. The first four have to do with the mammals, then three—100 pages—are devoted to birds, two—23 pages to the reptiles, chapter eleven is on tadpoles and chapter twelve on the infancy of fishes. On the whole the book is well worth adding to the nature-study library; it is illustrated with many photographs and drawings. Its perusal will add much to the stock of information which every naturalist needs and much of the information will be found to answer questions that have been long unanswered in the mind of the average nature instructor.

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*Elementary Entomology*, by E. Dwight Sanderson and C. F. Jackson, pp. VII plus 372, Ginn & Co. Price $2.00.

This book by two competent entomologists is intended to supply a text for a short course in elementary entomology. Part One is devoted to the structure and growth of insects and is about equally divided between the anatomy and transformations of various insect types and groups. Part Two is descriptive and deals with the classes of insects. This makes up the body of the book, some 200 pages, and systematically treats of the various insect orders devoting most space to those that are of economic importance, though the book makes no attempt to be an economic entomology. Part Three consists of laboratory exercises and gives methods of collecting, preserving and studying. A valuable feature of this short part is a key to the orders of insects. There is little or no attempt to include anything excepting the conventional material and indeed, one would not expect new material to appear in a text book. There does appear to be included results of late investigations, however, and the illustrations are drawn from modern sources. The treatment is concise yet clear and interesting.

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The publisher and price were inadvertently omitted from the *Review of Minots Modern Problems of Biology* in the January number. It is from the press of P. B. Blakisfor's Son & Co., and the price is $1.25.

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# NATURE-STUDY REVIEW

Devoted Primarily to all Scientific Studies of Nature in Elementary Schools

Vol. 10. No. 4
Whole No. 82

OFFICIAL ORGAN OF THE AMERICAN NATURE STUDY SOCIETY

APRIL 1914




CONTENTS


Foreword .................... 119

A Study of the Hyacinth ........ 120
Anna B. Comstock

Studies of Commercial Fertilizers 122
B. M. Davis

Astronomy as Nature Study (Second Paper). E. A. Fath.. 130

The Ways of Monarch Butterflies 132
Florence E. Lillie

The Nests of Some Common Birds 137
Ralph E. Wager

The Editorial .................. 152

News and Notes .............. 154

Nature Articles in Current Magazines .................. 157

Book Reviews ................ 158



Published Monthly except June, July and August at Ithaca, N. Y.

$1.00 a VOLUME (9 Nos.)

Elliot R. Downing, Editor
The University of Chicago The School of Education
Chicago, Ill.

15 Cents copy

Entered as second-class matter at the Postoffice at Ithaca, N. Y., under the Act of March 3, 1879.

# THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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VOL. 10 APRIL, 1914 NO. 4


## Foreword

The editor wants your help. We are publishing in the advertising pages of this number some very attractive clubbing offers. There is an exceptional offer to new subscribers also. Any new subscriber sending in four new subscriptions may have his subscription free for a year. These liberal offers are made because we want new subscribers. The subscription list has increased in the last six months ten per cent: this in spite of vigorous pruning to get out all dead timber. We have never pruned as closely. We have never had so many subscribers. We are getting a good line of advertising: thanks to the vigorous work of the Comstock Publishing Company. All this is duly appreciated we know for the office is in receipt of many letters of commendation. The REVIEW is a well established organ. But it is right at the point now where its efficiency would be multiplied many times if we could double our subscription list. Advertising pays in proportion to the number of readers. The advertising would pay for the expense of publication if we had five thousand subscribers and that is asking little. We could then begin to buy articles that would be even more attractive. We could reduce the price of the REVIEW. The editor can not reach these new subscribers. You can! If each reader will win one new subscriber we can begin to improve rapidly. Will you not do that much for the Nature Study Movement!

## A Study of the Hyacinth*

ANNA BOTSFORD COMSTOCK

The hyacinth has been famous from the times of antiquity, and played its part in Greek mythology. It was introduced into Northern Europe early in the sixteenth century. Rarely does a species of plant show such a wide range in the colors of its flowers—white, pink, purple, lilac, and pale yellow are common varieties—and each plant is a complete bouquet. Holland produces hyacinth bulbs for the world.

When the hyacinth first appears above ground its leaves are all drawn together at the tips, making a pointed peg to push up through the soil. Later the fleshy leaves spread out in star-shape and reveal at their center an oblong bunch of green buds packed so closely together that they look like a small pea-green pineapple. If we look closely at the flower buds we find that each bud is shaped to fit exactly its neighboring buds like a piece of mosaic. Each bud is covered with three green sepals that close tightly about its outside.

We might naturally suppose that those buds that first appear at the tip of the flower stalk would be the ones first to blossom. Not so! Those at the base are the first to open, and their first sign of bloom is the change in color of the green sepals. At first their bases take on the hue of the hyacinth variety, and this color, be it blue, purple, pink or yellow, creeps upward toward the sepal tips until, when the flower is ready to open there is scarcely any of the green left upon them. This gradual change of color should be one of the interesting points of observations on the part of the children. We could not, through dyes, change green to lilac, or pink or yellow to white. But the hyacinth does it to perfection. These once green sepals, however, always retain their thickened, close-fisted tips, showing where they once "held hands" above the bud.

When the flower is open we can see that it is set upon a short stem which has a little bract below it where it joins the central fleshy stem. There are now six lobes to the flower bell, and we can tell by the thickened tips which of these six lobes acted as

*This study is taken from one of the leaflets of the Home Nature Study Courses given by Mrs. Comstock in 1911 at Cornell University. The original leaflets are now out of print.

sepals to the flower bud. The six stamens are placed opposite the lobes and at the throat of the bell. Each stamen has a broad triangular filament which, like a bracket, holds the pale yellow anther at its tip. The stamens project toward the center of the flower and form a tent above the stigma and ovary. The anthers and pollen are often the same color as the flower. At the bottom of the flower is the green, three-lobed, almost globular ovary with sutures between and also at the middle of its lobes. This is crowned with a short, brushy three-lobed stigma, the color of the flower. The anthers ripen and shed their pollen before the stigma is ready to receive it. The strong fragrance of the flower attracts to it many insects, especially the bees, and they carry the pollen. In the flowers examined for this lesson, I found that most of the single varieties produced seed, occurring as twins, set in the lobes of the ovary.

The hyacinth bulb has attached to it many long, thread-like roots. If cut through the center we see that it is made up of many layers like the onion. Small bulbs are found around the base of the mature one. A rich, light soil is best for hyacinths. The bulbs should be set out in October and set about eight inches apart and four inches deep. The bed should be mulched during cold weather.

A potted hyacinth blossoming in the schoolroom or one of the plants brought in from the garden is all the material necessary for this lesson.

*Purpose.*—To lead the pupils to a knowledge of the hyacinth and to interest them in its cultivation.

*Observations for pupils:* (1) When the hyacinth first appears above ground how does it look?

(2) Do the flower buds appear as soon as the leaves?

(3) How are the leaves arranged around the flower buds? Describe the leaves.

(4) Describe the bunch of flower buds. How are they packed together?

(5) What color are the flower buds?

(6) Take one apart. How many of the green sepal-like lobes protect the flower?

(7) Do those flowers which appear above the ground first, open before the others?

(8) Where upon the stem do the flowers open first? How many open each day?

(9) What becomes of the green sepal-like lobes when the flowers open? Describe where the change of color begins? Which part of the lobes is the last to lose the green?

(10;) What sort of flower stem has the hyacinth? How are the flowers arranged upon it?

(11) Are they packed more closely at the top of the stem or at the bottom?

(12) What is there peculiar about the juice of the hyacinth plant?

(13) Take an open flower. How is it set upon the stem? Is there a bract where it joins the stem?

(14) How many lobes to the flower tube? Can you tell by feeling which of these lobes acted as sepals to the bud?

(15) How many anthers? Where are they placed? How do they open?

(16) What is the color of the pollen?

(17) Describe the stigma, the filament, and the ovary.

(18) Of what service is the strong odor of the hyacinth?

(19) What insects visit it? What do you think is its scheme for securing pollen?

## Studies of Commercial Fertilizers

B. M. Davis

The use of commercial fertilizers is becoming increasingly important, both from the standpoint of maintenance of soil fertility and of actual cash investment. In Indiana alone it is estimated that in 1912 $3,465,636.32 were spent for commercial fertilizers. It is significant that $2,431,312.00 were spent for complete fertilizers, and only $8,258.31 for rock phosphate. The average purchaser of a commercial fertilizer is unable to make the simple calculations necessary to an intelligent choice of the various combinations offered. Often he pays a high price for a combination of ingredients which, for his purposes, might be obtained in a slightly different combination at a considerable saving, or better by buying the ingredients separately and mixing at home. A still better practice would be for him to supply his own nitrogen by means of manures and rotation of crops, buying only the necessary phosphoric acid in form of ground phosphoric rock, and potash.

The arithmetic of fertilizer calculations is within the capacity of the pupils of the seventh and eighth grades. All that is necessary is an intelligent presentation of the problems by the teacher. However, teachers seem to have much difficulty in understanding such problems themselves. The two following exercises dealing in considerable detail with the application of commercial fertilizers have been presented to several hundred teachers in county institutes and in my own classes. Problems arising from such application have the two-fold value (1) of affording a practical use of arithmetic, (2) of giving direct service to a farming community. A school might well undertake to make all necessary fertilizer calculations for its patrons.

### Commercial Fertilizers

*Explanation:*

The plant derives certain substances from the soil which are necessary for its growth. All but three of these (nitrogen, phosphorus, and potassium) are generally found in the soil in sufficient quantities for the needs of the plant. The "essential ingredients" of a fertilizer are substances containing these elements; *i. e.*, substances which supply (a) nitrogen as nitrate of soda, dried blood, hoof meal, etc., (b) phosphorus in form of phosphoric acid as bone meal (raw or steamed), mineral phosphates, etc., (c) potassium in form of potash as wood ashes, kainite, muriate or sulfate of potash, etc.

A complete fertilizer is one that contains nitrogen, phosphoric acid, and potash in proportion supposed to be suited to the needs of certain crops. Such a fertilizer is made by mixing substances containing the basic ingredients so as to give the desired propro-tion of nitrogen, phosphoric acid, and potash.

It is often the practice to use substances rich in these "essential ingredients" and dilute the mass to the desired strength by means of some inert material such as dry earth. Materials used in this way are called fillers. A 2–8–4 fertilizer means one that contains two per cent nitrogen, eight per cent phosphoric acid, and four per cent potash. If the percentage of available basic ingredients is known it is an easy matter to calculate the value of a fertilizer.

*Directions:*

The percentages of ingredients are indicated on the fertilizer tag or label if sold in a state where fertilizers must be guaranteed. The list of ingredients on a fertilizer tag or label is often misleading or at least confusing. Only the *lowest stated* amount of *available* nitrogen, phosphoric acid, and potash should be considered. The following example of list printed on fertilizer tag will illustrate this point:

| | | | | | |
|---|---|---|---|---|---|
| Nitrogen | 1.64 | to | 2.46 | per | cent |
| Nitrogen as ammonia | 2 | " | 3 | " | " |
| Soluble phosphoric acid | 5 | " | 6 | " | " |
| Reverted phosphoric acid | 3 | " | 4 | " | " |
| Insoluble phosphoric acid | 1 | " | 2 | " | " |
| Total phosphoric acid | 10 | " | 12 | " | " |
| Phosphate of lime | 22 | " | 24 | " | " |
| Available phosphoric acid | 8 | " | 10 | " | " |
| Potash | 3 | " | 4 | " | " |
| Sulphate of potash | 6 | " | 8 | " | " |

In this fertilizer the lowest stated amount of nitrogen is 1.64 per cent, of available phosphoric acid 8, of potash 3. In other words, this is a 1.64–8–3 fertilizer. Sometimes nitrogen is expressed in terms of ammonia. Ammonia contains 82 per cent of nitrogen. Two per cent ammonia would therefore contain .82 of 2 or 1.64 per cent nitrogen.

In order to determine the value of the plant food in a fertilizer three easy calculations are necessary: (1) Determine in pounds from the percentages given in the guaranteed analysis the amounts of nitrogen, phosphoric acid, and potash in one ton (2000 pounds). For example, the above fertilizer contains 1.64 per cent nitrogen, 8 per cent phosphoric acid, and 3 per cent potash.

$2000 \times .0164 = 32.8$ pounds of nitrogen
$2000 \times .08 = 160$ pounds of phosphoric acid
$2000 \times .03 = 60$ pounds of potash

(2) Calculate the value of each ingredient at average market value per pound for nitrogen, phosphoric acid and potash. These values change somewhat from year to year, but are published annually in state fertilizer inspection circulars. For 1913, the

values quoted are nitrogen 19 cents, phosphoric acid 6 cents, and potash 6 cents. On this basis the value of 32.8 pounds of nitrogen at 19 cents is $6.23; of 160 pounds of phosphoric acid at 6 cents is $9.60; of 60 pounds of potash at 6 cents is $3.60.

(3) Add the values thus obtained in (2): $6.23 plus $9.60 plus $3.60 = $19.43. The selling price of such a fertilizer may be from $27 to $30 a ton, or at a profit of $7.57 to $10.57. This profit covers cost of mixing, freight, storage, agent's commission, loss from credit and bad debts.

In buying a complete commercial fertilizer the total value of plant food should be calculated, and this amount subtracted from the dealer's price. The difference should not exceed a reasonable allowance for profit,—for example, if the total value of plant food is $19.43 per ton and the dealer's price is $30.00 a ton, the difference or profit of $10.57 is too great.

*Problems:*

1. Find the value of plant food in a ton of 1–10–4 fertilizer.

2. If a 4–8–4 fertilizer sells at $32 a ton and 1–7–5 fertilizer at $26 a ton, which fertilizer allows the greater profit to the dealer?

3. A fertilizer tag shows the following guaranteed analysis:

| | | | | | |
|---|---|---|---|---|---|
| Water | 12 | to | 14 | per | cent |
| Ammonia | 2 | " | 3 | " | " |
| Available phosphoric acid | 8 | " | 10 | " | " |
| Phosphate of lime | 21 | " | 25 | " | " |
| Insoluble phosphoric acid | 2.5 | " | 3 | " | " |
| Potash | 8 | " | 9 | " | " |
| Sulfate of potash | 12 | " | 14 | " | " |

What is the percentage each of nitrogen, phosphoric acid, and potash that should be considered in estimating the value of this fertilizer?

4. Secure from dealers lists of fertilizers containing guaranteed analyses and prices per ton. Calculate food value of plant food in each and compare with selling price. Sometimes prices are quoted at so much per unit. A unit is 20 pounds. To find price of a ton multiply price of one unit by 100.

*Application:*

These problems illustrate a practical application of arithmetic in estimating the value of a commercial fertilizer. One should always remember that the *lowest stated* amount of *available* nitrogen, phosphoric acid, and potash are the only materials to be considered in a guaranteed analysis, although other statements frequently occur in the printed analysis of a fertilizer.

State Experiment Stations of State Departments of Agriculture furnish bulletins giving analyses of various commercial fertilizers on the market. By means of these bulletins the actual value of any fertilizer may be readily estimated if the market price of the "essential ingredients" is known.

**Home Mixing of Fertilizers**

*Explanation:*

In the previous study of commercial fertilizers a difference was found between the dealer's price and the actual value of plant foods contained in the mixture. When this difference seems to be too great the ingredients may be bought separately and mixed at home. When several farmers club together and buy the separate ingredients in quantity a considerable saving may be made. Nitrogen, phosphoric acid, and potash should be bought in concentrated form. For example, phosphoric acid, in an acid phosphate having 12 per cent. phosphoric acid, costs about seven cents a pound; while in an acid phosphate having 16 per cent phosphoric acid it costs a fraction over five cents a pound.

The amount of each ingredient desired should be accurately calculated before mixing.

*Directions:*

All calculations are based upon the percentages of nitrogen, phosphoric acid, and potash in the materials purchased. The following are the percentages of the most common forms of fertilizing materials: nitrate of soda, 16 per cent nitrogen; sulfate of ammonia 20 per cent nitrogen; dried blood, 10 per cent nitrogen; acid phosphate 14 to 16 per cent phosphoric acid (the guaranteed analysis will give the exact percentage); muriate of potash, 50 per cent potash (the guaranteed analysis will give the percentage of potash in other forms like sulfate of potash, etc.

The amount of nitrogen in a ton (2000 pounds) of nitrate of soda is found by taking 16 per cent of 2000. ($2000 \times .16 = 320$). A ton of nitrate of soda will, therefore, contain 320 pounds of nitrogen.

If a ton of mixture containing two per cent of nitrogen is wanted the amount of nitrate of soda needed to furnish this amount of nitrogen (two per cent) may be found as follows: A ton (2000 pounds) containing two per cent of nitrogen will have two per cent of 2000 (2000 x .02 = 40), or 40 pounds of nitrogen. Since nitrate of soda contains 16 per cent, one pound of nitrate of soda will contain .16 of a pound of nitrogen (1 x .16 = .16). Therefore, as many pounds of nitrate of soda will be required to furnish 40 pounds of nitrogen as .16 is contained times in 40 (40 ÷ .16 = 250), or 250 pounds.

Similar calculations can be made of phosphoric acid, and of potash by substituting 14 per cent for phosphoric acid and 50 per cent for potash.

Suppose a ton of a 4–8–3 fertilizer is to be made. How much nitrate of soda, acid phosphate, and muriate of potash will be needed? First, find the number of pounds of nitrogen, phosphoric acid and potash in a ton of 4–8–3 fertilizer:

2000 x .04 = 80, or 80 pounds of nitrogen
2000 x .08 = 160, or 160 pounds of phosphoric acid
2000 x .03 = 60, or 60 pounds of potash

Next find the amounts of nitrate of soda, acid phosphate and muriate of potash necessary to furnish the required number of pounds of nitrogen, phosphoric acid and potash:

80 ÷ .16 = 500, or 500 pounds of nitrate of soda needed to furnish 80 pounds of nitrogen.

160 ÷ .14 = 1142.8, or 1142.8 pounds of acid phosphate needed to furnish 160 pounds of phosphoric acid.

60 ÷ .50 = 120, or 120 pounds of muriate of potash needed to furnish 60 pounds of potash.

The cost of such a mixture may be easily found by using the following (average market price for 1913): Nitrate of soda $57.50 per ton; acid phosphate (14 per cent phosphoric acid) $16.00 per ton; muriate of potash $42.00 per ton. Find value of each material per pound and multiply by total number of pounds desired:

At $57.50 per ton, one pound of nitrate of soda will cost 2.375 cents (57.50 x 100 ÷ 2000 = 2.375). 500 pounds will cost $11.875 (500 x .02375 = 11.875).

At $16 per ton, one pound of acid phosphate will cost .8 of a cent per pound (16 x 100 ÷ 2000 = .8). 160 pounds will cost $12.80 (160 x .008 = 12.80).

At $42.00 per ton one pound of muriate of potash will cost 2.1 cents (42 x 100 ÷ 2000 = 2.1). 120 pounds will cost $2.52 (120 x .021 = 2.52).

The total cost of materials to prepare one ton of a 4–8–3 fertilizer will be $27.195 (11.875 x 12.80 x 2.52 = 27.195). The total number of pounds of these materials needed to make a ton of a 4–8–3 fertilizer will be 1762.8. Therefore, 239.2 pounds of filler must be added to bring the mixture up to the 2000 pounds (2000—1760 = 239.2). In farm practice, however, the fertilizer may be applied at a correspondingly lower rate per acre. In this case about seven-eights of the full amount per acre should be supplied thus saving the trouble of adding a filler.

*Problems:*

1. How many pounds of nitrogen are in one-half ton of nitrate of soda? In this amount of dried blood? Of sulfate of ammonia?

2. How many pounds of phosphoric acid in one and one-half tons of acid phosphate containing 14 per cent phosphoric acid? Containing 16 per cent phosphoric acid?

3. How many pounds of potash in three-quarters of a ton of muriate of potash? In the same amount of kainit containing 12 per cent potash?

4. How much each of nitrate of soda, acid phosphate (containing 14 per cent phosphoric acid), and muriate of potash will be required to make a ton of a 1–9–4 fertilizer? How much filler will be needed?

Estimate total cost based upon $57.50 per ton for nitrate of soda, $16.00 per ton for acid phosphate, and $42.00 per ton for muriate of potash.

5. Wheat straw contains .6 per cent of nitrogen. What would be the loss in pounds of nitrogen in burning 50 tons of wheat straw? Calculate the loss in dollars and cents if nitrogen is worth 19 cents a pound.

6. Manure on the average contains .5 per cent of nitrogen. Calculate the value of the nitrogen in 140 tons of manure.

7. The average loss of nitrogen by leaching when manure is in unprotected piles for two months or more is 50 per cent. What would be the value of nitrogen lost in 140 tons of manure kept under such conditions?

8. Phosphoric acid in rock phosphate is not immediately available for plant growth but may be made so in a few months by mixing with manure. Rock phosphate containing 12 per cent

acid phosphate may be purchased (including freight) for $8.00 per ton. How much can be saved in cost per pound of phosphoric acid by applying phosphate in this way compared with using acid phosphate (14 per cent phosphoric acid) at $16.00 per ton?

*Application:*

The foregoing problems illustrate the application of simple arithmetic in calculating amounts of fertilizer ingredients, and in estimating comparative values of fertilizers. Home mixing may be easily done with a scoop shovel on a tight barn floor. The calculated amount by weight of each ingredient is piled on the floor and uniformly mixed with the others.

The waste of nitrogen in straw and manure is shown in problems 5, 6 and 7. These materials also have much value in improving soil texture by adding humus to the soil, and by furnishing organic material for action of soil bacteria. Problem 8 suggests a further saving by making use of rock phosphate, a much cheaper means of supplying phosphoric acid than by the use of acid phosphate. In most soils except in very sandy soils there is a sufficient store of potash for cereal crops.

A reasonable farm practice in keeping up soil fertility would be to provide nitrogen, the most expensive plant food (costing about 19 cents a pound when bought), by use of manures and straw and by rotation of crops with legumes (clover and the like), to liberate phosphoric acid by mixing ground phosphate rock or bone meal with manures, and to add potash only for special crops. Sometimes a complete fertilizer may be needed. In such cases home mixing is often more economical than the purchase of materials already mixed.

Miami University, Oxford, Ohio.

## Astronomy as a Nature Study

E. A. Fath

(*Continued*)

In the first instalment of this article an attempt was made to show that certain difficulties which hindered the use of our science in Nature-Study were not as formidable as is often supposed. The statement was made that "A map of the sky is as easy to read as the map of a country and the constellations are as easily learned as the states of the union." In this instalment it will be our purpose to bring to the attention of teachers some of the books which will enable anyone having no preliminary knowledge of the heavens to get on speaking terms with them and to verify the above statement.

The first book recommended is "The Friendly Stars," written by Martha Evans Martin and published by Harpers. It was written by one who loves the stars and comes nearer expressing the poetry of star gazing than any other with which I am acquainted. Thus we find in the introduction a statement of the purposes of the book in the following words:

> "As the revolving seasons rise
> Above the tree-tops star by star."

"and the steady advance of the changing seasons gets a definiteness and an interest to one otherwise impossible when he has learned to associate the visible signs of the progress of the year as they appear in the skies as well as on the earth. He will then associate the blooming of the blood-root and the first warble of the bluebirds with the eastern splendor of Arcturus and the blooming of the maples. When he watches in the daytime for the first blue violets he will look the same evening for the blue twinkling face of Vega. He will know that the Juncos and Sirius leave us at about the same time in the spring; that when the goldenrod and the wild asters are blooming it is time to look for Fomalhaut and that Antares is about to go; and a creaking, frosty night will make him involuntarily turn his eyes up to mighty Orion striding across the southern skies."

If anyone can read this simple little book and not feel impelled to try to get on speaking terms with "The friendly stars" themselves I shall be greatly mistaken. Other books of a similar nature are

Astronomy with the Naked Eye" and "Round the Year with the Stars,'' both by Garrett P. Serviss, and also published by Harpers.

After one has become acquainted with the constellations it will be of great interest to learn something of the mythology of the heavens. An excellent little book for this purpose is "The Stars in Song and Legend" (Ginn & Co.) by Prof. J. G. Porter of the Cincinnati Observatory. The fact that it is written by a professional astronomer should not deter anyone from reading it for it is not technical in any sense of the word. The most authoritative book, in English, on astronomical mythology is Allen's "Star Names and their Meanings," published by Stechert, but its comparatively high price is somewhat against widespread use. Those having access to libraries containing this valuable work will certainly appreciate the pleasure of consulting it.

The books named thus far will put readers in close touch with the beauties of the night sky and their representations of the great figures of classical mythology. No instruments are required for this kind of astronomy. If, however, anyone desires to see a little more deeply into the depths of space it is possible to do so at slight expense. Nothing more is needed than a good opera, or field-glass and Serviss' volume "Astronomy with an Opera-glass" (D. Appleton & Co.). This little book is of great value. It tells how to select a glass and then gives ample directions for finding scores of interesting celestial objects which can be seen with it.

If one is interested in getting some knowledge of the whole field of descriptive astronomy any one of the following books can be recommended: Young's "Elements of Astronomy," Moulton's "Introduction to Astronomy," Todd's "New Astronomy," etc.

By the time anyone has read such books as have been suggested above he will be in a position to enjoy Chamber's "The Story of the Comets," Clerke's "The System of the Stars," Turner's "Astronomical Discovery," Jacoby's "Practical Talks by an Astronomer," Newcomb's Sidelights on Astronomy," Ball's "The Earth's Beginning" and many others which are written for those interested in astronomy but do not wish to be troubled by technical descriptions or details.

Enough has probably been said to show that a little study of the first two or three books mentioned, which are written especially for those who have no previous knowledge of the science, will enable any teacher to point out and tell the story of the constellations to a class. After that an almost limitless field is open provided there is the time and inclination to acquire further knowledge.

The third, and last, instalment of this article will contain a few suggestions concerning the teaching of constellations and the making of simple observations by day and by night.

## The Ways of Monarch Butterflies

FLORENCE E. LILLIE

I had known the life history of the Monarch butterfly for some time but fourteen years ago I began to observe it with a new interest and for a particular purpose which was to see if it did not sometimes hibernate in Minnesota contrary to the general belief. As far as giving any evidence bearing on that point this article is worthless for after all of these years of careful watching I am no more able to prove my belief, which is still firm, than when I first began my observations but I have had some experience with these butterflies which have been very interesting to others as well as myself and I trust may be so to the readers of the REVIEW.

I had read that no specimen of hibernating monarch had ever been found; every year I noticed monarch butterflies in Minnesota in May; some of these early ones had faded but not ragged wings while the wings of others were bright; this led me to believe that our late monarchs, which hatched after the rank and file had gone South, not only hibernated but hibernated in two forms, as a butterfly and in the last caterpillar stage; the chrysalis being suspended by the posterior end only, would indicate that they did not pass the winter in that form.

I could not believe that those with faded but unfrayed wings had gone south in the fall and returned in the spring without their wings showing more wear, or that they would have returned at so early a date; but rather, that they had hibernated as butterflies; the early ones with bright wings must apparently have just come from the chrysalis and hibernated in the last caterpillar stage.

I have read that monarchs usually appeared in New York early in July; I see them here every year in May. My records were very carefully kept until June, 1905, when they were destroyed by fire; since then such data as I have is just as accurate but some years not all early ones seen were recorded. Beginning with the spring of 1911 I will give the dates on which I saw the earliest ones, and as I spend much time going about in the spring they were seen in widely scattered places, sometimes miles apart on the same date. 1911—May 12th, one, wings faded, not frayed; May 14th, one, wings bright; May 15th, one, wings, faded; May 16th, three at one time, two with wings faded, one, wings bright; I probably saw others later in the day, but they may have been the same ones; May 17th, several, both faded and bright ones; May 19th, several, both faded and bright ones; May 18th, found two eggs of monarchs, the earliest date on which I ever found the egg but the weather was unusually warm; May 27th found a little monarch caterpillar; 1912—May 17th, one butterfly, wings faded; 1913—That was a most remarkable spring for monarchs; I never knew them to appear so early or be so numerous; the earliest dates on which I saw them were April 27th, one, faded; April 29th, one, faded; April 30th, three, all faded; May 1st, several, all faded; on May 15th I saw a most wonderful sight for that date or any other; I came across a large colony of milkweed plants, the tallest scarcely four inches in height and monarch eggs upon nearly every plant which I examined; I counted twenty eggs upon four little plants growing close together, the tallest one no more than one and one-half inches above ground, I found three eggs upon one leaf not more than five-eighths of an inch in length. I brought home four eggs; the first two hatched in two days; both little caterpillars died without eating, a very unusual thing for baby monarchs to do, the third became a chrysalis June 4th and the other June 6th, so it will be seen that they developed more slowly than those hatched later in the season, although they were kept in a warm room.

Believing as I do that the late fall monarchs hibernate in Minnesota I have tried to make them do so by keeping them in the dark and cold but I have not been successful; I have had some interesting experiences with some which I have tried to keep alive and awake all winter, one of which I will relate. One September I brought into the house six of their belated eggs; although it was very difficult to provide tender milkweed at that time of year it was done and by October 17th all were butterflies, five males and one female. A very slender framework was covered with mosquito netting (not wire). In this structure it was impossible for them to injure their wings and it was large enough for them to fly about; occasionally they were turned loose in a large room for several hours but the muslin curtains were first pinned closely to the windows and the radiator covered so that they could not injure their wings; they were fed on sweetened water or California grapes but netting was always stretched one-half inch above their food to protect their wings; they seemed as vigorous as though living out of doors in summer weather and interested many people until the middle of January when there was an unexpected drop of many degrees in the temperature; the next morning I saw that they had been chilled and within a week's time they all died, the one female outliving the five males.

One cold October day I found upon a milkweed plant a caterpillar which resembled a two-thirds grown monarch except that where the monarch is white this one was a dull purple; I showed it to two entomologists, neither of whom had ever seen one like it and by one the belief was expressed that it was a species new to the North. It was kept in a warm room and supplied with milkweed which was far from tender so late in the season; in four days it only ate two or three small bites and those on the first day. If I had kept it in the cold would it have hibernated and proved my theory? Perhaps so, but it would have been a much undersized butterfly; on the fourth day I saw it was preparing to change to a chrysalis; it was forty-eight hours in making the change, twice as long as it should have been and the chrysalis seemed very little more than half the usual size; I never expected it to live to become a butterfly but on the nineteenth day, after almost twice the usual time spent as a chrysalis, it emerged a perfect monarch but an extremely small one; it died in a few days without sipping sweets which were offered and it is now in the museum of our Minneapolis Public Library.

I have brought hundreds of monarchs through from the egg or very small caterpillar either at home for my own amusement or with my classes, both of children and teachers. I believe that a person knows very little about insects until he has found their eggs, fed them after they hatch and observed their different changes. It is not necessary that either teacher or pupil know into what kind of insects, eggs which are found will hatch, but they must observe the kind of plant upon which the eggs are laid and fresh leaves of that plant must be ready for food for the young when they hatch (that is if they feed upon leaves: feed aphis lions and the larvae of lady beetles upon plant lice). Very much of my knowledge of insects, and by far the best part I learned just in this way. Children with their sharp eyes soon become experts at finding insect eggs.

In my classes of teachers in summer schools we always raise many different kinds of insects and among them several kinds of butterflies and moths but I will only tell about our monarchs. In the summer of 1912 we raised twenty-six monarch butterflies, most of them from the egg but a few from small caterpillars; at one time twelve of the beautiful green chrysalids hung in a row in the room. I have many times in the presence of a class held in my hand the support from which a monarch caterpillar was hanging while they watched it quickly slip out of its skin and become a chrysalis and many times a class has seen the butterfly emerge from the chrysalis, its wings lengthen and dry, and later take its first nectar from flowers. Our monarchs are all raised in old Mason jars, old jelly glasses or glass tumblers. It is very easy to soon get a large collection for this purpose by asking a few of your housekeeping friends to save you their worthless ones. Three or four tiny monarchs can be kept in one glass but each large one should be by itself. I always use as a cover, whatever the glass, the heavy cover of a Mason jar and turn it upside down; this allows to enter what little air the caterpillar needs but does not admit enough air to dry the leaves quickly although in hot weather fresh food should be supplied twice each day; these heavy covers will not be blown off as the lighter ones will by a sudden gust of wind.

When the caterpillars are fully grown they always fasten themselves to the covers to change to chrysalids, this is usually about the eleventh day; the quickest time ever made by one under my observation was eight days and that was in my class room in 1912. When ready to become chrysalids they stretch themselves out on the covers and remain almost motionless for hours, usually about twelve, but during this time they weave a button of silk by which they attach themselves, at their posterior end, to the cover; they then drop, hanging only by the button of silk and remain hanging with the anterior part curved upward for, usually about another twelve hours when the caterpillar skin is shed and we have the beautiful green chrysalis. The classes keep a record of each caterpillar raised from the egg from the date it hatches until it becomes a butterfly and know just how long it remains in each stage.

Until the summer of 1910 I seldom came across a monarch caterpillar which had been stung by parasitic flies but that summer the greater part of those which I did not raise from the egg were stung even though they were small when I found them; the following summer the proportion was also large; a caterpillar would seem all right and make its button of silk preparatory to becoming a chrysalis; at the right time it would drop and hang from its support as normal caterpillars do but in a few hours it would straighten out, hanging head downward while soon from its body white maggots about three-eighths of an inch in length would drop. The usual number of these was three but seven issued from one caterpillar in our class room; gradually the white skin of the maggot would darken and harden until in about one-half hour it had become the brown pupa case from which in a few days a fly would emerge which a casual observer would think was a house fly; the caterpillar may live several hours after the parasites leave its body.

Every one who knows anything of monarch butterflies knows that they migrate southward in immense flocks in the fall. One summer evening as I was walking about the campus of the Minnesota College of Agriculture I came across two trees which looked as if every leaf upon them had suddenly turned brown but in a moment I realized that I was looking upon a flock of migrating monarchs rather than upon dead-brown leaves. There was nothing surprising in this; I had seen such flocks before but now comes something very mysterious; the next year I saw those same two trees covered with another flock of migrating monarchs. Why was that? Why were those same two trees chosen the second year and by another flock? It must have been, "just a happen so," but is it not probable that monarchs follow a certain path of migration as birds do? By what instinct they are guided we know not.

St. Anthony Park, Minn.

# The Nests of Some Common Birds

With Photographs by the Author

Ralph E. Wager

The nests of birds are as distinctive as their coloration, their call notes, or their songs. This is true, of course, in the broad sense only. For as we find variations in their coloration or their call notes, so we may expect to find variations in their nests. These variations may consist in differences in placement, form, or materials of which they are constructed. But it is not difficult to recognize the nests of each species as there are certain characteristics by which they may be identified. For as birds have become adapted to different modes of life, they have by a similar process of selection, found certain nesting habits best suited to their particular way of getting on in the world. Oftentimes it is difficult to understand just why birds nowadays nest as they do. Thus it is hard to explain just why the night heron, for example, nests in trees, frequently miles from their feeding grounds. Be that as it may, having chosen their site, certain materials present themselves for the use of the bird, and each then works out his own problem as best he can. These characteristics become specific apparently, so that one may learn by these peculiarities, to distinguish the nests of the birds of each species, usually, with certainty.

Because of these distinguishing qualities the study of the nests of birds becomes interesting. To discern in a nest some mark or marks, identifying it as belonging to some particular bird, is an attainment well worth working for, because it adds much to one's enjoyment of his out-of-door experiences.

In the spring you are watchful for the nests of your bird friends, and today you unexpectedly find one you had not known before. "Ah yes," you say, "I'm glad to know that you are intending to locate right here, my good brown thresher friends. I'll be interested to know how you succeed in your undertaking." And tomorrow you locate another, and are surprised to find that a pair of catbirds have staked their claim in your honeysuckle bush, and you welcome them. And the next day you pause to contemplate a pair of rough-winged swallows driving their shaft into the soft bank of the creek where the steep bank at the bend affords a vertical surface, and you wonder how far they have succeeded in carrying it, and just when the eggs will be laid. So each day brings its rewards.

Or, in the fall, when the leaves have begun to loosen their hold and the ribs of the trees show through, you discover in the shrub before your door a nest before obscured and unnoticed, and you pause to remark to yourself that it was strange you hadn't found that nest; that you do recall that some robins were apparently partial to that vicinity last spring, and that now you understand about it. Or later, when the leaves are well off, and only a few stragglers remain to rasp their monotones in the wind, you note, far out on the tip of the bending limb of the big elm, the pendant nest of an oriole. Then it suddenly occurs to you that last spring, after the leaves were well out, you had heard the full notes of the male coming out of that vicinity, and later in the season you had noted the monotonous call of the young. You remember that you looked for the nest but had been unable to locate it—and little wonder since it is placed so high and so far out! Then when winter whitens the earth, you are strangely impressed with the manner in which that vireo's nest, snow filled, clings to its branches in spite of the storms which have blown over it. Or you wonder why it was that you failed last spring to discover this summer warbler's nest, right here by the walk, and so near that you might many times in passing, have stretched out your hand and touched it.

Locating the birds' nests is, like hunting for anything else, largely a matter of going out to search for them. Yet we should not overlook the fact that one's knowledge of the habits of birds aids greatly in doing this. Instinctively, after a time, one knows about where to search for the nest of a given species, and of course, after many observations, at what time to begin the search.

In finding those of ground nesting species, walking about cautiously in the places where nesting is likely, and noting carefully the points from which birds are flushed, is,other than mere accident, the only method. Bear in mind the fact that the bird will mislead you if she can. She is likely to feign a broken wing or leg to induce you to follow her, and thus cause you to lose the point you may have had in mind, or, in other cases, to run some distance from the nest before taking flight. Or she may resort to both methods. Hence it is safe to form the habit of noting carefully the point from which the bird is flushed and begin to search for the nest. After a time the likelihood of certain places will enable you the more quickly to discover the nest. Those nests which are in shrubbery or thickets are not so difficult to find. Using a short stick, one may go about gently pressing aside

Fig. 1. The Killdeer's Nest, in Corn Stubble.


the tangles to peer into the interior. The nests are sufficiently large to be easily found in this way. Those high in the trees are the greatest problem, since the leaves obscure them so completely. Patiently noting the movements of the parent birds, centering about the nest, is the only method with which I am acquainted, and it is a task to try your patience. However, to one who is willing to devote time to the problem, the nest hunting becomes interesting and illuminating.

Equally distinctive, and, therefore, equally interesting are the eggs of the birds. Though they have not the seasonal durance of the nest, yet they have the added qualities of beauty of form and color. To associate the two, the nests and the eggs, and to relate

Fig. 2. Nest of King Rail.

them to their owners, is one of the interesting problems for the Nature lover.

With these notions in mind, we may call attention to the nests and eggs of some of the more common forms, in the hope that you will find them and get from each your own impressions and your own enjoyment.

Of the ground-nesting forms, the killdeer has one of the simplest of nests. This vociferous bird originally nested in the prairies and grassy spots but now is frequently located in corn stubble.

To dignify by the term nest, the nursery of this bird is hardly complimentary to the word. Little attempt is made apparently, to make anything of a permanent nature, so only a few shreds of corn and grass stems are drawn together, possibly in a slight depression. Here the eggs are laid, usually four in number. They are large for the size of the bird, about an inch and a half

Fig. 3. The Well Concealed Nest of the Meadow Lark.

in length, and strongly ovoid in shape. They are placed with the pointed ends toward the center of the group thus conserving space. In color they are highly protective. The background is brownish white, and the whole heavily marked with chocolate brown, producing a general effect resembling the ground and materials upon which they are laid. Hence you may pass by the nest without noting it at all. The large size of the egg when compared with the size of the bird is of interest, inasmuch as this is a common condition among the praecocial forms, or those whose young are able to run about immediately upon hatching. This large egg affords an abundance of food material upon which the young may develop to a more complete stage before hatching. This habit of the young, is doubtless associated in turn with the sort of nest constructed, since it is to serve merely as a place where the eggs may be incubated and not at all for holding and

Fig. 4. Nest of Quail. The Spots on the Eggs are Mud from the Feet of Parent Birds.

protecting the young. Hence it is of a very simple sort. Mere accident will discover this nest for you.

In the neighboring swamp you may be fortunate enough to find the nest of the King Rail. Here again, is a ground nesting bird, but more effort is made in the making of the nest. In all likelihood you will find it on the summit of a bog, well hidden by long, dead grass, stems and leaves. Among these dead grasses, the nest is made by drawing together the leaves and adding others until a mat is formed on which the eggs are deposited. As soon as the grass begins to grow the nest becomes quite entirely hidden. This too, is a praecocial bird, but the eggs, in actual size, are but

Fig. 5. The Song Sparrow's Nest. Slightly Elevated. Cowbird's Egg at the Right.

little larger than those of the killdeer, though the bird itself is at least twice its weight. Indeed, one is amazed that the killdeer can lay so large an egg. Unlike those of the killdeer, the eggs are not at all protectively colored. They number eight to twelve and hence make up in number what they may lack in size when compared with the previously discussed form. The background is a creamy white with spots of brown and lilac. The effect of the color is very pleasing.

Over in the pasture you may flush the meadow lark from her well concealed nest. As has been suggested, you need to mark the spot, and then you must search diligently in the surrounding grass tufts before you locate the nest. Rarely will you cause her to rise directly from it. She is a most suspicious bird, and hears

Fig. 6. Mourning Dove's Nest. Unequal Size Eggs.

you coming. She will then run some distance from the nest before taking flight, and, of course, away from you. This may enable you to judge somewhat of the position of the nest Look particularly in the tufts of long, dead grass. Here it is now! Tucked away under these long grass blades, it is little wonder that it took so long to locate it! Over it is a canopy of grass and leaves, thus completely obscuring it. On one side is the opening and one must peer into this before he can see the eggs at all. The nest is cleverly hidden. A slight depression in the ground makes possible the matting of dead grasses for the floor, and above is the intertwining grass-blade covering. The eggs are from four to six in number, and about an inch in length. The background is a dull white, heavily speckled with cinnamon brown. Thus marked, the eggs are inconspicuous. Altogether, there are few birds making a more completely hidden nest.

Fig. 7. Robin's Nest Used by Mourning Dove.
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While we are in the meadow we may as well be watching for the nest of our much-to-be-respected quail. The term respected is used advisedly, since few birds there be, doing so great good, few so brave and hardy, few struggling more in the face of persecution. The grasses are deep now. Many birds have reached their first brood. Since early spring, though, the clear mating call "Bob-White" has been coming up out of this meadow and it is the time birds were nesting. As likely as not they have located over here by the fence neighboring the cornfield. As with the meadowlark, so here, flushing the bird is the likeliest clew to the whereabouts of the nest. At any rate, you will find the nest to be well concealed in the long grasses, and well covered over with the rank growth. For the size of the bird the nest is very large in order to accommodate the great number of eggs—from ten to fifteen. The eggs are white, about an inch in diameter. The young are able to run about as soon as hatched. The mother quail with her large brood of young ones must be a formidable foe of the insect hoards abounding at this season of the year.

It would be unfair to omit from our list the familiar song sparrow. A most cheering bird. The fact that it is a common bird only adds to the possibility of your finding the nest. Like the others we have mentioned, it nests usually on the ground. Occasionally a nest is found a short distance above it in a shrub or clump of stout grasses. Look for them along the banks of a stream, well up among the grasses. Sometimes you will find them in the margin of the woodland, or at least in the open places therein. The nest is an open one, though it may be in part obscured by overhanging leaves or branches. It is placed on the ground, in a slight depression which is lined with blades of grass and bits of leaves, and occasionally finer grasses and horsehair are added as a final touch of fine workmanship. The eggs are whitish with heavy markings of brown, so that they are not at all conspicuous as they lie in the grass-lined nest. Four or five is the usual number, although six or seven are sometimes found. I recall once having found a nest under a coil of barbed wire in the margin of a woods. Here was excellent protection surely! In spite of it, however, somebody, or something, destroyed the eggs and the venture of the birds was consequently a failure. The cowbird is fond of parasitizing these nests with her despicable kind, and it is worthy of note that the eggs of the two species look quite alike. That of the cowbird is slightly larger than the song sparrow's, and the markings are a darker shade of brown. A close comparison will enable you to easily recognize the two. It may not be out of place to remark that it is good ethics to remove and destroy the cowbird eggs from the nest. Its presence there will mean, otherwise, the loss of the lives of the legitimate nestlings, all of which are quite likely to be crowded out of the nest by the voracious and rapidly growing parasite.

But we must give attention to other than those birds nesting on the ground. Of those building in trees, the mourning dove constructs the simplest of nests, although the cuckoo is not far ahead of it. It consists only of a few twigs laid horizontally across a suitable foundation, and interwoven very loosely. So loosely, in fact, that frequently one may see from below, the two white eggs

Fig. 8. Nest of Brown Thresher.

characteristic of the bird. It is a marvel that the nest maintains its identity for sufficiently long time to permit of the rearing of the young. Doubtless their weight, as well as that of the parent bird, assists in making this possible, for soon after the nest is deserted, it falls to pieces. Sometimes one of the two eggs is smaller than the other. Whether this small one is the first egg of the female or not I cannot say. Such a case is illustrated in the photograph. More rarely, one may find that the birds have taken a fancy to the nest of some other species, as is shown in the illustration herewith, of a robin's nest taken over by the doves. In this instance eggs were destroyed so that the pre-empted nest was never fully utilized. The bird nests low, seldom over ten feet above the ground. The whistling noise of the bird's flight makes it easy to locate the nest after they are driven off by your approach.

Fig. 9. The Dainty Nest of the Chipping Sparrow.

The brown thresher builds its nest low in a thicket or low growing tree. A thick tangle is most attractive, and if it be of the thorny sort, so much the better. A gooseberry bush or hawthorn seem especially suited to them. Having chosen the site, there is laid a broad foundation of twigs, closely interlocked, surmounted by a well moulded cup of finer material, the whole lined with fine rootlets and leaves. Taken together, it is a well constructed nest, as is evidenced by the fact that they last so long. The eggs are greyish white, heavily speckled with brown, thus harmonizing well with the color of the nest. One frequently finds nests a year old which are in a fair state of preservation. Altogether, this is one of the most attractive nests.

The chipping sparrow is a bird of almost domestic habits. Its confiding nature will lead to the nest in the shrub before your door or to the vine over your porch. Its quiet habits, however,

Fig. 10. Red-winged Blackbird's Nest in Mustard Plant.

will give you no clew of its presence. You will find the nest to be an interesting bit of bird architecture. Indeed it may be styled a dainty nest. One would expect it from so quiet and thoughtful little sparrows. The basis of the nest is coarse grass and rootlets, though this is not heavy, and the cup is well rounded and lined with long horsehair. One wonders where they find the hair, and what they used before they had it. The eggs are a pale blue, usually with a few brown markings at the larger end.

One of the most cleverly constructed nests is that of the red-winged blackbird. Its habits of nesting near water is well known. This results in the frequent use of rushes as a support for the nest. Another favorite is the cat-tail, though in the absence of such plants it may make use of almost anything else. I have found them even in the rosebushes. These bushes were man-planted, however, about the shore of an artificial pond. The nest is semi-pendant. If such plants as cat-tails be used as a support, several closely growing stems are bound together by long stiff grass stems, and the nest suspended by them. In other cases the nest may be located in the crown of a plant utilizing several branches in the same manner as the separate stems of the cat-tail. Within the framework of heavy material the nest is modeled of finer elements usually consisting of fine grass or rootlets. The eggs are pale blue, spotted with dark purple or black, and with long scrawling lines of the same color, principally at the larger end. The nesting season is relatively late, beginning about the first week in June. By this time the region about our swamps are well mosquitoed so that one needs to make his explorations in full realization of that fact. Otherwise he may be disappointed. The nest whose photograph is here reproduced was built in a mustard plant. This species of mustard was used by several pairs of birds. A severe storm overturned at least five of the nests, bumping the eggs out into the water. Two other nests escaped this fate, and one of them was despoiled by some animal, as the feathers about the nest plainly showed. Evidently the birds make mistakes in the choice of sites. Nevertheless, the nest is very interesting and the eggs beautiful.

Our brief survey may be brought to a conclusion by reference to the nest of the rose-breasted grosbeak. Though the bird is very common, yet its nest, is, I suspect you will find, difficult to locate. This is true for two reasons. First, because the nesting is not undertaken until after the leaves are well out, thus obscuring the nest, and, secondly, because it is located high in the trees. The elm is a favorite one. Even though you do succeed in distinguishing the nest, its position in the small terminal branches makes it difficult to get at it. The nest, however, is well made, though not bulky. It consists of small twigs and rootlets closely woven for a foundation, and a shallow cup of firmly woven and compacted fine materials, consisting chiefly of rootlets. The whole is thin, but firm. One can almost see the eggs through the bottom of it. The eggs are pale blue, heavily marked with various shades of brown. Birds so beautiful as the grosbeaks give added interest to their nests. The rose-breasted is no exception.

In conclusion it may not be out of place to urge that in your study of nests and eggs, regard be had for the rights of the birds.

Fig. 11. Nest of Rose-breasted Grosbeck.
Cowbird's Egg at Right.

It is well to bear in mind that most of them are very suspicious and the least disturbance of their nest, or the touching, or, much more, the handling of their eggs, may lead to their deserting both. If necessary to draw aside grasses or leaves, therefore, use a short stick and make as little disturbance as is possible to obtain the results you wish. Have regard also for the success of the bird nursery in that you do not tarry long over or near the same during the incubation period thus resulting in the chilling of the eggs. Be kindly considerate. By so doing you will carry with you no memories of households destroyed, and your study of the nests of birds will be interesting and inspiring to you.

## Editorial

Do you believe in Nature Study? We do, and we believe in it not as a pleasant fad, but as a very fundamental element in the curriculum. The so-called practical man is much in evidence these days in his demands that the studies of the schools shall be practical. He insists that the boy shall be drilled on the things that he is actually going to use when he gets out into the world to earn his living.

Here is a boy fresh from school who is looking for a job. Suppose he gets it as an apprentice in a machine shop. The foreman takes him to some mechanic working at his bench and says, "Here, John, is a boy who is going to work for us. I will put him in your hands to help you."

Imagine that boy learning to run a lathe for instance. John says to him something as follows: "Now, my boy, you take one of these bars of iron that we are going to turn into axles, and you clamp it here in the machine like this," and he shows him how. "You take this tool that I have in hand and hold it so, just as I am doing; start your machine by pressing this lever and guide your tool along the rest here so as to take off a thin shaving from the bar of iron." "You must oil your machine so," and he picks up an oil can and demonstrates. "After you have taken off shaving after shaving you measure your bar with this pair of calipers You must make sure that your axle is of exactly the right diameter. When you have it done stop your machine and unclamp your work so. Now try your hand at it, boy!"

This, of course, is just a type of the instruction that the boy will receive in almost any trade or almost any job that he undertakes. He must learn through his ability to observe and to follow the instructions which he has both seen and heard. I take it that it is evident that any subject which sharpens his senses and keens his power to observe clearly and accurately has large practical values.

The girl who goes into a store as a clerk must use her ability to observe as she learns to differentiate the various goods that she is to sell, and this is quite as important as to be able to figure correctly the cost of seven yards of goods at six cents per yard. If she insists on showing cheese cloth when muslins are called for or cannot promptly distinguish a silk from a satin, she is worthless as a clerk. Yet these are differences that require keen vision and accurate sense of touch.

Suppose that you are sick and a physician is called. He comes into your room and sits down beside your bed; feels your pulse, looks at your tongue, taps your chest, listens to your respiration and by ear and eye and finger-tips makes note of your symptoms. Bye and bye he announces it to be a case of scarlet fever and proceeds to write the proper prescription. The last step is a fairly easy one. He must merely remember what his books tell him is a successful prescription for this disease. Now suppose after taking his medicine for a day or two you find that you are not getting well. You begin to lose faith in Dr. Jones. Perhaps Dr. Smith is called. He goes through a similar performance and concludes that it is not scarlet fever at all but measles. Now wherein lies the difference between the correct diagnosis of your trouble and the incorrect. Merely a difference of the accuracy of observation. Smith has seen some little character that escaped the eye of Dr. Jones.

These are just samples of commonplace, every day experiences yet they suggest what you will find true as you examine your daily doings, that in the course of a day's work more depends upon the accuracy of sense of impressions and their correct interpretation than upon any other single factor. And yet few teachers and few school boards address themselves to the task of providing adequate sensory training and the correct use of the data so obtained through the senses to reach sane conclusions. This is what good nature study does. Believe me, we shall yet universally recognize its importance. The nature study idea is gaining ground daily.

## News and Notes

Through the kindness of a scientific friend who is interested in nature study the Comstock Publishing Company can supply specimens illustrating wheat rust in its several stages to any readers of this magazine for 30c, which covers merely the cost of handling, packing and mailing. Send your name and address to the Comstock Publishing Company, Ithaca, N. Y. This is an excellent opportunity to add to your stock of illustrative materials.

From the February number of *School Nature Study*—the English Nature Study journal—the following items are taken:

## School Journeys

The School Journey has advanced by leaps and bounds during the last few years. In 1913, nearly one hundred London schools sent classes to the seaside, forest or mountain for periods varying from four days to a fortnight. The Pioneers have fought hard for a free hand in deciding the nature and method of the educational work attempted on the school journey, and so far they seem to have succeeded. One general principle is commonly recognized, and that is the opportunity should be seized to do that which is impossible in London. Hence we find the school tourists studying plants and animals in their natural homes; they see something of the struggle for life in the hedgerow, and in the wood; they note the way plants adapt their leaves to prevent excessive loss of moisture while living in dry positions; they learn that the spindle and wayfaring tree grow on the chalk, but not on the sand near by; they sketch the stunted trees on top of a hill bent over by the prevailing winds. They go to the bog, to the salt marsh, to the sand dune and see plants equipped with all manner of devices for exceptional circumstances. They catch a fleeting glimpse of a rabbit and a squirrel, of trout and snake; they hear the wild song of the birds, and peradventure get a peep into a nest.

A new world is open to them in the rocks and pools of the sea-shore with their wonderful seaweeds, and weird animals, but the children visit this new world with a guide who is able to ask suggestive questions and lead them to investigate in such a way that they may see and admire, but not harm or destroy.

—G. G. Lewis.

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Nature-study planned on such foundations will have a pronounced effect on the adolescent child. Signs are not wanting that it provides the child with valuable assets.

(*a*) Nature-study is an added interest in life, and one which leads to healthy pursuits and pleasures.

(*b*) The habit of clear seeing and independent thinking receive training.

(*c*) The wisdom of reserving judgment grows by degrees.

(*d*) Nature-study lays the most normal and sound foundations for all the problems of life that confronts the adolescent boy and girl. By its aid the biological facts of sex and hygiene are approached in a direct and objective way.

It has occurred to some of us that if sex knowledge in broad outline formed an integral part of more advanced nature-study, it would be acquired in its right setting, and the danger of provoking morbid pondering and introspection would be avoided.

—C. VON WYSS.

## BIRD PICTURES FREE TO TEACHERS

The sum of $15,000 has been contributed to the National Association of Audubon Societies for the purpose of helping teachers to give simple instruction in bird study to their pupils during the year 1914. The Audubon plan to helping teachers in this connection is as follows:

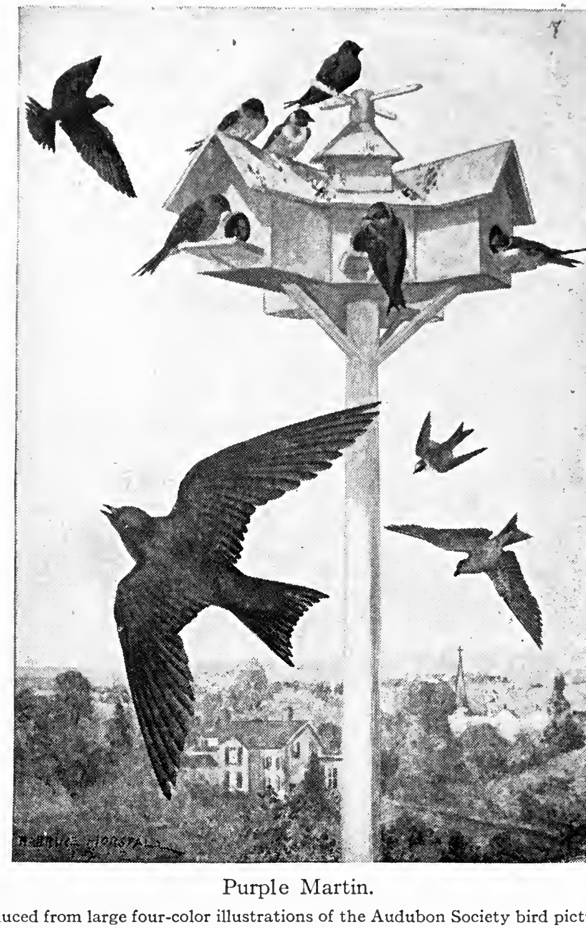
Any teacher or person who will interest not less than ten children in contributing a fee of ten cents each to become Junior Members and will send this to the office of the National Association will receive for each child ten of the best colored pictures of wild birds which have ever been published in this country. With each one of these ten pictures goes an outline drawing intended to be used by the child for filling in the proper colors with crayons. Each picture is also accompanied with a four page leaflet discussing the habits and general activities of the bird treated. Every child also receives an Audubon button. The cost of publishing and mailing this material is a little more than twice as much as the child's fee.

The teacher who forms such a class receives without cost to herself one full year's subscription to the beautiful illustrated magazine *Bird-Lore*. This is the leading publication in the world on bird study. To the teacher also there is sent other free literature containing many hints on methods of putting up bird boxes, feeding birds in winter and descriptions of methods for attracting birds about the house or school house.

The accompanying illustration will give some idea of the character of these pictures, but remember they are all in natural colors, are much larger than are here illustrated and are printed on cards of sufficient size to make attractive room decorations.

The ten subjects supplied to the children this year are as follows: Nighthawk, Mourning Dove, Meadowlark, Flicker, Sparrow Hawk, Screech Owl, Purple Martin, Cuckoo, Hummingbird and Robin.

In 1913 school children to the number of 53,157 availed them-



Purple Martin.

Reduced from large four-color illustrations of the Audubon Society bird pictures.

selves of this opportunity. Hundreds of enthusiastic letters have been received from teachers.

Any teacher reading this notice may immediately form a class, send in the dues and receive the material, or further information will be gladly furnished upon request.

T. Gilbert Pearson, Secretary.
1974 Broadway, New York City.

At a recent meeting of the California Nature-study Society in San Francisco C. A. Stebbins was recently elected president.

The meeting held in San Francisco was a top-notch meeting. Two afternoons were devoted to agricultural nature-study and both were overflow meetings.

We are emphasizing home and school gardens as a basis for nature-study work. At the present time we have organized some two thousand boys and girls in northern California. We furnish free seeds to those gardeners as well as the *Junior Agriculturist.* In March the nature-study society meets in Oakland.

---

Send to Edward F. Bigelow, Sound Beach, Conn., and get a sample copy of the *Guide to Nature.* They have just added some interesting new features.

## Nature Study Articles in Recent Magazines

The January number of *All Outdoors* is No. 2, Vol. 1. Published quarterly at 143 W. 36th St., New York.

*February*

*Field and Stream*—The Canoe Trail to Fort Albany. Henry A. Aver.

*Harper's*—Through the Heart of the Surinam Jungle. Chas. W. Furlong.

*Outdoor Life*—Trout Fishing in Colorado. A. L. Moffat.

*Outer's Book*—The Nerve of a Trapped Knave. (Coyote). Otto M. Jones.

*Outing*—In Quest of the Canvas Back. Herbert K. Job.

*Popular Science Monthly*—Hibernation of Certain Animals. Walker J. Haben.

*Scribner's*—Scenes on Old Trails. Earle Harrison.

*March*

*Atlantic*—The Spirit of the Herd. Dallas Lore Sharp.

*Garden Magazine*—An Oregon School Garden. Alice V. Joyce.

## Book Reviews

We inadvertently omitted to mention that "Minot's Modern Problems of Biology," reviewed' in the January number, is published by P. Blakiston's Sons & Co., Philadelphia. Price $1.25.

THE FLOWER FINDER. George L. Walton. pp. xxvi + 394. J. B. Lippincott & Co. Price $2.50.

This is another of those keys to the common plants designed for the amateur. The analyses are made upon the basis of color first and then leaf characters. The combination of these two criteria seems to make a scheme that will be readily serviceable in identifying most of the common plants. As a further aid to the separation of the plants in the groups formed on the basis of color and leaf character there are line drawings of practically all the common plants which one is likely to meet except in out of the way situations. There are also quite a number of full page illustrations from photographs and these are of very superior quality. The book is printed on thin paper and bound in leather so that it makes a light and serviceable field book. Without having had opportunity to try it in the field it would seem to be by all means the best manual for determining the common plants for one who is not ready to work with the customary scientific keys. The last seventy-five pages is given up to a series of keys for determining plants by their fruits; the scheme again depending on fruit color and leaf character.

MOTHER NATURE AND HER FAIRIES. Hugh Findlay. 130 pp. C. W. Bardeen, Publisher, Syracuse, N. Y. Price 50c.

The attempt of this book is to tell fairy stories in which there is mingled nature-study. The reviewer fails to find any nature-study. There is an attempt to tell some nature facts and these are apparently accurate, but to call a few facts diluted with a great deal of story nature study is to misuse the term. The reviewer does not consider himself expert in judging literary values, but so far as his literary sense does go he would consider much of the poetry and a good deal of the prose as atrocious. Here is a sample of the verse, a squirrel is digging up some squirrel corn.

"Oh now he took out some queer wee things
That looked like grains of corn,
But they were little tubers, round,
Called 'Squirrel Corn.'"

Here is another:

"From out the sky in passing by
Down near the stream where oft I dream
The fairy danced with glee
And here below, she did bestow
Her golden slippers to the marsh."

Here is a sample of the so-called nature study: "Mr. Monkey-faced Barn Owl came and was welcomed by the fairy queen. He brought his family with him. They carried meadow mice, barn mice rats, jumping mice, shrews and star-nosed moles, and these made enough meat for a whole party of owls."

There are some tasteful photographic illustrations, but the line drawings and free-hand sketching that make up the bulk of the illustrations are on a par with the literary inferiority of the book.

The Life of the Fly. J. Henri Fabre. 477 pp. Dodd, Mead & Co. Price $1.50.

This is a translation of one of the works of that most patient French student of insect life. Fabre's simple and forceful writing is quite as remarkable as his accurate and worth-while observations. The English translation seems well done so that it puts at the disposal of English readers this admirable book upon the fly. In the book in addition to chapters on the life of the fly there are several that are autobiographical and some of the chapters while nominally on the fly lead into problems of large interest, such as, for instance, the chapter on hereditary. The book is not only interesting reading but there are many suggestions of ways and means of studying insects. Fabre's experiments on the intelligence of the insect are as ingenious as they are simple. The book is written primarily for the layman, not for the scientific specialist. As a matter of fact the specialist will read it with as keen interest as the laymen, and Fabre has the happy faculty of making commonplace things matters of interest and of suggesting the more profound significance of things that seem trivial.

PRESS OF W. F. HUMPHREY, GENEVA, N. Y.

# NATURE-STUDY REVIEW

Devoted Primarily to all Scientific Studies of Nature in Elementary Schools

Vol. 10 No. 5
Whole No. 83

OFFICIAL ORGAN OF THE AMERICAN NATURE STUDY SOCIETY

MAY
1914

CONTENTS

The Exhibition of Rural School Work. Anna B. Comstock .......161

The Horned Dace ..............168
G. C. Embody

Spring Wild Flowers.............174
R. E. Wager

In the Children's Green House ...185
Nellie Storie Salton

Studies of Commercial Fertilizers—Corrections. B. M. Davis.......188

The Reformation of Mary Hogan..189
Jean Dawson

Nature Study Articles in Recent Magazines ...................202

Published Monthly except June, July and August at Ithaca, N. Y.

$1.00 a VOLUME (9 Nos.)

Elliot R. Downing, Editor
The University of Chicago The School of Education
Chicago, Ill.

15 Cents copy

Entered as second-class matter at the Postoffice at Ithaca, N. Y., under the Act of March 3, 1879.

# THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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VOL. 10 | MAY, 1914 | No. 5

## The Exhibition of Rural School Work

ANNA BOTSFORD COMSTOCK

A nature-study exhibit from rural schools is certainly as interesting as it is encouraging, for the place where nature-study can do its greatest good is surely in the rural schools. Such an exhibit brought cheer to the Cornell nature-study contingent during Farmers' Week, 1914.

Farmers' Week is the one week of the year when the farmers of New York State own the Agricultural College of Cornell University. Thousands of them gather at these meetings and all regular instruction is suspended. Professors and students all are hosts to the visitors that flock in from the farms. There are also lectures by experts and conferences of special organizations, all conducing to make it a week of great benefit to those who wish to learn the latest ideas about farming.

During this week the corn and potato exhibits from the rural schools are sent in. For a year Mr. Edward M. Tuttle, through correspondence and the *Rural School Leaflets*, has been organizing and planning the corn exhibit for this year, with the remarkable result that 892 schools responded with one of the most beautiful and gratifying exhibits that the writer has ever seen.

It was as late as December when Miss Alice G. McCloskey, editor of the *Rural School Leaflet*, sent letters to the District Superintendents asking them if they had any nature-study material to send in for Farmers' Week. Since nothing had been said of this before, Miss McCloskey did not expect a large amount of material, but it came in in overwhelming quantities. In fact, there was so much of it that there was not sufficient space allowed to properly mount it for exhibition; and we were all delighted and surprised at the general excellence and the scope of the work.

There were several collections of grains in boxes and in vials, not only of a grain itself but of the feeds and flours made from it, and in some instances, the commercial foods made from the grains. In other instances, the grains were classified according to the

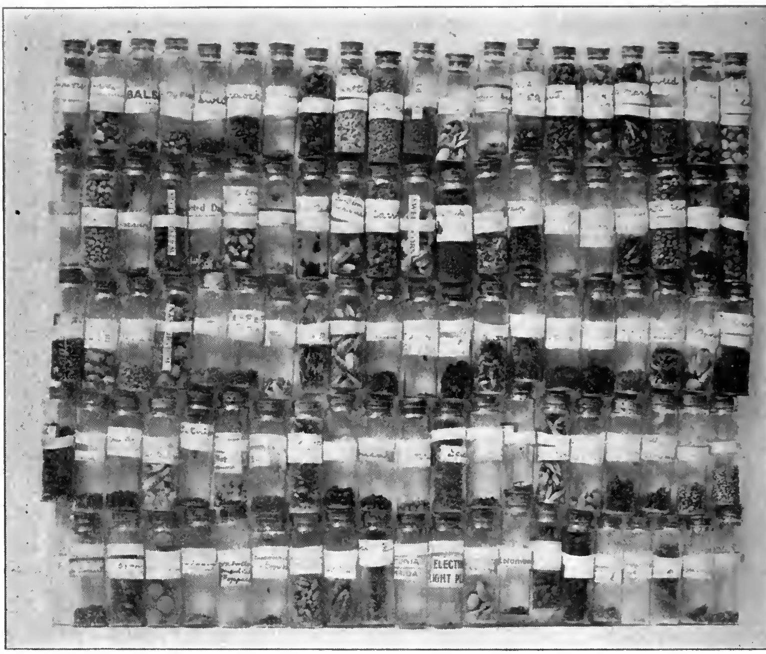

FIG. 1

domestic animals to which they were fed. There were some tastefully arranged heads of grain mounted on cards. One large card gave a very complete record of the corn plant showing the stalk and sections of it, the roots, including the brace roots, the leaf, the tassel, the husk, the ear, the latter also in cross section, the kernel, and the seedling. There was also an illustrated account of the germ and food in the seed.

There were several collections of weed seeds. In some cases, these illustrated the weeds of special crops. In some instances,

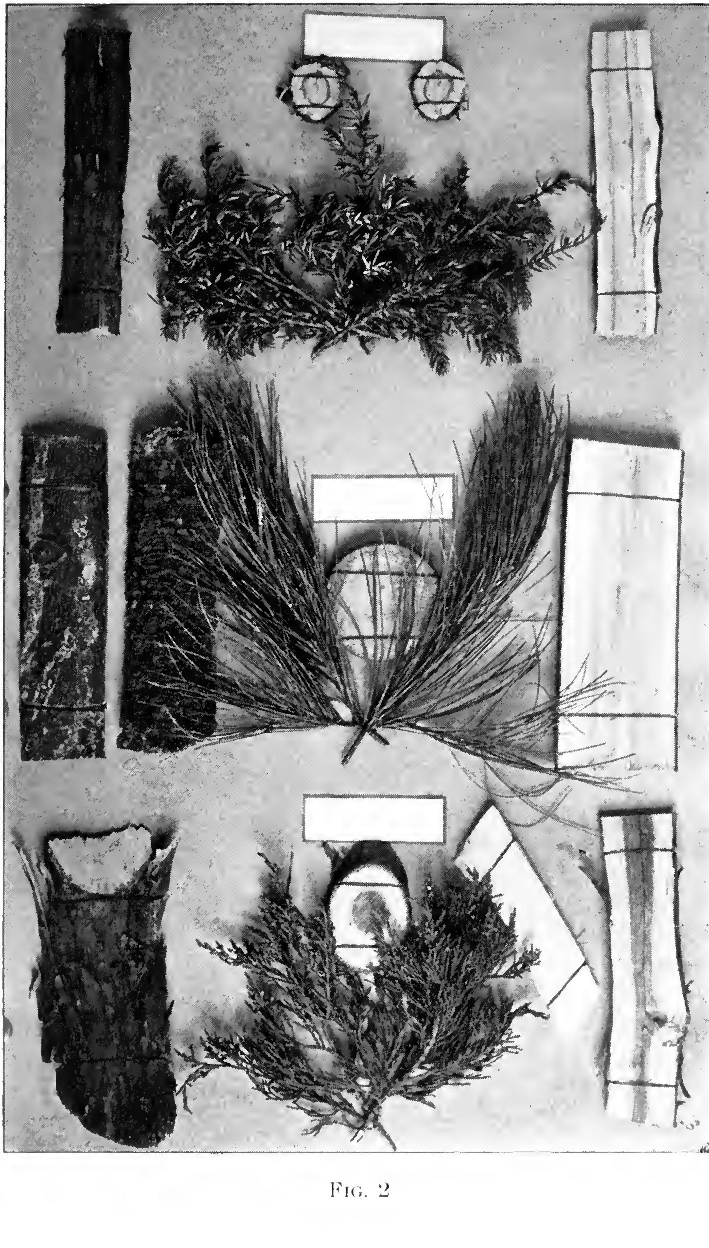

Fig. 2

the weed was mounted showing its seeds and methods of distribution. There was one collection of 300 vials containing weed seeds properly labeled.

On the whole, the exhibits of tree study were most complete and satisfactory. There were several sets of bark with cross sections and lengthwise sections of the wood all carefully labeled. There were also many large collections of twigs accurately determined; there were 63 species shown on one card. And best of all, there

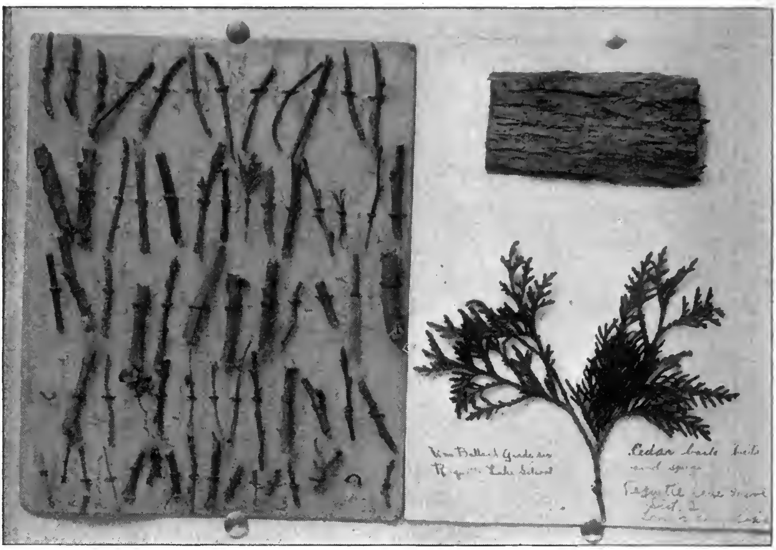

Fig. 3

were collections of mounted specimens showing wood in cross and lengthwise sections, the bark, the leaves, and the fruit. There were several complete collections of our native evergreens and one particularly excellent of our native oaks. There were also numerous collections of autumn leaves, with colors well preserved, each leaf being specifically labeled. One cross section of a tree was correlated with history. A pin to which a paper was attached giving an important historical occurrence was set in the ring of growth of the year in which it happened. This covered about fifty years of history and it attracted much attention.

The plant collections were numerous. One was especially well mounted, containing 63 specimens of common field plants. There was also a collection of mosses, lichens and ferns.

The bird work was most attractive. There were many collections of birds' nests but not very accurately named. But there were two collections with each nest mounted upon a card, upon which was also placed a water color drawing of the bird made by the pupil, and a little essay on the birds' habits. This seemed to us an ideal exhibit. There were besides many water color pictures of birds and also many essays upon their habits, and some attractive and carefully recorded bird calendars.

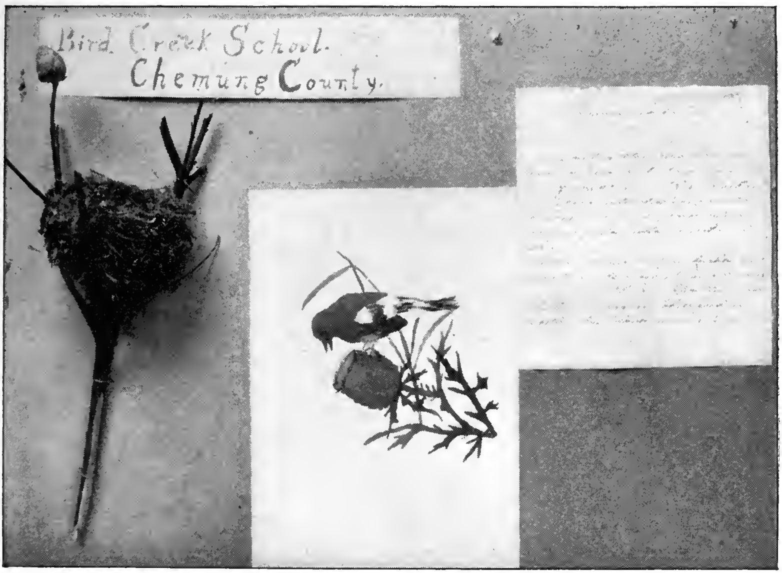


FIG. 4

The domestic birds came in for a large share of attention. There were several exhibits of feathers of domestic fowls arranged according to their position on the bird's body, as shown in the accompanying picture. There were so many of these that a poultry expert was sent for to judge them. There were also other collections of feathers of all domestic birds, and here and there a partridge tail or wing feather put in and properly labeled. There were many essays upon the care of fowls, and some particularly neat scrap books containing descriptions and pictures of many varieties of domesticated birds. The best of these showed 35 kinds of fowls and several varieties of ducks, geese and turkeys.

There were several collections of mounted insects, a few of them remarkably large for a rural school. There were also pencil drawings of butterflies, which were very good indeed. From an economic standpoint, one exhibit was truly remarkable. It consisted of a box containing 12,000 egg-masses of the apple-tree tent-caterpillar collected by the pupils of one rural school.

There were several exhibits of textiles. The picture shows the

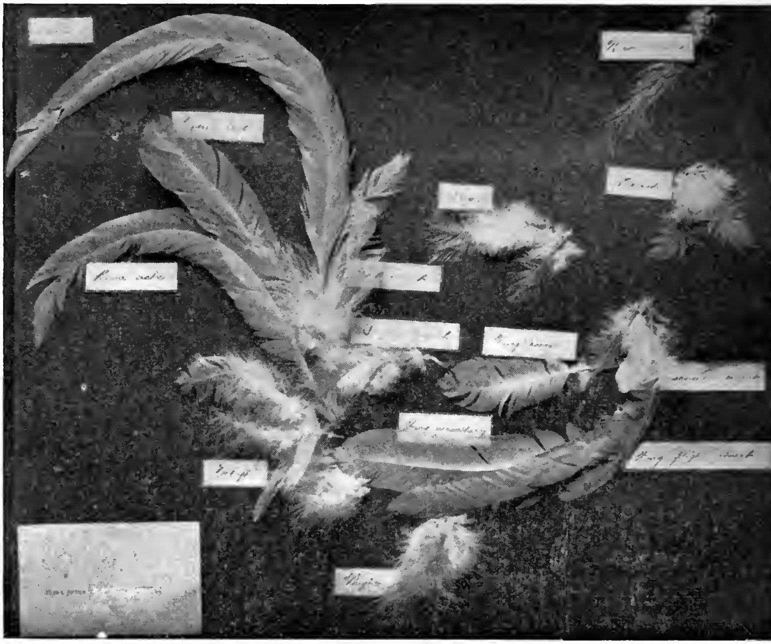

Fig. 5

best of these, which was a remarkably complete wool collection. There were several sets of drawings of cattle, which were very good, and were accompanied by essays upon the stock.

There was only one collection of pebbles and stones. There were several collections of water color drawings of flowers and also of landscapes which were original and interesting. There were two good relief maps, one of the United States, and one very remarkable map of New York State.

A very well constructed terrarium was sent by one school, made entirely by the children. It had a frame of wood and sides of glass and cover of wire netting.

Of special interest to the writer were three squirrel nests, made of the finely shredded bark of wild grape, each a compact mass nine or ten inches in diameter, with a cosy pocket inside just large enough for one little creature. One of these was labelled—"Nest of the Flying Squirrel." And although, the annals of flying squirrel literature, so far as I can discover, make no mention of such a nest, Miss Mathilda Schelgel, a very reliable authority,

FIG. 6

assures me that these squirrels often make such nests, high up in or above grape vines.

Some of the collections sent for the exhibit had been exhibited at County Fairs and had received prizes. It is encouraging that the Agricultural Fairs are helping this work. From every point of view, this exhibit was gratifying and gives sure hope for advancing excellence and usefulness of the rural schools in New York State.

## The Horned Dace

By G. C. Embody

One of the numerous brook minnows is usually the first prize of the youthful angler who happens to live in the eastern half of the United States and ten chances to one the particular kind first taken is the common chub or horned dace. Chub has always seemed to me a better name than horned dace, because it has reference to the general body form of the fish throughout life. The term, "horned," probably has reference to the short spines occurring on the head of the male alone and then only during the breeding season.

One can find the chub in almost any brook in the United States east of the Mississippi River. In the one which becomes dry in summer leaving here and there rather deep isolated pools, the chub is often the only fish to be found. In the cold spring trout brook, the chub still persists even though many of them fall victims to the trout. They may still remain common where the brook has become a creek or even a small but swift river. But in the larger sluggish streams they become rare for at least two reasons, the presence of predaceous fishes like the pike and bass and the absence of gravel beds for spawning purposes.

They are most at home on the moderate sized brook which has numerous deep, shady pools, and whose waters become too warm in summer for trout. Here they have been known to grow to a length of a foot but more often they are caught before the six inch mark is passed. Those fishermen who have caught them for use as bait for game fishes, no doubt have contributed largely to their decrease both in size and numbers in the streams near our cities.

There are certain characteristics by which the chub may be known from other fishes. Firstly, there are no teeth in the mouth; secondly, all of the fins are supported by a soft frame work, there being no sharp stout spines in any of them; thirdly, the scales are all smooth which can be appreciated by rubbing the finger from the tail towards the head. The combination of these three characteristics is found in all brook minnows but not in other brook fishes. The form of the body is cylindrical, about as wide as deep; the lower jaw is a trifle shorter than the upper; there is a longitudinal black stripe in all except the males in breeding time which however have spines on either side of the head and a red coloration on the belly. The most distinctive mark is the black spot or blotch situated at the base and front part of the dorsal fin. By this spot the chub may be known from all other brook minnows.

### Breeding Habits

Fishes may be divided into two groups, nest builders and non-nest builders. The nest builders are also of two kinds, (1) those giving personal care and protection to eggs and young and (2) those deserting nests soon after the eggs have been deposited. The chub belongs to the second class of the nest builders.

The breeding season varies with the temperature of the water and thus may occur earlier in the southern than in the northern states. In the latitude of New York State the chub usually begins about the first of May and continues well into June. If one visits a stream during this time he may observe in shallow rapid places elongated patches of clean gravel which stand out prominently from the remainder of the silt and slime-covered bottom.

Closer examination will show that these patches are ridges of gravel ending down-streamward in a slight excavation which in turn is followed by a roughly angular shaped area of sand. The ridge may be two to three inches deep and as wide as the ridge. This whole structure is the work of the male chub alone. According to Professor Reighard, the chub begins to excavate a cavity on the level both by pushing the larger stones up stream and carrying the smaller ones in his mouth. As he works the former cavity is not only filled but the stones are heaped above the bottom. In this manner he continues to excavate and refill always working down stream. The cavity at the end represents the place where the male stopped working and the sandy area below is the fine material dug up by the fish and carried down stream by the water current.

During its construction the nest is guarded by the builder. Often fighting takes place between two males at which time the "horns" on the front of the head are used as weapons. It is stated by Professor Reighard that the female does not deposit all of the eggs at one time but may return repeatedly to the same nest or even to one occupied by another male. Thus a chub nest may contain eggs from several different females.

After each successive spawning the male begins again to excavate with the result that the stone ridge is lengthened and the deposited eggs are covered with gravel. As soon as the nest is completed and the male has lost his mating ardor, the former is deserted.

The writer has had much pleasure in collecting the eggs from chub's nests and hatching them at home. In order to secure them it has been found convenient to use a small dipnet with a shallow bag of fine bobbinet or cheese cloth. The mesh must be very fine for the eggs are small, the largest of them smaller than an ordinary pin. The net is placed in the basin of the nest with the opening up stream. With one hand some of the gravel is scooped from the ridge above and agitated gently under water directly in front of the net. The gravel and sand being heavier will immediately fall to the bottom, while the lighter eggs will be carried into the net by the current. The net is then turned inside out into a basin or tray of water. An agate-lined photographic developing tray answers the purpose admirably. From the tray the eggs may be gently poured into a wide mouth bottle, fruit jar or a clean tin pail and carried home.

Two different but equally successful ways of hatching the eggs without the use of running water have been used. The first and simplest is to place them in a shallow tray covering with water to no greater depth than one-half inch. A little more water may be added each day to replace that which has evaporated. One 5 x 7 tray will accommodate one hundred eggs without changing the water at all. The eggs in order to develop must have oxygen but in a shallow dish enough of the gas is taken up at the surface of the water directly from the air to fulfill this requirement.

The second method necessitates the use of a tray made of strips of cork pinned together at the corners, the bottom to be covered with bobbinet of small mesh. A tray 3 x 4 x ¾ inches will be sufficient for one hundred eggs. One must be sure that the tray will float, then it must be placed in an ordinary balanced aquarium and the eggs distributed over the bobbinet. In this manner the eggs are kept in the surface layer of water which is always well oxygenated. In from six to ten days when all the young fish have appeared the tray is simply turned over under water and the young allowed to disperse in the aquarium. It is of course necessary that the aquarium have no predacious inhabitants such as aquatic insects, hydras or fish of any kind. Whatever means is provided for hatching the eggs one must never allow direct sunlight to fall upon the eggs.

THE YOUNG CHUB

The newly hatched fish (figure 1) is very small and so transparent that it is seen with difficulty. If placed in a watchglass and viewed with a hand lens against a background of black paper, something of its form and external structure may be made out.

When quiet the young chub is usually resting on its side or else is attached to the side of the watchglass by means of an adhesive substance secreted at the front of the head. This latter is an important provision common among young fishes by means of which they may suspend themselves above bottom on any submerged object thereby preventing suffocation which might otherwise occur from the deposition of sediment.

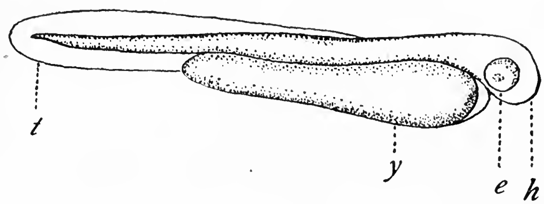


FIG. 1. Chub at hatching; *e*, eye; *h*, head; *t*, median tail fin; *y*, yolk sac. Length, 22 inches. Magnification 12.5 diameter.

When moving the young chub swims rapidly in circles, spirals or in very erratic manner all over the watchglass. It cannot rise up in the water and remain there nor can it swim in a definite direction in search of food, for it not only lacks internal control of its movements but is without the necessary organs, such as paired fins directly concerned in the execution of these movements. Only a median vertical tail-fin is present and used for a forward locomotion alone. Nature, again, has provided amply, for its nourishment in the form of a yolk-sac full of richest nutriment. Although this sac is heavy and interferes with the movements of the fish, yet it provides that which is necessary for the fish to develop and grow more like its progenitors. Coincident with the disappearance of this sac, we find a development of the paired fins which begin to function just before it is necessary for the fish to seek its own food (figure 2). At this stage we find the young fish rising slowly from the bottom, moving in a definite manner in any direction and at short intervals snapping up both organic and inorganic particles floating in the water.

RATE OF GROWTH

There is considerable individual variation in the growth of all fishes, even when they are living apparently under identical conditions. For this reason, it is impossible to predict just how large a fish will be at a certain age.

The writer has only a few data to offer concerning the chub covering a period of about nine months from the date of hatching. In the manner referred to heretofore, eggs were collected and hatched indoors. When the young began to feed, they were placed in a small pond approximately 3 x 8 feet provided with plenty of aquatic plants and minute organisms but destitute of fishes. At different times a few young fishes which seemed

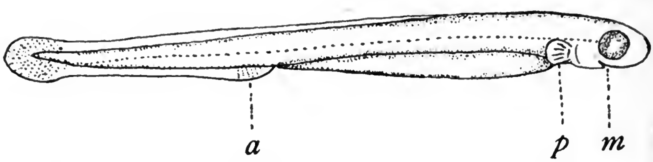


FIG. 2. Chub 7 days old. Yolk sac nearly absorbed. *m*, mouth; *p*, pectoral fin; *a*, anal fin in formation. Length 31 inches. Magnification 11 diameter.

to be of average size were taken out and measured with the following results:

| | May 22 (1913) Just hatched | May 28 7 days | July 29 67 days | Feb. 26 (1914) 280 days |
|---|---|---|---|---|
| Length in inches | .22 | .31 | 1.38 | 2.5 |

How large chubs will be at the end of the second or any subsequent year and at what age they first begin to breed, are interesting questions which, so far as the writer can find, have never been determined.

FOOD

The study of a fish's food is always interesting. In the chub it seems to vary to a certain extent with the age of the fish and with the kind of food available in the particular spot where the chub lives. As stated heretofore when the fish is first hatched it carries its own food supply in the yolk sac. But in three to seven days this is used up and the young swim towards the surface where they may seize almost any minute particles floating by. In the stomachs of such young fishes the writer has found diatoms and a few other minute plant forms, small protozoa, and the smallest crustacean animals such as minute species of copepods.

(See figures in Mr. Alee's article on the smallest crustaceans p. 105, Vol. 9, No. 4, of the NATURE-STUDY REVIEW). Many of the young continue to feed near the surface but others investigate the bottom and the surface of submerged rocks and stones where in the slimy covering they find both vegetable and animal food similar to that already mentioned. Upon this material chubs continue to feed in no small degree even when they are adults of three years or more. But ordinarily as they become larger they seek larger food and we find in their stomachs such organisms as filamentous algae, insects both terrestrial and aquatic including the water-boatman, May-flies, caddis-worms, stone-flies, small crayfishes, occasionally aquatic snails of the smaller kinds and not infrequently other fishes. The writer once placed some young trout slightly over an inch long in a small artificial pond which, unknown to him contained a few chubs possibly averaging four inches in length. The trout were devoured right before his eyes, and time proved that not one of them escaped.

### CHUBS IN THE SCHOOL AQUARIUM

Chubs are easily kept alive in the school aquarium where they will become fairly tame in a few days. A battery jar of one gallon capacity will accommodate two or three small ones not more than one and one-half or two inches long, and if a few stalks of water plants such as Elodea, Myriophyllum or Ceratophyllum are made to grow in the aquarium change of water will not be necessary. The rectangular aquarium is always better than any other type because it provides greater space for swimming and a greater surface area exposed to the air for absorption of oxygen. Such an aquarium of five gallons capacity and well supplied with vegetation should suffice for four or five chubs three inches long. Whatever type of aquarium is used, it should be kept covered to prevent the fishes from jumping out.

In feeding chubs one should be guided by their natural food. We have seen that in a stream it feeds largely upon animal matter and to a slight extent upon vegetation. Its diet should also be varied when it is living under artificial conditions. The writer has been successful in using bread or cracker crumbs as the vegetable part of the diet feeding once every third or fourth day and then only an amount which will be entirely consumed by the fish. Mealworms, earthworms, sowbugs, house-flies, shreds of lean beef, liver and fresh fish furnish a good variety for the animal part of the diet. Enough of this animal food only to supply the immediate appetite of the fish should be given each day when the bread is omitted.

It is necessary to remove all food which is not consumed within an hour or else pollution of the water will sooner or later result in death of the fishes.

## Spring Wild Flowers

R. E. Wager

**Photographs by Author**

Winter is heavy and cold and lifeless; Spring is light and warm and lifeful. Winter is lean and gaunt and hard of heart; Spring is full with the outlines of youth, and gentle of heart. Winter witholds; Spring gives. Winter paralizes with fear; Spring incites to tenderness. Winter hisses, "Wait!" Spring sings, "Come!" Winter's face is silent and stern; Spring's face is open and loving.

Winter slinks grudgingly away with backward glances, and Spring eagerly and lifesomely comes with her myriads of followers. Out of bud, on tree, shrub and vine, and from hidden recesses underground, there start numberless flowers, answering the call of the just-arrived season. The woodlands are carpeted by them; the old meadows soon are peopled too, and finally in glory the trees and their kind burst into color, and laden the air with perfumes delicate. Soon even the waters of pond and stream are lending themselves to the support of some flower or another. And the coming of all these makes us glad.

This influx of new life into the animate world is felt by the soul sympathetically attuned to the rhythm of Nature. The pulse beats a little faster; the step is lighter; the heart is more free. After the long quiet, the weight is finally removed, life springs back, and begins, apparently, anew.

And thus it comes about that the early spring flowers make to us so powerful an appeal. Their appearance is the sign of the great awakening. Their coming is a token of new beginnings, of new cycles, of stirred impulses and aroused emotions. They make the border between cold and warmth, between apparent lifelessness and a life abounding.

This appeal is quite universal. Children are drawn into the woodlands. They roam the meadows and play by the warming stream. Young lovers bind their vows under the seal of the violet. The middle-aged carry their babes into the flower-strewn stretches and tarry a time to rest from the stress of the world's work. The aged, flower in hand, feel again the throb of youth, and live over its golden days.

To know and respect the wild flowers as they come; to call

FIG. 1. The earliest and bravest is the Spring Beauty

them by name; to be acquainted with the times of their coming and the places of their abode; to see in them the operation of great and fundamental principles of life—and not, only, a pleasing combination of form and color—to do this—and let them live—is to have won an intimacy, and a source of pleasure, well worth striving for. Then one is a part of the great movement of the season. His satisfaction is gained from the contemplation of the wild flower as a part of the whole scheme of life. It is a creature to be viewed with tenderness and awe—and not to be pulled up and carried away, lifeless and limp. We may note some of the commonest of these early blooming flowers.

The earliest and bravest is the spring beauty. Hardly has the snow melted away before its two slender leaves, with flower bud between, appear above the ground. Frost is still in the earth and cold nights chill, and cold winds blow. But in spite of these conditions the leaves grow and the buds expand, and some warm

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FIG. 2. The nodding blossoms of the Dog's-Tooth Violet

bright day, on the sunny side of some giant of the woods, you will find a few pioneer blossoms, pink, purple-lined things of beauty. These are, as has been said, only the pioneers. They are trying out the conditions. For with the advance of the season their numbers increase greatly, and many woodlands will you find whose open places are carpeted with these delicate forms, so thickly growing that you will hesitate to walk through them, lest you tread them down. For four weeks or more will the blossoms continue to develop, those at the base of the scape developing their fruits, while at the summit new buds and blossoms appear. Finally their work is done; grasses are growing high, shutting out the light; their seeds are scattered, and their store of food for the spring to follow is hidden away underground, and we shall see them no more for a time.

FIG. 3. Spring Beauties and Dog's-tooth Violets over which the trees cast their dark shadows

By the time the spring beauties are well under way in their blooming, the dog's-tooth violet will make its appearance. Its mottled leaves have been growing for some days, and the single bud in the erect scape now opens, and the nodding bell-shaped blossom quivers in the passing breeze. It is a tender blossom, quickly wilting when plucked, its perianth soon falling away. In company with the spring beauty, over which they seem to hold sway, they present, however, a most pleasing picture. For you will find these two flowers growing in intimate association, forming a dense mat of bloom, over which the small solitary bees fly quisically about, and the still naked trees cast their dark shadows.

Now in some localities, we shall find the hepatica throwing up its clusters of delicately shaded blossoms. Each on its hairy scape, snuggles closely to its brothers, partly, it may be, to keep warm, and partly, it may be, out of an affectionate regard. The diversity of tints and shades of the blossoms stands in striking contrast to the torn and faded leaves which have functioned the season



Fig. 4. The Hepaticas—helter-skelter among the brown leaves

past, and soon to be replaced by delicate young ones after the blossoms shall have disappeared. The hepatica is a beautiful woodland flower, sometimes growing as a single plant at the base of an old stump, or in the angle between the roots of a giant tree, or helter-skelter among the green leaves.

Closely related to the hepatica, and growing in similar places, is the Rue Anemone. It is a plant of larger growth, however, and possessed of a tough wiry stem, bearing at its summit an umbel of white or pink-tinted blossoms. Sometimes you may find colonies of considerable numbers, though more frequently it is found in relatively small numbers.

We must not overlook the bloodroot. This would be, however, a very easy thing to do, since it is found less abundantly, in most places, than any of the others we have mentioned. But in the margins of the woodland, and in thickets of low-growing shrubs, you may be fortunate enough to find its colonies with their pure white blossoms. The very large leaves present a rich background for them. This blossom, too, is a very delicate one, quickly



FIG. 5. The Rue Anemone bears on its summit an umbel of flowers

shedding its petals when plucked. The plant is charged with an orange-red sap easily marking the hand which despoils it, as much as to say, "My blood be upon your hands!" The bloodroot is rapidly disappearing from many localities.

All of these flowers are decorating the open places in the woods, occurring in numbers! In isolated groups of a few plants, you will find the curious blossoms of the Dutchman's Breeches. The name is not entirely inappropriate. The finely cut leaves look as if badly torn by a heavy wind, which at the same time had broken, and blown into the air, the line bearing these odd shaped pieces of wearing apparel!

The Wake-Robin, or Trillium, is now growing rapidly, and will soon open its single, erect bud. Then the hillsides glow with myriads of white blossoms, over which the now forming leaves on elm and maple throw their delicate shadows. These blossoms

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FIG. 6. A colony of Bloodroot with its pure white blossoms

are long persistent, the white ones becoming pinkish with age. You will be interested on determining the different kinds of Trillia, since each locality will furnish more than one species. These of course differ among themselves in habit and color of blossom.

If now you will go to the neighboring swamp, or find in the woods a low wet place, or on the hillside the opening of a spring, you will be certain to find the huge leaves and twisted spathe of the skunk cabbage. If you bruise the plant you will be better aware of the reason for this name, especially if you have had experience with the odor of the humble, yet independent animal from which it is taken. Within the purple, or green spathe, look for the short spadix upon which the blossoms are borne, and later you will be interested also to find the fruits. The spathe frequently appears before the leaves.

In similar situations, and, indeed, often associated with the skunk cabbage, you will doubtless find the Marsh-marigold. Its light yellow blossoms are conspicuous, and, together with the large leaves, and succulent growth of stem, present an appearance

FIG. 7. The curious blossoms of the Dutchman's Breeches

of real opulence. You will find this plant also in the low spots in the meadows, especially if a spring be near to supply a constant abundance of water.

The preacher of the woodlands, the exhorter and admonisher, is the Jack-in-the-Pulpit. Much like the spathe of the skunk cabbage is that of the Jack, though erected upon a scape, so the effect is far different. This plant, however, you will find even in relatively dry soil. Everybody knows about the Jack-in-the-Pulpit, so we need say nothing about him.

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FIG. 8. The Wake Robin opens its single erect bud

FIG. 9. Skunk Cabbage and Marsh-marigold are frequently found together

The twisted column of the leaves of the May-apple are now appearing above the ground. When well free they will slowly open, exposing a single bud carried between the point of attachment of the two leaves. Occasionally you will find a plant with a flower bud when only one leaf is present. This, however, is unusual. In the warm days of late spring, when the Trillia are abundantly blooming, the colonies of May-apples, hiding under their broad canopies the purest of waxen flowers, are one of the

FIG. 10. The broad canopies of the May-apple hide the purest of blossoms

pleasantest of the flower-lovers discoveries. The flower is highly odorous, and serves to indicate the essence of a colony even when you are some distance away from it.

You cannot well escape the Shooting Star. This you will find somewhat sparingly in the depths of the woods, but in great numbers, occasionally, in the open prairies, or rocky hillsides. There is a single cluster of leaves close to the ground, and from their midst a shaft bearing on its summit an umbel of pendant pink, or white blossoms. These are most striking in their appearance. It reminds one most of a sky-rocket whose path has been marked by the shaft, and which on bursting has thrown out these brilliant balls. This plant too, is rapidly disappearing.

It is impossible here to call attention to more of our common spring forms. Let it suffice to urge upon you, good reader, that you undertake earnestly to know them all as they grow. Go into the woodland and meadow, and follow the stream courses, to look

FIG. 11. You cannot escape the Shooting Star

for them. Pluck them with your eye, and gather them together in your soul. Let them be for you a part of the great wonderland of the out-of-doors, full of new things, abounding in new experiences. So shall these various flowers be left to perpetuate their kind, that future generations may know them as you have known them, and your wanderings afield will serve more closely to link you with the spirit of the season of Spring.

## Spring Day in the Children's Greenhouse

Nellie Storie Salton*

By unconscious signs we realized that spring was approaching as we came to the children's greenhouse, early that spring morning. There was no first robin or bluebird, no first spring flower anywhere in sight, for these things never come to Bedford avenue and Logan street in Pittsburgh. Not even the swing doors on the saloons had appeared yet, that sign by which city boys can tell the approach of spring, yet we felt it in the air. The greenhouse impressed it more deeply on us, for the freshly cleaned walls and roof aided the starting plants in radiating the feeling that it was time to put aside winter gloom and come forth fresh and ready to grow. Already the bulb plants from the cellar had opened their bright blossoms to see the sunshine.

And the little children feeling the warmth of the sunshine through the dingy tenement windows were coaxed out of doors. It seemed a long, long time since cold weather had driven them inside from their street play. The small children, too small to go to school yet somehow remembered the house where they planted bulbs and seeds, and where their flowers grew. The greenhouse doors too, had been closed during the cold weather but now it was spring and surely time to plant seeds again. Before the flower teacher had finished her part in caring for the greenhouse plants, the most anxious of the little ones were knocking for admission.

One could not do otherwise than hope to aid this spring longing in these smallest children by letting them smell the pretty flowers and feel their bright petals. The bright petals of the pink hyacinths seemed to draw the happy group towards them and like busy bees the little tots went back and forth from one flower to another. Our own flowers, even if we can not grow them in our homes, are a precious possession when we can have a place somewhere else to grow them. The shrill city whistles break the spell and children must go home and greenhouse doors close until playgrounds open for the afternoon.

Two o'clock, the hour when regular greenhouse lessons begin, has arrived and with it the group of youngest playroom children

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*Miss Salton has been for some time in charge of the greenhouses that are connected with the playgrounds in Pittsburg.

and their play teacher. Eager because they already know that the flowers, some of them of their own planting are blossoming, they hurry to the flower room. They feel that it is time to plant more flowers, so only for a short time are they kept to admire the blossoming ones. They have been singing a new planting song for several days and they are in a hurry to begin work. When they return to their planting room they find seed flats on the floor, an assurance that they may make little gardens. Older children in the group who perhaps have helped in planting last year, become helpers, some to gather the pieces of broken crocks or small stones for drainage, some to fill pails with soil which has already been prepared for planting. All children help in placing the drainage in the bottom of the flats so that "the seed baby's feet wont be too wet when he begins to grow." Then they fill the flats with soil. A circle of children then form about the flats and the play teacher begins the song:

In my little garden bed
  Raked so neatly over
First a little seed I'll sow
  Then with soft earth cover.

Shining down the great round sun
  Smiles upon them often
Little raindrops pattering down
  Help the seeds to soften.

Soon the little seeds awake
  Down the roots go creeping
Up they shoot their little heads
  And open into flowers.

Each child made a little rake of his fingers and raked his little garden. And so each part of the song was fitted to action. We helped them make their rows straight and gave each child a few tomato seeds to plant. Carefully they place their seeds and cover them with the soil. Small watering cans furnish the raindrops when they water their flats. A small pot label is marked and placed in each flat and the flat carried to a sunny window for the sun to do his share. Over and over the children sang their song as they worked. When the last flat was in place they said goodbye.

The older playroom group followed at once. They watered their pots of blooming hyacinth with warm water. Almost all had planted seeds before and remembered the important things about planting. Each two children were allowed to take a flat, find the material for drainage, and put the soil into their flat. Greater attention was paid to putting the drainage in and why we did it and to the soil, what it was made of. But every one is so anxious to plant that those questions can only be brief reviews. They made their rows as straight as possible. They planted their seeds and marked their flats with their names. When watered and placed away in the sunny room their work for the day was over.

The third group which for the day was girls from nine to twelve years of age came next. To-day they watered their pots and cleaned their plants. Because our greenhouse is in a very smoky location near factories and railroads, we are obliged to wash the leaves of our plants once each week, and dust off the cinder almost every day. Water was warmed and each two girls took a large pan of it, a piece of soft cloth or sponge, and a piece of whale oil soap. The leaves of the aspidistra were washed and then wiped dry, then fresh water was used in washing a Kentia palm. The materials were then cleaned and put to dry while the girls spent the remainder of the time in naming the bulbs which were in blossom. Numbers were placed on ten pots of flowers and slips of paper with ten blank spaces were given the girls. Each wrote the name of as many of the plants as possible. Most of this group could name all the blossoming bulb plants correctly. We only grow the common varieties of the hyacinths, tulips, crocus, the paper white narcissus and the yellow narcissus.

While the girls are working at this the older group of girls arrive and join them in identifying flowers. They have five more plants added to their number. In a number of cases the older girls are able to add the variety, as King of the Blue or Gertrude pink hyacinth. The younger girls finish their papers and leaving the older girls at work on theirs, we go to the workroom to compare the lists and correct any mistakes a girl has made. Their work for the day is over and they leave the greenhouse.

When the older girls have finished their identification work they compare their papers. They see that all the plants have been watered and add water if any is needed. They remove any plant whose blossom has faded, and bring in fresh blossoming plants from the growing room. These are arranged by the girls to give the best effect they can obtain. In the workroom they mix the soil, sand, loam and fertilizer in which to plant their seed. Each girl prepares her own flat, puts in the seeds, marks her flat with her own label and puts the flat away. There is just time left to put the tools away. The greenhouse day is over.

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The article on Studies of Commercial Fertilizers by B. M. Davis in the April number should be corrected as follows:

1142.8 on page 127 should be 1142.5.

Last two paragraphs on page 127 and second on page 128 should read as follows:

At $57.50 per ton, one pound of nitrate of soda will cost 2.875 cents (57.50 × 100 ÷ 2000 = 2.875). 500 pounds will cost $14.375 (500 × .02875 = 14.375).

At $16 per ton, one pound of acid phosphate will cost .8 of a cent (16 × 100 ÷ 2000 = .8). 1142.5 pounds will cost $9.14 (1142.5 × .008 = 9.14).

The total cost of materials to prepare one ton of 4–8–3 fertilizer will be $26.035 (14.375 + 9.14 + 2.52 = 26.035). The total number of pounds of these materials needed to make a ton of a 4–8–3 fertilizer will be 1762.5. Therefore, 237.5 pounds of filler must be added to bring the mixture up to 2000 pounds (2000—1762.5=237.5). In farm practice, however, the fertilizer may be applied at a correspondingly lower rate per acre. In this case about seven-eighths of the full amount per acre should be supplied thus saving the trouble of adding a filler.

## The Reformation of Mary Hogan

Jean Dawson

Josephine Lacy, or "Mrs." Lacy, as many of the school children called her, was in despair,—the despair of the deep black sort, that admits not a single ray of hope. The school dismissed, she sat long at her desk, her face bowed on her arm; her heart sore and heavy with a sense of dismal failure.

How differently things had turned out for her. Happy and brave at the thought of facing the world, to earn a living for herself and her widowed mother, she had never entertained a single thought of failure. Why should she? "Joe" Lacy, as her classmates fondly called her, had always been a lucky girl. She had taken the highest honors of her class in college, and had been among the very first to get a position to teach, and that too in a high school in one of the largest cities in the State. She was particularly pleased with her position because she was to teach biology, the one subject over which she was most enthusiastic, and the one she was best prepared to teach.

Graduation over, the summer had passed in one continuous round of gayety and fun. It was not until her mother had begun to pack their household goods preparatory to moving, and her friends to give her "good-bye" parties, that she realized what it really meant to leave the town of her birth and the college in which her father had been an honored professor until his death.

Perhaps the present blackness of her despair was due somewhat to homesickness. Things had not gone well with her since she had arrived in the city. Her disappointment had been keen when she learned that Miss Grimes, the woman whose position she was to have taken, was back, ready to go to work. The doctor had advised the superintendent that it would be years before Miss Grimes could teach again. The Superintendent told Miss Lacy that he was sorry, but the best he could do was to give her a fifth grade, until a vacancy occurred in one of the high schools.

It was best any way he had added for a girl to get a little experience in the grades first. Feeling glad that Miss Grimes had recovered and yet smarting under the disappointment, the girl put up a brave front. She received the assignment from Mr. Dahl, the principal, and awaited with some anxiety the opening of school.

To her amazement, many boys and girls the size of herself crowded into the room. Miss Knott, the little kindergartner across the hall, told her that the children had to go to school until they were sixteen whether they wanted to or not. Some of the boys and girls had been in the room for three years; if they stayed out, the truant officer brought them back again.

Trouble began early. "Cat-calls" and groans greeted her when she assigned her first lesson. Whispers of she's a "lefter" reached her ears when she turned to write on the blackboard. "She won't stay long. Bet we can get her bawling, like we did the ones last year." Josephine Lacy turned about and faced Mary Hogan, the biggest girl in the room. The girl met the teacher's stern look with a bold stare which boded no good for the teacher.

The principal informed her that the school had been pretty unruly in the past, but he had promoted Ed Potts, the worst boy in the room. and he hoped that she might have no trouble. Miss Knott told her after school that night that the principal had undertaken to straighten out the gang the previous year by severely thrashing Ed Potts. The parents promptly had the principal arrested and rather than have the incident aired in the newspapers, he had pleaded guilty and paid his fine.

"I don't believe anyone really expects me to stay!" She raised her head as the scrub-woman passed her door. "She, too is pitying me," the girl thought bitterly. "I'm not big enough to 'beat them up' as the janitor tells me to do, so I must devise some other means of getting hold of them. I simply must not fail for mother's sake."

In the two weeks that had passed, the girl had tried every means she could think of to get her school interested. All to no avail, they would not work. It wasn't because they were dull that they didn't get their lessons. Far from it, Miss Lacy sometimes wished that they were less bright. They, at least, could not think of so many schemes to annoy her, and she would have more time to devote to real teaching. With the exertion of sheer will power alone, she had managed to maintain fairly good order but when her back was turned things happened. One day, during the drawing period, Miss Lacy left the room for a minute, and Mary Hogan had the school in an uproar by painting a face on the back of Will Doolittle's head who sat in front of her. Nearly every child in the room was craning the neck to see,—

some even left their seats and stood about her. Just as Miss Lacy appeared in the doorway, the girl picked up a bottle of ink, and poured it all over Will's head. The rivulets of black ink coursing down the boy's light hair and over his face, presented an appearance so ludicrous, that Josephine Lacy dodged back into the cloakroom to recover from the fit of uncontrollable laughter that seized her.

Even the funny things that had happened did not appear amusing to her now. "What unnatural children they are," she said half aloud, supporting her aching head on her hand. "They are doing everything in their power to make me leave. They got rid of five teachers last year, and they're quite openly boasting that they are going to do a better job this year. I can't remember that I ever liked to see anyone cry, but Miss Knott tells me that they used to boast of the number of times they made their teacher cry in a day. I'll not cry for them, at least I'll never let them see me do it."

While she mediated, it began to grow dusk. For some reason, words that she had heard her father utter came to her, "No child should ever be brought up without living things for companions, if they are to develop character. I mean pets to care for and plants to rear and watch grow."

"It's all right to talk about bringing children up with a knowledge of nature, surrounded as we have always been, but here—" Josephine Lacy laughed bitterly as she rose and went to the window to look out. Factories, shops, tenement houses, railroad tracks and street-car lines were all that she could see as far as her eye could reach. The school yard could not boast of even a single blade of grass; gravel had been placed in front of the building and cinders in the rear. Two struggling sycamores were the only trees in the region, that has withstood the dust and smoke. The only things that were holding their own, in spite of adverse conditions, were the weeds in a nearby vacant lot.

"Poor old dad, he did not dream that children were ever brought up in a neighborhood like this, I guess. What wouldn't I give though, to have him here to advise me in this present crisis."

In spite of herself, the words of her father haunted her. She went home to dinner, and tried to forget her trouble, but again and again she found herself pondering the effects that the study of nature has upon the formation of character. "If father is right, I wonder why they don't teach it in the schools,—they seem to teach everything else."

Although the day was Saturday, she found herself awake at five o'clock in the morning, thinking,—a habit she had acquired in college, when she had problems that were difficult to solve.

"If only I had a garden or park near the school." Suddenly she clasped her hands together and sat bolt upright in bed. "The *weeds—the weeds in the vacant lot, why wouldn't they do?* If father is right, I'll prove it with the weeds."

Josephine Lacy was young, and hope sprang up readily in her heart. The girl went about her work with much of her old-time vigor. She wrote letters asking, the State Agricultural Department for all the bulletins they had on weeds and then she went over to study the possibilities of the vacant lot.

Monday afternoon when the school seemed possessed with a spirit of unrest, their teacher did not scold, but told them in a pleasant tone to lay aside their work, that she had something she wished to show them. Going to a closet, she brought out a tall plant which she had dug out by the root.

"The name of this plant is Curled Dock. Can any of you tell me how it got its name?"

" 'Cause its leaves are curly." half a dozen voices cried in chorus.

"Yes, there are other members of the Dock family, but this one can always be told by its leaves."

"What are those brown things in the middle of the plant, that look like coffee?"

It was little May Britton who asked the question. Before Miss Lacy could answer her, Bobby Day cried, "Why they're seeds! Don't you know seeds when you see them?"

"The seeds are pale green first, May, and then they turn dark brown when they are ripe." Miss Lacy ran her fingers along the brown seeds which grew on a long stem, as she spoke. "Can any one tell me what the plant *does*?"

"Why the plant can't do anything," Joe Bangs cried, with some contempt in his voice. "They have roots which hold them in the ground, so they can't move!"

"The plant is a living being, Joe, and everything must eat, drink, and breathe that is alive."

"But plants haven't mouths, so how can they eat, drink and breathe?" Joe remarked with doubt in his voice.

Encouraged at the interest she had awakened, Miss Lacy told them that a nose and mouth were not necessary to plants because they could breathe by means of their leaves much as people do with their lungs. She showed them the little rootlets that took up the water from the soil and explained how the water was carried to the leaves, where with a gas called carbon dioxid, the plant makes sugar and starch. She said that when they ate potatoes they were eating starch, which was made in the leaves of the potato plant. Curled Dock, she said, took what food it needed from the air and soil and then stored some away in the seeds, so that when the little plants came up they would have something to eat.

While she was talking, she had broken off the seeds and passed them to each of the children. Some of them had taken off the outside covering and had gotten out the little three-cornered light brown seed which was tucked away within. She told them to plant a seed in the soil in the flower pots in the window and to watch, from day to day, to see the little baby plant come up.

All during the lesson the children sat wrapped in attention. When Miss Lacy had first told them to put aside their books, Mary Hogan left hers on the desk and began to mumble aloud in open defiance. Miss Lacy saw the girl's attitude, but determined not to spoil the lesson by stopping to reprimand her. Failing to get the desired attention from either her teacher or the children about her, the girl sat and sulked in her seat. Soon, however, she found herself listening with the rest.

When the story was finished, it was time to dismiss school. The children flocked about the desk to ask questions. Even Mary Hogan lingered on the outside of the group, as though half ashamed to show that she was interested.

The result of the first lesson, had made Miss Lacy hopeful. To her disappointment, the school the next day was more disorderly than ever. Mary Hogan seemed bent on avenging the brief loss of power of the previous day. By two o'clock Miss Lacy was so worn and discouraged that she was undecided as to whether to undertake another lesson on nature. Still debating the point with herself, she brought out the Curled Dock and placed it on her table. Although she had kept it in water, the leaves of the plant drooped in a dejected way and Josephine Lacy could not help thinking that Curled Dock looked about as she felt.

At the sight of the plant, some of the children looked expectant; it was a signal for Mary Hogan to begin to whisper loudly and scrape her feet. Weary with scolding the girl, Miss Lacy determined to pay no attention. She kept her eyes on the face of Benny Ford, a delicate boy who seemed interested, and somehow, she gained courage to go on with the lesson.

"Can any one tell where Curled Dock grows?"

"In the vacant lot," a chorus of voices cried. Half the children rose in their seats to see if they could see a Curled Dock from the window.

"It grows everywhere around here. Everybody calls it a weed, it is so common," Joe remarked with an air of great wisdom.

"Where did Curled Dock come from in the beginning?" Leslie Gordon asked.

"From Europe."

"Weren't there any Curled Docks when Columbus came over to America?" Mamie Dolan asked, her eyes big with interest.

"No," Miss Lacy smilingly replied.

"It's no good, why did they allow it to come over here?" My father says that they are very particular about what people they let come over now."

"They should be and they are more particular about the plants than they used to be, Joe." "You see," she continued, "the people in Europe did not like Curled Dock and would not give it room to grow, because they needed all the land to raise food for the people. Labor is cheap in Europe, so Curled Dock had a hard time. Only the strongest plants succeeded in growing and bearing seeds. One day the seeds from one of the successful plants got mixed with some other seeds that were being sent to America, and that was how Curled Dock came across the ocean. In America there is a great deal of land which is not cultivated so Curled Dock had a good chance to grow and produce a great many seeds. Soon there were so many of these plants that the American people called them troublesome weeds, and tried to get rid of them by cutting them down and digging them up by the root. We have not been able to get rid of Curled Dock as easily as they did in Europe and it has kept right on growing and traveling across the country."

"I know why they could get rid of Curled Dock better than we could, Miss Lacy."

"Well, why Pete?"

"They only have to pay a man fifty cents a day to work over there and we have to pay a dollar and a half!"

Miss Lacy had become so interested in the lesson that she forgot about being discouraged and annoyed; she even forgot about Mary Hogan and her followers. She had always had the faculty of interesting others in whatever she herself was interested in; for this reason she had always been a leader in school. She was delighted now, to find that her gift had not failed her; every one in the room was listening intently.

Before she could reply to Pete, Mary Long, asked earnestly, "Why does God make weeds to bother people so?"

Almost before Miss Lacy knew it, a heated argument arose and to her surprise, Mary Hogan defended the weed against the whole school. Never before had Josephine Lacy heard the girl talk; when called upon to recite, her invariable answer had been a brief, "I don't know!"

Had Josephine Lacy known more of Mary Hogan's life, she would have better understood why weeds appealed to her. Motherless, the girl had come up among strangers and, not unlike a weed, she had held her own in spite of every one's hand being raised against her.

When the discussion had gone far enough, Miss Lacy rapped with her pencil for order. "Watch, while I drop some seeds which have their coverings on into this glass of water," she commanded, holding it up to view. "Now I will put some of the seeds without their coverings in and see what happens."

"Those with the coverings float, and those without them sink," cried several children at once.

"Can you see why?"

Receiving no reply, she pointed to three little swellings on the outside of the cover. "They are made of a corky material and act to float the seed on water."

"It makes the seeds float just like a life preserver holds you up in the water," Ned O'Brien remarked, rising in his excitement, and poking the seeds to try and make them sink.

"Can any of you children see, that it is an advantage to Curled Dock to have its seeds float on water?"

Quick as a flash, Mary Hogan answered, "They may be floated from place to place on the water."

"Good thinking, Mary, the seeds may be floated on the surface of streams or may be carried along during heavy rains."

The color mounted into the girl's cheeks, and a pleased, surprised look passed across her face. Suddenly, Josephine Lacy became conscious that it was the first time that she had ever spoken words of praise to Mary Hogan.

The incident set her thinking. She felt sure that she had gained an insight into the girl's character that she had never had before. *Mary Hogan wanted to be noticed. In the past the girl had gained a greater notoriety by not getting her lessons and strenuously opposing her teacher than she could gain in any other way.* "Hereafter, I see where I shall be blind to all her meanness, and I shall see and praise in her only the things that are desirable. And Josephine Lacy kept her resolution.

Nearly every day during the early fall and winter, the fifth grade had a lesson on weeds. Sometimes they brought the weeds into the school and then again they went out to the vacant lot for them. Miss Lacy made a practice of writing on the blackboard the things she wished the children to observe, and the questions she wished them to think about. It was Mary Hogan, herself, who had made her think of trying this plan. A few days after they had discussed how the seeds of Curled Dock might be carried from place to place, the girl announced that she had found that they might be carried in another way. She had been out to the vacant lot after a rain; afterwards, while cleaning her shoes, she had found a weed seed sticking in the mud which she had carried home upon them.

It was along about this time that Miss Lacy was no longer annoyed by seeing cartoons of herself chalked on the sidewalk or at finding unpleasant notes on her desk; bits of candy, apples and grapes appeared there instead.

With the aid of the bulletins she received from the State Board of Agriculture, she identified twenty-five weeds that grew in the vacant lot. Each day she brought a new weed into the school room for study, much as they had studied the Curled Dock.

One day, Miss Lacy thought to measure the extent of the children's interest. She wrote the names of six plants that grew most abundantly in the vacant lot, and told them that she wished to know how many seeds the largest plant of each kind produced. She chose six children who stood the highest in the work to take charge of the counting. Each could choose the boys and girls that he wished to have help him. She also told them that they could choose the weeds whose seeds they wished to count, but, she warned them, that it would not be an easy task especially in the case of the wormseeds which bore so many and such tiny seeds. The work must be done after school hours, and she said that the one who undertook to count the seeds must not get discouraged.

Because Mary Hogan had made the highest grade in the nature work, she had first choice. Josephine Lacy held her breath. Here was a fine chance to learn whether she had read the girl aright. Without a moment's hesitation Mary Hogan chose the wormseed and proceeded to pick out the children who were to help her. "The most difficult weed, but the one which will undoubtedly yield the greatest number of seeds. Now for the helpers!" Some of the girl's boon companions sought to catch her eye, to let her know that they wished to be chosen. The girl gave no hint that she saw them. With a sigh of relief, Miss Lacy murmured under her breath, "Couldn't have done better myself, not a lazy nor careless one among them."

Mary Hogan had need of good helpers. The largest wormseed plant grew in moist loam and was seven feet high, measured five feet across, and produced 26,085,150 seeds.

Miss Lacy wrote the results of the work on the board. Wormseed came first, followed by the others in the order of the largest number of seeds found.

| | | |
|---|---|---|
| Wormseed | 26,085,150 | seeds |
| Lamb's-quarters | 1,813,320 | " |
| Pig-weed | 305,760 | " |
| Curled Dock | 7,000 | " |
| Stick-tights | 2,555 | " |
| Milkweed | 2,510 | " |

Opposite the number of seeds, Miss Lacy wrote the names of the group of children, who had done the work. Never before had Mary Hogan's name been associated with those of the best children in the school. Miss Lacy heard one of Mary's former chums accuse her of being with the goody-good crowd. The girl made no reply to the taunt. Miss Lacy would have given a great deal to have known what was going on in the mind of the girl. Perhaps she had been working so hard, that she had no superfluous energy to waste on mischief. At any rate, from that time on Mary Hogan deserted her former companions.

Miss Lacy had supervised the work of counting the seeds. The day that the children were carrying the six weeds from the vacant lot, to the basement, Principal Dahl met them. He had seen Miss Lacy getting a hold on her students from day to day, and marveled. He greeted the children pleasantly, examined the weeds, and asked them if they would not let him know how many seeds they found. Aside to Miss Lacy, he said, "What magic have you used to tame these children so that you can take them out-of-doors to study?"

It was during this time that Miss Lacy began to respect and even to love Mary Hogan. Never having done such a piece of work herself, Josephine Lacy had given her school a task so difficult that it would have resulted in dismal failure, had it not been for the example set by Mary Hogan. It took two weeks of steady hard work to separate the seeds of the wormseed from the chaff and bits of pulverized leaves, but the girl was never heard to grumble. She had even started to count the tiny black-shiny seeds one by one, without a protest at so impossible a task, when Miss Lacy gave her an easier way. She told her to measure the seeds in a tiny bottle, and then multiply the seeds in the bottle by the number of bottlefuls that the plant bore.

The girl measured the number of bottlefuls of seeds and counted the number of seeds in a bottle, but alas for Mary Hogan, she could not multiply such large numbers together. To be sure, she might have asked her helpers to solve the problem, but they looked up to her in nature work and she could not bring herself to confess her ignorance to them. Strange as it may seem, for the first time in Mary Hogan's life she saw the usefulness of things taught in school.

Wondering why Mary did not bring in the results of her work, Miss Lacy sought her out, and to her utter astonishment, found her in tears. Ashamed to let her teacher see her crying, Mary Hogan hid her face and would not look up. The sight of the girl in tears, strangely affected Miss Lacy. She put her arms around the child and drew her close up to her. As she did so, she saw the unsolved problem on the desk before her. Guessing the source of the trouble, Miss Lacy did the multiplying and quietly left the girl to her own thoughts. From that time on Mary Hogan began to be a student of books as well as a student of nature and Josephine Lacy began to have time to teach.

The work with the weeds was finished Thanksgiving week. What her school would do the rest of the year she did not know. She only knew that her father's idea had been well founded, for through it she had gained a hold on her school, that was little short of miraculous and that, too, with the much despised weeds. Could she hold them without further work with nature? Well, at any rate, tonight she would pause to be thankful for her success. She startled her mother by suddenly laughing out loud. "What would some people whom she knew, think of her if they could realize the feeling of devout thanksgiving that was in her heart because weeds grew in a vacant lot near her school."

The next day Miss Lacy received a notice informing her that it was customary to hold appropriate exercises in all the rooms the afternoon before Thanksgiving. Appropriate exercises meant recitations and songs,—why she had been so busy keeping order that she did not know who could sing and recite. To be sure, they could sing together after a fashion but not well enough to go on a program fit for guests. The thought of the program brought such consternation that she forgot to call her class on time. It was little wonder that Josephine Lacy was disturbed, for stories of the last year's Thanksgiving exercises were still fresh in the minds of both teachers and pupils in the building. They purposely had sung out of key, talked out loud so as to drown out the speakers and had even pelted the guests with paper wads. For some time Miss Lacy gave herself up to unreasoning fear. When she grew calmer, she thought out a plan.

At recess she called Mary Hogan to the desk. She frankly told the girl that she would like to have her help in picking out pupils who were best fitted to appear on a program for Thanksgiving. If she would think about it and talk it over with the pupils, she, Miss Lacy, would be pleased.

Flattered by the teacher's confidence and appeal for aid, Mary Hogan soon had the whole school enthusiastic and ready to help. With the aid of the girl, Miss Lacy appointed committees to decorate the school and get up the program.

How busy everyone was that week and how happy! In those few days, Josephine Lacy became genuinely attached to her pupils and she wondered why she ever thought them so terrible. She was at school early and late; when her mother remonstrated with her for working so hard, she replied that teaching was great fun.

As for the program, she assured her that the pupils were doing all the work themselves and that she was there merely for advice and consultation.

The day came at last and as Miss Lacy stood at the door, waiting to receive the guests, she stole an occasional look of satisfaction at the school room, beautifully decorated with pumpkins and corn stalks and the blackboards adorned with sketches of log cabins, pilgrims and turkeys that her pupils themselves had made. Her glance wandered to the children, dressed in gala attire, all impatience to have the guests arrive so that they could begin their program. "No fear of any one misbehaving today," she thought. This is *their* program and everyone of them feels responsibility for its success." She met their anxious looks with a smile of sympathy which warmed their hearts and put them at ease.

It proved to be a great day. Josephine Lacy knew that the program was good but she was not prepared for the enthusiastic reception that each number received by the parents and friends which thronged the school room.

When the applause for the last number had died away, Miss Lacy announced that she had prepared a little contest, in which she hoped everyone would take part. "I have taken twenty-five of the most common weeds which grew around here and placed them about the room. Those mounted on cardboard are the weeds and leaves which I pressed when the plants were still fresh and green; those stuck in the bottles are the dried and ragged weeds which can still be found in the vacant lot. In all there are seventy-five specimens each one of which bears a number. The one who can correctly name the plant to which the largest number of these specimens belong wins in the contest."

Principal Dahl and Peter Wright, a member of the Board of Education, came into the room just as they were ready to start. For a moment their presence threatened to dampen the spirits of the crowd. All restraint, however, vanished when both men declared that they knew the common weeds and desired to enter the contest too.

Watch in hand, Miss Lacy gave the signal to start. Soon the children and their guests were merrily jostling one another in their eager desire to name all the weeds in the brief twenty-five minutes allowed for the purpose. Great excitement prevailed when time was called and Miss Lacy had them exchange papers while she read the correct list aloud. To the delight of the school, Peter Wright stood 96 per cent; Mary Hogan 98 per cent.

At the announcement of the results of the contest, Mary Hogan's heart nearly stood still and then began to pound so hard that she could scarcely hear what was being said. It was truly the happiest moment of her life. When the applause had died away, Peter Wright rose to his feet and bowing low to Mary smiling said, "I am glad indeed to meet a little girl who knows more about the common weeds than I do. I have had a long acquaintance with weeds. You see I was the youngest son of a large family. Money was scarce and I had to work, if I was to get an education. I received permission to use a vacant lot as a garden and in it, not only raised all the vegetables for the entire family but I made about seventy-five dollars from it besides. It was hard work, but he added reflectively, I think it made a better man of me. I have often wished that all children had gardens of their own, but perhaps you have. I am sure Mary must have one to know as much about weeds as she does."

Miss Lacy briefly told him the story of the vacant lot. When she had finished, Peter Wright remarked, "Not a bad idea to study the enemies of a garden first. Most people begin the other way. Now, I am going to tell you what I am going to do he continued, clasping his hands behind his back and keeping his eyes fixed on the eager faces in front of him. "I am going to get you permission to use that vacant lot as a school garden. Each one of you will have a plat of ground of your own to raise what you like and make all the money you can from it." Looking over at Mary Hogan he said smiling archly, "To get even with you for winning from me today I am going to ask the school to make you the head gardener. And this," he said handing the girl a ten dollar bill, "is to be used for ploughing and getting the lot in shape. Principal Dahl will, I am sure, subscribe for a good garden magazine so that this winter you can all be learning how to raise vegetables and flowers. Now, good-bye, until spring. Then I shall make it a point to come and see you all happily at work in your gardens."

* * *

Elated, Josephine Lacy hurried home to tell the good news. She found a letter awaiting her from the superintendent. He wrote to inform her that there was a vacancy in biology in the West High School and that she should report the following Monday if she cared to accept the position.

Somehow the news did not bring the joy that she had anticipated such news would bring. Perhaps it was the effects of her success or the thought of having a school garden, or was it because the face of Mary Hogan haunted her that made Josephine Lacy write to the superintendent that night asking him to let her stay where she was, at least for the remainder of the year.

## Some Nature Study Articles in Recent Magazines

John Burroughs—Science and Literature, *North American Review*—March.

Bliss Carman—The Redwing, *The Century*—May.

Harrold Kellock—The Winged Armageddon (Gypsy and brown tailed moths) *The Century*—May.

Winifred Kirkland—The Road that Talked—*The Atlantic*—April.

Herbert Ravenel Sass—A Suit against Science—*The Atlantic*—May.

E. L. D. Seymour—The War on Agricultural Pests—*The World's Work*—May.

Will C. Stevens—A Sensible Outfit for Amateur Hikers—*Outing*—May.

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Date...............................

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# NATURE-STUDY REVIEW

Devoted Primarily to all Scientific Studies of Nature in Elementary Schools

Vol. 10 No. 6
Whole No. 84

OFFICIAL ORGAN OF THE AMERICAN NATURE STUDY SOCIETY

SEPTEMBER 1914


CONTENTS


Foreword . . . . . . . . . . . . . . . . . . . . . 203
Cricket Music . . . . . . . . . . . . . . . . . . 204
Mrs. Anna B. Comstock
Nature Study in Art . . . . . . . . . . . . . 207
C. H. Robison
Nature Study in City Parks . . . . . . 210
N. E. Nelson
Nature Study and the Teacher . . . . 213
John Voaden
A Rare Deformity in a Painted Turtle. R. W. Shufeldt . . . . . . . . 218
Out of Doors in Doors . . . . . . . . . . 223
Helen M. Reynolds
Animal Life in Prairie Ponds . . . . . 2[illegible]5
T. H. Hankinson
School Gardening in the South 243
E. A. Miller
Editorial . . . . . . . . . . . . . . . . . . . . . 248
Book Reviews . . . . . . . . . . . . . . . . . 249



Published Monthly except June, July and August at Ithaca, N. Y.

$1.00 a VOLUME (9 Nos.)

Elliot R. Downing, Editor
The University of Chicago The School of Education
Chicago, Ill

15 Cents copy

Entered as second-class matter at the Postoffice at Ithaca, N. Y., under the Act of March 3, 1879.

# THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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VOL. 10 SEPTEMBER, 1914 NO. 6

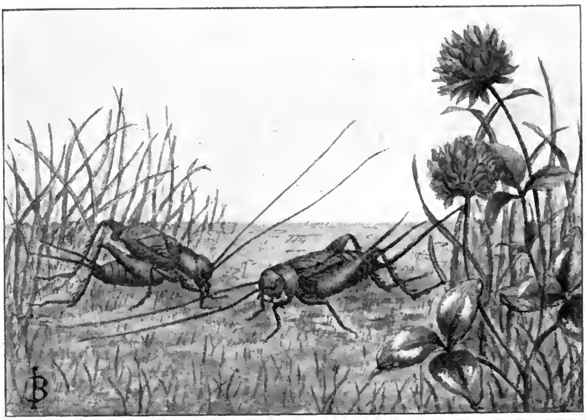
## Foreword

With this September number we begin another improvement in THE REVIEW, an enlargement of the magazine. We have averaged more pages per volume the last three years than ever before. But we want to give the members of the American Nature-Study Society all we can for their money. The financial returns do not justify the added expense. In fact, the Comstock Publishing Co. is sure to lose money on the venture. But they believe the members of the Society will coöperate in securing new subscribers to the improved magazine so much more heartily that the added expense will soon be justified. If the experiment is to prove successful we must have *your* heartiest help. Let your friends know about THE NATURE-STUDY REVIEW. Boom it! The Editor gives his services gratuitously. The Comstock Publishing Co. promises to put all income in excess of actual expenses into the betterment of the magazine. Will the members do their best to help proclaim the nature-study idea? The movement is growing splendidly. We see it in the increased demand for Nature-Study courses in the Normal Schools and Teachers Colleges. There never have been so many students or such enthusiastic ones. Three years ago the editor begged for articles. Now he returns half of those sent in and has a supply three months in advance. The readers are getting selected material. Please push hard while things are moving well. It is our opportunity. (See special offers elsewhere.)

# Cricket Music

ANNA BOTSFORD COMSTOCK

After our bird songsters have left us, and only the meadowlark remains to greet us with his summer song, we still have, until the heaviest frosts come, the most insistent and cheerful of insect musicians, the crickets. These little creatures seem to recognize that their time for music making must soon end, and therefore they keep their winged mandolins vibrating more steadily than ever before. This is a very interesting fact, because with the crickets,



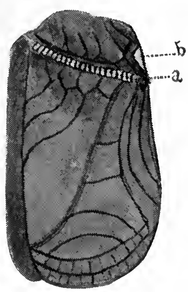
A pair of dusky lovers
Drawing by Ida Baker

as with birds, only the males are musicians, and music is the means of attracting their mates. But in October, long after the breeding season has passed, the male crickets keep up their music for the mere love of it. This is carried so far that with the Snowy Tree-crickets, an orchestral performance is accomplished, each musician keeping the beat and the rhythm of the notes. Sometimes an individual player joins the chorus at the wrong beat, but he soon discovers his error and rectifies it. The Snowy Tree-Crickets' orchestra begins on hot afternoons in early August, and continues throughout September, and during the warm days of October.

Since so much attention is given these days to the study of music in the schools, there can certainly be no more interesting nature lesson than the study of the methods of the little musicians of the grass and field. Incidentally the life habits of the crickets will be made plain.

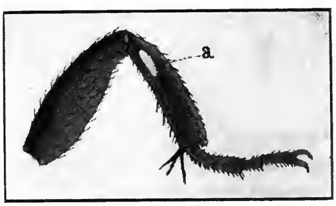
### *A Cricket Cage*

Use for this a small flower pot in which has been set a little fresh sod, containing clover and grass. Place over this, and press well into the soil, a lantern chimney; cover the opening of the chimney with a square of wire netting; place the pot in its saucer, so that it may be watered by keeping the saucer filled. There should be several such cages in the school room. Place in one cage a male,




The wing of male cricket enlarged
*a*, file; *b*, scraper

A section of the file enlarged




The front leg of a cricket enlarged showing ear at *a*

and in another cage, very near to it, two or three females of the large black crickets. The two sexes may be readily distinguished, since the female has a large, long, bayonet-shaped ovipositor at the end of her body. Two males should not be placed in the same cage, for they will fight and maim each other. Place the cages in a sunny window, where the pupils may observe them at their leisure.

### *Observations by Pupils*

1. Are the wings of the mother cricket the same size and shape as those of her mate; how do they differ?

2. Is the mother cricket able to make music with her wings?

3. How does the cricket musician carry his wings when he is making music? How do you think he makes the noise? Can you see the wings vibrate?

(The teacher should place on the board the accompanying diagram of the cricket's wing, showing the scraper and file. After this is explained, the pupil should again observe the cricket musician to see, if possible, how he draws the scraper of one wing across the file of the other.)

4. Look at the front legs of the crickets, and notice a little white spot placed near the elbow. This is the cricket's ear.

5. Do both the father and mother crickets have ears?

6. Are there any other insects that have ears in their elbows?

(The long-horned grasshoppers and the katydids also hear in this peculiar manner.)

7. Place a bit of melon rind, or a piece of sweet apple in the cage, and describe how the crickets eat it. Do the jaws act sidewise, or up and down like ours?

8. Can you see the two pairs of little feelers connected with the mouth; how are these used when the cricket is eating?

9. How does the cricket use its long antennæ? How does it keep them clean?

(The antennæ are used for examining everything in the immediate vicinity of the insect, and it may be seen nibbling antennæ from base to tip to keep them clean.)

10. Where do the black crickets live?

(They have their homes in the fields and lawns; they live under sticks and stones and clods, where they can get tender grass.)

11. How does the cricket escape from his enemies?

(It is as smooth as patent leather, and therefore difficult to seize. It has long, strong hindlegs, and can jump high and far, when chased by the enemy.)

12. How can you distinguish the father from the mother cricket? (The mother crickets' wings are not fitted for making music and she has a long bayonet-shaped ovipositor at the end of her body which is used to puncture a hole in the soil, and to place the eggs within this hole where they will be safe during the winter, and hatch into little crickets in the spring.)

# Nature-Study in Art

C. H. Robison

State Normal School, Upper Montclair, New Jersey

Many recall that burlesque lesson based on Scott's lines beginning, "The stag at eve had drunk his fill," and the absurd length to which the correlation idea was there carried out. Doubtless well intentioned efforts to get out of a topic all there was in it have called forth at times both tears of pity and sneers of contempt. The more general understanding, probably, of correlation is that two studies, so-called, shall be so organized that related topics in each shall be taught about the same time, shall be so placed in the curriculum as to be mutually illuminating. Obviously this can happen only at intervals unless one subject or the other sacrifice some of its own continuity. In practice then any considerable amount of correlation compels one subject to become handmaiden to the other; which is no discredit to the first, though the thought of it may hurt some one's pride. We should bear in mind that no such vivid boundary lines exist in the children's minds. A schoolroom demonstration showing how efficient is a loose top layer of soil in preventing evaporation may be an integral part of a course in elementary agriculture, of the inorganic part of a nature-study (or "elementary science") course, or of a well taught topic on the Great Plains.

It is my purpose primarily to point out by a few examples how the materials of nature may be the materials for art work while retaining the spirit of nature-study, how the observations of nature may motivate some of the drill work in art, and, not the least by any means, how the study of nature may lead to a greater degree of truth in art work. By truth I mean the eternal verities of nature and not photographic reproduction, which is sometimes very inartistic.

We often find the motive for a decorative design drawn from natural objects. The outline and often the entire appearance of the object are purposely modified or conventionalized to conform to the requirements of the design or the harmonious composition of the picture. The fundamental part of the object is preserved sufficiently to suggest what furnished the inspiration. Its details may be omitted or changed, but properly not to such an extent as to violate truth or to give offense to the lover of nature, just as bad combinations of color are avoided out of consideration for the feelings of persons of artistic temperament. When a butterfly is used on the four corners of a sofa pillow or when the dragonfly is used in a flat design, curved lines may give place to straight lines and corners, but we do not put three pairs of wings on the animals instead of two. Though too often, do we find insects with legs not merely indeterminate in number but variable as well. We find butterflies used in designs for hat pins, barrettes, and brooches. The writer calls to mind at a public address recently a handsomely designed barrette in front of him that was really more pleasing than the speaker. One element necessary to its utility was a certain degree of strength. This was obtained by using each antenna to connect one end of the central body to the fore wings. The same idea was duplicated at the other end of the body. Utility furnished some justification for the extra pair of appendages. Not so in the case of a brooch recently seen. The tail antennæ, possibly they should charitably be called stylets or cerci, projected from the posterior end of the monstrosity and coiled in a way that got on one person's nerves at least. The above instances differ from examples taken from school work in that the former are cases of designs really applied and not merely make-believe "applied designs," that is, applied to something nobody wants but merely made to accommodate a design that is supposed to minister to a real need.

If one were to represent a dragon with a very long body, the conventional shoulder wings would give only the idea of weakness. We recognize the cause of the smile that the appearance of a dachshund arouses. It does not seem properly buttressed so to speak. We remedy the deficiency, in the case of the dragon design, by adding wings. Incidentally I may say that we add them, according to precedent in pairs and not tandem fashion; for we do not know how the latter arrangement would work. A much smaller number of persons than would notice faults in the case just mentioned would also feel conscious, I fancy, of any incongruity if a dragonfly design had but one pair of wings to the animal, no matter how elongated the body and despite the fact that nature herself provides two pairs. This lack of sensitiveness on the part of the general public does not excuse us, however, in perpetrating an untruth when no pressing need is to be served.

An Easter card or other article bearing the sentiment, "Consider the lilies, how they grow, etc.," would be grotesquely illustrated by a drawing of flowers with five petals. By being generalized or slurred over, the number of flower parts may not necessarily be evident. Even though not showing the characteristic three and multiples thereof, the design should avoid the appearance of the four plan, found mostly in the mustard family, or the number five, shown by most blossoming plants with net-veined leaves. Art teachers in schools have been known to show little concern over a six-petalled rose, though they would be horrified by one that was blue. Just recall how faithful the fleur-de-lis figure is to its most commonly accepted prototype, the iris, even bending over backward in its conscientiousness about the color. Though we do have yellow irises, who ever saw a yellow fleur-de-lis? The number three is as characteristic of the lily and its allies as it is of the number of pairs of insect legs. To one who knows better, it is as absurd to illustrate the jingle, "Little Miss Muffet sat on a tuffet," with a six-legged spider as it would seem to one at all acquainted with history to find a picture of Julius Caesar wearing a silk hat. An indistinguishable tangle of spider legs, at least, does not tell an untruth. The defense for some of these biological monstrosities is "proper spacing," "harmony," and other similar reasons. Since we cannot easily crowd the leaf of a Virginia creeper into a triangle without mangling it, why not substitute poison ivy? If the design be square, we might find suggestions from the unusual form of the tulip tree, the yellow poplar of commerce. The same protest applies equally to color, but here we find the art people keen enough to insure little violation of any one's sensibilities, except as styles change. After all the amount of conformity to nature is a matter of the generality of experience, just as no one would ever think of painting a sky green.

The mention of sky leads to another point of contact between nature and art work in school, especially in the primary grades. It was true once, let us hope it is true no longer, that the first exercises in applying water colors were just that, exercises, in the same sense that the term, manual training, as applied to woodwork once called up memories of such unapplied exercises as sawing off ends of boards, planing with no final product but shavings, making various kinds of joints that were never destined to be parts of an object desirable in itself. The simplest landscape we can imagine is of only two tints within a rectangle, the upper part representing the sky in shades of blue or gray, and the lower representing seasonal conditions successively in dark green for September vegetation, brown in October with dashes of red and yellow for the variously colored shrubbery, "meadows brown and sere," in November, white in the winter months, and a fresh green in spring. From the standpoint of the teacher, this is one set of many exercises in gaining technic; from that of the pupil, it is painting the country, that is, landscape, remembering of course that children of the first and second grades think in terms of the things that make up landscape rather than in terms of the unity itself. So with sunshine charts for a few days when drawn off or copied from the progressive monthly calendar on the blackboard, the variously tinted rectangles have a differing aim for teacher and pupil.

It must seem evident to any one that the least important thing is to set off certain school activities in the program and dub them "nature-study." Too often such a course defeats its own end.

## Nature-Study in Our City Parks

Norman E. Nelson

Rockford, Illinois, has, perhaps, one of the best park systems for nature-study that one could wish. Of the three largest parks, Fairgrounds (twenty-four and one-half acres) is best adapted for the study of cultivated plants, shrubs, and trees; Black Hawk Park (eighty acres) for geology, birds, wild flowers, native shrubs, and trees; Sinnissippi Park (one hundred twenty-three acres) for trees and birds.

In Black Hawk Park we have about forty-five species of trees, over half of which are native. For the most part, at least one tree (often two or three) of each species is labeled. The Nature-Study Society placed the labels which were provided by the Park Board. The labels are of zinc, about four by two and one-half inches, painted white. The lettering is sunken, using a metal die, and finished in black. The scientific name is at the top, common name at the bottom. They are fastened securely to the tree with two nails. The contrast of black and white renders the labels readable at over fifty feet. Labeling has also been done in the two other large parks.

Native shrubs make a fine showing in Black Hawk. Among the fifteen species we have the leather-wood (*Dirca palustris* L.), which is seldom found in our region and the burning bush (*Euonymus atropurpurea* Jacq.). Wild flowers are allowed to grow undisturbed in the woods. Above the quarry there are many spring flowers, Dutchman's breeches, dog-toothed violet, spring beauty, waterleaf, and the blue and yellow violets.

In the park there are two quarries (one being worked for stone that is used in park drives) where a number of geological facts are nicely illustrated. (See photo.) In the east one there is a fault extending across the floor and up one side. This is also found in

FIG. 1. The West Quarry in Black Hawk Park

the spring on the river bank. A pothole in the limestone shows that the river once ran (probably in Glacial Period) several thousand feet east of its present course. A few fossils are to be found in various layers. At one point on the west quarry the stones show where the rock has been dissolved and then deposited in crystalline masses. The Nature-Study Society made four trips to Black Hawk Park in the fall and winter of 1913–14 on account of the excellent advantages for nature-study. One trip was on geology, one on weeds (of which there is a fine collection), and two on trees.

Birds have been made much of in the large and the numerous smaller parks of the city. One large feeding station has been placed in each of the three larger parks (see photo) and an extra smaller one in Black Hawk and Sinnissippi Parks. Suet, sunflower, hemp, millet, oats, rape seed, and broken dog biscuits are used in the feeding stations. "Food sticks" are made by boring holes in small branches and pouring in melted tallow and bird seed. The stick was then nailed to a tree. Artificial brush piles were made for the brown thrashers, at least three of which were occupied. Crotches were pruned for nest sights and several were used. Robin shelves consisted of a log cut three-fourths thru and one end hollowed out for the nest. This left a projecting piece above for shelter and when fastened to a tree looked like a bracket ([).

Fig. 2. Feeding Station in Black Hawk Park

Other logs were hollowed out according to the plans of Baron von Berlepsch. Many flickers occupied them this spring. The total number of bird boxes (368) made are arranged as follows:

| | | |
|---|---|---|
| Nuthatch......75 | Robin......40 | Red-headed Woodpecker..30 |
| Chickadee.....80 | Wren......50 | Flicker..................15 |
| Bluebird......40 | Phoebe.....30 | Owl...................... 8 |

It is to be hoped that the present movement for nature-study will not slacken, and that another year more birds will take advantage of the feeding stations, and that all of the bird boxes will be occupied.

## Nature-Study and the Teacher, or the Point of View in Nature-Study

John Voaden

This brief outline is undertaken with the desire to assist younger teachers, with little or no experience, to begin and continue the work along proper lines and in accordance with the interests and activities of the children in our public schools. It may also help some of our more experienced teachers, who are still, in the name of Nature-Study, teaching high school science to the children in a very dry, bookish way that is distasteful to them. Only recently I learned about a teacher who was teaching (?) agriculture by assigning lessons in a text book and just hearing them recited. The children did not like it. Simply giving information and learning facts or any method other than that which will lead the children to enjoy the work in Nature-Study and Agriculture is most detrimental to the aim in view and must not be continued. So much is being said and done now in regard to arousing greater interest in agriculture and making the farm and country life appeal to the young people that it is most important for our rural teachers to assist this effort by using better methods in the school room and taking greater interest in what is going on in Nature outside.

I. *The first principle:* Take advantage of the child's natural desire to wander abroad. He is more or less an aimless wanderer. He sees a host of things but for the most part in a very vague and indefinite way. He loses much time and many chances to secure at first hand a knowledge of the facts before him. Therefore, guide him more definitely, take an interest, ask him questions, let him tell what he has found out, go with him if necessary, he will assist you to bring some of the outside world into the school room to enliven that "information lesson" you intended to take with your class.

"I should not try directly to teach young people to love Nature so much as I should aim to bring Nature and them together and let an understanding and intimacy spring up between them."—*Burroughs.*

"And he wandered away and away
With Nature—"—*Longfellow.*

"I wandered lonely as a cloud,"
"When all at once—"—*Wordsworth.*

"We need but eye and ear,
In all our daily walks to trace,
The outlines of incarnate grace
The hymns of gods to hear.—*Wordsworth.*

II. *The efficient training* of the child must always be kept to the front. Only that which he actually accomplishes through his own activity will be of much value. In discovering the truths of Nature by the Nature-Study method we ought to expect him to become more patient, persistent, careful, thoughtful and considerate as a result of this effort.

Lead him to go through all of the following steps as frequently and efficiently as you can and be very perservering. Use any of Nature's material that is near at hand, that most of the children are coming in contact with and may be led to take an interest in.

(*a*) *Observing*—actual seeing is the first step. Do not be satisfied with the casual, indifferent look, but the "stop, look, listen," the stepping aside or drawing cautiously nearer, if necessary in order to look more closely. This is the interesting, inquisitive kind of looking that Nature-Study always encourages in the hope that it may grow into a habit. Some teachers are content to have the children just report what they have seen on the way to school in the morning, taking a few minutes each day or perhaps taking the reports for the week on Friday afternoons. This is not satisfactory for three reasons: It becomes tiresome after a time. They report indefinitely and imagine things. Observing is only the first step, and to be effective, must be followed through the rest of the processes.

(*b*) *Inquiring*—the inquiring mind is most essential. Follow the observations with questions. Lead him to ask himself questions when out wandering. He knows that "teacher" will not be satisfied if he just reports that he saw, say, a chickadee and so he goes further, asking himself perhaps such questions as these: What is this I see? What is it doing here? How does it do it? Why is it here? Anything else to do? Any place else to stay? Can I do anything for it? etc.

(*c*) *Investigating*—this should involve such planning, thinking, reasoning, judging, comparing, etc., as he is able to bring to bear on the subject. The school lesson in Nature-Study does not afford sufficient of these processes. Can he be led to do more of it out-of-doors while at his wandering and observing work? What is wanted is well represented by what the child does with his pet crow or rabbit. He plans a suitable cage, thinks over all the requirements—kind of food, water, nest, etc.—refers to wild crows, compares the two conditions of life, and judges what will be best. He has answered many of his own questions. The teacher should always be on the look-out to assign suitable out-door problems, at the most favorable times, in order to stimulate interest and more investigation. Allow him to wonder and to anticipate. Sometimes an interesting fact may be told if it will encourage him when he shows signs of "giving it up."

> "And whenever the way seemed long,
> Or his heart was beginning to fail,
> She would sing a more wonderful song;
> She would tell a more marvellous tale."—*Longfellow.*

(*d*) *Understanding*—Facts learned by the good method that Nature-Study stands for are always well understood and what is better, they are enjoyed. The effort put forth and the time spent in getting this knowledge were also enjoyable. Training was always in the front with knowledge in the background. Repeat your efforts along this line. He is gaining in power, he feels encouraged, is more independent and wants to try again. A splendid tendency is being developed which if persisted in will make for efficiency in mastering the problems of life's work and life's leisure.

"Nature-Study is training the eye to see and the mind to understand what is seen."—*L. H. Bailey.*

How much are our rural workers in need of this kind of training? The farmer has his little problems to solve, they are as "many as the minutes of the day and as varied as the face of nature." Should the school not begin to train the children to have Nature problems "many and varied" and to solve them just as they will be sure to meet them in later life? Greater interest and efficiency will make him realize that he is no mere toiler.

III. *The three salient features*—"The three H's". It trains the hand to work, the head to plan and devise ways and means and the heart to govern and control, appreciate and enjoy. Nature-Study must have its constructive and productive features. Every child and every teacher should be a planter. Plant something, raise something, care for a plant from seed to seed; have a pet animal and provide thoughtfully for its necessities and comforts. The teacher should have a plant because it is good for her to have one but primarily for the sake of example; the children should always have them both at home and at school. In many school gardens the "three H's" have not had full play. Remember that mere work becomes drudgery the moment the head and the heart are left out of consideration. Better stop the work immediately when this is the case for you are only doing harm. Better begin small—a few pots or window boxes—to find how well you can link the last two H's with the first H.

"A little child who seeks plants and cherishes and cares for them cannot be a bad child nor can he become a bad man."—*Froebel.*

IV. *The matter of the lesson*—We assume that a very great amount of Nature Work may be carried on outside of the school room, and incidentally in the school room, when there are specimens, and that the teacher may take a few minutes occasionally each day from other school work, as if for a change, and receive reports or call attention to some developing caged specimen or other specimen. This is true, very good and quite in order. Remember, however, that there must be properly taught lessons, and time periods for their development. In most cases you must have the illustrative materials for these lessons and in every case they must be based upon the actual observations and personal experiences of the child.

(*a*) The limited viewpoint of the matter—the plant, bird or insect as a whole; then the parts by themselves after that, the relations of the parts both whole and the beautiful adaptations of the structures to their several functions. Some of this work is good, depending on the age of the pupil and how it is carried on—actually seeing and understanding. It is more adapted to older children and is very apt to become too scientific or formal and not to be appreciated by the average pupil or teacher.

(*b*) The broader view of the matter of the lesson involving the wide outlook to nature. See every natural thing in its relations to everything else in the world, study its environment. Nature never isolates anything. Thus recognize how the subject matter multiplies and how interesting it becomes, especially to children, because it has a larger place in active, personal experience. Taking any common plant as an example, it has relations to: wind, frost, sunshine, air, rain, soil, animals, birds, insects, other plants, children and grown people. How is it helped or hindered in its living, growing and spreading, by any or all of these factors in its environment? Does it in turn help or hinder any of them? How? State the facts as found out by investigation or experience in regard to as many as possible of these relations.

> "I wonder if the sap is stirring yet,
> If wintry birds are dreaming of a mate,
> If frozen snowdrops feel as yet the sun,
> And crocus fires are kindled one by one.
>
> —*Rossetti.*

(*c*) Taking this view in getting at the subject matter of the lessons, it will be seen that the points to be discussed assemble quickly, abundantly and quite logically in the mind of the teacher. Select that which is most interesting, which the child has worked upon under your guidance or has in some other way become a part of his experience. It will be most suitable for public school children especially the lower classes and you can prevent it from becoming too scientific or dry and uninteresting.

V. *The spirit of Nature-Study:*

> "Is this a time to be cloudy and sad,
> When our mother Nature laughs around,
> When even the deep blue heavens look glad,
> And gladness breathes from the blossoming ground?'
>
> —*W. C. Bryant.*

The introduction of Nature-Study represented a rebellion against many of the "nasty" ways of the schoolroom, our information lessons, our dry science lessons, book-learning and mere memorization of facts that are not well understood, Knowledge, capacity, happiness and love, these four are in the ascending order and the greatest of them is love. The quotation from John Burroughs is the keynote. It is easy to work up some enthusiasm in the month of May when the birds have returned. Spring flowers are to be had in abundance and everything is "budding new," but the fall and winter months may be made full with delight as well.

> "If thou wouldst read a lesson that will keep
> Thy heart from fainting, and thy soul from sleep,
> Go to the woods and hills."—*Longfellow.*

"While I live, I trust I shall have my trees, my peaceful landscapes, my fine country life, and while I possess so much, I shall own 100,000 shares in the Bank of Contentment."—*Ruskin.*

## Rare Deformity in a Painted Turtle (*Chrysemys picta*), With Notes on the Species

By R. W. Shufeldt, C. M. Z. S.

In the course of my life I presume I have seen at least some six or seven thousand living specimens of the North American Painted Turtle (*Chrysemys picta*), and not a few museum examples. Among all these I have never met with a single one that presented any kind of congenital physical deformity. As we all know, we frequently meet with mutilated individuals, that is, healed mutilations, the results of traumatism. Cases of teratology are also, though very rarely, met with, such as examples having two heads, or two tails, and similar abnormalities.

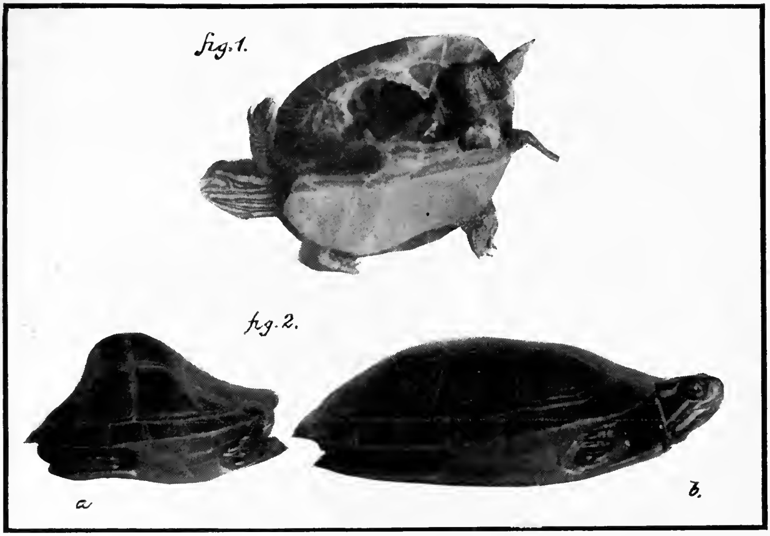
A case of this sort was described by me several years ago for a species of Box Tortoise (*Terrapene carolina*) occurring in eastern United States.[1]

Such abnormalities do not belong, however, in the same category with the case here to be described, although examples of either are of the greatest possible rarity, and fully deserving of description and record.

Mr. Edward S. Schmid, of Washington, D. C., is the proprietor of an animal establishment in that city, and probably disposes of four or five hundred specimens of *Chrysemys picta* every year. On several occasions I have seen two or three hundred in his aquaria at one time, a fact affording unusual opportunity to make individual comparisons. It is to Mr. Schmid that I am indebted for the

1 SHUFELDT, R. W. "Double-headed Animals." *Western Field*, Vol. 8, No. 2. San Francisco, Cal., March, 1906, p. 117, illustrated.
——————— "Doppelköpfige Erscheinungen in Tierreich," *Natur und Haus.* Jahrgang XIV, Heft 11, Berlin, March 1, 1906, pp. 165, 166. Illus.

abnormal specimen described below, he having presented it to me on the 17th of July, 1913, at the same time making me a gift of one of the most beautiful examples of the normal reptile that it has ever been my pleasure to study. This latter is shown in Figure 2, *b*, and is normal in every particular. Its inferior aspect is seen in Figure 3, which is correct in all respects in so far as form is concerned; but it gives one no idea at all of the great beauty of this species;

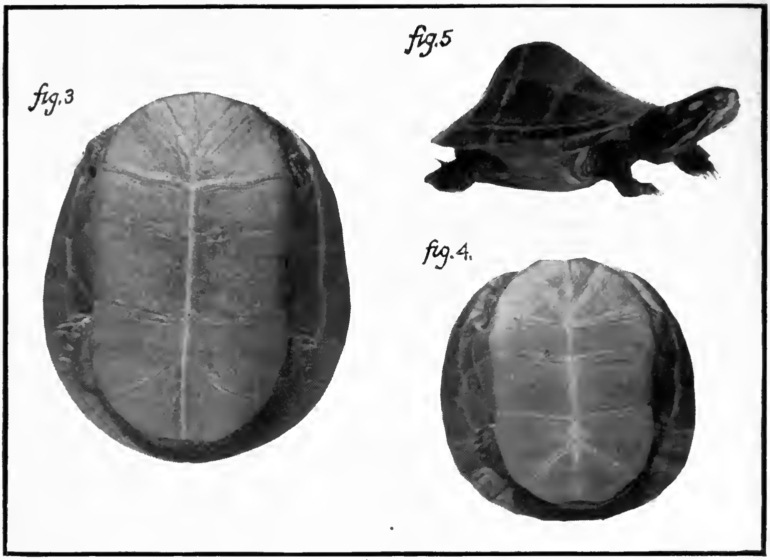



Reduced One-half — FIGS. 1 AND 2 — Photo by Author

its elegant, orange-colored plastron, and the intense scarlet and jetty markings of the marginal parts of the under side of the carapace.

Figures 1, 2, 4 and 5 are devoted to the abnormal individual, the entire series of photographs, of which these figures are reproductions, having been made by me on the 18th of July, 1913, and are of the size of nature. Both these turtles were in perfect health and vigor when received, and the deformed one was kept alive until the 10th of August, 1913, in order to observe whether its deformity caused it any inconvenience or not.

This deformity consisted in a central and symmetrical mounding-up of the carapace, as shown in the cuts (Figs. 2, *a* and Fig. 5), while in all other respects the animal was perfectly formed, being able to swim and walk quite as well as a perfect specimen; when placed on its back on a smooth, level surface, it was to be observed that it had already learned the trick of smartly righting itself by perhaps a somewhat more than usual vigorous use of the two limbs of either side. The dermal scutes covering the osseous carapace were normal in number and arrangement and modelled perfectly upon the enlargement, even the paler shade of their margins being in evidence, and exhibiting no more distortion than was necessary in order to accommodate their several outlines to the increased area




Figs. 3, 4 and 5

Reduced One-half Photo by Author

to be covered over (Fig. 2, *a*). Viewed from below (Fig. 4), this turtle appeared to be normal in every particular, and when so regarded, the presence of the great hump on its back would never be suspected.

It exhibited no evidences whatever of having received any injury or abuse that might account for its extraordinary shape, the animal being in all other respects a remarkably pretty one, with all its markings very brilliant and deep-tinted.

The reason for such a deformity defied all speculation, for there was no external evidence whatever of what might have given rise to such a condition. Therefore it was surely congenital; but even so, it would be a matter of no little interest were we able to ascertain the primal cause of such a deformity, and whether it was inherited or whether—in the event of a number of other individuals having appeared from the eggs of the same clutch—any of them presented the same curious enlargement. Its very symmetry and position were puzzling, and the carapace being of normal thickness, it was further evident that whatever the trouble was, it had its origin internally.

Possibly the enlargement had been formed to accommodate some growth, as an exostosis upon the ventral aspect of one or more of the centra of the dorsal vertebræ of the carapace. As the specimen was probably not more than two or three years old, such a solution was not at all likely, any more than a soft tumor of any of the viscera would be the cause of creating such a concavity for its accommodation. These two suppositions I discarded prior to dissection, the first as being highly improbable, and the latter as quite inconceivable.

There was a possibility of its being a case of *inclusio fœtale*, and room had been gradually made for the storage of such a product. As turtles of this species are oviparous reptiles, such a suggestion could hardly be entertained as an explanation for the presence of a hump of this kind. To be sure, as pointed out above, double-headed turtles have been found; but whether a complete inclusion could take place in such an animal, I can only say that I have never seen or heard of such a case.

In the human species, prominences of this kind usually occur at a very early age, and are due to scrofula or rickets. The victims are known as "humpbacks" or "hunchbacks," and in them the disease, whether active or passive and healed, is usually in evidence. Carious vertebræ are to be found at the seat of the curvature, and ulceration of the intervertebral cartilages is not uncommonly present; as a symptom, we meet with more or less complete loss of power in the pelvic limbs.

Apart from the diseases mentioned, which the Chelonia are not known to suffer from, this turtle may have had, at the time it issued from the egg, some vertebral disease, which eventually healed, though it was of sufficient duration to have caused, or been the cause of, this prominent hump. As the turtle exhibited great vigor of limbs, and was extremely healthy in all respects, this theory hardly seemed tenable. Indeed, I was quite at a loss to imagine what might have been the origin of such a peculiar hump on the back of this chelonian.

On the 10th of August, 1913, I killed the specimen with chloroform, death taking place, apparently, in a very few moments. I immediately parted, longitudinally, the bridge connecting the carapace and the plastron on the left side, as shown in Figure 1. The lungs and viscera were gently pushed to one side—all of them being in a perfectly healthy and normal condition—whereupon the ventral aspect of the carapace forming the dome of the hump was exposed. Beyond this being uniformly concave in conformity with the external convexity on the back, there was absolutely nothing present to account for the enlargement. All the osseous structures were healthy and exhibited no distortions of any kind beyond all entering, each in due part, into the formation, as far as it extended, of the concavity present.

In other words, this deformity was congenital, and must have been present when this turtle first emerged from its egg; but to account for its presence, in the light of what has been shown above, is another matter, and this very interesting problem I am quite unable to solve at the present time. As shedding light upon certain questions in embryology, its solution may be considered important from several points of view.

These turtles, when young and up to a certain age, are quite circular in outline, if viewed from above or below (Fig. 4); but they gradually assume the ovoid form as they mature, while at the same time they usually lose entirely the variegated markings on the plastron, which are nearly always present in the young (Fig. 3). Their wonderful beauty in the matters of form and coloration can only be fully appreciated by seeing the living specimens; photographs give but the correct idea of their external morphology.

# The Out-of-Doors Indoors in the Fall

Helen M. Reynolds

Principal of Primary Department, Training School, Mankato State Normal School, Mankato, Minn.

Few spots can be lovelier than a Minnesota hillside in September, all aglow with the burning scarlet of the sumach broidered with golden rod and purple aster, the maples and oaks still softly green in the back ground. The out-of-doors is too good to leave behind, yet we must in, so the out of doors must go with us and we must go back to it, as often as we may.

What can we do with Nature-Study in the primary grades in the Fall days? Our course of study is a very tentative one. It is still in the making and we are hopeful that it will continue to be. We studied that which seemed waiting for us, took the excursions that seemed to be demanded, worked thoughtfully over our outline of what children ought to know about the outdoor life surrounding us, sought earnestly for just the *right* big question which should start everybody on the keen search for the "something new" that is good for us to know. We tried to help the children to the knowledge they asked for. We have gone with them to the library to "hunt it up" when our all too limited knowledge failed. We have noted in careful records the things we tried to do, the happily put question which brought the interesting discussion, the bit of planting which was such a success, the carefully planned lesson which turned out a dismal failure, the "Caterpillar" poem from Rosseti which was just what we needed, Sherman's "Golden Rod," poem, the "Crane Express" in "In the Child's World" (such a humorous rendering of the southward flight of the birds ), the "Bob White" song, beloved by the boys because of the chance to whistle, the Color Books, which are now well established favorites. We have consulted the Kindergartner to discover whether there were beginnings which we were ignoring. We have conferred with the Intermediate Grades Principal so that we might have our "forward look." The "Science-Man" has given his criticism.

We have come to see the futility of serving "beans" in every grade for the meal called germination; "we have become more and more convinced that we must not have a string of isolated topics but that each subject must be a part of some bigger and related part of the children's own nature interests; we have realized the need of progressive increase in the demand for thinking which this subject makes on the advancing boy or girl, not the same treatment of a subject in the third grade as in the first. Studies which will insure a child's observation and realization of cycles of growth, whole life histories, have come to be the goal of our efforts (not some logical analysis of a plant's life history but a child's actual contact with the plant throughout its stages of growth): planting a bulb in the ground in the fall, another in a pot to be kept for winter blooming, the study of the same or a similar bulb grown in water, the enjoyment of the blossoming plant at Christmas time, the watching for the first green leaf tips in the spring, the keeping of the wilted plant and the watch for the growth of the new bulb. All this we have come to feel necessary if children are to be started on the road to "the habit and power of reflection." We are trying to make our lessons a study of our *own* surroundings and not those of the author of our favorite book on Nature-Study. And yet we do need all the help we can get from books and pictures. We may visit the grocery store to see "fruits grown near Mankato," but we must tell some small boy "where oranges come from." We may answer briefly now for our own immediate surroundings offer too much of interest to allow us to go far afield, but in the winter days when we are "shut ins," some Third Grader may give a talk on "How I got an Orange for Breakfast," illustrated by California post cards shown in the Radiopticon, an inexpensive bit of apparatus used in our own class room, a machine which can be easily operated by any one.

As to method, we distrust mere listening on the part of the children and are relying more and more on doing, planting, gathering, collecting, sorting, drawing, talking on the part of the child himself, seeing (with a chance to ask questions) good pictures which help complete chains, links of which it is impossible to bring under the boys' own observation. We are becoming more fixed in the idea that the recording of impressions in some pictorial way, drawing, cutting, painting, molding in clay, pasting of pictures to form charts, has much to do with the permanency of impressions. Booklets which by reason of the teacher's planning will organize the simple experiences of the children will help toward orderly thinking. The framing of questions is most important. Children do better thinking if the question seems to them clear and questions seem clear to us or to them to the degree that the starting point of thinking lies in a familiar region. Has your mother a store room? What does she keep in it? Who else has store rooms? What are kept in them? Have plants store rooms? What do we find in them? Bring all the plant store houses you can find for to-morrow's lesson." Again, when the subject is the proper provision of food for birds, the questioning as to types of food needed by children, bread and meat and water will disclose the fact that most birds need the same types.

Another end sought is the doing of the same work at home, Home Gardens, Home Bird Houses, Home Bird Feeding Troughs. Carefully thought-out typewritten notes are sent home every spring with the envelopes from the Cleveland Home Garden Association and about three-fourths of our children have home gardens. These help to make up for our lack of space for individual school gardens.

We give two periods a week, about twenty minutes in length, to the Nature-Study lessons. The related work is given in the periods devoted to Music, Literature and Handwork. In the Spring and Fall especially, we feel that the Nature-Study forms the largest center of interest. These Nature-Study periods merely start questions and help correct and interpret the outside experiences. We take many short trips at the ends of sessions to observe nearby objects of study. Our brook and our bank swallows are carefully watched. Two or three longer trips are taken each spring and fall. The matter of Hygiene receives more definite attention during the winter months.

In deciding the vexed question as to "What Nature-Study is," we try to keep clearly in mind the meaning of the words. We feel that it is not a species of "Kindergarten extension lectures;" that it is not the telling of pretty stories about birds and flowers, though we must and do have the stories; that it is not the artistic arrangement of bird pictures in a room though eighty-five out of our hundred children are the proud possessors of the Audubon Bird collection of pictures; that it is not the drawing of golden rod nor the singing of Helen Hunt Jackson's "September." We try to hold to the thought that Nature-Study must be a real study of Life—actual contact with life, working with life in varied forms, helping change conditions, getting pleasure out of growing things, questioning, wondering, searching, recording in child ways the results of study. We will use books as sources of help when our observations seem to conflict. Round this basis of truth as exact and complete as the child can for the moment see, we may weave the fabric of poetry and story, art and song.

We hold to our plan for the moment till something better can be worked out. We do not insist on eating dried prunes when fresh strawberries are offered and the "finds" of the children often lead us into new paths.

The first morning of school usually brings to each class room a "bunch" of Fall Wild Flowers. So we plan for our first lesson by saying in the General Assembly period, "I wonder which room can have by Thursday the most interesting bouquet of Fall Wild Flowers, not many of the same kind, you understand, but all the different kinds." This is a problem in identification, a chance to collect, a lesson in discriminative gathering, a problem suited to any group of children anywhere. The purples and gold of the autumn flowers, softened by the white of aster and clematis so blend that there is no danger of a discordant note. The teacher's part in this collecting may be the bringing in of some flower unfamiliar to the children. The first lesson in the first grade may be the grouping of the flowers into "known" and "unknown" and the teaching of one or two new names. Some form of Flower Calendar helps to impress new names. For the first grade a large sheet of ordinary school water-color paper showing a picture of the flower in color, its name and that of the discoverer printed beneath fills at least one small heart with joy. With each addition it is of course necessary to follow the catalogue round the room to "see how many have brought flowers." For older children a large card decorated with a half dozen of the children's best drawings of golden-rod, the words, Fall Wild Flowers printed beneath, and below the title space for the following data, name of flower, date, where found, and seed time, may be used. The School Arts Book will furnish many suggestions as to the spacing, decoration and printing for these calendars. The end of the first lesson may leave the first grade with this question, "Can we make our bouquet any larger by finding any pretty stranger flower whose name you would like to know?" With the second or third grade, the question, "Is there more than one kind of golden-rod?" may start a "golden-rod" bouquet or a similar question in regard to the Wild Aster will increase the pleasure in that flower because of increased sensitiveness to its variations in form and color. Another lesson may be given to the study of the Golden-Rod as an illustration of a "village of blossoms"as Mrs. Comstock calls it in her "Handbook of Nature Study." These first lessons are largely the startings of interests. The Flower Calendar, once begun, flourishes late into October.

The hand work which is such a factor in fixing impressions in elementary Nature-Study offers almost endless possibilities in connection with this subject. We must make color books, a wash of color with the picture of a wild flower for each of the series. Perhaps we will draw a little border of our favorite flower for the cover. Here, again, Mr. Henry Turner Bailey will help us both in his booklet on "Booklet Making" and in the School Arts Book. We must find time to make blue-prints. If a teacher has never made any, she may find it better to get a small package of paper and experiment, the directions being given on each envelope. Few pictures are lovelier decorations for a room than long panels in blue or brown prints of autumn flowers. For the children's printing frames we obtained damaged camera plates from our local photographer. These cost a merely nominal sum and may be cleaned by washing in hot water in which common baking soda has been dissolved. For backing we used oblongs of pasteboard cut from boxes. Snapping clothes-pins held everything in place. The blue-print paper may be obtained in large rolls as prepared for drafting plans. The flower is arranged on the glass, blue-print paper (cut to proper size in a dark room) placed upon it, cardboard upon the paper, clothes-pins snapped into place, two are generally sufficient, and the printing outfit placed in the sun. Follow directions given on the roll. A little experimenting will determine length of time for making prints. Press beneath weighted blotting paper. All our blue-prints are preserved in booklets. Van Dyke Solar paper gives a beautiful brown print with slightly more trouble in the fixing. Prints made of the small Japanese stencils of flowers, butterflies, fish, etc., are most interesting for decoration of Nature-Booklets.

The Third Grade children, studying Miss Dopp's books on Primitive Life are interested in discovering whether any flowers from their bouquet could furnish coloring matter. The use of games in connection with Nature-Study offers an almost untouched field for investigation. The sense games of some of the kindergarten song books may be used in the learning of the flower names. Flower games similar to games of Authors may be made and used in the Third Grade.

The children will enjoy simple classifying of the flowers as to color, place of growth, and manner of growth (in villages like the golden-rod, one or several flowers on a stem).

In our Third Grade, the Spring Calendar was in sections, grouped as to habitat. Each section was made on a separate sheet of manila, at the top of each a water color sketch of roadside, hill-side, field, or deep wood, the word printed beside it. In the Fall, the question, "Does the Deep-wood shelter most of our Autumn blossoms?" offers an interesting point of departure. The Spring Wild Flower Calendar should always be kept for comparative study. "Which of the flowers noted on your Spring Calendar are still in bloom?" "What new flowers did you learn to know this summer?" "One of the questions well adapted to a second or third grade is the "Party Decoration" problem, "We are going to have a party. Each room is to be in one color. If we have wild flowers, what color can we use and what flowers can we have in each room?" If anything rare appears in one class room, it must be shown to all the children. The brown thrasher killed by the telegraph wire and tenderly carried the rounds by the wee kinder-garten lad will not soon be forgotten and the bouquet of fringed gentians which little Irene brought down from the intermediate department for the primary children will not soon slip from our memories. Not all these exercises on Wild Flowers would follow in succession, other topics would demand attention, neither would any one teacher and class follow all these suggestions.

Last Spring we used as the basis for our Spring Festival, the little play of "The Enchanted Garden" in "The House of the Heart and other Plays for Children" by Constance Mackay. In this little play, the central idea is the beauty of the wild flowers and the relationship existing between them and the flowers of the garden. The recall of this play and its story leads naturally to the study of the garden flowers. A new series of lessons begins with the ques-tion, "Have these wild flowers any relations in our garden?" Our Demonstration Garden under the charge of the Science department of the Normal school is a great help in the gaining of acquaintance with the common garden plants. The children are led to feel that every thing done there is to be carefully noted. The older children in the period given to written composition kept a Spring Garden Notebook. Of course the garden gains on us in the long summer vacation and "What has happened during the summer in the garden?" is a big question which will take several days in the answering. Pictures from Flower Catalogues may be used in making charts of "Our School Garden." Individual charts of "My Garden" and "My Mother's Garden" may be made, names of flowers being written beneath the pictures. Blue-prints are valuable here, also. The gathering and careful arrangement of flowers in the rooms is most important. From the standpoint of Nature-Study as well as from that of art, children should be taught to treat plucked flowers carefully, to study their needs, to place them in bowl or vase so that they will seem to be growing.

There seems to be little excuse for giving time for a lesson on a familiar garden plant unless some new knowledge, or new appreciation of use or beauty is to come from it. Most of our lessons in the past have been so isolated, the observation so perfunctory, the interest so temporary that no further pursuit of the subject followed. How shall I work out a lesson on the Nasturtium so that the children will really study? What in the cycle of growth of this plant can children really see,—see for themselves? What questions can be asked that will help them see farther than their own unguided observations would lead them. Last spring we planted the seed ourselves all along the edge of the terrace. We saw the row of tiny green plants a few inches above the ground when we left the first week in June. We return in September to a mass of glowing, pungent flowers which lend brilliant color to our brown toned rooms till late October. The vines show buds in all stages, opening flowers, full blown blossoms of every tone of yellow and orange, decaying blossoms with half-formed seed pods and ripened seed vessels. Few plants show so well the whole life story. Shall we make a nice little lecture and deliver it, holding up a spray to illustrate each part and be sure that the children listen? Rather let us so select our material that the steps in the plant's growth can be seen and then leave the children to do the "seeing" for themselves. The Japanese say, "We all talk too much" and that is certainly true of the average Nature-Study lesson where the enthusiastic teacher does most of the learning and talking. Study with the teacher which is not the starting point for individual, unconscious intensified interest is not worth much. "What has happened to our Nasturtiums since last spring?" will bring a medley of answers. "Vines grew, flowers blossomed, seeds have come." "What happened first after we went away?" "The plants grew into vines. I know for we had some at home." What happened next? What next? Look at your spray. We will lay the sprays on the table so that we can have the whole story of the Nasturtium's growing. Whose spray must come first? Whose second? There will be necessity for much comparison and study. "Now let us have the story drawn on the blackboard. Who must draw first?"

With older children, the peculiar shape of flower, the variation in petals, the sweetness stored in the long spur, the visits of the humming bird to the flower, the beautiful markings on the largest petal leading inward to the storehouse, the curious shaped leaves with their shimmering silvery loveliness in water, the use of flowers and leaves in the home, the use of seed pods in salad, all is worth study. The ease with which this flower is cultivated makes it a particularly good one for the school or children's home garden. Our nasturtiums have never failed us. The children may be asked to find other "Life Stories" in the garden. Perhaps someone can bring the "Life Story of a Sweet Pea" from home as our school sweet peas never seem to flourish. Perhaps some "Life Histories" may be found in the vegetable garden.

One of our fall trips is a visit to the grocery store. We talk over before going the fruits and vegetables we may hope to see, the possibility of our good fortune in seeing the farmer actually deliveriing his potatoes, the fact that we may see the big truck from the Fruit Commission Warehouse, the anticipation of seeing them grind coffee at Otto's—all the pleasantly surprising though familiar things we saw a year ago. Each class has some definite question to answer, the older ones proudly recording observations on the spot, the younger ones calling on "teacher" to help them make lists. After the trip Charts on "The Grocery Store" are made in each class and vary with the enthusisam and originality of the teacher and the consequent interest of the children. One of the cleverest, because most happily adapted to the children's tastes while still accomplishing the desired result was in the form of an immense postcard folder, a picture of a resplendent grocery store on the outside, the next page, showing the vehicles in front of it, another page the family each carrying home some desired purchase, other pages the farmer with his load, pictures showing the production of the crop, the growing of the wheat, the flour mill, the baker making our cookies, all the details brought our during the trip and in class work later were reproduced upon the chart. "Explaining the chart" is a favorite way of entertaining visitors. Sometimes after our trip "The Farmer in the Fall" has been rendered in a lifelike way in a Shoebox. The sides represent the country landscape, the bottom of the box is colored to represent the ground, the farmer cut freehand from paper, his wife, his children all aid in the harvesting. Colored crayon and manila drawing paper are the only materials needed. Each child supplies his own box. The possibility of taking it home to show mother adds to the attractiveness of this form of record. Sometimes a poster emphasizes some special phase of the harvest study. "A Thanksgiving Dinner from a Mankato Garden" was the subject of a chart made by mounting pictures cut from advertisements. "Down in Grandfather's Cellar" was an interesting poster made in freehand cutting in a first grade. The cuttings were colored with crayon. Baskets of fruits and vegetables and "Store windows just before Thanksgiving" strengthen the growing realization of the working together of Man and Nature to supply our needs. "Drawing" by Fred Daniels will give much help with this work.

Here again the primitive life study leads to questions as to our natural food supplies. What wild food could the Indians find near Mankato, brings the wild grapes, the thornapples, the wild berries and hickory nuts to our mind, with another association formed. "What would the Cavewomen have found near here for baskets? Make a basket out of something you find out of doors." This suggestion brings a fantastic addition to "Our Cabinet" of baskets made by fingers skilled or clumsy, baskets made of cat-tail leaves, burrs, twigs of the wild grape vine, gourds, even of leaves cleverly pinned together. Nature-Study? Yes, for the quest of materials means out of doors searching.

A visit to Highland park, a bit of fenced in hill-top behind our building has suggested the squirrels preparation for winter and thus another line of work opens. "Who besides the squirrel prepares for winter?" "Ants do" is the answer from some small reader of "The Ants and the Grass Hopper"; so the animal preparation for winter may be the next subject for a lesson. One of our favorite projects is a booklet showing the way in which people, animals and plants provide for our long northern season of cold and snow.

The spring time with the return of the birds seems the natural time for their study, but the Audubon Bird Club will need to meet to compare notes as to summer experiences and the Bird chart must come out so that John may show Jack the yellow-headed blackbird he saw at Lake Fairmont last July. We like to look at our Spring Calendars of the Bird Arrivals also and see how many of them still linger. We note the gathering of great flocks of blackbirds. Last fall, we each contributed our penny towards a feeding trough for the use of the birds in winter.

We do not keep weather records for each day in the year as they seem to grow stale and unprofitable, but during one month in each season we keep a record of the days. In the first grade this is entirely pictorial. In the second and third grades, we have used various forms, class and individual ones.

Our fall nature work culminates in our Harvest Festival. Last year this was "The Rice Harvest in Minnesota," a part of the history work in the Second grade, a combination of pantomine, dialogue and a very satisfying Indian dance portraying the harvest activities.

The story of Ceres and Proserpine told to the children in the Literature class after the lessons on fruits, vegetables, and the preparation for winter in the Nature-Study class served as the basis for another joyous celebration of the Fruitful season of the Year.

The outline given below aims to suggest the organization of topics and their progression from grade to grade. It also suggests the adaptation to our own environment.

### First Grade

*Fall*

Main topic: Studies of the fruitful year.

I. The Joy of the Harvest.
  1. Gathering wild flowers—excursions.
     Flowers from school and home gardens.
     Use in school room.
     Special study of garden flowers suggested in spring.
  2. Autumn coloring.
     Study of box elder and maple.

II. Preparation for Winter.
  1. Food for the winter.
     A study of home grown vegetables and fruits.
     A trip to the grocery store.
  2. Animal preparation for winter.
     a. The squirrel gathering his winter store.
     b. The fish in winter quarters—aquarium studies.
     c. Rearing caterpillars.
        Crickets and grass hoppers.
  3. The seed for next year.
     a. Treasure boxes—fruits and vegetables.
     b. Seeds that fly—Nature's seed sowing.
  4. Provision for winter and spring gardens.
     a. Indoor planting of Chinese lily bulb in water.
     b. Outdoor planting of daffodil.

III. Seasonal changes.
  1. The approach of autumn—first week.
  2. The approach of winter—last week.
  3. Trip to Sibley Park.
  4. Weather records.

### Second Grade

*Fall*

I. The Joy of the Harvest.
  1. Gathering wild flowers.
     Special study of the golden-rods.
     Special study of garden flowers suggested in spring.
     Flowers from school and home gardens.
  2. Autumn coloring.
     Special study of leaves of trees on school grounds.
     Special study of elm and linden.

II. Preparation for Winter.
  1. Food for the winter.
     A study of home grown fruits and vegetables.
     A trip to a grocery store.
  2. Animal preparation for winter.
     a. Crickets and grasshoppers in autumn.
     b. The rabbit in the fall—winter quarters.
     c. Animals in Sibley Park.
     d. Fish in winter quarters.
  3. Seed for next year.
     a. Seeds from school and home gardens stored.
     b. Nature's seed sowing—seeds that steal a ride.
  4. Provision for winter and spring gardens.
     a. Indoor planting in soil and water of paper white narcissus.
     b. Outdoor planting of crocus.

III. Study of seasonal changes.
  Same as in first year.

### Third Grade

*Fall*

I. The Joy of the Harvest.
  1. Gathering wild flowers—excursions.
     Gathering flowers from home and school gardens.
     Special study of asters.
     Special study of garden flowers suggested in spring.
     Comparison of spring and fall flowers.
  2. Autumn coloring.
     a. Special study of leaves of trees growing in the home yard.
     b. Map of trees of school yard.
     c. Special study of fruit trees and oaks.

II. Preparation for Winter.
  1. Study of fruit trees grown in Mankato.
  2. Animal preparation for winter.
    a. Insect homes.
    b. Fish in winter quarters—aquarium studies.
    c. Special study of the deer in Sibley Park.
  3. Seed for next year.
    Nature's seed sowing—Seeds distributed by birds and plants' own tissues.
  4. Provision for winter and spring gardens.
    a. Raising plants from cuttings.
    b. Indoor and outdoor planting of Dutch hyacinth bulbs.

III. Study of Seasonal Changes.
  Same as grade I.

### Stories for the Autumn

For the Children's Hour—*Bailey and Lewis:* Ceres and Proserpine, page 3; The Anxious Leaf, page 120.
In the Child's World: The Crane Express, page 14; The Thrifty Squirrel, page 101.
Stories to Tell to Children—*Sara Cone Bryant:* The Country Mouse and the City Mouse, page 19; The Blackberry Bush, page 42.
First Book of Stories: Clytie, page 177; A Bag of Winds, page 189.
Aesop's Fables: The Ant and the Grasshopper.
Riverside Reader III: The Corn Story, page 176.
Kindergarten Stories and Morning Talks—*Wiltse:* Coming and Going.

### Poems for the Autumn

Three Years with the Poets—Autumn Fires, *Stevenson*, page 1; A Chill, *Rossetti*, page 20; September, *Helen Hunt*, page 41; October, *Helen Hunt*, page 93; November, *Alice Cary*, page 115; Jack Frost, *Celia Thaxter*, page 42; The Tree, *Bjornsten*, page 52; The City Mouse and the Country Mouse, page 54.
The Children's Hour—*Tappan*, Vol. 9; Autumn Among the Birds, *Thomas*, page 362; A Journey, *Josephine Peabody*, page 356.
Little Folk Lyrics—*F. D. Sherman:* The Goldenrod, page 22; Leaves at Play, page 81; Ghost Fairies, page 84; Birds Music, page 107.

# Animal Life in Prairie Ponds

T. H. Hankinson

A nature student, living in a prairie region like that over so much of Illinois and in a neighborhood where land is owned by progressive agriculturists who practise "clean farming," may have little else in the way of animal life to study than that found in such artificial habitats as corn fields, hedge rows, orchards, and farm

Fig. 1. A Prairie Pond, showing some of the surrounding cultivated region

yards. He may regret from the naturalist's standpoint, the success of drainage ditches and tile-drains and wish he could be put back to the time when the extensive marshes and sloughs covered much of the now rich, black corn land. When we read Robert Ridgway's observations* made in 1871 on the bird life of one of these pieces of wild prairie, located in Richland County, Illinois, we can make inferences concerning the abundance of forms of animal life, other than birds, that used to exist on these old prairies,

*American Naturalist, volume 7, 1873, pages 197-203 and we realize, to some extent, what wonderful places for the field biologist they must have been. In a short time and in a restricted area, Mr. Ridgway recorded ninety-five species of birds, including a number now absent or very scarce on Illinois prairies but then apparently common. Some of these are: black tern, kites of three species, ravens, yellow-headed blackbirds, and marsh wrens.

It is lamentable that so few naturalists wrote as Mr. Ridgway did, of the life of these undisturbed prairies, and little information

Fig. 2. A Prairie Pond in Winter

has been preserved in zoological literature concerning this important stage in the history of our prairie life, when marsh and swamp animals thrived in such large numbers there. We still have an opportunity to find out something of the smaller animals, at least, that used to live in these prairie ponds and marshes, for man's extensive drainage systems have not been successful to the last degree; and here and there, over some parts of the Illinois prairie, in low places, there are small ponds or marshes that are remnants of the old prairie sloughs with thick, rank vegetation, resembling, in all probability, that which used to prevail in these places before they were reclaimed. Such a variety of organisms live in these ponds, compared with those in the dry, level, monotonous surrounding country, that the discovery of one of these habitats by a prairie naturalist, gives him a pleasure that must be something like that of a desert traveller on finding an oasis.

In the prairie region just north of Charleston, Illinois, there are a few of these ponds. The largest covers three or four acres. The vegetation is abundant in them and has the usual zonal arrangement found in ponds. Some cottonwoods grow in the center in all

FIG. 3. Portion of a Prairie Pond, showing details of the Grass Zone

cases. Around these, is a more or less complete zone of willows, and then comes a region of marsh plants, which is only well-developed in the larger ponds, where it almost completely surrounds the willow growth. A thick, triangled-stemed, and flat-leaved rush (*Scirpus robustus*) is the chief plant here; but associated with it are some sedges and smartweeds and a few other plants, that thrive when partly submerged. A broad, distinct, zone of low herbs, chiefly grass, adjoins this and forms the outermost region of the pond. Patches of low button bushes (*Cephalanthus*) help to form a border in a few cases. In the early spring, water stands over most of the region, and it is ordinarily shallow enough and over a sufficiently firm bottom-soil, so that wading can be done easily with ordinary rubber boots. During ordinary seasons, the water dries off completely in summer, and it is probably exceptional for the ponds to contain water for the entire year, so they are temporary in character.

Aquatic insects, adults and larvæ, form a conspicuous part of the animal life of the ponds. Especially noticeable forms are, dragon-flies, damsel-flies, water-striders, whirl-i-gig beetles, back-swimmers, water-boatmen, diving-beetles, and water-scavenger beetles.

Fig. 4. Prairie Pond in Summer, showing Zones of Vegetation

Crustaceans are represented by many crayfish and large numbers of entomostracans, including big, red copepods, an eighth of an inch or more in length, that swarm by the thousands in the water during the early spring. Mollusks are prominent; a large *Lymnæa* with a long, spiral shell, some inch and a half in length, is the most noticeable form. Besides this there are many individuals of *Physa* and *Planorbis*. Some leeches and sponges have been found in the ponds by the writer as well as a few other of the larger invertebrates.

Not many kinds of aquatic vertebrates are present in these ponds. No fish have been found due chiefly to the temporary nature of these bodies of water and to the fact that they are not connected with any stream systems. Tadpoles of at least three species of amphibians become very abundant and conspicuous in late spring and early summer. These come from the eggs of the common toad, the leopard frog, and the swamp tree frog, *Chorophilus nigritus*. The eggs of all of these are laid in early spring. Those of the swamp tree frog are by far the most numerous. These eggs are found in large numbers and are very generally dis-

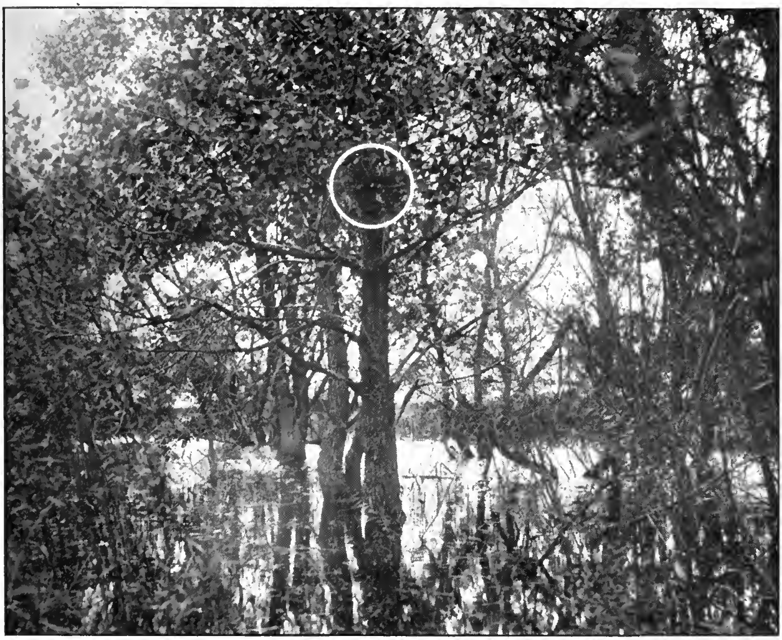


FIG. 5. Interior of the Cottonwood Region. The ink circle surrounds the green heron's nest

tributed through the pond, and they are readily identified by the small size of the gelatinous masses, which are near two inches in length by perhaps an inch in thickness. They are attached to slender submerged sedge and rush leaves. Two turtles have been found in the largest one of these ponds, a huge snapping turtle and a Blanding's turtle.

These ponds are favorite resorts of a number of kinds of birds. In spring and summer, red-winged blackbirds are universally present in conspicuous numbers. The males come in March, and their songs, mingled with those of the swamp tree frogs, form a chorus very characteristic of one of these uncultivated prairie areas. The female red-wings arrive in late April or early May, and nesting soon begins. On May 27, 1912, the writer found ten occupied nests of these birds in a short time; nine of them were in the buttonbushes, and only one was in the rush region. This latter is shown in figure 8. The nests were from one to five feet above the ground or water surface, but most of them were near two feet up. All contained eggs, varying in number from one to four; one had,

Fig. 6. Green Heron's Nest. Size: about eighteen inches in diameter. Its situation shown in figure 5

in addition to an egg, two just-hatched young birds. A bronzed grackle's nest, about seven feet up in one of the willows of the willow zone, was also found on May 27, 1912. It contained two young birds ready to fly. On this date, nine feet up in one of the cottonwood trees at the center of the pond, was found a green heron's nest with three blue eggs in a shabby nest, typical of that made by the species. Figures 5 and 6 show this nest and the nesting habitat. Rails are frequently seen about these ponds. Three species have been noted in them by the writer, Carolina rail, king rail, and Virginia rail. On April 23, 1911, an American bittern flew up from the grass region. On April 16, 1913, a flock of pectoral sandpipers were feeding in the field close to the pond margin. Upland plovers also frequent such places in early spring as well as killdeers. Other birds that have been recorded in or close to these ponds, undoubtedly attracted by them, are mourning doves, marsh hawks, Cooper's hawks, flickers, rusty blackbirds, song sparrows, tree sparrows, juncoes, Maryland yellow-throats, and bluebirds. A number of other species of birds undoubtedly

FIG. 7. Prairie Pond, showing details of the marsh zone in early spring

visit or dwell at these ponds or small marshes, that have not been noted by the writer. Farmers say that wild ducks and even wild geese alight in them in spring and fall, when plenty of water is present there.

This brief and incomplete account of the animals of some prairie ponds, based on observations made during the last few years on a number of trips taken to them, separated by rather long and irregular time intervals, may be of some use to nature-study teachers. Places of the type described may be looked for. Not only should they be used as objective points for field trips with classes and sources of objects for aquaria and class room exercises, but as many facts as possible should be obtained concerning their life and these permanently recorded, for, judging from the way their wood is being cut out and their grass being burned and from the efforts that are being made to drain them by farmers, it looks as if even these small remnants of the old prairie ponds and marshes will soon be effaced and we will lose this last chance to learn a little something concerning the primitive life of this large and biologically unique part of the country, the prairie region.

FIG. 8. Redwinged Blackbird's Nest attached to rushes, *Scirpus robustus*

# *School Gardening in the South with Suggestions for the Fall and Winter Period

By E. A. Miller

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## *Value and Purposes.*

It is unnecessary to advance reasons in this paper favoring school gardens. The movement has long since passed the point at which there is any question as to the value of garden work for school children. Practically all the friends of the movement are agreed that its real purpose is educative in a broad sense. The student who has the privilege of an extensive school garden experience profits, first, from the vitalizing influence that such work has upon the regular subjects of the school course; next, from the productive impulses set in motion within him by seeing the work of his hands develop; in the third place, from the esthetic stimulation which he receives by coming in contact with the beauties of nature; also, from the spirit of co-operation engendered within him as a result of his laboring with his fellows for a common purpose; and last, but by no means least, from the sense of resourcefulness he feels growing out of the possession of a product all of his own or the proceeds of its sale.

A second purpose of garden work is to connect the home and the school. It is only necessary to remark in passing, that too long a great loss has been sustained on account of the lack of co-operation between these two vital forces in the life of the child. A means that promises to bring the home and the school together in a closer sympathy and understanding can not fail to commend itself to thoughtful people.

Another point upon which most people are agreed is that the school garden has a value from the economic point of view. While the pupil derives no considerable profit from his garden, the sense of ownership develops within him a bud of pride and independence possible of flowering and fruiting into a strong, self-reliant spirit.

## *A Continuous Factor of School Work.*

In the light of what has just been said, I take the position that the garden work should be a continuous factor in the work of the

*Paper read at meeting of School Garden Association of America, Atlanta, Ga., Dec. 31, 1913.

school year. The garden should mean infinitely more to the school than the interest that attends an incidental crop. What value, measured by any standard, is a plat of ground upon which a few vegetables are grown during one season while for the remainder of the year it is abandoned to the weeds.

### *Crops by Seasons.*

The attention given a garden at any one season of the year depends very largely upon two things; namely, what crops have been grown on the ground the previous season, and what the conditions will permit to be done during the season in question. Of course, in addition to these might be mentioned overlapping work such as gathering the crops of the preceding season, and making preparation for the succeeding crops.

In the case of school gardening the vacation season is a very potent factor in determining the succession and companion crops of the year. For reasons previously advanced there should be, without question, vacation crops. Of course they should be of such a character as to demand a minimum of attention and be least subject to any unfavorable conditions of environment that are likely to arise during the summer months. Their time of seeding, period of growth and date of maturing should be such as to make it possible to connect them up with the school work. In other words, vacation crops should be planted just before the close of school in the spring and should mature just in time to be gathered by pupils after school opens in the fall. The question naturally arises, how can the garden be kept economically busy during the months from September to May? To meet the needs of the school and to conform to Southern climatic conditions fall and winter crops should be planted that can be removed by the latter part of February at the latest, and early spring vegetables be grown that can be disposed of in time to prepare the ground for planting vacation crops in May.

### *The Fall and Winter Period.*

It is the purpose of what follows to suggest some possibilities for the fall and winter period. Under the head of outdoor work fall, growing crops in the open, in hot beds and in cold frames; starting early spring vegetables in hot beds, hardening off the more delicate ones in cold frames, and planting in the open the very hardy early spring vegetables and flowers; keeping the unoccupied soil, if any, in condition to receive the benefit of weathering agencies; preparing and seeding lawns, and transplanting and pruning shrubbery. The indoor work consists in caring for window plants, testing the vitality of seed for spring planting, experimenting with seeds to determine the depth at which they should be planted and with fertilizers to ascertain the needs of the garden soil to feed properly the different kinds of crops. Thus, it is evident that there is abundant work to do if the school interest is kept up, and that it must be done if the work of the succeeding period is to be successful.

*Particular Suggestions.*

It is manifestly impossible in a paper of this character to prescribe methods of practice in outdoor gardening in the winter for the entire Southern States. The kinds of plants to be grown, the time of planting, the particular varieties, will vary with the climate, the soil, the needs, and the practice of each particular section. It is sufficient to say, however, that there is no place in the Southern States where some outdoor gardening may not be done in winter. During the fall months after the vacation crops have been removed and the ground thoroughly prepared and fertilized attention may be given to the setting of violets and narcissus bulbs, and to the planting of fall onions, turnips, winter radishes, spinach, lettuce, and endive. In some sections it will be safe to sow cabbage seed in open garden for early spring sets. Sweet peas may also be sown in deep drill. (Fall planted sweet peas will bloom at least a month earlier than spring planted). Plats of small grain, crimson clover, vetch, etc., may be planted if land is plentiful or if it is not desirable to risk some of the other plants. Keep this constantly in mind, that to be an educative factor there must be work going on in the garden all the time. The physical changes taking place in unoccupied soil due to weathering agencies are important and need to be brought to the attention of the pupils as forcibly as possible. Such observations properly directed provide valuable instruction. Even with those plants which are too delicate to stand the coldest Southern winter weather outdoor work may be done by using hotbeds and cold frames. These can be made by the students and at very little expense. Their value in affording opportunity for outdoor work will certainly justify any ordinary expenditure incurred in construction.

The window boxes and pots already referred to supply another means of growing winter plants and starting others for early spring transplanting as well as for experimental purposes. It should be borne in mind and impressed upon the pupils that these devices contain a small part of the garden soil transferred to an environment more favorable to the successful growing of plants. The opportunity is here given to teach valuable lessons in connection with supplying to the plants favorable artificial conditions.

*Policy of the Agricultural Education Service.*

The speaker is authorized to say that the Agricultural Education Service of the United States Department of Agriculture recognizes the school garden work as a most potent factor in elementary education. Taking this view its policy has been to encourage the work in any way possible within the scope of the Service. Publications have been issued, lantern slides have been collected, and lectures have been outlined relating to the subject. The supply of slides is being increased continually. Friends of the school garden movement will confer a favor upon the Agricultural Education Service and the public, by furnishing the office with any striking photographs of garden scenes that may come into their possession. Slides with lecture outlines are loaned to school authorities without cost excepting transportation to and from Washington. This Service stands ready at all times to co-operate with State and college authorities in collecting and publishing information that will be of profit to the school garden movement.

## PLANTING TABLE

### Yearly Succession of Crops for School and Home Gardening in the Southern States

*Fall and Winter Crops—September to February 15*

| Kind of Vegetable | Distance for Plants to Stand | | Depth of Planting | Time of Planting | Seeds or Plants per 100 ft. of row | Ready for use after Planting |
|---|---|---|---|---|---|---|
| | Between Rows | Between Plants | | | | |
| Onions | 1 to 3 ft. | 3 to 5 in. | 1 to 1½ in. | Sept.–Oct. | Seed—1 oz. Sets—1 qt. | 90 to 130 days |
| Turnips | 2 to 3 ft. | 3 to 4 in. | ½ in. | Aug.–Sept. | ½ oz. | 60 to 80 days |
| Carrots | 1½ to 3 ft. | 3 to 4 in. | ½ in. | Aug.–Sept. | 1 oz. | 75 to 100 days |
| Lettuce | 1½ to 2½ ft. | 4 to 6 in. | ½ in. | Sept.–Oct. | ½ oz. | 60 to 90 days |
| Radishes | 1½ to 3 ft. | 2 to 3 in. | ½ in. | Sept.–Oct. | 1 oz. | 20 to 40 days |
| Spinach | 1½ to 3 ft. | 2 to 4 in. | ½ in. | Sept.–Oct. | 1 oz. | 30 to 60 days |

*Early Spring—February 15 to May 15*

| | | | | | | |
|---|---|---|---|---|---|---|
| Onions (sets) | ½ to 3 ft. | 3 to 6 in. | ½ to 1½ in. | Feb. | 1 qt. | 60 to 90 days |
| Lettuce | 1½ to 2½ ft. | 4 to 6 in. | ½ in. | Feb. | ½ oz. | 60 to 90 days |
| Turnips | 2 to 3 ft. | 3 to 4 in. | ½ in. | Feb.–Mar. | ½ oz. | 60 to 80 days |
| Radishes | 1½ to 3 ft. | 2 to 3 in. | ½ in. | Feb.–Mar. | 1 oz. | 20 to 40 days |
| Spinach | 1½ to 3 ft. | 2 to 4 in. | ½ in. | Feb.–Mar. | 1 oz. | 30 to 60 days |
| Carrots | 1½ to 3 ft. | 3 to 4 in. | ½ in. | Feb.–Mar. | 1 oz. | 75 to 100 days |
| English Peas | 2 to 3 ft. | 3 to 6 in. | 2 in. | Feb.–Mar. | ½ pint | 50 to 80 days |

*Vacation Period—May 15 to September*

| | | | | | | |
|---|---|---|---|---|---|---|
| Onions | 1 to 3 ft. | 3 to 6 in. | 1 to 1½ in. | May | Seed—1 oz. Sets—1 qt | 90 to 130 days |
| Cabbage | 2½ to 3 ft. | 2 to 2½ ft. | 2½ in. | May–June | ¼ oz. | 90 to 130 days |
| Pepper | 2½ to 3 ft. | 1 to 1½ ft. | ½ in. | May–June | ⅛ oz. | 100 to 140 days |
| Irish Potatoes | 2½ to 3 ft. | 1 to 1½ ft. | 2 to 3 in. | May | 5 to 6 lbs. | 80 to 140 days |
| Pumpkins | 6 to 8 ft. | 6 to 8 ft. | 1 to 1½ in. | May | ½ oz. | 100 to 140 days |
| Tomatoes | 3 to 4 ft. | 2½ to 3 ft. | ¼ to ½ in. | May | ⅛ oz. | 100 to 140 days |
| Beets | 2 to 3 ft. | 3 to 5 in. | ½ to 1 in. | May | 2 oz. | 60 to 80 days |
| Parsnips | 2 to 3 ft. | 3 to 4 in. | ½ in. | May | ½ oz. | 125 days |

## Editorial

The Report of the United States Commissioner of Education which appeared this last summer does not throw any light directly upon the situation in Nature-Study. Indirectly, however, there are some interesting inferences to be drawn. There is no tabulation of the distribution of students in the various subjects in the grades, and the distribution of students in the high school is no longer shown in the various subjects as it was in 1909–10. In this last year 91.99% of the high school students were enrolled in science. That undoubtedly means that many students were taking two or more sciences, so that not only 8% graduated without any science, but probably a larger percentage. It is practically impossible to make a comparison of this last report with preceding years because many of the sciences like zoology, botany, and agriculture are not reported until 1909–10. There is a decided increase in the number of students in the courses in agriculture in the high school, rising from 22,230 in 1910–11 to 29,825 in 1912–13. The enrollment in scientific courses during the same two years has risen from 35,370 to 41,614. This seems to indicate continued interest in science, and when we recognize that a larger number of pupils in the high school are taking the agricultural courses, the domestic science courses, we recognize that in the high school at least there is a decided drift toward the use of useful materials in nature work. What is true of the high schools seems equally true in the grades so far as can be judged by observations in the schools with which the editor is familiar. The multiplication of text books in agriculture avowedly for the work in the grades, and the increasing interest in school gardens and domestic science shows the continued interest of pupils and teachers in scientific materials, and at the same time a tendency to deal with subject matter that is useful. The wise teacher of Nature-Study will try to incorporate into her nature work as much material as possible that is related to the practical projects of the community. On the other hand, we must see to it that we are not misled by the use of such commercial materials. It is very easy to become so engrossed with the commercial aspects that we neglect emphasis on the training in the scientific method of thinking, which, after all, is the most important thing commercially as well as educationally. There is no reason why we should not utilize useful materials in education in place of the useless. It is worthwhile recognizing too that education is accomplished quite as efficiently through doing things as it is through studying things. The motor areas of the brain are quite as essential as foundation for its higher activities as are the sensory areas. The activity of the garden, or the shop, or the kitchen, is quite as educative as the reading lesson, or the arithmetic lesson. In fact in early childhood the sensory training and the motoractivities are the things that need to be emphasized because it is during the period of childhood that these brain areas must be developed if ever they are going to achieve their maximum of efficiency.

## Book Reviews

*The Hygiene of the School Child*, Lewis M. Terman. p. xvii + 417. Houghton Miflin Co. $1.65.

This book is one that calls for superlatives. It hardly seems possible to crowd so much well selected information into such brief compass. The opening chapters on "The Physical Basis of Education," "The General Laws of Growth" and "The Factors Influencing Growth" should be read and reread by every teacher and parent. There are chapters on Disorders of Growth, Malnutrition, Tuberculosis, Ventilation, Teeth, Nose and Throat, Hearing, Vision, Voice, Sleep and Preventative Mental Hygiene. One of the best features of the book is the bibliography appended to each chapter. The author is evidently conversant with his materials and writes in a forceful style. The book is novel in its utilization of extensive statistical tabulations for instruction in hygiene.

*School Hygiene*, by Fletcher D. Dresslar, pp. 369; The Macmillan Co. Price $1.25.

Mr. Dresslar is a specialist in school hygiene and school sanitation of the United States Bureau of Education. As such he is in touch with all the movements that aim to improve the sanitary conditions of the school throughout the country and for that matter throughout the world.

Chapters on Playgrounds, School Baths, Humidity of the School Room, Stuttering, Fatigue, Medical Inspection, Qualifications and Duties of a School Janitor, make it apparent that here is a lot of unusual reading matter and that at least the experts in school management are awake to new responsibilities and new opportunities. We have long since been accustomed to examinations for teachers and prescribed reading courses. What community will be the first to insist on both examinations for members of the School Board and prescribed reading courses for them? To this progressive community this book is recommended as one of the best for the reading course. Such chapters as the chapter on Fatigue and the Hygiene of Instruction are chapters that every teacher should be familiar with as well as the content of the bibliography to be found at the end of these chapters.

*Materials and Methods in High School Agriculture*, William G. Hummell and Bertha R. Hummell. pp. xi + 385.

This is a somewhat new type of book. It is not a text-book on agriculture so much as it is a discussion of methods and materials to be used in the teaching. It is, therefore, a book for the teacher rather than for the pupil, and high school teachers in agriculture as well as others who are interested in the teaching of agriculture will welcome this book as a source of information regarding what is being done in various parts of the country. Chapter I is historical; Chapter II discusses the reasons for introducing agriculture; Chapter IV is an interesting one on the teaching methods to be employed; Chapter V is on the equipment. Then follow chapters on the first year work, animal husbandry, dairy work, the high school poultry course, and horticulture. Chapter XII is on the school farm. The very title of the chapter suggests the advance we are making in methods of teaching agriculture; Chapter XIII is on the teacher. Every one who is teaching agriculture will need this book as a means of keeping up-to-date in the pedagogy of the subject.

*Sixty Lessons in Agriculture*, Buffum and Deaver, pp. 268; The American Book Co.

The authors state in the preface that this book is intended for the 6th, 7th, and 8th grades. The book is simply written; is so simple and so brief in fact that it is questionable whether there is much of anything in it that a boy in a rural community does not know. There are some practical exercises at the close of many chapters that are suggestive, and the reference to the various bulletins of the United States Department of Agriculture and State Agriculture Departments will help the children to get in touch with interesting material. If the book were used pretty largely as a reader, and in the hands of a teacher who could supplement it by a good deal of outside work, it would serve as a basis for some interesting school exercises in agriculture. Without such supplementary work it would not seem to be as stimulating a book as some of the other agricultural texts.

*Elementary Agriculture*, by William L. Nida, pp. vi+238–CLXIX; A. Flanagan & Co. Price $1.00.

Students' Edition of the same; 228 pp. Price $.60.

The two books are alike except that the second part of the teachers' edition contains 147 pages of questions and answers. The book opens with a series of chapters on the animals found on and about the farm. Part II deals with soil, its tillage, and the various farm crops. There are some suggestive chapters also on the farm garden, country roads, and farm sanitation. This is another one of the numerous books on elementary agriculture that continue to appear. It is simply written, well illustrated, but has nothing especially to mark it as an advance over the others that have already been published. Perhaps the thousand questions on agriculture and answers that are given may be of help to the teacher who lacks initiative, but it hardly seems worthwhile loading a book with such a catechism; the student's edition seems quite as serviceable as the teacher's edition.

*Manual of Experimental Botany*, by Frank O. Payne; pp. 272; The American Book Co. Price $.75.

If this were designated "A Laboratory Manual in Botany" the title would more clearly indicate the content. It is true that the approach of the book is through a study of the activity of plants, yet as one runs through the pages there are recognized many of the experiments that have been commonplace in botany texts for years. And a large part of the book is given over to morphological studies. It is to be recommended, however, as a very good guide for laboratory work in botany. And any student who does the work suggested will have a very fair idea of the activity of plants, and the physiological processes that underlie intelligent agricultural procedure.

*The Chemistry of Plant and Animal Life*, by Harry Snyder, pp. xxii+388; The Macmillan Co., $1.50.

This is intended as an introductory book in agricultural chemistry and such a title would be more apt than the one the book possesses, for the purchaser is at first hopeful that he is going to get a clear statement of the latest information regarding the chemical composition of the organic substances. There is no attempt, however, to do more than give the well known reactions and formulas of some of the simpler organic compounds. And then there follows a simple discussion of the organic compounds found in plants, their values as foods, and a couple of chapters on the feeding of animals. The book is clearly written and will serve admirably as a text in elementary agricultural chemistry, especially if the student realizes beforehand that there is a great deal of the chemistry of both animals and plants that is still unknown.

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# NATURE-STUDY REVIEW

Devoted Primarily to all Scientific Studies of Nature
in Elementary Schools



Vol. 10 No. 7
Whole No. 85

OFFICIAL ORGAN OF THE
AMERICAN
NATURE STUDY
SOCIETY

OCTOBER
1914

CONTENTS

Elementary Science Course in Normal School. Ora May Carrol 253
The Mourning Doves.......... 260
Sarah V. Prueser
Los Angeles Nature-Study Exhibition. Charles Lincoln Edwards. 263
Elementary Agriculture ........ 271
A. W. Nolan
Should School Gardens be Made to Show Financial Gains? .... 273
E. S. Sell
School Gardening in Portland, Oregon. Alice V. Joyce ....... 275
Some Experiments for the Garden 281
J. W. Emery
Editorial (Signed) ............ 287
Anna Botsford Comstock
Book Reviews ................ 289

Published Monthly except June, July and August at Ithaca, N. Y.

$1.00
a VOLUME
(9 Nos.)

Elliot R. Downing, Editor
The University of Chicago The School of Education
Chicago, Ill.

15
Cents
copy

Entered as second-class matter at the Postoffice at Ithaca, N. Y., under the Act of March 3, 1879.

# THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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VOL. 10 | OCTOBER, 1914 | NO. 7

## Elementary Science Courses

ORA MAY CARROL

### *A. In Normal Schools*

A survey of courses in elementary science in Normal Schools shows that little has been done to increase the content or length of such courses since 1903–1908. During this period many normals introduced a nature-study course. These courses varied in different schools according to the length of the term and included four or five recitations each week for twelve weeks, two recitations each week for twenty weeks or one recitation each week for forty weeks according to the arrangement of courses in the respective schools. In a limited number of normals there has been an advanced course of the same length offered for students who wish to continue this line of study. Courses in elementary agriculture have been organized in some normals which offer a second term that may partake of the essentials of nature-study but generally its nature is restricted to interests of the farm, rather than to elementary nature-study.[1]

In most normals there has been little change in the content of the nature-study course since its introduction nearly a decade ago. Teachers have been placed in charge of such courses who have attained high scholarship in biological study and many of them are eminently fitted for carrying on such teaching. As a result, however, of the large store of material and the briefness of the course, instructors and committees in charge of courses of study seem to have overlooked the fact that many normal students have

[1]The data collected has been mainly concerning Normal schools in the Middle West.

had little or no previous instruction along these lines of study, therefore the student lacking a suitable foundation, is unable to retain sufficient knowledge of the many subjects covered to become proficient as an instructor in such courses.

There has been little change in the attitude of school officers toward the place of nature-study in the schools during this same period, hence, no demand has been made for better courses.

Many city normal schools offer a course in nature-study. Teachers in these schools find the results of such courses a disappointment because in cities where these courses are given there is no systematic nature-study course in the public schools and therefore only a few teachers will carry on the work in actual practice.

We wish to quote from the reports of educators who are familiar with the situation regarding the preparation of teachers.

B. O. Moore, a county superintendent in Illinois, replying to a question regarding the situation in nature-study, in 1908, said, "Teachers generally are not well prepared for the work, either from the standpoint of knowledge or method. The present trend is for the teaching of these things, and the needs are for prepared teachers and some good nature-study courses that will outline good material, not all to be done, which shall be general and pedagogical in nature."

In June, 1908, a paper on *The Training of Teachers of Nature-Study,* by M. A. Bigelow, was written and presented at a conference of the American Nature-Study Society, Cleveland, Ohio. The following points with which his paper was concerned indicated the direct problems before leaders of the nature-study movement at that time.

It is obvious that for the A. N. S. S. there is a three-fold work:

(1) In securing more general agreement and understanding of nature-study ideals, principles, methods and materials.

(2) In determining how teachers of nature-study should be prepared.

(3) In working for increased attention to nature-study by those in charge of training schools for teachers.

The first point considered by Professor Bigelow has practically been accomplished. Nature-study outlines and books on nature-study have been written, there is already an agreement of the most fundamental elements in a nature-study course and character of the material to be used, and excellent methods have been tested in leading training schools. The third point has partly been accomplished, for some training schools for teachers have competent instructors in charge, excellent courses have been arranged and it is from such schools that the progressive movement is reaching into the elementary schools. There is an opportunity for extending this spirit of investigation and demonstration into many more training schools. The second point in the outline, however, appears to be no nearer solution today than it was nearly five years ago. Only a brief course is being offered to elementary teachers and the same lack of adequate preparation for teaching nature-study, is felt by teachers who take these courses.

In this article we refer only to the two year courses offered at most normals, this being the time usually required in preparation for elementary grade teaching.

Nature-study appears only as an elective in the course of study in several state normals.[1] Courses in nature-study, biological science and agriculture in our leading normals have not been considered of greater importance than any one of the common subjects in our schools and only in a limited number of schools does this subject rank equally with these ten or twelve subjects. We have referred to subjects as common which have been studied by pupils throughout their school course, in all grades from the first grade to the eighth, most of which are continued to the twelfth, (reading, arithmetic, grammar, geography, music, drawing, history, literature, spelling, writing, physiology, manual training, etc.).

In normals where nature-study ranks equally with other regular school subjects a nature-study course is required consisting of one unit of study. In some states where the normal school has become an institution of college grade and where courses are offered in advanced study we find that the two year courses for elementary teachers has advanced farther in the appreciation of the real value of nature-study in the course, i. e., (in Iowa Teachers' College the student is allowed a wider choice of electives during the first two years. At the Nebraska Teachers' College, Kearney, Neb., a five hour course in biology is required and other similar courses may be taken as elective during the first two years. Ohio State Normal at Miami University requires six hours of biology; the Northern Illinois State Normal at DeKalb requires twelve hours with oppor-

[1]Michigan, Wisconsin and Indiana.

tunity for more electives. Other Normals in Ohio and Illinois offer similar courses to the above. Columbia University, N. Y., Chicago University, Ill., Cornell Agricultural College, N. Y., and Hampton University, Va., each offer two year normal courses for teachers and have offered special courses in nature-study).

In most normals, however, the course given in nature-study is an elective and should a student choose to omit the course some other subject may be substituted. We find that other biological courses are placed in the same class and as these subjects are also elective in many high schools, it is possible for a student to complete courses in both high school and normal without having taken any subject under the head of nature-study.

Most of the common subjects required in a normal course have been required in high school so that the student is better prepared to teach these subjects than she would be to teach nature-study, even though she chooses to take the latter course at the normal. Added to this disadvantage, most students know surprisingly little about any subject introduced into the nature-study course, because common forms of interest in out of door subjects were not systematically taught when these students were in elementary schools. As a result of previous training, most students must be introduced to the many phases or groups of study coming under the head of nature-study. Such groups usually include trees, plants, gardening, insects, birds, pets, domestic animals, wild animals, and physical phenomena; these subjects being subdivided into seasonal aspects relating to autumn, winter, spring and summer and again rearranged for an outline by grades. Let us review briefly some of the points included under two of these subjects. In the subjects of plants and gardening, students must learn to identify a large number of wild flowers, common weeds, garden plants, make an herbarium of one or more of these groups, study germination of seeds, propagation of plants, study different kinds of soil, best methods of planting, what to plant, how to lay out gardens and the care of gardens.

The hopelessness of teaching such a variety of new subjects in a brief course is apparent. Nature-study is a subject which most teachers enjoy but it is because of the meagerness of the course and the feeling of inability to grasp the essential principles from such a limitless field that teachers avoid the course or care little about adding it to their other subjects when in the school room. The lack of knowledge of normal students regarding the most elementary of common nature forms is astonishing. An instructor in one of our normals has made a careful record of students entering his classes for a number of years and he reports that the average high school pupil coming into his classes knows about eight birds, eight trees and eight insects.

With this meager training given in normal schools teachers are expected to go into schools and teach nature-study. Some teachers do teach nature-study very satisfactorily regardless of the unimportant place it holds in most courses of study. If an outline for this course is available it is generally indefinite and very little attention paid to carrying it through the grades. Each teacher may teach nature-study if she chooses; if she does not wish to do so she may use her time allotted to that subject in some other way.

There is little satisfaction for a teacher to spend time in preparing a lesson which has no definite place in the curriculum and for which she feels absolute lack of preparation. The largeness of content of a nature-study course makes a short period of study of little value to a teacher who has had no other means of learning subjects included in the course. Since the content of the course is so varied and the field so large the subject can never be satisfactorily taught until more time is allowed for nature-study in courses offered to teachers.

"No one can be a successful teacher of nature-study without a genuine enthusiasm for the subject as no one without a passion for the works of great authors can accomplish the best results in the teaching of literature."—*Hough.*

"The teacher should forage widely and incessantly and bring everything within reach in his field to his class."[1]—*G. Stanley Hall.*

### *B. In Agricultural Colleges and Universities*

Perhaps no other department in education has made more progress in the last decade than the department of agricultural education. This department is closely associated with the progressive nature-study movement and in many agricultural colleges courses in agriculture are offered for high school teachers. Something of the extent of this work is shown in the report of the U. S Department of Agriculture for the year of 1906, by Dick J. Crosby.

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[1]Hall's Adolescence.

"In 1906 agricultural colleges were in operation in all states and territories except Alaska, Hawaii and Porto Rico." The report also names several agricultural colleges which opened departments of education during that year. These departments were established for the purpose of promoting agricultural instruction in the elementary grades. Several of these colleges offered two year normal courses for teachers and also maintained summer schools for teachers.

Relating to the teaching of elementary agriculture the report states "The laws of over thirty states now permit or require the teaching of agriculture in the public schools. These laws were accompanied with provision making agriculture one of the subjects on which teachers may or must be examined."

"At a round-table discussion on agricultural education held during an afternoon and evening in Feb., 1906, by the Department of Superintendents of the N. E. A. held at Louisville, Kentucky, it was generally agreed that agricultural study in some form be introduced into the public schools and that this might be efficiently done, opportunity should be afforded teachers to receive instruction in agriculture in normal schools."

Since 1906 agricultural education has been steadily progressing and courses are now offered for teachers in township and rural high schools, for teachers of agricultural courses in high schools, and for rural school teachers. The promoters of agricultural education in elementary schools included nature-study in their plans, as a necessary preparation for courses which should have a place in the upper grades.

The nature-study phase of agriculture, or courses adapted to elementary grades has been neglected altho the promoters did not intend that this condition should prevail. The laws of many states required teaching of agriculture in the elementary schools, and in several Agricultural Colleges courses arranged primarily for nature-study have developed into courses for elementary agriculture. When state laws made the teaching of agriculture compulsory, teachers were required to prepare for an examination in that subject. This condition created a demand for courses in elementary agriculture. Some teachers however, have reviewed a text book, successfully passed an examination and are now teaching elementary agriculture, who have not studied in any school after graduation from high school and who had never taken a biological course in high school.

The Agricultural College at Cornell University and the Agricultural College at Hampton, Virginia, have promoted nature-study, and offered courses for elementary teachers, continuously for the past ten years. Only a few agricultural colleges have recently offered courses in nature-study for teachers.

Teachers' College at Columbia and The School of Education of Chicago University have been actively promoting nature-study work for several years. Several courses are offered in these schools for teachers wishing to take special work in nature-study, and the nature-study courses conducted in the training schools are under the direction of leaders in the nature-study movement.

In the summer of 1912 Miami State Normal, Miami University offered a course in elementary science for elementary teachers which partook largely of the nature-study ideas. The above course required the students' full time. Miami Normal also offers a two year agricultural course arranged for superintendents, principals and science teachers in rural schools, which requires about one-third of the entire course in biological subjects. The Teachers College, De Kalb, Ill., offers a third year normal course for specialization along any one of several branches; the whole time of the third year may be devoted to science.

Biology stations are conducted by several state universities and offer courses during the summer which are excellent courses for nature-study teachers. These, however, are planned primarily for regular courses in biology as taught in high schools and colleges.

Similar to these, are many helpful courses given in most colleges, teachers colleges, agricultural colleges and universities, which are arranged for instruction and preparation of teachers in secondary schools, all such courses requiring four years for completion. Most of these schools offer teachers' courses from two to four years in length, but except where there is a Teachers' College or School of Education no systematic courses in science are planned for teachers below high school.

In a report on courses offered in summer schools during the summer of 1911, including normals, universities, private schools, etc., we note that biology has a prominent place in the list of subjects, the subject being offered in different forms in most schools. In many of these schools, offering several biology courses, nature-study or gardening was not given; therefore, we find that courses are not prepared especially for grade teachers and consequently the number of grade teachers entering these courses, which offer work of college grade and prepare especially for teaching in high schools, is small. The teacher in elementary grades could select courses in these schools from subjects best adapted to elementary grades and arrange such material to meet the needs of elementary courses.

We must look to our neighboring country to see the progress in nature-study that we wish to see and to find a school which is conducted primarily for the interests of science courses for the elementary teachers and the elementary school.

At the Ontario Agricultural College, Guelph, Ontario, courses are offered which make it possible for a teacher to gain considerable nature knowledge during a course of one or two terms of study. During this period all subjects taken, deal directly with nature-study, including garden, field, laboratory and class-room work, thus giving teachers an opportunity to become thoroughly informed in several phases of elementary nature-study.

## The Mourning Doves

SARAH V. PRUESER

It is not always in April that you hear the sad love-song of the mourning or turtle dove. It may be on a clouded June morning that the pensive cooing disturbs your merriest mood; or on a dark day in August, when an east wind predicts a three-day drizzle that its cooing seems somewhat melancholy. The mourning dove arrives early in the spring, usually April 1–15, and remains late in the fall. Its song, a rather sad "coo-oo, coo-oo" is heard throughout the summer season.

On April 20th, I found a mourning dove's nest in the lowest branch of a yellow pine, not more than nine feet from the ground. Had not my walking under the tree disturbed the mother bird, causing her to fly from the nest, I should not have suspected that the few dry twigs and sticks laying criss-cross on the branch, were a bird's nest. The colors of the bird and nest were so like that of the twigs and needles that she was all but invisible. In the nest were two white eggs, much smaller than the eggs of the passenger pigeon, for which they are often mistaken.

After a few visits, she became accustomed to my coming and never left the nest unless I pulled down the branch, when she would drop to the ground giving vent to a low muttered alarm, then scuttling away to a safe distance from the nest, she would fly into a tree, and return again to the nest.

Fig. 1. A Mourning Dove on Her Nest

In two weeks the eggs were hatched. The young birds grew fast. In two weeks more they left the nest, the last one leaving on the fourteenth day. Young robins and mocking birds usually leave the nest on the eleventh day but the young turtle doves require a little longer time to develop strength for flight.

Soon after the last little dove left the nest, the mother bird began laying eggs for the second brood. Seldom does the turtle dove lay more than two eggs, but often two and even three broods are raised in a season. The nest is not always built in the lower branches of the trees. You may find them in low bushes, in brush piles, and on the ground. I have found quite as many nests on the ground, as in any other place. One pair of doves built their nest under an elm at the foot of the tree trunk. Another pair collected a few sticks, placing them in a bare, open space in the woods, and there reared their young.

Fig. 2. A Young Mourning Dove about Two Weeks Old

Few land birds have as beautiful babies as the mourning doves. When a week old, their backs are uniformly and narrowly streaked in black and white. What a soft, silvery look they have at this time! Their appearance is quite in keeping with the beauty of the lichens that grow so near them. When two weeks old, they begin to show strong resemblances to their parents and are ready to try the world, outside the nest, with them.

What healthy vegetarians the doves are! Their food is almost exclusively vegetable matter. Many of the troublesome weeds in the waste fields and meadows furnish seeds for them. Wood sorrel, barn grass and prairie grass seeds are eaten in large quantities. In the stomach of one dove, more than 7,000 seeds of wood sorrel (oxalis stricta) have been found. I do not know of any bird that is a better exterminator of that prolific weed than the mourning dove.

So often mourning doves are mistaken for passenger pigeons which are now rarely seen at all in this country, but at one time were very numerous. Their nesting colonies in the northern woods, numbered into the thousands. It is possible that there are a few isolated pairs of pigeons in northern Michigan and Wisconsin. Mourning doves can readily be distinguished from the passenger pigeons by their size. They are about a foot long whereas the pigeon measures nearly seventeen inches. Another marked difference is that the pigeon's back is a grayish blue, the dove's grayish brown. The males of both doves and pigeons have the irridescence on the sides of the neck. The nests are much alike, a mere platform of rough sticks. The pigeon arranges her twigs in a tree, preferably near streams and lakes, while the dove is more likely to lay her irregular wreath of sticks on the ground.

## The Los Angeles Nature-Study Exhibition

Charles Lincoln Edwards

The second annual nature-study exhibition of the Los Angeles City Schools was held June 6th. Throughout the day a constant stream of school children and their parents attested the interest aroused by this subject in the 75,000 pupils of the grammar schools.

In order to emphasize certain lines of the work, ten prize awards were made. During the year a nature club had been organized in each of the 127 grammar schools, with the purpose of going on field excursions, collecting animals and plants and building up school museums. In order that the collecting instinct might be properly guided, the friends of man—like toads, horned lizards, snakes and birds—were protected, and if taken from the field, were kept in live-boxes for observation. On the other hand harmful animals—like many of the insects—were preserved and their life-histories and economic relations demonstrated.

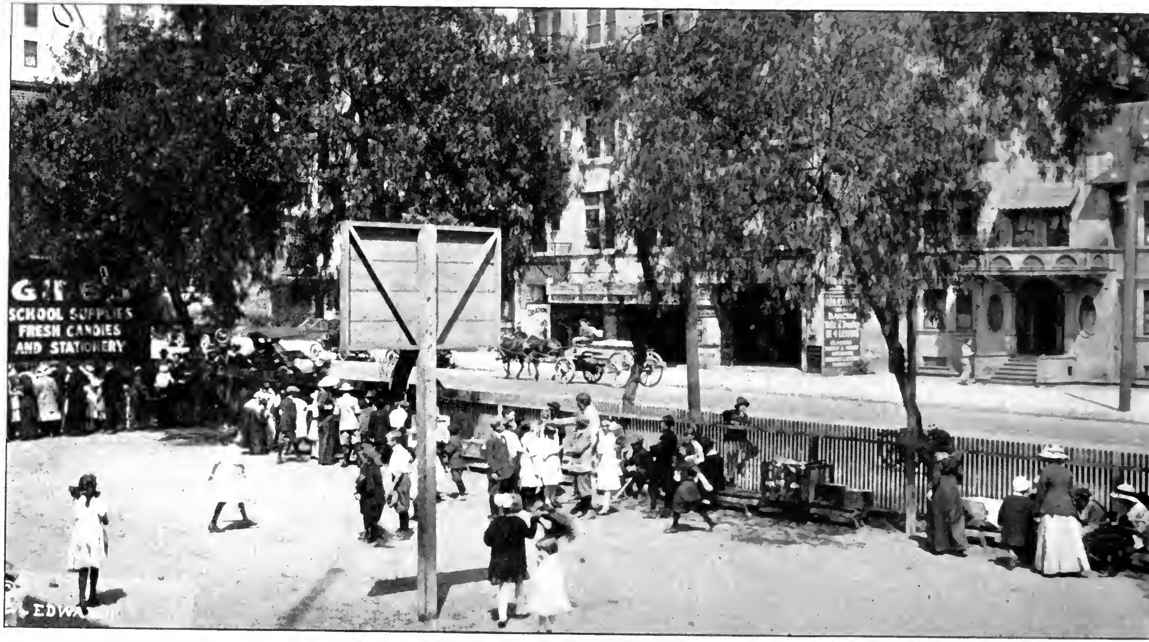


Fig. 1. Part of the Exhibit of Live Animals at the Nature-Study Exhibition in the Grand Avenue School Grounds, Los Angeles.


Fig. 2. Portion of the Western Avenue School Museum Awarded the Prize.

Each nature club held meetings for the discussion of topics concerning the animals and plants observed and collected. Many young naturalists have been developed and stimulated to results which show much promise. One boy had prepared and mounted the skeleton of a cat, skinned and stuffed birds, alligators and lizards, collected insects and cared for snakes, horned lizards, a Gila monster, and other live animals.

The prize for the best school exhibit of live animals brought out many interesting creatures. There were cats, rabbits, guinea pigs, chickens, lizards, snakes, toads and frogs in live-boxes. Donkeys and ponies were ridden or driven about in the yard. Dogs were tied to posts or held in leash. Fishes, tadpoles and turtles were swimming in aquaria. Insects were shown feeding upon the plants they naturally destroy.

The Jungle Film Company contributed to the exhibition "Sally," an educated chimpanzee, and a monkey and her little son, "Easter Morn." "Sally" is very gentle and particularly fond of very young children. She will walk up and down with a toddling three year old, or sit and unbutton the child's dress, like a little girl playing with her big doll. The girls and boys were delighted with the beautiful picture of affection shown by the mother monkey and her baby. "Easter Morn" with long arms and legs like a spider and hair comically parted in the middle, spent the day looking at his visiting cousins while clinging to his mother for protection.

In a number of schools dog-shows and general animal-shows have been held during the year. All the neighboring animals from white mice and parrots to calves and donkeys have been assembled, to the delight of both pupils and pets.

A number of schools have specially constructed zoos for the proper entertainment of animal visitors. The Edendale school exhibited the attendance card of their favorite dog, showing absence on only two days of the year. The taming and education of animals has been encouraged. These cousins of the field, forest and home are to be loved and cared for and thus the happiness of all concerned is promoted. Nature-play both develops the heart and trains and stores the mind, wherein enlarging affection is equally to be desired with increasing knowledge.

For the cultivation of an esthetic appreciation of nature, in co-operation with the department of art, much attention was given to sketching and painting.


Fig. 3. (Upper picture) Exhibit of Special Class in Drawing, including Drawing, "Boy and Dog," by Harold Chan, and Honorable Mention, "Collie" by A. Figeroa. (Lower picture) Two Insect Cases. Prize Individual Museum Collection of Clifford Grant, Western Avenue School.

A class of the most promising young artists has been instructed in drawing from nature, in the field, or from the model, in the


Fig. 4. Rabbits and Their Trustees, at the Animal-Show of the Loreto Street School Nature Club.

Fred L. Guiol, Awarded the Prize for the Best General Work of a Young Naturalist.

studio. Not only for its esthetic value but because of general usefulness in natural history, photography has been encouraged. A prize was awarded for the best nature photograph taken by a pupil in 1913–14.

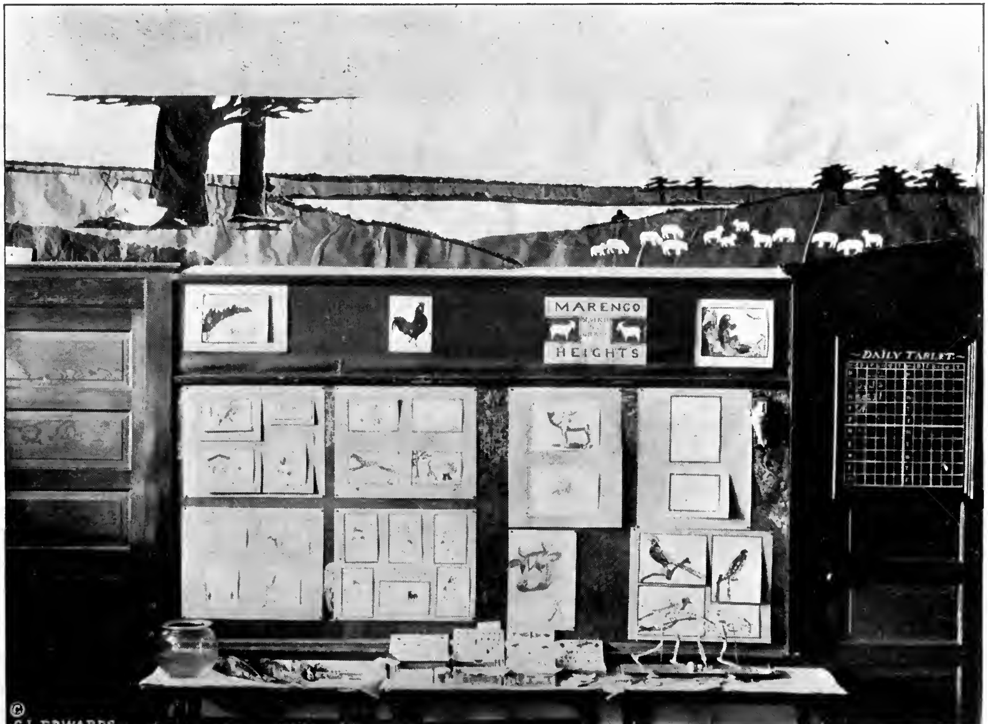


Fig. 5. Marengo Heights School Exhibit including Large Mural Decoration "Bo-Peep and Her Sheep." Made by Children of the Second Grade.

The record of observations and experiments made in the field and at school, illustrated by drawings, photographs and diagrams, led to the production of many interesting note-books. Neighborhood maps were made, some setting forth the plants and animals found and their economic relations, and others the unsanitary conditions like piles of manure leading to the mutliplication of flies and stagnant pools for mosquito breeding.

In the class of animal industries of commercial value, there were exhibits of silk caterpillars, showing the eggs, feeding larvæ, cocoons, silk spinning reel in operation and articles woven from the silk.

Observation bee-hives gave the visitors an opportunity of finding the queen and of watching the workers with their loads of golden pollen, endlessly busy with whirring wings, evaporating the gathered nectar into honey, or building their wax cells, or feeding the young grubs.

Most interesting and important of all were the pupils, enthusiastically explaining their various exhibits to the visitors. There was the story of a long tramp in the mountains when the treasured skulls of the coyote and wild-cat were found. The capture of king and gopher snakes involved no danger, for these friendly creatures seldom snap at man. At the minus tide, crabs, sea-urchins, periwinkles, limpets and starfish, were taken from the tide-pools and the octopus dragged from his lair beneath a huge rock. One pupil had fed many caterpillars of the west coast "lady" to pupation and then later secured the perfect butterflies. Another had followed the nest life of a family of mocking birds, noting the number and kinds of insects brought to the hungry babies until, as fledglings, they departed from their parental home. All the children of the schools were happy, for they had bathed in the glorious California sunshine and had learned many wonderful things about the wild animals and plants of mesa, mountain and seaside and the tame animals and cultivated flowers of the home.

The two annual nature-study exhibitions which have been held by the Los Angeles City Schools have demonstrated their value as yearly reviews of the achievements and ideals of the department. Pupils and parents attending have been drawn together in a common interest and have learned much of nature. The schools have been stimulated to better work by the models selected by the judges for prize awards and the general public has been informed of the purpose and scope of nature-study.

# Elementary Agriculture

A. W. Nolan

Nature-study, school gardening and elementary agriculture are all related to one another, and our rural and village schools are beginning to realize that they have excellent opportunities for effective instruction in these subjects. To open the minds of the children to the world of nature about them, to make them thoughtful and observant, and to give them practical knowledge relating to the soil, the plant life, and the animal life of their surroundings, are the fundamental objects in such instruction. Where nature-study ends and agriculture begins, who can say? Perhaps most of us will think of agriculture as emphasizing the economic side of nature, and for present purposes we may let that vague differentiation stand. In order to be concrete and to establish principles upon which to base our discussion of elementary agriculture, we may state rather arbitrarily the following:

1. Beyond the fifth grade, a study of nature material in any way related to agriculture should receive the emphasis upon the vocational side.

2. Agriculture as such should not be taught below the seventh grade.

3. Only well-known "stock" information should be taught, principles which deal with practical needs *here* and *now*.

4. Instruction in school agriculture should follow the seasonal sequence.

5. The practical work in connection with elementary agriculture, should be more in the nature of home projects than of laboratory exercises and school plots, as our schools are now organized.

6. Elementary agriculture should be a part of the curriculum of every rural school, the excuse of "no time or place", will not hold good in these days of modern demands.

It will probably be more interesting and profitable to readers of the Nature-Study Review to learn of actual work given in elementary agriculture than to follow the discussions of what should be done. The writer will therefore in a series of articles describe and criticize a course given in elementary agriculture in a consolidated rural school in Illinois.

The principal of the school states in his catalogue that the course is a general one, covering the whole field of agriculture, and given in the seventh and eighth grades. The work follows the seasonal sequence and is a direct outgrowth of the needs of the community.

An actual farm of 160 acres is selected as the field laboratory for the year's work. The farm is purchased (in theory) at the price of good land in the community. It is layed out and fenced according to good farm management. A rotation of crops for permanent agriculture is planned. Each farm crop is studied at the season most appropriate to the farm activities for this crop. The farm animals needed in the system of agriculture adopted, are studied. Records of all transactions are kept. The farm buildings are planned and constructed. Farm arithmetic is here involved.

When school opens in September, the agricultural work at once begins to bridge the wide gap, between the free, open-air life of the farm, and the bookish four-wall life of the school.

The farm selected for the basis of the agricultural work is visited perhaps the second day of school, by the class. Subsequently the pupils are required to make reports upon their home farms, stating the system of farming used, the size and shape of the home farm, the surface conditions, general fertility, drainage, water supply, advantages and disadvantages of location, improvements, trees, crops, climate, healthfulness, etc. This method at once makes home and school interests common, and the farm at home has been "dignified" by the attention given to it at school.

Each pupil is then required to make a map of the farm selected for the year's work—a map showing the "lay-out" as it is now planned. A map, showing fields, woodlots, orchards, gardens, location of buildings, etc., is then required of each pupil's home farm. All these maps, and reports, with subsequent work in agriculture are recorded in a permanent and neat agricultural note-book required of each student.

Following the study of the home farm from this general outline, a more detailed survey of local farm life and other natural conditions is made, and incidentally an invoice of the child's own stock of information about farm nature-study is brought out. Reports as follows are required of each student in the agriculture class:

1. Collect samples of the different kind of soils found on the farm and bring them to the school.

2. Make a list of all the useful plants growing on the farm.

3. Make a list of the weeds or useless plants known, growing on the farm.

4. List the farm animals at home.
5. What wild animals are seen on the farm?
6. List the birds you see in the time given to this study.
7. Make a list of the insects you see and know on the farm.

This observation work is carried on for several weeks and furnishes a basis for many class and field exercises. Out of such work should grow the realization that the farm is a place full of life and interest, and that there is much to learn of which the country boys and girls have not thought. This attitude of mind on the part of teacher and pupil alike is a fertile field for results in teaching elementary agriculture.

The farm crop engaging the attention of farmers throughout the North Central States about the time schools open in September is wheat, and the school soon begins a study of this crop. An opportunity is here afforded to introduce the study of seeds, represented by the grain of wheat. Methods of study found in all elementary text-books are followed. Following this a study of germination is made. Wheat is planted in pots or boxes, and the growing plant is observed. The whole plant is soon introduced, and as it grows in pot or field the whole question of how the plant lives and grows is taken up.

The practical work of soil preparation, plant feeding, seed-bed, crop rotation is introduced in connection with the sowing of wheat. The insects and diseases of the wheat crop, the winter conditions effecting wheat, and the harvesting of wheat conclude the study of this crop, and make up the final work of the month.

In the next article the work for October will be taken up.

## Should School Gardens be Made to Show Financial Gains?

E. S. Sell

Professor of Agriculture, State Normal School, Athens, Ga.

Without hesitation, many teachers would say, that gardens used for educational purposes cannot be made to show financial gains. To this I would say, that it depends on what is expected to be taught. If school gardens are conducted, simply to carry on experiments and beautify the school grounds, then it will be difficult to make profits from school gardens.

### *A New Interest in School Gardens*

Of course simple experiments, such as inoculating legumes, soil mulches to show the effect on moisture, etc., should be made as well as to make the school grounds attractive. But when pupils are made to feel the responsibility of marketing their crops, to receive money for what they have produced, a new and a deeper interest is taken in the work. These are the things that men and women do; consequently this interest is based on a pedagogical principle.

When the pupil is concerned about the profits and grows beans, for example, which have been attacked by insects, he wants to know the remedy and sets out to find it. In this particular instance, the desire for gain, a very strong tendency, is made a means of studying insect pests in a practical and direct way.

### *An Experiment*

Working on this theory, that school gardens should be run in such a manner as to show financial gains when possible, the writer is making an experiment at the State Normal School to test this manner of procedure.

This plan has caused us to do away with the individual plots and substitute much larger plots which are worked by four or five students. Crops can be grown more economically on the larger plots. Individual work is brought in by making each student responsible for the marketing of one or more crops. A record is kept by the students of the crops that they are to market, from the time of planting to the time of maturity. Notes are even made on the disease or insect pests affecting the plants as well as the remedy used.

### *Profits an Incentive to Learn*

As has been said, this plan is an experiment and has just been put into practice. Just how much profit we will be able to show, is difficult to estimate. The thing that has been demonstrated is that school gardens can be made to better serve the purpose when records are kept that involve the profits and losses.

Pupils will be interested in learning the effects of the soil mulch if they know that this mulch will be a means of getting larger yields. Consequently, the greater the returns from the soil the more it will mean to them. We have despised too long in education the things that have to do with making a living. Let us make the desire for producing and making something a means for education and education a preparation for life's work.

*The Domestic Science Department Utilizes the Products of the Garden*

The Domestic Science department needs vegetables in order to teach cooking and canning, and plans it work to use products from the garden as they mature. Products not used by the school are sold to near-by stores and homes.

*A Real Purpose in Gardening*

In selling the vegetables the students must find out the market price and use skill in marketing to advantage. The record kept gives ideas of value and ways of determining the profitableness of fields.

By planting such crops as can mature during the school term, the pupils can study the plant from germination to maturity as well as many problems in harvesting and marketing.

One of the most gratifying things about this method is the increased interest shown by the students in the garden work. It seems to vitalize and make it more of a definite problem.

## School Gardening in Portland, Oregon

Alice V. Joyce

In the fall of 1911 when two new teachers in one of the grammar school buildings of Portland surveyed the beautiful scenery surrounding the building, their attention was directed to the tract covered with young Oregon firs diagonally across the street. One of the teachers remarked, "What a glorious place for a school garden!"

When they spoke to their principal concerning it, they found that he was intensely interested, had been assisting with home gardens for five years, but had not attempted the community garden. So the news that the teachers desired one was gratefully received, and later he appointed a garden committee among his teachers.

Letters were written to the president and secretary of the National School Garden Association, the Department of Agriculture, Washington, D. C., Cornell University, Luther Burbank, and various other persons who might assist by suggestions or literature, and later the most interesting replies read to the pupils.

The city librarian sent a garden library to the school; also back numbers of the *Garden Magazine*, to which the school became a regular subscriber.

When the principal asked how many boys could come the next Saturday to help clear the two and one-half acre tract which the owner had kindly consented to let them use their answer was a joyous shout.

By the following Saturday, April 20th, it had been plowed, and staked so that each of the sixteen teachers was assigned a section where every pupil in her room might have a plot eight feet by ten feet, a path surrounding each group of six individual gardens. This is the Woodlawn school garden, the pioneer school garden of Portland.

Many visitors have noticed the happy activities of the children and the industry displayed. Among the special features were "The Variety Gardens" (vegetable and flowers), the "Industrial Garden" where sixty varieties of grains, grasses, lentils, forage, and fibers were planted, "The Exchange Garden" where surplus plants from thinning were transplanted and exchanged, "The Old-Fashioned Flower Garden," "The Twentieth Century Garden," and a "Sand Garden" for the kindergarten visitors. The latter proved to be a happy introduction of school life to the younger brothers and sisters.

On the last day of school, the garden was used for a reception to the many visitors who attended the "Pet Show" where benches for the various pets had been arranged on the east side of the garden.

There were no prizes offered by the Woodlawn Advisory Committee. The desire to excel was sufficient incentive. The principal and teachers are pleased to say that no expense for supervision was needed. The work was done voluntarily during hours not assigned as school hours.

In the meantime, the business men of the various clubs organized a garden contest, offering prizes for the best school garden, best home garden, and the best individual vegetables. When the exhibit was held, June 15, 1912, in the Armory, it was a revelation to the people to see the results of the children's efforts, and they were fully awakened to the possibilities of the school garden.

This garden contest was re-organized in 1913, and a director with one assistant placed in charge of the work. They succeeded in getting twenty-seven schools to co-operate with them with the result that including Woodlawn's 585 gardeners, the city enrolled 3568 juvenile gardeners with equally as many home gardens.

Among the home gardens, a boy nine years old was the pride of the city, and when he showed his vegetables at the exhibit with an air of manliness which portrayed having done something "worth while," one gentleman remarked, "If school gardening brings forth boys like this, we must have more school gardening."

Nor are the men doing everything to support and encourage the work. Through the efforts of the president of the Woman's Club, a building has been donated where a juvenile market is conducted daily since the exhibit, June 27, 1913. Children may bring vegetables or flowers from the garden, cakes, bread or jelly that they have made, fruit that they have earned by picking, and even pets that they have raised, or wish to dispose of, and it is being patronized by the best people of the city.

Very little has been done for the vacation gardens, but I think the plans for the new year will provide for them also. In some places the abandoned individual gardens are being planted in potatoes, beans, endive, and similar vegetables adapted to a later season.

When the garden plans provide for the "all year gardening" to which the climate of Oregon is ideally adapted, the juvenile market might be profitably maintained throughout the entire year.

Some of the principals have planned to introduce domestic science in the grades, and through this department learn to demonstrate the food and economic value of the vegetables raised in the gardens. They also hope to solve the noon lunch problem by this plan.

A committee of teachers realizing that thrift and economy should be encouraged among their pupils, called upon the assistant secretary of one of the leading banks, and enlisted his services to establish a School Bank.

Bank books for principals, teachers and pupils with entry card for the bank were supplied. It is hoped that this will be a great stimulus to the garden work since cash returns from the sales in the market and at home were rapidly increasing, and a bank account proves a great incentive to saving.

Nothing can rival the School Garden movement in securing the co-operation of organizations and individuals.

The editors of the leading newspapers were generous in giving publicity. Eagerly the children watched the papers for the

Fig. 1. Tarling School Garden. 360 Pupils (Russian Jews largely) had Gardens.

columns of information regarding the planting and varieties of seeds, the various pictures of different school and home gardens, the awards of prizes, and special features of interest.

The city donated water for the gardens. Many tools, seeds, fertilizers, etc., were liberally donated by various firms. One lumber company furnished lumber for a fence to enclose the garden. One teacher expressed her appreciation by saying, "If our garden friends only knew how badly the teachers are handicapped for want of seeds and tools, there would be more expenditure in this direction and less for supervision."

The teacher should have full charge of the garden work where she may come in closer sympathy with her pupils. She should not be handicapped in any way by supervision unless weakness shows, and even then, the help should be asked directly by the teacher.

Fig. 2. Kenton School Garden. Parking Used Where Lots Were not Available.

If the principal is the leader of his community to which his position entitles him, he will be the central unit of the garden's success. With his committees among teachers, parents and pupils, he can stimulate his community to higher ideals of industry and economy. Through his suggestions, advice or commendation of worthy efforts, he is given a wonderful opportunity for this development of "Gardens growing children for more useful men and women."

Under the leadership of our Superintendent, who is a recognized leader of industrial progress, we hope to do good work in gardening. He recommends the natural development of the garden for each school when parents, teachers, and pupils have awakened to the possibilities of the garden and the actual results to be obtained.

Under these conditions, the school gardens will not be absorbed into an artificial "City Beautiful," but with their throngs of happy children among birds and flowers, will become "The Real City Beautiful."

### *Valuable Lessons Gained Through Gardening*

The practical lessons achieved in the garden, which may be called the laboratory of nature, are:

The power of invention while studying nature.

Many lessons of economy by saving seeds, conserving strength, and supplying the home with vegetables of the child's production.

A lesson in good roads from the careful construction of paths.

Lessons in the beauties of nature through harmony of colors and simplicity of design.

Respect for others' rights and protection of property.

Self-respect in working at a self-appointed task.

Dignity in labor worth while.

Perseverance and faith in replanting of seeds and awaiting their production.

Lessons in forming habits of industry and thrift.

That to be well and happy are lessons of life.

Self-reliance through personal ownership.

### *Results of the Gardens*

The school gardens are popular; they bring the school nearer the home, and the child nearer to God. This interest in school work increases its usefulness. The immediate interest and increasing pleasure shown in the children's faces tells their own story of happiness.

The teachers, by coming in direct contact with the real nature of the child, have been given a wonderful opportunity for character building, and have proven that the children's gardens give an interest in plant life, by health giving, out-door work promote physical and mental development, stimulate efforts to increase savings accounts, encourage gallantry by the assistance of smaller and weaker pupils.

It was noticed that the desire to excel was not manifested by the individual alone, but in class loyalty to the school.

In literature, many poems and selections relating to nature may be studied and memorized. The subjects for composition are without limit.

The teacher may develop many lessons of faith by encouraging the child while the plants are growing. The lessons of mathematics become real problems through actual measurements and calculations. The real lessons of life may be taught through concrete teaching.

The individual is recognized when permitted to work out a self-made plan.

The pupils are taught that social adjustment is an essential to life, that their education consists not only of thoughts as presented by others, but they will have learned that to lessen the numbers of the poor, sick and inefficient, and to teach the inefficient to be happy, healthy and successful are the greatest lessons of life.*

## Some Experiments for the Garden

J. W. Emery, B.A., B.Paed.
Normal School, Stratford, Ont.

The subjects of nature-study and gardening were placed on the curriculum of the public schools of Ontario about ten years ago, and shortly afterwards elementary biology became compulsory in the high schools for those taking the course for teachers' certificates. It was expected at that time, that, in an agricultural province such as this, the project would be eagerly welcomed and that a few years would see the garden established as an indispensable part of the equipment of every rural school. Progress here, however, as in other places has been slow up-to-date, only about 200 schools possess gardens receiving grants from the Department,

*Read at the annual meeting of the National School Garden Association, Salt Lake, July 11, 1913.

and, although there are many schools doing good work on a smaller scale, it must be said that the school garden is even today more of a curiosity than a regularly accepted part of the school work. The chief obstacles met with are scarcity of land, dangers from neglect during the long summer holidays, lack of broad knowledge on the part of the teacher and apathy or even active opposition on the part of the trustees and parents. These we are trying to meet with "home" gardening, summer courses for teachers, and the sending out of capable young men from the Agricultural College to visit every rural section, enlist the sympathies of the parents and give the teacher a start in the work.

"Agriculturalize the school garden," this is the new watchword. The economic side is to be emphasized and it is even hoped that in this we may find the solution to the problem of rural depopulation.

Do we not run a danger here of forgetting the great spiritual aim we once formulated, viz., to bring the child into sympathy and harmony with Nature? The economic phase we once held to be quite secondary, and, now, in order to popularize our subject we seem ready to make it of primary importance. Nature-Study always will have a higher place in developing the religious, moral and æsthetic in the child than in helping him to raise good corn, hens or apples. The causes of rural depopulation are very numerous and complex and the remedy will not be a simple one. The teaching of agriculture will, no doubt, do some good but we can never get away from the basic principle that a good character not a good farmer is the end at which we should aim. This is, of course, not saying that both results may not be achieved by the same process.

As a sort of compromise between the purely cultural and the purely agricultural aims of nature-study, I wish to suggest the introduction of some systematic experimental work, some advantages of which may be here enumerated:

1. Children are particularly prone to reliance on what the teacher or the book says. In the case of many of the school subjects, the book and the teacher will be the only sources of information but in nature-study an opportunity is presented of showing the pupil one of the great sources from which human knowledge flows. The best teacher will be the one who raises problems not the one who merely answers questions. The child should early

get the habit of relying on his own exertions for the knowledge he obtains, thus, the school training will give him power rather than facts.

2. In experimenting, careful measurements, accurate observation, and patient investigation are essential; habits are thus formed that are of inestimable value in after life.

3. Interesting practical problems in arithmetic grow out of these experiments; new interest is thus infused into what to most children, is a very dreary study. For example, we note by the rain-gauge that a one-half inch rain is necessary to be of real benefit to the garden; hence, the question: To produce the same effect on a plot 12′ x 6′ how many 2-gallon watering cans must be applied? What weight of nitrate of soda should we use on a plot 10′ x 5′ if we wish to apply at the rate of 160 lbs. per acre as directed in the book? From the alfalfa plot 10′ x 10′ we cut 13 lbs. of hay. How may tons per acre?

4. Farming is placed in a new light. The child learns that, instead of its being a laborious task that anybody with strong muscle can do, it has real problems hard enough to occupy the best trained scientific minds—problems, many of which are still waiting for a solution.

The following experiments have been found to work out successfully in the neighborhood of this Normal School, 43° N. lat. They are suggestive only, since anyone may lead the way to others of similar nature. Some will be found suitable for spring, others for the autumn. Some are adapted for the schoolroom, others for the farm or garden plots at home or at school. The order is not important but it is necessary that the question should have arisen before the experiment is performed. If the children can devise their own experiments so much the better.

I. Germination:

(*a*) After the pupils have examined a soaked bean and discovered its chief parts the question arises, what becomes of each part? Line the inside of a battery jar, (a tumbler will answer) with white blotting-paper, fill with sawdust or moss then drop seeds down between the glass and paper. Moisten the sawdust and keep the jar in a warm place. The seeds will sprout in full view, and their development may be watched.

(*b*) In (*a*) the roots may be seen growing downwards, the stem and leaves upwards; keep the jar inverted for a few days.

(*c*) What are the fleshy seed-leaves for? Plant some beans in earth, and as soon as they are up clip from some plants both cotyledons, from others clip one and leave others untouched. Note future growth.

(*d*) Will seeds sprout in the darkness?

(*e*) Will they sprout in dry earth?

(*f*) What if the earth is kept saturated with water like a badly drained field.

(*g*) See whether seeds will sprout if the soil is kept at a temperature of 35° or 40° F.

(*h*) Devise an experiment to see whether air is necessary for sprouting.

(*i*) A germination test—place 100 grains of wheat, between two sheets of blotting paper; cover with moss, sawdust, or sand kept moist and warm. After a few days uncover and count the sprouted seeds. Try with shrivelled grains, plump grains, grains that have sprouted once before and dried, try last year's grain, grain 2, 3, 4 years old, etc. Test grains of corn from various parts of the cob. Test the vegetable and flower seeds before planting and prevent future disappointment.

II. Soil:

(*a*) Fill two equal sized boxes, one with moist humus, the other with moist sand; weigh and leave in a warm room for two or three days. Again weigh and note which loses water more rapidly.

(*b*) Fill a box with humus, another with clay, another with a mixture of clay and humus. In each plant corn. Compare the crops.

(*c*) Deprive all the corn in (*b*) of water. Which field suffers first?

(*d*) Fill two equal sized tin cans with moist soil making them equal in weight. Pack the surface of one and loosen the surface of the other to a depth of an inch. Weigh from time to time noting the effect of the dry mulch in conserving moisture. The applications are many and of great importance.

(*e*) After a lesson on capillarity, arrange several glass tubes about three feet long and one inch in diameter. Fill these with humus, fine sand, coarse sand, clay, etc., respectively, and stand them vertically with lower ends in water. Compare rates and heights of the rise of the water.

The above experiments and others may be performed with soils from different fields and different depths or with different mixtures.

III. Wheat, or other grains:

(*a*) Have several plots one rod square, or smaller; in one plant fall wheat year after year. In another the same but manure well. In a third adopt some system of rotation, as wheat, clover, corn, oats. This year we have a plot that has grown wheat four years in succession. It yields very poor crops. We will try the effect of sowing half the plot with cow-peas and turning them under before sowing this fall.

(*b*) Try the effects of late and early sowing; of deep and shallow planting; of thick and thin planting; of keeping a portion of the plot free from snow all winter; of the use of various commercial fertilizers, nitrate of soda, sulphate of potash, superphosphate, bone meal, etc., or mixtures of these.

(*c*) Plant a single grain of wheat, study the process of "stooling out." Estimate the amount of wheat produced in three years from one grain.

(*d*) Watch for the tiny ears of corn and before the pollen has a chance to fall on the silk, wrap up a few ears in muslin or paper bags. Do the same with other ears after the pollen has fallen. Examine these ears after the corn is ripe.

(*e*) Procure a small quantity of a culture of nitrogen fixing bacteria for alfalfa and inoculate the seed sown in the plot. Compare the growth with that in another plot in which the seed was not inoculated. Dig up plants from time to time and look for nodules.

IV. Potatoes:

(*a*) Does the size of the sets affect the yield? Cut sets of accurate weight, one-eighth ounce, one-half ounce, etc., plant a row of each and compare results in the fall.

(*b*) Is it good to plant whole potatoes?

(*c*) Do small potatoes make as good "seed" as large ones?

(*d*) If your land is not too rich try the effect of a potash fertilizer (an ounce of sulphate of potash to the sq. yd.).

(*e*) We have been troubled here with blight for two years. This year we have two plots; one we spray religiously with Bordeaux mixture; the other we leave to the tender mercies of the fungi.

V. Weeds:

(*a*) Have a bed in which the common weed seeds are sown in rows properly labelled. This gives opportunity for identifying the weed at any stage of its growth. It also leads to experiments on eradicating.

(*b*) Twitch-grass is common and very troublesome. Get the children to dig up the long root-stocks and cut them into small sections planting the nodes in a box of earth and the internodes in another box. This will teach a good lesson on how to control the pest.

(*c*) Nearly all my students from the country are firmly convinced that chess is a degenerate form of wheat and that chess seed will not grow. Try it.

(*d*) A good winter exercise consists in collecting samples of snow from drifts in the country, melting it, filtering the water and examining the residue for weed seeds.

VI. Storage of food:

When turnips are being harvested in the fall, two questions should arise: (i) Since these turnips have no flowers whence the seeds that were planted in the spring? (ii) Why do the plants form such big roots? Both questions may be answered by planting a root next spring. Try this also with carrot, parsnip, salsify, beet, mangel, cabbage, kohl rabi, etc. Have a plot on purpose and grow your own vegetable seeds.

VII. Demonstration plots:

(*a*) A large number of valuable farm and garden plants are entirely unknown in many localities. If the teacher can introduce a new food for man or beast into her section she will have done the people a real service. The writer has this year planted teosinte, sorghum, crimson clover, soy bean, cow pea, vetch, Russian millet, also chives, Swiss chard, kohl rabi and okra just to see what they are like.

(*b*) In looking through a seed catalogue one finds the names of many annual flowers all said to be very beautiful. Plant short rows of these flowers in a special plot in order to find out which are really desirable. In this way new flowering plants may be brought into the section. Subject for debate: *Resolved* that a new flower is of greater value to a section than a new fodder.

(*c*) The family bed is always interesting. It consists of a plot containing numerous representatives of a botanical order. In the

"Crucifer" plot would be found cress, mustard, cabbage, turnip, cauliflower, radish, kale, rape, broccoli, candytuft, etc. How much alike the seeds are and even the early seedlings. "Solanaceal" contains tobacco, potato, tomato, egg plant, peppers, petunia, salpiglossis, with a despised thorn-apple (*datura*) or nightshade transplanted from their disreputable associates in some waste lot. The "legumes" make another interesting collection.

The experiments cited above are all possible in the poorest equipped school. More elaborate ones may be performed where time and equipment permits. Useful books in this line are Plant Biology by Cavers; Experiments with Plants by Osterhout; Agriculture through Laboratory and Garden by Jackson and Dougherty.

## Editorial

During the past summer at Chautauqua at an Educational Council the question was debated, "Has Nature-Study in the Schools Been a Failure?" The chief debaters were Professors Earl Barnes and Vaughan MacCaughey. Professor Barnes spoke first and said in substance:

"There has never been any great enthusiasm in nature-study since the world began until about forty years ago. Since 1870 there has been intense interest in it, in connection with the scientific movement. We are living in a scientific epoch. Considering this, we ought to have a perfect efflorescence of nature work. We have had well organized forces back of nature-study, take for example Cornell University, the University of Chicago, and other great institutions. Yet the amount of work done has been almost negligible. Most of the nature work has come through vocational training. In most of the schools there has been comparatively no nature work because our teachers are women. You could not have kept nature-study out of the schools by any other means. It took a tremendous force to keep it out of the schools. That force has been the women who guard the school room. Women are not primarily interested in science. If they are interested in birds, it is to have them in a cage to show the children; if they are interested in blossoms, it is for dining room decorations. Women do not care for science, for the abstraction. They want something concrete."

Professor MacCaughey maintained that while certain types of "fluffy, moonshiny nature-study" had been failures that genuine nature-study has always been successful, but he agreed with Professor Barnes and admitted that:

"One of the causes that have produced this imitation of nature-study is the fact that the average woman teacher is not qualified to teach it. Traditions of childhood prevent her from understanding nature; she has been brought up to be afraid of things, she has been raised indoors. The clothing and physical equipment of women have prevented them from getting this out of door contact. They must realize that there is an outfit suitable for rough outdoor work, just as there is for an afternoon tea. Women are fundamentally interested in humanity and in romance, not in science. The average woman has a mentality that is introspective. She lacks the objective attitude most men have."

This is surely an arraignment of the sex which has been demonstrating in so many ways in recent years, an effectiveness equal to that of the opposite sex in many and varied activities. But this is a blow at woman in her own special field of teaching small children, and if the statement is true, it is high time that this state of affairs was remedied.

The writer has had a long experience in trying to introduce nature-study into the public schools; and although she belongs to the sex under attack, she can, by no means, deny that the criticism is just. However, there is a reason lying beyond this criticism and that is the conservatism of educational methods and ideals. The women who are teaching in elementary schools today have had little science training, because the whole trend of the schools in which they were educated has been away from science. They have been obliged to follow a certain routine of studies; and biology in most high schools is still an optional course.

From the writer's rather extended experience, another obstacle quite as stubborn as that offered by denatured women is the school principal, bred and educated in the classics, and with no appreciation of science or of nature. Not that all classically trained principals are of this type. By no means! There are two kinds of college bred men; one who finishes his education when he gets his degree, the other who regards his college education as a mere foundation for the structure. Too many of the former type are at the heads of our secondary schools, and they have held that nature-study was a fad and have regarded manual training, agriculture, and elementary science with more or less of contempt. Such principals have had great influence in keeping the feminine mind at its ladylike tasks in the schoolroom. I know many teachers who would have been excellent naturalists if their tastes and interests had not thus been swerved into literary ways.

But, with the growth of appreciation of life out of doors, with teachers and pupils spending their vacation in camps, the outlook of the elementary teacher is surely changing. The feminine mind doubtless lacks somewhat the investigating quality of the masculine, but the feminine eye is keen and feminine curiosity is a pretty fair equivalent of the powers of investigation. My experience in field work with women students makes me entirely optimistic as to the future of nature-study, as soon as the elementary teachers have a fair chance both as to proper education and a freedom in curriculum, not so crowded with "musts" as to squeeze out all "wish to's." Manual training and agriculture are both efficient wedges, which driven into the tight and fast educational edifice will surely open the doors for the teachers to come out and for nature-study to enter in.

The growth of nature-study in the schools of the United States and Canada has been during the last ten years slow, but steady and satisfactory.

In some later number of the REVIEW I hope to place before the eyes of the members of the Nature-Study Society of America, news based upon facts that will surely make their hearts glad.

ANNA BOTSFORD COMSTOCK.

## Book Reviews

*Feeble-Mindedness: Its Causes and Consequences.* By H. H. Goddard. pp. xii + 529. Macmillan Company. $4.00.

There have been reviewed in this magazine during the past year or two a number of the books dealing with the problem of heredity and our readers who are interested in the subject will appreciate the notice of this excellent publication. Mr. Goddard is director of the research laboratory of the Training School for Feeble-Minded Boys and Girls at Vineland, New Jersey. The data which he has brought together are exceedingly valuable and his conclusions are socially of much importance. His first chapter deals with the social problems in connection with the feeble-minded,—

the problem of juvenile delinquency and crime, of alcoholism and prostitution, and of pauperism. Chapter two discusses the reliability of the data. The author seems to be quite conscious of the fact that the method of investigation and the material that he is dealing with necessarily make the conclusions tentative and yet, as he says, "It is all a matter of probability. It is true that the probability may be made so high that it amounts to what we call practical certainty. In all of the material presented in this book we have aimed at that high degree of probability."

While the data obtained do not seem to be free from doubt, because of failure to eliminate such other possible causes as venereal diseases, yet the mass of them must impress anyone as making the author's conclusions at least sufficient for tentative eugenic procedure. He considers that the eugenic programme, so far as the feeble-minded are concerned, should consist in their colonization and sterilization. He emphasizes the necessity of recognizing the levels of intelligence as a basis for the treatment of those feeble-minded who are at present in the hands of the law.

The book is abundantly illustrated with diagrams of various families, pictures of the individual cases, and samples of writing and drawing of feeble-minded individuals. Withal, the book is one that every student of social conditions will feel repaid for reading. It is an excellent type of the sort of investigation that we need in dealing with such social problems as are here involved.

*Guide to the Study of Animal Ecology.* By Charles C. Adams, Ph.D., pp. xii + 183. The Macmillan Company. $1.25.

This book is very largely a bibliography. The author briefly discusses the main content and point of view, value and method, of ecological surveys, field studies, collection and preservation of specimens, all in the first four chapters of some fifty-four pages. Chapter five is on references to scientific technique; chapter six is on important sources of information on the life history of insects and allied vertebrates, and these are purely lists of books and references. Chapter seven states the laws of environmental change briefly and then cites literature. Chapter eight deals with the laws of internal change. Chapter nine is headed "Process of Adjustment".

The book is valuable to the student of ecology as an excellent source of information regarding the bibliography that is constantly growing more extensive on the subject.

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# NATURE-STUDY REVIEW

Devoted Primarily to all Scientific Studies of Nature in Elementary Schools

Vol. 10 No. 8
Whole No. 86

OFFICIAL ORGAN OF THE AMERICAN NATURE STUDY SOCIETY

NOVEMBER 1914



CONTENTS

A Request .................... 291
The Annual Meeting and Election of Officers .......... 291
Seed Collections ............ 292
Anna B. Comstock
Preparation of Teachers for Nature-Study and Civic Biology 294
C. F. Hodge
The Story of a Kernel of Corn .... 307
A. W. Nolan
An Evening with the Aquarium and Snailery. Frank C Baker .. 315
An Aquarium in a Tumbler ..... 320
Elliot R. Downing
Editorial .................. 324
Gilbert H. Trafton
News and Notes ............... 326
Book Reviews ................. 329

Published Monthly except June, July and August at Ithaca, N. Y.

$1.00 a VOLUME (9 Nos.)

Elliot R. Downing, Editor
The University of Chicago The School of Education
Chicago, Ill.

15 Cents copy

Entered as second-class matter at the Postoffice at Ithaca, N. Y., under the Act of March 3, 1879.

THE
# NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

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VOL. 10 NOVEMBER, 1914 No. 8

## A Request

There are a number of Nature Organizations, Societies connected with Study Clubs, Women Clubs, etc., whose object is to learn more of the out-of-doors. Many of these are not in touch with any National Society like our American Nature-Study Society that undertakes to foster such interests. The secretary desires to learn of interested groups of persons of this sort in order that the literature we have available may be gratuitously sent them. If you know of any such organization, Nature Clubs, Hike Clubs, Camping Clubs or similar associations will you please send the name to the Secretary with its location and names of officers, if you know them. Any information, no matter how incomplete, will be gratefully received. Please write at once. Postage will be refunded you.

The University of Chicago,
The School of Education,
Chicago, Ill.

ELLIOT R. DOWNING, *Secretary.*

## The Annual Meeting and Election of Officers

The annual meeting of the American Nature-Study Society will occur at Philadelphia, December 30, 31. At this time and place the American Association for the Advancement of Science and its affiliated Societies will all meet. Last year the American Association met in Atlanta, Georgia, and our Society deemed it unwise to try to have a meeting there. So this is the first meeting in two years. The program will be published in the next issue. It will be an attractive one. Many of our officers and members have already signified their intention of being present. The local committee will arrange at least one excursion to some point of interest, more if time will permit.

The present officers are as follows: President, Mrs. Anna B. Comstock, New York; Vice-Presidents, M. A. Bigelow, New York; Otis W. Caldwell, Illinois; B. M. Davis, Ohio; B. M. McCready, Ontario. Directors, *E. E. Balcomb, North Carolina; L. H. Bailey, New York; *Ora M. Carrel, Michigan; *Anna Clark, New York; *John A. Dearness, Ontario; J. A. Drushel, Missouri; C. F. Hodge, Oregon; *Alice J. Patterson, Illinois; Susan B. Sipe, District of Columbia; Grant Smith, Illinois; H. C. Drayer, Missouri; G. Straubenmueller, New York; Gilbert H. Trafton, Minnesota; Elliot R. Downing, Secretary-Editor.

The president, five vice-presidents, five directors (in place of those whose names are starred) and the secretary-editor are to be elected. Nominations are made by the Council and these will be published in the next issue together with a blank ballot. All subscribers to The Review are entitled to vote. The vote may be mailed to the Secretary, if you are not planning to be present at the meeting in Philadelphia.

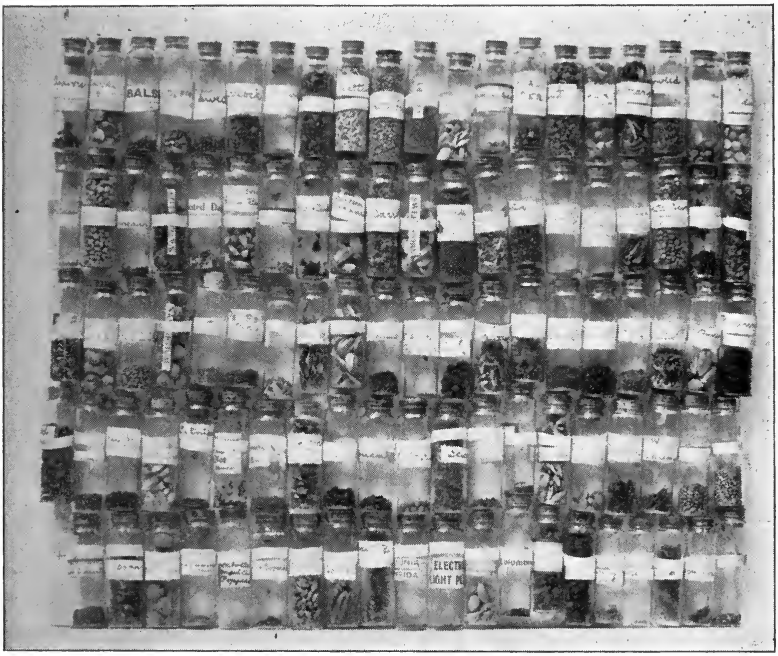
## Seed Collections

Anna Botsford Comstock.

There is at present, sweeping over the schools of the land, especially the rural schools, a wave of seed collecting. The seed are gathered by the pupils, each kind placed by itself in a vial and properly labeled with the name of the plant which produced it. These vials are neatly arranged upon cardboard and are sent to county fairs as a part of the school exhibit.

Seed collecting is like the collecting of coins or beads or pebbles. The simple making of the collection appeals to the child. The care in collecting seeds which is necessary in order to properly label them, is the only real educational factor in this Nature-study exercise. To be sure it is of value for it increases the child's intelligence in several directions; it teaches him the names of plants and also the appearance of seeds. But to make the collecting of seeds of very much value to the child, a more extended study of plants is necessary. There should be attached to each card of seed collections a booklet made by the pupil telling many things about the seeds in the bottles.

If the seeds form a part of our food, an account of the sowing and cultivating of the grain should be given as well as a short description of how the seeds are prepared for food. For instance a story of a grain of wheat should be quite different from that of a kernel of



Indian Corn. If the seeds are used for the food of stock or of poultry, they should be similarly described.

For the study of weed seeds the following outline might be followed:

*Outline for the study of weed seeds.*

1. Where was the weed growing? Was it in a cultivated crop or in meadow or roadside?

2. What kind of root has the weed? Has it a tap-root like the wild carrot; or a tassel-like root like the plantain or a creeping rootstock like the Canada thistle?

3. What sort of a stem has it, round or broad? Is it erect or does it trail upon the ground? Has it many branches or is it a single stem? Is it hairy, woolly, or spiny?

4. Does the seed vessel hold many or few seeds and how and where does it set the seeds free? Have the seeds or seed vessels any hooks or wings or plumes by which they may be carried away from the parent plant?

5. Do any of the birds feed upon these seeds? Does any animal eat them?

6. How many seed vessels were there on the plant and how many seeds in each? (Count the seeds in one or two and take this as an average.) How many seeds does this individual plant produce?

7. Look in Gray's Botany and see whether the weed is native to America or introduced from abroad.

Following this outline may be illustrations of seed capsules or of the plant itself if the pupil likes to draw. Seed collections made in this way naturally would not be so large but would be of greater value from every point of view; and if prizes or premiums for such collections are offered, at least half the points in judging should be given to the essay and half to the collection.

## Preparation of Teachers for Nature-Study and Civic Biology*

Clifton F. Hodge

Clark University, Worcester, Massachusetts

All things considered, progress in the teaching of elementary public school biology has been phenomenal in the last ten years. Millions of boys and girls are now alive and awake to the study of birds and insects, gardens and soils, flowers, trees, weeds, corn, cotton and tomatoes, who would have been dead or asleep to all these interests under the old régime of ten years ago. Under the law of momentum and acceleration, progress in the next ten years is bound to be even better. The field is as infinite as Nature and

*In reply to a request for an article C. F. Hodge wrote: "I enclose an address delivered before the Wisconsin Teachers Association two years ago. I do not feel that I could write anything new that would help the present situation more effectively." The editor is sure readers of the Review will be glad to read it. The address was printed in the Pedagogical Seminary but is worth reprinting here.—Editor.

simply teeming, abounding, bursting with knowledge and possibilities of life and education, all wholesome, all worthy and delightful, and all worth while. We are only in the dawning fringe of a new era of cleanly living and splendid good health, full of beautiful homes, glorious, gorgeous and luscious gardens, teeming fields and shady roadsides, green pastures and still waters. Verily in this work is the Lord our Shepherd and we shall not want.

Nothing gave me more pleasure and genuine satisfaction in my travels of the past summer than the glimpses I got of children's gardens everywhere. The world is surely moving in the right direction. They were everywhere, roof gardens, window gardens back-yard and front-yard gardens, school gardens, garden cities, and everywhere there were children in them, standing and looking. bending over and pointing out things to companions, gathering vegetables and flowers. Among many others, I visited the garden of one little girl in Cleveland; it occupied part of a vacant lot next door to her home and was fifty feet square. Early in August it was a mass of bloom, asters and sweet peas, lilies and roses, with wonderfully well-grown tomatoes, lettuce and other vegetables at the rear. This was the third year she had had this garden and every plant in it seemed perfect. The first year she had sold about $20 worth of flowers, plants and vegetables from her garden, the second $60 worth, and so far this year she had actually sold $125 worth and hoped to bring the amount up to $200 mark before winter; her garden looked as if she would. Think of it! This is already at the rate of $1975 per acre, and if she succeeds in her ambition the yield will be at the rate of $3160 per acre—and by a slim, little slip of a girl, fifteen years old. Mable Musser's garden record for 1913 was $250.83 actually sold from a garden fifty-two feet square. This is equal, as she figures it to eleven cents per square foot, or $4791.60 per acre—possibly a world record by a child.] But in all the garden the finest and best crop is the knowledge, and interests, the ideals and ideas in the life of the girl herself. She was glowing and sparkling with love of her garden. She has developed strength of body and of mind, power to concentrate and patience to persist until the result is in hand, resource and ability to plan wisely and to work out the problems in her way. She has made a good start on the road to knowing how to produce her own living by fundamental and wholesome industry. No matter where her lot is cast, she will be better able to surround her home with the wholesome comforts and beauties of the garden; and what a teacher she may be in a few years.

All this progress has meant change in subject matter, growth in ideas and advance in methods on the part of teachers. A whole new field, the whole out-of-doors, has been thrust upon them to teach. It is one thing to teach the easy little lessons in the easy little printed books and quite another matter to study and learn together with the children and try to teach the big book of nature. Far too little thought has been given to this phase of our problem—teachers expected to teach children to garden who have themselves never so much as thought of planting a seed of any kind; to lead their pupils in bird study, who have never learned to tell a crow from a crocus or a hawk from a handsaw; to teach the trees, who have never been taught rightly a single common oak or maple; and to teach insects, who have never dared to look a single bug in the face. All this infinite wealth of nature dumped on them to teach, on the one side; on the other, courses and equipment, gardens and other facilities and opportunities for study at first hand in the normal schools of ten years ago, in which most of the teachers in the harness to-day received their preparation, utterly inadequate or even absolutely nil. The public is making these demands on the teachers, and nothing can be plainer than the simple, common-sense proposition that the public must supply adequate instruction and equipment for their preparation to teach.

Two propositions thus become clear at the outset. We must adequately reorganize and equip our normal schools with laboratory, greenhouse and garden facilities, properly to fit teachers of the present and future; and, of even more moment just at present, we must offer every possible help and encouragement to the teachers already out in the work. This may be done through educational journals, State nature-study and biology leaflets, and really helpful, practical and inspiring lectures in institutes and the summer schools. Wisconsin has already set the pace in its *Arbor and Bird Day Annual*, a model of both inspiration and instruction; a happy union of art and science. Be liberal, the subject is well worth all we can possibly afford to spend on it, even in money, and much more in life. To require bricks without straw was an outworn policy five or six thousand years ago.

Teachers cannot be prepared to teach nature-study by unkindly criticism. The first thing one is likely to hear when instruction in some new field is discussed is: "The teachers don't know anything about it." And this is too often said as if they ought to know. Fortunately, nature is too infinitely vast and manifold for anyone to know it all, and the more one really knows the humbler he becomes and the more careful of the feelings of others, because he realizes how little of the whole he ever can know and how dependent on others he must always be for what they may have been able to have learned. Hence, the best preparation to teach is the humble spirit, eager to learn but free and even glad to tell another "I do not know." And why not give the pupil the pleasure of finding out and telling? Nature-study reduces to instant absurdity the silly, shallow notion that the teacher ought to know everything. The sum of the knowledge of nature of all mankind, all learning, all science for thousands of years, is only a minute fraction of what remains to be discovered. If everybody knew everything, what a pretty pickle we would all be in! Nobody would have anything to tell anyone else and human society would be on a level with a bank of jolly little clams in the mud.

A friend returning from abroad told me that a well-to-do Frenchman in Paris had asked him: "Well now, is America in New York, or is New York in America?" I was perfectly delighted to hear it. How well I remember the endless, dull, deadening grind of geography in the district school—the wearisome map-making, the everlasting parrot-like telling over and over of boundaries, cities, rivers, mountains, industries and productions. That was some years ago, of course, but I've been told that it is a hundred times worse and more of it now. Oh, man is the only animal on the face of the earth that compels its offspring to learn for the pure torment of learning. From all this dull black misery of useless memory cramming just one bright star, to me a star of hope and inspiration, shines in my soul even to this day. One teacher, her name was Miss Hunt, the only teacher I ever had whom I really loved and would run my little legs off to do, fetch or find anything for Miss Hunt told us that *she did not know the source of the Nile!* that a great many had tried to find it, but could not, that she did so wish somebody would discover it. This was the only thrill I got from all the years of geography. It kindled my infant soul and I vowed then and there, "when I got big," I would discover the rising-place of the river Nile.

In nature all about us, however, we have thousands of things of more vital interest to us than the discovery of the sources of the Nile. Why not tell our children that we wish they would find them out and give us all they are able to discover? This attitude and spirit would mean the very breath of life to our whole system of public education. Why is it that Louis Agassiz is the intellectual father or grandfather of every biologist in America? Because he told his students what he did not know and asked them to find out and tell him. And then:

"His magic was not far to seek, he was so human."

If there was just one element in preparation of teachers for this work that I could have each one possess for the asking it ould not be, that they wear themselves to the bone trying to learn everything in creation, but that they become "as little children," saturated with the spirit of little children and come to heartily enjoy studying and learning together with their pupils. Of such, verily, is the kindom of the heaven of nature-study. From what a burden of cram and sham, pretence and bluff would this not set us free, if every teacher in the land could be glad to say: "I do not know. Does anyone in the class know just the best way to plant a grape vine? Who will volunteer to find out all about it and tell us?" Comfortable and vital honesty between teacher and pupil will be the instant result; they will be truly and sincerely working out their problems together, and not until this blessed condition is secured can we hope to have the best teaching of science.

The definition of "Science" as classified and arranged knowledge, cut and dried hay of the mind, baled and mowed away in books—may have some meaning to the adult who works with it; but it is utterly dead to the child. Lessing's definition of Science as "The eternal struggle of the human mind after truth" is the only one a child can understand. The quest, the hunting, the "struggle" is the thing. We rack our poor brains to invent puzzles, artificial and trifling, while here all about us are the "Riddles of the universe"—all tingling with vital significance. To solve them is what we are here on this earth for—lessons set us to learn in three score years and ten. Lessing saw the point clearly when he defined science, and he says, as you know: "If God were to hold before me the truth itself in His right hand and the struggle to find it out in His left, and ask me to choose, I would humbly bow before the left hand and say, O Lord, for Thee alone is truth, give me rather the struggle." Every child, and everyone else who is not a book-word eating, mental parasite, would do the same.

This, then, is the first great essential in preparation of a teacher —the ability, the knack, the spirit of *working out problems with the pupil.* Compare in effect on the class such assignments as the following: "To-morrow you will commit to memory and recite pages 21, 22 and 23" and: "Come on, let us all study this and see who can find out most about it and each may have the chance to tell what he has learned in the class to-morrow."

Knowledge with this spirit and attitude is wisdom—above fine gold, rubies and diamonds—which draws all men to itself. Knowledge without this spirit and attitude is sure to be disagreeable, uncomfortable, of the kind that "puffeth up," which repels and tends to separate pupil and teacher.

This spirit germinated in Froebel and Pestalozzi. It seems to be beginning to bloom, perhaps more especially, in Montessori, in all whole-souled, active education, agricultural and industrial. It is bound to permeate and dominate every fiber of our educational life and bear the rich fruitage of paradise re-won in the earth. "Come on in," the educational water is fine. It is the river of the elixir of life, a veritable fountain of eternal youth: for true delights of nature never grow old. One of the first fruits of this spirit must be to make teaching the most vitally joyous of all human occupations, next, at any rate, to actual home-making, as it leads us back to the most ancient altar of life, the primal source of our profession, the love of mother and father, working together with their children. And this spirit, springing perhaps more naturally, out of these primeval and original relations of nature and life, must come to vitalize and leaven the whole lump of our public education. "Come on in," this water of life is fine.

Yes, but, do you say, "you must tell us how." What! Don't you know how to swim, mentally and spiritually in the water of life and truth, as well as physically? Do you stand shivering on the bank of book knowledge, afraid to take the plunge into vital, thrilling, sparkling reality? Must I pick you up bodily, or rather, spiritually, and duck you in it? Well, if I must, I must.

Huxley never spoke a truer word; indeed no truer word has ever been spoken in education than this: "Knowledge gained at second hand from books or hearsay is infinitely inferior in quality to knowledge gained at first hand by direct observation and experiment with nature." We have always, everybody always and everywhere has a proverbial distrust of "book larnin," but until recent years how much of any other kind of "learning" have we had in our public schools? Even yet the toils of the books threaten to crush and strangle the life out of our education, like the serpents of the Laocoon group. With the apple trees in full bloom all around them a teacher asked her class to write a description of an apple tree. The class gathered about at the close of the lesson and asked her for references to books on the apple tree. She told them to refer to the apple trees. The results, however, showed that they all went to the library and copied their descriptions out of books.

Dr. Jean Dawson, of the Cleveland Normal School, has just made a remarkable series of tests for knowledge of the most common out-door things, remarkable, I mean, in showing present conditions. About seventy specimens—staple grains, beans and common vegetables, common household plants and branches of common trees—were numbered and passed around the class entering the Normal School, graduates of the high schools and even of colleges. The specimens were large and typical and the pupils handled them at will and were not hurried in their work. A few typical cases follow:

| | | | | |
|---|---|---|---|---|
| 2% | did | not | know | shelled white beans. |
| 20% | " | " | " | bean plant. |
| 4% | " | " | " | clover, of any kind. |
| 10% | " | " | " | a dandelion plant. |
| 67% | " | " | " | a radish plant. |
| 91% | " | " | " | a parsnip plant, with little parsnip. |
| 44% | " | " | " | a potato plant, with little potatoes. |
| 22% | " | " | " | a tomato plant, with blossoms and green tomatoes. |
| 52% | " | " | " | a lettuce plant, with roots, leaves and head. |
| 51% | " | " | " | a squash vine. |
| 60% | " | " | " | a cucumber vine, with leaves, blossoms and little cucumbers on it. |
| 79% | " | " | " | a burdock. |
| 92% | " | " | " | a ragweed. |
| 79% | " | " | " | wheat in head. |
| 43% | " | " | " | wheat kernels in hand. |

The figures might indicate that these students have a low grade of intelligence or that such material was not common in their environment. Neither is the case. An average of 85% standing is necessary for admission to the Normal School. Cleveland is known as the "Forest City" and is truly a city of homes and gardens. All the specimens were gathered within a few rods of the school building and grew, many of them, in profusion everywhere. One of the young ladies had always had a garden at her home and spent many of her summers on a farm, where all the specimens on which she was examinied grew in abundance, but her average was no higher in the test than the other members of the class. Although her average standing had been 91 in high school and she has spent one successful year in college, she did not know an elm, apple or plum tree, could not recognize a raspberry or blackberry bush, a melon or a cucumber vine, a carrot, parsnip or potato plant, although she had picked up five bushels of potatoes once on the farm. She knew oats only in the head and could not recognize wheat either in the head or after it was threshed.

Dr. Dawson explains this whole condition of mind and knowledge through the lack of developing the senses by first-hand observation. Everything practically for years has been learned from books, books, books. The statement of a problem out-of-doors means nothing to such people, and this renders live teaching at this late stage extremely painful and difficult. The remedy for this senseless, thoughtless, condition is clearly insistence upon lessons and first-hand work with things of nature, daily in the home and in the school from the kindergarten up. A few minutes a day and a little direction and encouragement is all that is necessary to stimulate and develop invaluable powers of observation and give a clear knowledge of all the common things about the home. While the above data were gathered in Cleveland, other cities are probably in even a worse condition. We must face things as they are. Here is the finished product of our public schools. The fault lies in the system, not in the pupils. What are we to do about it? Get them all in the water of real life, working out problems with interesting and vital things and keep them alive and growing.

Typical illustrations will be given later, but before doing so we must suggest two other important lines of preparation.

After the spirit we must have the body and the mind for the work. Given the spirit, the body responds, and we must have strong, sound, vigorous bodies. We must be able to enjoy, fairly to revel in out-door things.

> "As the bird wings and sings,
> Let us cry, 'all good things
> Are ours, nor soul helps flesh now, more than
> flesh helps soul.' "

We must have clear, well-developed senses and strong hearts.

> "Eyes, ears took in their dole,
> Brain treasured up the whole;
> Should not the heart beat once
> 'How good to live and learn?' "

It requires real bodily ruggedness and vigor to say from the heart:

> "Then, welcome each rebuff
> That turns earth's smoothness rough,
> Each sting that bids nor sit nor stand but go!
> Be our joys three parts pain!
> Strive, and hold cheap the strain;
> Learn, nor account the pang; dare, never
> grudge the throe!"

Bodily aches and pains, sicknesses of all kinds, are rapidly coming to be recognized for what they are—punishments for errors, mistakes or even crimes against one's self. The first duty of life, biological, educational, social, is to keep the bodily machine up to top-notch efficiency. Keep strong, sleep long, breathe deep, eat right, and we shall have bodies sparkling with euphoria and bubbling over with good health and vital with the will to do good work; bodies capable of carrying the spirit joyfully every step to tops of mountains and through hard days' works. We need and must have in all normal schools and wherever teachers are trained such practical courses in hygiene and physical culture as will make our teachers an inspiration for good health to every school child in the land. In my experience most of the sourness and grouch in school work—I am tempted to say all of it—is due to physical weakness and ill health, and consequent ill-nature and irritability on the part of teachers, or that of the few defective or ill-kept pupils who are so apt to make life a burden to the teacher and the whole school.

Properly prepared themselves, teachers will be able to safeguard the health of their pupils and thus nature-study and civic biology in the high school may be made to serve as the really vital foundations for the conservation of national health. Properly prepared for it, our teachers could set us well forward toward saving our billion dollar tax now annually paid to preventable disease. Nature-study and civic biology should be the corner stone of national vigor and health conservation.*

If we make this instruction really good enough, we reach bad health conditions in the homes as we can in no other way. One girl writes Dr. Dawson: "The biology course revealed so many interesting things to me that sometimes I could hardly wait until I reached home to tell my mother. The knowledge of civic biology was so badly needed in our home that it was impossible for me to keep quiet on the subject." And the "mother" in question testifies that the family got almost as much benefit from the course as did the daughter.

Of course, all such divisions are recognized as artificial, but, given the true spirit and a strong, resilient body, the third element in adequate preparation—a strong clear mind—is apt to be a natural consequence of the other two. By this I mean mental vigor and resourcefulness which gives the teacher power to use materials at hand, the elements and opportunities of the envoironment, and organize them into just the course in nature-study or civic biology which the community needs. This is the diametrical opposite of that deadening "preparation" which so often leads the proverbial normal student to cry out: "Dear teacher, I have come to the end of my note book, What shall I do?"

In this work, as nowhere else, we need clear-headed common sense. I know a school superintendent who in visiting his country districts attempted to stimulate interest in nature-study about us as follows:

"How many of you boys and girls have ever seen a frog?" (Every hand in the room *up*.) "Yes you all know the frogs, I see. How many of you boys and girls ever saw a frog *wink*?" (Every hand in the room *down*.)

"What! Not one of you ever saw a frog *wink!* Well, for country boys and girls I am ashamed of you. Next time I come around I shall expect you all to be able to tell me how a frog *winks*."

He moved to another district. His district was in an uproar. People were not slow in telling him that they did *not* send their children to school to learn how *frogs winked!* Everything that went by the name of "nature-study" suffered in consequence.

*See in this connection a brief paper by Dr. Jean Dawson: Some Effects of Civic Biology in the Home, *School Science and Mathematics*, 1912, pp 313-321.

One little girl was seen bringing hands full of grains from her father's barn.

Her father: "What are you doing with that?" Girl: "Teacher wanted me to bring samples of grains to school for our lesson in nature-study."
Father: "You take that stuff right back into the barn and leave it there, and you tell your teacher that I don't send you to school for any such tomfoolishness."

In the same neighborhood the question: "What kinds of insects and how many will a toad eat for a meal?" set the child population studying and protecting toads, and the good work restored nature-study to public favor.

So here the aim of education is not stuffing the memory with useless information but developing common sense, mental resourcefulness, to study out and work out whatever it is worth while to teach and to learn. The intelligent part of the public, at least is ready entirely to relieve the teacher of the impossible task of trying to know it all, if only he will teach the children in common sense fashion how to find out what they really need to know.

We have purposely not stopped, till now, to differentiate between nature-study and civic biology. The sphere of nature-study is the life and needs of the child in the home. Civic biology consists in those problems that require united action of the community to solve. The two fields are naturally very closely related—*i. e.*, if the life of all the homes were ideal the life of the community would be. The nature-study point of view is to teach the child what he needs to know. The scientific point of view is to teach the subject. If the scientific student cannot master the subject, he has no call to study science. This line of cleavage is thus perfectly clear between educating citizens and instructing specialists, and even specialists ought to be men and good citizens before they become specialists. The line between nature-study and science ought to fall clearly between the high school and the college. It is an advantage, however, to change the name of the course in the high school to "Civic Biology" in order to emphasize preparation for active citizenship.

The trouble with our high school biology in the past has been, and, I fear, still is, that the teachers are trained in college and university and, knowing nothing else, attempt to adapt the college course to the high school. Indeed, most of the text-books written by college or university men for the high school fall into the deep old ruts and turn out to be college texts. Here is a clear point of view which at once relieves us of college domination. It says: admit no topic into the high school course that is not clearly demanded by the best life of the community, and with this criterion any teacher of sense and resource can organize his own course to fit the needs of his community.

It will not be difficult to choose two or three typical subjects which will illustrate this spirit and method for both nature-study and civic biology. Any one of a hundred different insects—which will continue to cost the country more than a million dollars a year, until we study them and learn to combine both home and civic effort to control them; any one of a dozen common microbes—which impose our insufferable burdens of preventable sickness; any one of two score garden, home, orchard or farm fungi, moulds, blights, mildews, smuts, or rusts; the study of birds or gardens, trees, flowers, fruits, nuts; or anything vital to home and community life might serve as well as those selected. Outlines must be the briefest possible but any teacher can fill in between the lines.

MOSQUITOES

*PURPOSE.*—To study the problem with the view of relieving the homes, public parks, streets and school premises—the entire town, city or neighborhood—of the pests.

*METHOD.*—Begin by finding out what the pupils know about: *a.* What mosquitoes do—bite, annoy, inoculate with malaria, chills and fever, or with yellow fever, lower value of land where they are numerous.

*b.* Different kinds of mosquitoes. Common rain-barrel or Culex, malarial Anopheles, or yellow fever mosquitoes.

*c.* Life history: the eggs and wrigglers, larvae and pupae, of different kinds in neighborhood, habits, and places where they are found.

*d.* Hunt for breeding places about school premises and, by each boy or girl, around the home, (if in a high-school class, in all parks, public dumps, streets, in gutters and catch basins, public reservoirs and the like). Maps show extent and distribution of breeding places.

*e.* Methods of dealing with the breeding places—screening and oiling of rain barrels and cisterns, keeping clean, desirable waters stocked with fishes and keeping the shores clear of weeds and pockets of stagnant water, draining or filling undesirable water, or, if this is not possible, covering it with oil, whenever the wrigglers appear in it.

A little timely, well-organized instruction in all the grades and high schools, with appropriate aid of the local papers, which always gladly coöperate, and we gain an advance in home and community life. Special attention to the sewers and catch basins is apt to be the last move on the enemy, and that can be taken by the local board of health or by the sewer department.

THE HOUSE FLY

*PURPOSE.*—To promote health and cleanly living and relieve home and community life of this time-old plague.

*METHOD.*—Bring out by question and answer importance of the subject:

*a.* Annoyance, filth in foods, fly-specking of the windows, chandeliers, ceilings and woodwork. Cost of labor in cleaning up the filth of flies.

*b.* Filth—disease infections carried by flies—typhoid cases in neighborhood, summer complaint of infants, ditto, tuberculosis, ditto, any others? (5,000,000 cases of typhoid yearly for the country with about 50,000 deaths, one-third of which, probably due to flies. Forty-nine thousand infants die under two years of age, and 7,000 over two years, by filth infections of acute dysentery; number of tuberculosis cases, unknown.)

*c.* Different kinds of flies, known to the class? (There are 43,000 species of flies known in all.) Distinguish house, or typhoid fly by appearance, habit, veining of wings—with a magnifying glass. Learn to know the stable fly, the fly that bites cows and horses and people, in the same way. (This fly has just been convicted of carrying infection of infantile paralysis.)

Fly screens disagreeable and expensive. Cost for different families per year. (Expense for U. S. annually, estimated at $12,500,000.)

*d.* Life history: Number of eggs laid by a fly? Where laid? Maggots, found in horse manure and all sorts of decaying animal or vegetable filth (Professor Forbes bred horse flies out of snuff from a druggist's counter.)

Since eggs are laid *before* material is put into manure boxes or pits, it does little good to make these places "fly tight," and is very hard to keep them so.

Maggots hard to kill—experiment in school-room with kerosene, strong alcohol, copperas, lime, other chemicals. (Buried six feet deep, Stiles found that they worked their way to the surface.)

*e.* Foods of adult fly? Substances that attract them most strongly? Distance flies travel? Most effective means of killing adult flies? Best traps? Poisons? Out-door methods of extermination?

*f.* Plans for enlisting every member of the community to keep his premises free from flies? Experience of other places? Flyless homes and cities?

## A GRAPE VINE

The grape has been cultivated since prehistoric times. The suggestion is often made that it may have been the first plant to be selected, to attract the attention possibly of some primitive boy or girl, and be planted or encouraged to grow and be trained over the home of man.

Among the many wholesome garden interests here is one of more permanent relation to the home. A grape vine can be obtained for the price of a package of seeds or a bulb and it will live for centuries. No plant is more easily grown or possesses greater aesthetic, educational and practical possibilities. It requires so little ground space that every child ought to be able to find a place to plant his vine, where he can train it over a back porch, a fence or a blank wall.

*a.* How many of the children have grape vines of their own? How did they get them? Varieties? Age? Size? Yearly crop?

*b.* Methods of propagation? By layers? Cuttings? New varieties by seeds?

*c.* Best ways of transplanting a vine? Training? Feeding or fertilizing? Watering? Thinning blossoms? Summer and fall pruning?

*d.* Stories of grape vines? Origin of varieties? Exhibition of grapes grown by the school?

## TAMING BIRDS ABOUT THE HOME

In the sweetest of all songs "Home Sweet Home" among the memories that cling to the wanderer's heart are those of the "Birds singing gaily that came at my call; Give me these and the peace of mind dearer than all." How many of us have these memories? Among our 20,000,000 homes, how many are there around which the birds sing blithely and come at the children's call? What kind of a country should we have; what kind of homes; what kind of children, if this were livingly true of all of them? It has long been a dream of mine, perhaps the dearest dream in my whole galaxy of dreams, to have this true of every home and of every child in our beloved country. Truly this relation to our bird life will add the liveliest charm and one which will cling most lovingly among childhood's home memories; and why not have every home possess this charm? A charm literally from the skies.

In seeking a universal motive which shall carry this relation to the heart of every child I find this deep, ancient motive of taming things, feeding and giving the cup of cold water. If it is only eating salt together, it brings a thrill, truly magical, of sympathy and life which can never leave the heart as cold as before.

How many of the children have birds tamed to come at call? Kinds of birds tamed? How was it accomplished? How many have bird fountains at their homes? How many provide food for their birds in winter and early spring? How many have put up bird houses? Provided nesting materials?

The end product of the course of nature-study should be a living and abiding interest and love of nature. We can develop this only by active doing, by working out, year by year, the problems in our way. The function of the well prepared teacher is to inspire the children and point out to them the problems that are most worth their while.

I have just written little Mable Musser and asked: "If you could whisper in the ear of every boy and girl one sentence about your garden, what would it be?" She answers: "I feel nearer God's heart in my garden than any place else on earth."

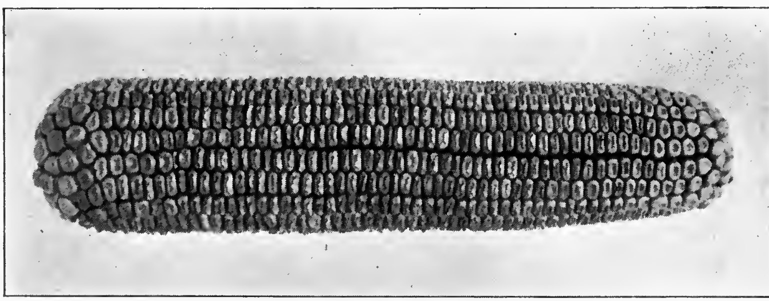


Fig. 1. Reed's Yellow Dent Corn
Champion Ear. Illinois Corn Growing Association, 1914

## The Story of a Kernel of Corn

A. W. NOLAN
University of Illinois

On a beautiful spring morning in April, when all the world was feeling a new impulse of life, our kernel of corn began to realize it, too, contained a germ of life, and would grow. It had been safely guarded in a dry, well-ventilated seed room all winter and its germ was alive and healthy. It stood in a beautiful golden, straight row among its fellows, and its broad square shoulders filled all the space it had on the ear.

Mr. Farmer came into his seedhouse that morning and began to select the best ears of corn for the seed tester. Our kernel whose story is here being told belonged in one of the good ears selected. The rows were straight, the kernels fitted tightly together with no wide spaces between the rows. The butts and tips were well filled with uniformly large kernels. There were no mixed colors, and

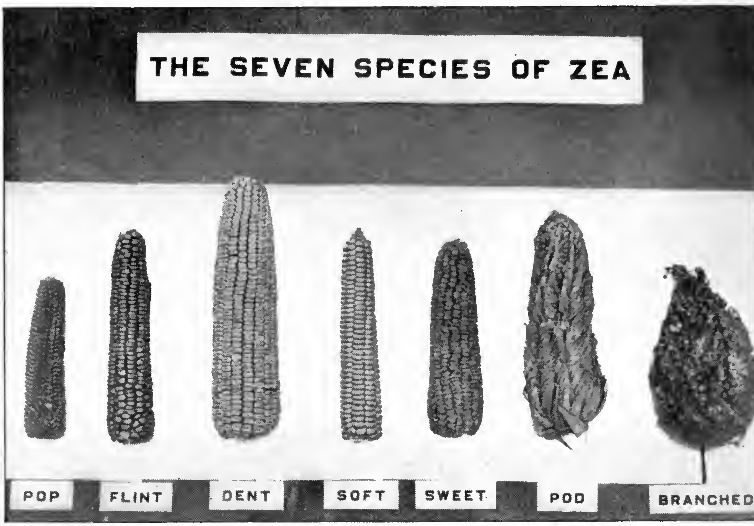



Fig. 2. Seven Species of Corn

the cob was red, for our corn is one of the yellow dents. The farmer seized the good ears in his hands one by one, and those that were firm and well matured he selected for the final test. He used the "rag doll" test, a cloth about one foot wide and three feet long, marked off into two-inch squares, which are numbered to correspond with the number of the ears tested. The cloth was saturated with water before the kernels were placed. Six kernels were taken from six different parts of the ear, and placed in one of these squares, and so on until all the squares were filled. The cloth with the kernels was carefully rolled up so that they remained snugly in place and then tied at each end. The "rag doll" was then placed on end in a pail containing an inch or so of water so that the whole kept moist. The tester was placed in a warm room and in five days the kernels had germinated. The cloth was very carefully unrolled so that none were misplaced, and the farmer could see which ears showed that all the kernels were vigorous growers. Of course any square which shows a single dead kernel, or one that germinated weakly, was proof to the farmer that he should not plant the ear numbered as this square. Our kernel of the story happened to belong to an ear in which all six of its fellows used in the tester grew vigorous shoots.

After the seed was tested the tips and butts were shelled from the ears selected, so that the kernels remaining for the planter would be nearly alike and make a more even and regular drop in the field. Thus our story kernel finally got into the farmer's planter and was dropped with two of its fellows, in a warm, moist, and mellow seed-bed, and covered over about two inches with a rich, loamy soil.

In the warm, moist, and porous seed-bed, our kernel began to germinate in a very few days. While its little roots were getting established in the soil and the shoot was breaking through to the sunlight, the kernel was supplying the little plant with the food necessary to give it a start in life. But soon the old kernel had wasted away, it had given up its life to the young corn plant, and the hull of the seed returned in decay to the soil to add its mite to the food of the plant for which it had died.

Our story must now concern itself with the young corn plant, for our story kernel is now gone. The young corn must now shift for itself. It must get its food from the soil and from the air. It must face the ravages of insects and disease, it must struggle with weeds and endure the handicap of dry weather, perhaps. But it will not be unaided in this struggle for Mr. Farmer is a wise and helpful friend for our corn plant. He has been making a seed-bed and preparing the food for our corn plant for several years, before he placed the kernel in the soil. The field had been well drained. A good clover crop had been cut and left lying on the ground, the previous June, and a second crop from which the seed had been taken in September grew up to a rank growth by November. Upon this clover in November the farmer had applied a ton of fine ground rock phosphate, and after discing the land both ways the whole had been plowed down to a depth of about seven inches, before the freezing days of December came. Through the long winter months the rains and snows were being stored away in the plowed soil in part for a water supply for the next summer; the freezing and thawing weather broke up the soil particles into finer texture and killed also many insects that were hiding away in the soil to be ready to damage our corn when the warm summer sunshine brought them forth again; the clover and rock phosphate were decaying together, to be ready to supply our corn plant with a rich and ready food supply, and a loose, live soil in which to grow. During his spare time in the winter Mr. Farmer had also spread two tons per acre of ground limestone on the cornfield-to-be, in order to sweeten the soil, and otherwise prepare it

Fig. 3. Phosphate Spreader at Work

for a future clover crop which would follow wheat in a rotation after the corn.

As soon as the ground was dry enough to work up mellow and loose, it was disced and harrowed in cross directions, and left in excellent tilth for the planter, which dropped our story kernel as described above. Very soon after our corn plant appeared above the ground, even before all the shoots appeared, Mr. Farmer went over the land with a roller, firming the soil about the germinating and growing corn so that the moisture coming up from below would travel easily by capillary attraction to the surface layer, where it was needed by the young plant.

For the next few days the weather was warm, the earth was moist, the sun shone bright and clear, and our corn plant made rapid growth, reaching to a height of five or six inches above the little weeds that were everywhere appearing to challenge our corn for its space and food. The corn plant now has the lead. The roots are firmly and deeply set in a soil rich in nitrogen, phosphorus, potassium and other plant foods, made ready for the root hairs to absorb. The broad green leaves are unfolding to take in the carbon and oxygen which the plant must use, and on every hand the weather, the soil and the farmer are befriending our corn plant in its growth.

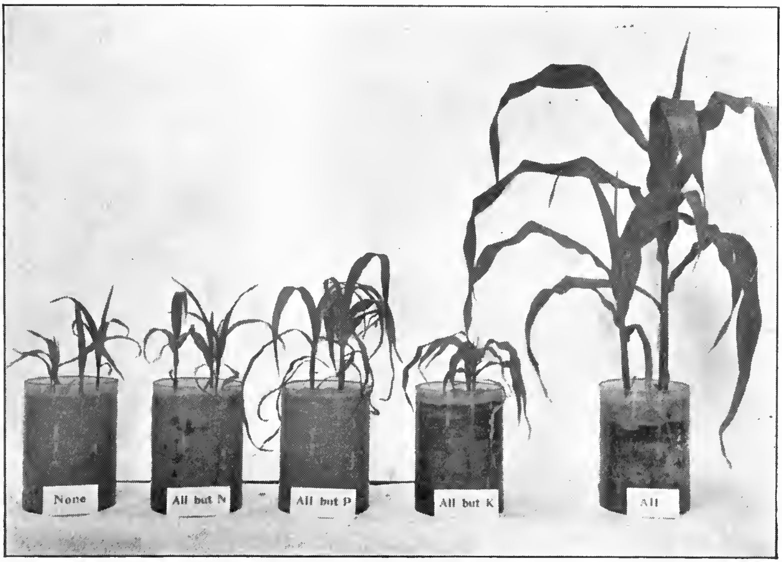



Fig. 4. Feeding the Corn Plant

When our corn plant is about six inches high, Mr. Farmer comes to aid it, with his horses and cultivators. Some farmers harrow the little corn when it is only a few inches high, but the corn of our story receives its first cultivation at the height mentioned above. Mr. Farmer used a small-shovelled cultivator which stirred the ground thoroughly, tore up the weeds and provided a shallow soil mulch to prevent the moisture, coming up from the water table below, from escaping at the surface, and direct it into the corn plant through the roots. Four or five such cultivations during the season were given, and the corn grew green and beautiful, coming into maturity well fed and well bred. The corn root louse, and probably some diseases that tried to rob our corn plant of its food and sap, failed to injure it because it was so well fed and was therefore strong enough to resist its enemies.

About the time the wheat was harvested, a great army of chinch bugs were mobilized and began an invasion toward our corn field. Mr. Farmer and his neighbors learned of the plans of the enemy and began a co-operative movement to head off their advance. Each farmer laid a narrow line of heavy road oil, known as Road Oil Number 7, on properly prepared strips around the borders of their wheat fields. About thirty feet apart along this oil-line were dug post holes. When the hungry bugs started to leave the wheat fields on foot, because they cannot fly at this stage of their life history, they found themselves unable to cross the oil-line, and traveling back and forth along the line, they tumbled into the post holes in great quantities. It was an easy matter to pour a little oil into the holes and kill the entrapped bugs. When all the farmers worked together the corn fields were saved from the ravages of the chinch bugs.

When our corn plant had grown so tall and its roots had spread from row to row, Mr. Farmer stopped the cultivator and let the weeds and grass grow as they would. Perhaps it was best for grass to grow then since it would use up some nitrogen which might otherwise escape from the soil into the air, and being taken up by the grass it is not lost to the soil.

The chief work of our corn plant now is to mature and put on a good ear of corn. In about 60 days from planting it had developed a strong, leafy stalk, well braced in the ground, and had begun to send out a tassel at the top and a cluster of silvery silks from the end of an ear, bending gracefully down from the center of the stalk. The tassel and silks are the blossoms of the corn. Unlike most of our common flowers, the parts of the flower in the corn are thus separated, the stamens with the pollen grains make up the tassel, the pistils each produce the kernels of corn with a silk hanging from the end of the ear. When the tassel is ripe, clouds of pollen grains are blown about through the corn, and at the same time the silks at the end of the ears are ripe to receive the pollen grains which drop upon them. Now these pollen grains must fall upon the silks, and every silk must receive a pollen grain, otherwise the kernel of corn at the end of the silk will fail to develop and the ear would be only a cob. When the pollen grain from the tassel alights on the silk, it begins to grow a slender tube down into the silk and this tube grows until it reaches the little kernel which has just begun on the cob. All the contents of the pollen grain flows down the long tube into the little kernel, and then the silk dies. The kernels are then said to be fertilized. They at once begin to grow and to fill out the cob with plump, well-shaped kernels, each containing a germ which will grow again into a new stalk of corn if properly cared for and planted the next season.

Fig. 5. A Good Stalk of Corn

During the greater part of August and September our corn plant with its ear is maturing. That means that much of the plant food which went into the roots, stalk, and leaves during the growing season, is now being changed into kernels of corn, making them hard and firm on the cob, and leaving the stalk dry and dead. Our corn plant stood among thousands of others, rustling their dry leaves in a cool November wind, when Mr. Farmer came swinging down the row, carrying a sack over his shoulder, selecting his next season's seed. He stopped at the plant grown from our story kernel. It was a beautiful stalk of corn. It stood in ample space for free development, its brace roots held it firm and straight, broad leaves came out and bent down on all sides of the tall, strong stalk, and the ear hung over on a short shank about midway up the stalk. Mr. Farmer turned back the husks and saw that the ear was firm, had a good shape and was well filled with straight rows, so he broke it from the stalk, flung it into his sack of seed corn, and took it into his store room where it lay, safe from the severe frosts and winter freezes, until he was ready to select his seed in the spring and plant again his next corn crop. The stalk left standing in the field may have been browsed over by some pastured cattle, the st ry cannot say at any rate, when the field was ready for the plow again, the stalk was broken down by a drag, cut into bits by a disk, and turned under to decay and furnish plant food for other crops coming in the rotation.

The story might have been different and our corn ear and its stalk might have had a different fate, but the end of our kernel's story has come, it has lived and died in a useful life history, and because of its life more and better corn will follow.

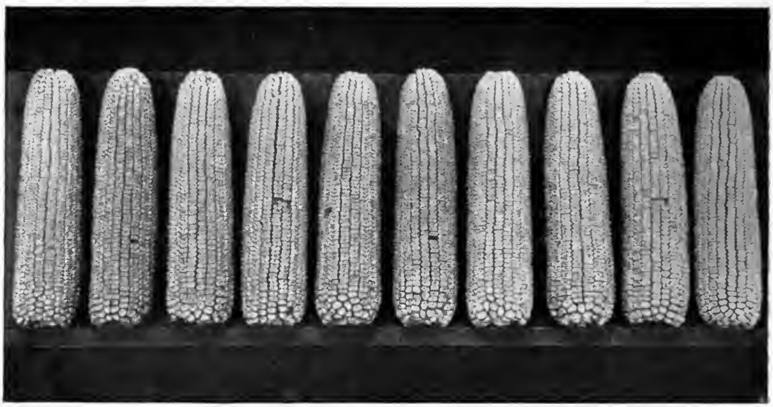


Fig. 6. Boone County White Corn
Grand Sweepstakes. Illinois Corn Growing Association, 1913

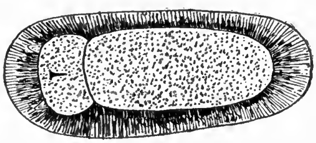
Have you noticed the attractive offers to subscribers, made in the pages at the back of this magazine? Read them; they will interest you. Call the attention of some of your friends to them. This magazine is a missionary. It has a message for every teacher and parent in this country. It could serve a wider constituency if it were more widely known. Help it on. Tell your acquaintances that it exists.

## An Evening With the Aquarium and Snailery[1]

FRANK COLLINS BAKER.

One evening, shortly after our trip to the woods, we met by appointment at Professor Parker's home for the purpose of spending a few hours in study. The Professor greeted us in his usual hearty manner, and we were soon deeply engrossed in our favorite subject.

Of great attraction to us was a large rectangular aquarium (about two feet in length and one foot in width and depth), which was tenanted by various species of pond snails, and fresh-water clams. A light was placed behind the tank, and thus we were able to study the habits of the imprisoned animals. A clam was



A Fresh Water Limpet
As Seen Through the Side of an Aquarium. Greatly Magnified

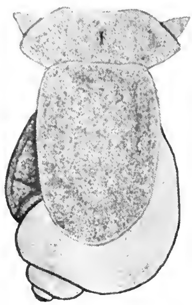
slowly pulling its shell through the muddy bottom, its siphons extended, and the little cilia moving nervously about. Professor Parker told us to watch these siphons closely. A stream of water was constantly passing down the lower siphon, a fact of which we became aware by seeing several very small particles of vegetable matter float near the siphon and quickly disappear into its orifice. The upper siphon was violently expelling waste matter, and we could see the little particles thrown out into the water. We noticed that this siphon seemed to move like clock work, opening and closing at regular intervals, each time ejecting a current of water filled with waste matter. Out of curiosity we counted these pulsations and recorded twelve each minute.

In another part of the aquarium, a number of pond snails were gliding slowly along. On one side, several large snails were eating the growth of of green vegetable matter which had accumulated. This side presented a curious appearance, for each snail had

[1]From "Shells of Land and Water," by permission of the author.

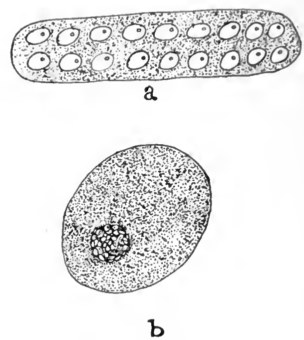
left a clear path behind it where the scum had been cleaned off. We could plainly see the mouth open and close as the animal grazed along. Every time the mouth opened, the tongue was thrust out, and the whole operation reminded us of a cat lapping milk. The brown jaw was also plainly seen.

As we were watching the animals on the side of the aquarium, one of them rose suddenly from the bottom of the tank to the top of the water: there it floated, shell downward, and with the foot applied to the under surface of the top of the water. Sometimes a faint, clicking sound could be heard when one of the pond



Pond Snail Crawling on Glass

Tadpole Snail



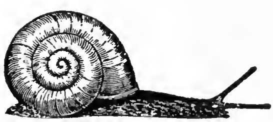

Egg Mass of Physegyrna

snails made this ascent. This, Professor Parker said, was caused by the escaping of the imprisoned air from the lung.

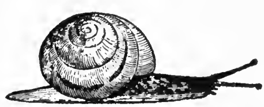
George inquired how the snail was apparently able to crawl on the under side of the surface of the water and also how the little insects called water-striders could run over the surface as though it were perfectly solid.

"This apparently impossible feat," answered the Professor, is easily explained when we understand some of the laws of physics, and those of you who are studying the subject at the University are probably well acquainted with the fact. It is now a well-established fact that the surface of the water and other liquids, is covered with a very thin film, and the insect is able to walk upon the upper side of this film and the mullusk on the lower side. One proof of the presence of this film is found by the oft-repeated experiment with the needle. If we carefully place a fine needle on the surface of the water, it does not sink, but will float, although seven times heavier than its own bulk of water. If the needle is wet, or if it is very large, it will not float, which shows that this film is very delicate. If we place the glass holding the needle so that we can look through the glass at the surface of the water, we will then see that the needle rests in a little hollow, as if the water were covered with a membrane."

Among the pond snails were a number of orb snails carrying their shells in a perpendicular manner, and waving their slender tentacles about. Several of them were crawling along the bottom of the tank, with a peculiar stepping motion. The animal pushed its foot deep into the sand, the shell being drawn well down toward the head. It was then pushed forward and upward, making a little furrow, which prepared the way for another step. In this way it "stepped" along at a lively gait. We learned from Pro-



A Carnivorous Land Snail



A Common Land Snail

fessor Parker that this "stepping" was more for procuring food than for locomotion. One of the large orb shells was crawling up the side of the aquarium, eating everything in its path. Several times a morsel was taken which proved distasteful to the animal, and it was immediately "spit out."

Some of the smaller snails, *Amnicola* and *Valvata*, were wandering about, the former crawling with a wabbly gait, rolling the shell from side to side. In another part of the aquarium, a number of *Physas* were crawling rapidly along the bottom. Some of these rose suddenly, like the pond snails. Others descended from the top, suspended by a slender thread of mucus. Several of the pond snails had crawled out of the water, and were attached to the glass, a number of inches from the surface. Several apple snails, as well as other members of the water breathers, were enjoying themselves by crawling about the bottom, or on the sides of the aquarium, apparently feeding; their long tentacles were waving, and their blunt, cylindrical rostrum was moving about like the nose of a hound on the scent. All of this animation in the aquarium made it seem like a miniature world, as indeed it really was.

On the narrow end of the aquarium we discovered a number of little, jelly-like masses, which Professor Parker told us were the eggs of the *Physa* snail. They were nearly an inch in length and very narrow. Each mass contained a large number of eggs. By the aid of a magnifying glass we counted the eggs in three masses, and found one hundred and thirty in one, one hundred and sixty in another, and two hundred in the third. The Professor placed one of these masses under the microscope, and we observed the little embryos slowly rotating about.

"The eggs of the fresh-water snails," said the Professor, may be found any time during April or May. The young hatch out in June. They are transparent little animals, about one-fiftieth of an inch in length. They are very active, and eat voraciously of anything which they find. Some of the water-breathers lay but a single egg, which is inclosed in a round capsule. The young of the apple snails are born alive, and are minute, transparent animals, about one-eighth of an inch in length; they are very active.

Near the aquarium, the Professor had a snailery in which were several dozen snails of various species. The snailery was made of an aquarium about the size of the one in which the fresh-water snails and clams lived; the bottom was covered with earth to a depth of three or four inches, and a little pan of water was sunk in one corner to imitate a lake; several ferns were growing in the opposite end; a piece of netting was stretched over the top to keep the snails from escaping.

A snail was crawling over the moist earth, and we watched to see what it would do. It was evidently headed toward a fresh piece of lettuce leaf, which had been recently placed within. The snail went along slowly, moving its eye peduncles about nervously and retracting them when they came in contact with a lump of earth. Occasionally it would raise its head until it rested only upon the last third of its foot, and then, it would twist about its head and eye peduncles as though it scented danger.

In a little while the lettuce leaf was reached. Resting upon the hind part of its foot, it raised the fore part and began to bite off pieces of the leaf. We could see the horny jaw come out of the mouth, bite off a piece of lettuce, and then swallow it, accompanying the action by a faint rasping sound. Professor Parker told us that the jaw was used to bite off large pieces of vegetation, which were then reduced to pulp by the action of the teeth or radula.

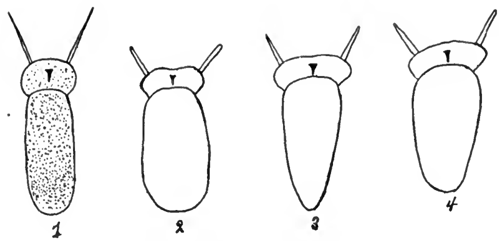
The sight of the aquarium and snailery filled with living animals fired our ambition and we plied the Professor with questions relative to the immediate possession of aquariums and snaileries for each of us.

He smilingly encouraged us in our desire, and said that almost any kind of a glass jar or globe would answer the purpose. A fish globe was recommended as was also an electric battery jar, and even a quart mason fruit jar. The top, he said, should be covered with netting to keep both land and fresh-water snails from getting out and crawling about the room. Some floating water-plant in the aquariums, as duckweed, bladderwort, and watercress, with a few small ferns and some moss in the snaileries, would add to their beauty, and make them more homelike for their inhabitants.

We were warned against mixing different kinds of snails in one snailery, for while the majority are vegetable feeders, and perfectly friendly with each other, a few are carnivorous and would prey upon each other and also upon other snails. Such species as *Circinaria*, *Glandina*, and *Testacella* were to be especially avoided. We also learned that if there was not a sufficient amount of lime in the water of the aquarium, the snails would eat each other's shells to obtain this necessary material. Professor Parker advised us to study the growth of some of the land snails; and as a preliminary lesson, he set us to hunting for some of the eggs in his snailery. After a few mintues' search, George found a little cluster of eggs under a projecting clump of earth. They were perfectly white, and about one-sixteenth of an inch in diameter.

The Professor told us that during May or June these snails lay their eggs, to the number of forty or more, in moist localities where they are sheltered from the rays of the sun. Favorite places are under old leaves which have space beneath them, by the side of logs, stones, or sticks, and under loose pieces of bark or chips. Twenty or thirty days after the eggs are laid, the young snail is hatched and starts on its life journey, reaching full maturity in about three years. In October or November, in this latitude (about 42 degrees north), the snail ceases to be active and hibernates during the cold winter months.

We asked Professor Parker how fast a snail could travel. This, he said, was a part of the subject which he had never studied; so he took a large specimen of the white-lipped snail from the snailery, placed him on a board, and took out his watch. The snail hesitated for a moment, and then started to crawl to the other end of the board. In one minute it had crawled two inches. He then again timed it, and it crawled twenty-four inches in fourteen minutes. He then tried a snail of a different species, and found that it took this snail two minutes to crawl two inches. Several other species were tried, and it was found that each seemed to have a certain regular speed, which did not vary to any great extent.

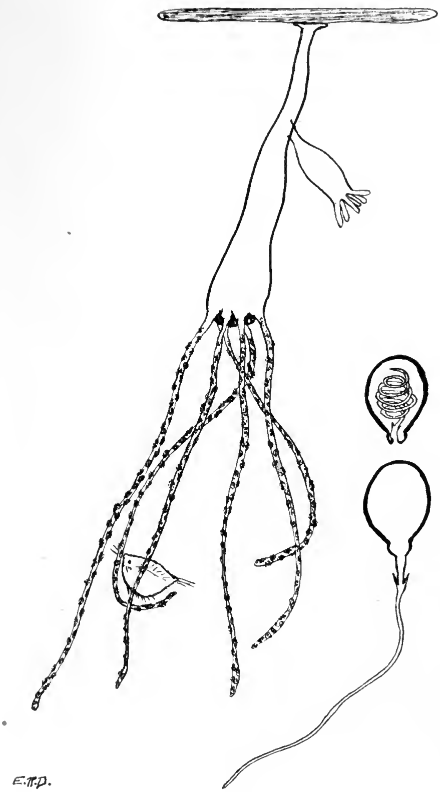



Four Species of Orb Snail

## An Aquarium in a Tumbler

Elliot R. Downing

These fall and winter months are the ones when it is more difficult to get nature-study material, especially the living material. The author has been interested in a little animal for many years that lends itself readily to observation now-a-days. This form is hydra. It is to be found in almost any fresh water pond where there is abundant plant growth and it may be readily collected. You need merely to take a stick with a hook on it, such as may be cut from any tree, using a fork to shape the hook, and with this instrument reach out into the pond and pull in water lily pads, chara, or any of the submerged water plants. This material can be put into a bucket or quart fruit jar and you do not need to carry water in the receptacle unless you are a long ways from home and must take considerable time before it can be put into the aquarium. When you get back from your collecting trip, take out the material and transfer to an aquarium, or glass jars or even quart fruit jars—a handful of the stuff in a quart fruit jar is about the right quantity. Cover this with water and allow it to stand preferably in good light




Hydra bearing a bud.

Nettle cells or nematocyst, before and after discharge. The animal is pendant from bit of plant.

for twenty-four to forty-eight hours, then if you have been successful you will find the little animals attached to the sides of the jar, to the water plants, or the surface film of the water.

The animal is hard to see at first so that you may think that you have been totally unsuccessful, but as you look more carefully you will see the hydra abundantly. It is a tiny cylindrical sack attached by a slight enlargement at one end, called the foot. It bears a circle of tentacles, usually six, at the other end, and in the midst of these tentacles is the mouth. Usually the animal hangs mouth down with its tentacles floating in the water, ready to capture swimming animals that make up its food. If the animal is desired for study in the school room it is a good scheme to have each pupil provided with a tumbler. In these put a little spray of the water plant that has been brought in from the pond or such a plant as cabonia that is supplied by dealers in gold fish. For that matter no plant is necessary if the hydra is to be kept under observation for a short time only, for they will live in the tumbler of water for several weeks without the presence of the plant. A medicine dropper may be used to transfer the animal from the larger jar to the tumbler. Pick the animal up if it is on the surface film by simply drawing the water into the pipette, the point of which is close to the animal. If the animal is attached to the side of the jar it will be necessary to loosen its hold by shoving it off with the tip of the pipette, when it may be drawn up as before and transferred to the tumbler. The tumbler may be filled half full of water from the larger jars or from the tap.

When you disturb hydra in this process it contracts into an almost spherical mass, the tentacles are now simply little prominences on one side of the sphere. In fact it may contract so much that you will fail to see it in the tumbler unless you look very sharply for the altered form. It will shortly re-establish itself on the side of the tumbler or the surface film, expand and await some chance animal as food.

You will undoubtedly have brought in with the material on which hydra was found an abundance of small animals that will serve it as food. Small crustaceans will be observed swimming about in the water. Some of these collect in clouds on the surface of the water on the side of the fruit jar near the light. Here, too, you are likely to find the blood work Chironomus which is really the larva of one of the tiny gnats. Animals of this sort may be transferred to the tumbler in which hydra is living to feed it. It is interesting to watch this process of feeding and to do this it is well to transfer the hydra in a drop of water to a piece of glass. If the drop with the hydra in it is ejected from the pipette carefully the drop or two will make a hemispherical heap of water on the clean surface of the glass and in this drop the hydra will shortly expand ready for a meal. Now, if two or three of these small animals can be added to the drop from the pipette taken up in as little water as possible, the animals are confined in a small territory and soon they will bump up against the tentacles of hydra. If the hydra has been kept for a couple of days in the tumbler without food, it will probably be hungry enough to feed quite promptly. The blood worm for instance comes in contact with hydra's tentacles and seems to be shocked by the contact. It remains quiet for just a moment and then as it begins to wriggle the other tentacles move over in its direction and several of them lay hold on it. As a matter of fact these tentacles of hydra are provided with thousands of nettle cells. Each one of these cells is furnished with a sharp thread which can be ejected with some force and which penetrates the skin of the blood worm. This thread is really a fine tube and through it a poisonous fluid is sent into the captured prey. The larva soon becomes quiescent, the tentacles pull it down towards the mouth at their center, and it is slowly swallowed. It does not go out of sight even then for the body wall of hydra is so thin that it may be seen plainly even after it is entirely within the animal. The mouth of hydra is capable of very wide expansion, so that this little beast may take in animals that are apparently several times its own size. If the blood worm for instance which it undertakes to swallow is large, one end of the worm may be swallowed and the digestive process will then proceed. After the portion swallowed has been thus digested still more of the worm is crowded down through the mouth into the body cavity. I have seen hydra thus engulf young fish that were three-eighths of an inch long. The animal you see is a hydra-headed monster to these tiny denizens of the ponds where it lives.

Hydra has been known to scientists for a long time. I have in my library two books devoted to this little animal, both of them written before the middle of the eighteenth century, and even these old zoölogists knew a great many of the wonderful things that hydra can do. You can cut the animal in half, either crosswise or lengthwise, and in a few days you will find that each half has remodeled itself into a perfect hydra. This process of regeneration is quite common among the lower animals especially. You can even cut hydra up into fourths or eighths and still the process goes on and you get four or eight complete hydra in place of the one. They are of course small at first but as they feed they soon grow to the size of the adult. If you try this experiment you will likely fail in a large percentage of your trials because there are bacteria and moulds that grow rapidly on the cut surfaces of hydra and kill some of the specimens that you experiment on, but with due care to see that your dishes are clean and the instruments that you use are clean and that you use clean water, the experiment will succeed in many cases, especially if you will keep the dish covered. The hydra should be well fed also before the experiment begins.

There are several different kinds of hydra, one very common one is green, due to the presence in its cells of some tiny plants that live with it as mess mates. The other kinds are brown and some of these brown forms get to be fairly good sized. When expanded the animal may be a half inch long with tentacles that stretch out like tiny hairs three or four inches in length, but even a large one like this when it is disturbed contracts until it is not larger than the head of an ordinary black-headed pin. Not only will a common species of hydra regenerate when cut as above described, but if you cut a green hydra in half and a brown hydra in half, then pin the upper half of, say, a green hydra to the lower half of a brown hydra, using a bit of bristle as a pin, the cut surfaces will grow together and you will have a hydra half green and half brown. Many of these experiments in regeneration are described in these old books on hydra.

You will be quite sure to find some of the hydra in your jars that are growing their young by a process called budding. A little bulge appears on one side of an adult hydra. This grows larger and larger, the body cavity of the parent extends up into this extension that is to be the young animal. Bye and bye tentacles appear, a mouth breaks through at the upper end of the bulge and it is evident that a little hydra is growing on the side of the parent. Sometimes this young one will grow to maturity and produce young on itself before it detaches from the old hydra.

You will surely find a good many other interesting animals as you are looking for hydra and studying it. If you can have a little pocket lens to help you you will, in the course of a few weeks work with this tumbler aquarium, be able to draw and make record of an exceedingly interesting lot of animals. These animals, too, are of large economic importance for it is these tiny forms, especially the crustaceans, little relatives of the common crayfish and lobster, that form the bulk of the food of the smaller fishes.

## Editorial

### Need of Purposeful Observation in Nature-Study

One of the great needs in teaching nature-study is some definite aim to guide children in their observation of materials. The teacher should always have in mind the general aims of education and the special function of nature-study, but it is equally important that the child should have in mind some definite purpose for each lesson. Too much observation is carried on without any specific purpose, other than the meaningless one of observing everything that can be seen about the material in hand. When educators held the disciplinary aim of education, in accordance with which the chief aim of nature-study was to develop the power of observation, there seemed some justification for this aimless study; but now that the researches of modern psychologists have compelled the abandonment of the old theory of formal discipline, one can no longer find any educational reason for pursuing this kind of indiscriminate observation of any and all points.

To meet this need of purposeful observation the teacher should acquire a variety of children's problems. These problems should be very specific, they should find their source in the present life of the child, based on his immediate interests and needs; and they should find the promise of their fulfilment in the near future.

As an illustration of the point under discussion we may suppose the topic of a lesson for primary grades is the hepatica. Instead of a set of miscellaneous unorganized observations on the number, color, size, and shape of the parts of the flower, and on the arrangement, shape, size, margin, and veining of the leaves, there is needed some definite limiting problem, in which the child is interested, to determine what shall be observed, such as the following: "How may the hepatica be distinguished from the anemone?" This marks out definitely the field to be studied, and limits the observations to those points that help answer the problem.

A good problem may in itself suggest the possibility of using the knowledge gained. This consideration may help in determining the value of a problem. In the case previously given the child has an opportunity to apply what he has learned in distinguishing the flowers as he sees them growing.

The chief value of children's problems, however, as underlying their use in directing study, lies in the fact that they act as a stimulus to arouse the children's interest. Too often the stimulus which directs the child in school is an external one, imposed from without, heedless of the child's interests, in the form of fear of, or love for teacher or parent. Real children's problems serve as a natural internal stimulus arising from the child's interests, and guiding the child to do things because they appeal to him and seem worth while. Successful teaching consists largely in arousing children's interests. After the children are really interested, the rest of teaching follows naturally and easily. The right kind of children's problems is a powerful means of awakening interest. Children like to do things not merely because they are commanded by some one in authority over them, but because they can see some benefit to come to them from doing a certain thing. And this internal stimulus leads to much more effective and lasting results than the external stimulus.

Not only will these problems arouse the interest of the children, but they will also be of great aid to the teacher in two ways; first, in selecting the facts to be taught in a lesson, and second, in organizing them.

In the very nature of the case nature-study deals so largely with the things of the child's immediate environment that there is a great abundance of problems in which children are interested. One problem of almost universal interest, especially in the primary and intermediate grades, is the means of identifying the common plants and animals. In dealing with the beneficial forms of life one naturally finds the problems of their value to man and their protection by man; and with the injurious forms, the problems of the harm done and the methods of control. In gardening there arise the problems of how to raise plants and what use to make of them. Young children are interested in the problems of the use and care of pets. And throughout the whole realm of Nature many other problems of interest to children present themselves in great variety.

State Normal School,
Mankato, Minn.

GILBERT H. TRAFTON.

## News and Notes

The Secretary of the Society is in receipt of letters from the Merchants Association of New York City and from the Dean of the Faculty of Education, University of Toronto, extending invitations to the American Nature-Study Society to meet respectively in New York and Toronto for the mid-winter meeting in 1915. Action will be taken on them at the coming meeting in Philadelphia.

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Current magazines are quite devoid of nature-study articles. The war has driven them into retreat. Journals devoted to the out-of-doors present some good things but all know where to look for them in *Outing*, *Bird Lore*, etc. The October *Catholic Educational Review* has an interesting article, "A Plea for Nature-Study."

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The St. Louis section of the American Nature-Study Society held its first in-door meet and annual election on Tuesday, Sept. 15, 1914, in the Assembly Rooms of the Harris Teachers College.

The business of the day was the reading of the annual report of the Secretary-Treasurer, and the nomination of officers for the ensuing year.

The remainder of the afternoon was taken up with suggestions and discussions concerning the field trips for the fall months. At the close several interesting reports on observations, made during the summer vacation, were given.

The officers for 1914-1915 are as follows: President, Mr. W. J. Stevens, Field School; Secretary-Treasurer, Miss. Carolyn Lefferty, Harris Teachers College; Director, Mr. H. C. Drayer, Jackson School; Executive Committee: Mr. J. A. Drushel, Harris Teachers College; Miss. Estelle Windhorst, Ashland School.

The Chicago *Examiner* recently conducted a competition for twenty Scholarships for which it supplied the funds. The competitors were from the high school graduates of Chicago and Cook County, Illinois, and the competition was open to all such. The Scholarship Committee was composed of Miss. Gertrude E. English, representing Mrs. Ella Flagg Young, Superintendent of Schools of Chicago; Dean Willard E. Hotchkiss, of Northwestern University; Mr. Walter A. Payne, Recorder of the University of Chicago, and Edward J. Tobin, Superintendent of Schools of Cook County. The successful contestants are now attending University of Chicago, Northwestern University, University of Illinois, and Cornell University.

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"This number of the journal is issued with many misgivings. Unlike its predecessors, it will meet with chill reception and its leaves will be turned over with listless fingers. This is a time of stirring events and great issues, and nature-study has a remote sound, barely arresting attention. It seems trivial to concern one's self with the potting of bulbs and setting of butterflies, when the fate of nations is in the balance and the terrors of war hold our mind spell-bound. What excuse have we for playing with trifles and sending out a journal that contains no reference to the war in its pages?

"We believe that we also serve our country who care for the coming generations, and our way for caring for them is now to put our shoulder to the wheel of education and push with ever greater might. The task is heavy in these days of tense waiting, of excitement and of dark shadow—but they are also days of restraint, control and courage. Since nature-study is part of our school work, we continue to attend to it, and because it presents to its votaries visions of things as they are, and shows them in wide perspective, the study is at least restful.

"We venture, therefore, not only to send forth this journal as usual but also to arrange an exhibition of fruits and fungi and teaching material produced in connection with the study of these treasures of autumn. Lord Sudeley has testified to his sympathy with our efforts by consenting to open the exhibition. The visit of a public man of great renown on the occasion of so small a thing as a nature-study exhibition is of great significance. Let us honour this act of service on his part by coming together in great numbers for his reception!"—*From School Nature-Study, London.*

## Nature-Play

In a recent number of the *Popular Science Monthly*, (April, 1914), Dr. Charles Lincoln Edwards, director of nature-study in the Los Angeles schools, makes some practical discussions, especially appropriate to the summer time as to helping children to a more intelligent interest in nature. He suggests that one type of animal or plant be taken up for observation each week—one of the domestic animals, for example, or one of the plants in the garden. "Never tell children that which they may find out for themselves," but ask them to see how much they can find out in ten minutes of personal observation.

"The chief thing is to bring the child in contact with nature and give him the pleasure and stimulus of original discovery." When a child notices that a horse walks on the tops of his middle fingers and middle toes, he becomes fascinated with the stories of the evolution of this animal from the small mammal, about the size of a dog, which had five fingers on each hand and five toes on each foot. "The child learns that germs are not bugs, nor worms, nor little devils, but they are minute plants. Some germs are the best friends of man."

To develop narrative skill we have introduced a game called caravan. Beginning in one of the rooms of the upper grade, the teacher selects three pupils especially interested in nature-play, each to describe some animal from the course. The name of the creature is not to be given by the narrator, but must be guessed by the others.

Contrary to most guessing games, the object is to have given such a lucid description that the name of the animal will be guessed very soon. Then every one is invited to add anything not mentioned, or to correct any mis-statements; so that the descriptions may become the general contribution of the room. By a majority vote the animal is selected to represent the room in the caravan, and then in a similar manner the pupil who can best describe the selected animal. Thus, the caravan starts on its way, in each room, adding a new animal after those already in the caravan have been described. The game proves an admirable review, in which each participating mind is keenly stimulated by the spirit of competitive play.—*The Bulletin.*

## Book Reviews

Rocky Mountain Flowers. An Illustrated Guide for Plant Lovers and Plant Users. Frederick E. Clements and Edith Schwartz Clements. pp. xxxi + 392. H. W. Wilson Co., New York. $3.00.

The Rocky Mountain region is coming to be used so much as a summer recreation ground for our American people that this book will be welcomed by all, and especially by those who are interested in nature as nature students.

The keys that are used in the book are made so as to be serviceable to a person who is not a botanical specialist, though they will serve the purpose of the latter individual also. The book is illustrated with a number of plates, some twenty of them in color.

Unfortunately the book is printed on a moderately heavy paper and is a fairly large volume. It would improve it materially if it could be printed on thin paper and bound with flexible cover, for when one is tramping through the mountains every added ounce that has to be carried is taken under protest.

The book has a glossary of the scientific terms that are used and is well indexed. It is an excellent addition to the library of the nature lover who expects to live in or even visit the western states.

The Spring of the Year, Summer, The Fall of the Year, Winter. Dallas Lore Sharp. Houghton, Mifflin Co. 60c. each.

This series of four volumes, each of about 150 pages, makes a group of books that will be much appreciated as nature readers.

Anyone familiar with the work of the author will anticipate that the writings are true to nature and that the style is both interesting and simple. The language used will put the books into the upper grades, although as suggestive material the teacher even of intermediate grades could make good use of the books. The subject matter covers principally the lives of the birds and the smaller mammals, although there is more or less space devoted to plants and the other animals. The illustrations are by Robert Bruce Horsfall and are pen and ink sketches or black and white wash drawings. They add materially to the value of the books.

Frog Culture for Profit. The Aqua Life Co., Seymour, Conn. $2.00.

This book contains only twenty-five pages of print, well spaced and provided with wide margins at that, only about 6000 words and yet it is priced as if it were a generous book. We presume the author, whose name by the way is not given, conceives that the information he gives is worth the price even if it does occupy little room. And that might be true if one were contemplating starting a frog pond. [This is immensely profitable, according to the booklet.] Still about all the information is readily obtained from the government bulletins, such as "Notes on the Edible Frogs of the United States and their Artificial Propagation," by F. M. Chamberlain, U. S. Fish Commission Reprint 348, or the Bi-Monthly Bulletin of the Division of Zoology, Pennsylvania Department of Agriculture, Vol. III, Nos. 3 and 4. "The Amphibians of Pennsylvania," and these are free publications. There seems to be no excuse for the little volume except to make large earnings on a meager investment for said Seymour Co., depending on the gullibility of an unsuspecting public for the sales.

Learning and Doing. Edgar James Swift. pp. x + 249. The Bobbs-Merrill Co., Indianapolis. $1.00.

Education is coming to be a science. We actually begin to know some things in the educational field with a fair degree of certainty. Whereas formerly personal opinion of methods and processes in learning were based on limited experience, now facts resulting from careful scientific experiments afford foundation for our procedure. This book puts at the disposal of the teacher much of the new information and incorporates it in a forceful statement of the modern point of view in education. Chapter one has the suggestive title "The Revolt from Monotony." The nature lover will appreciate this (p. 25) "Out-of-door work in nature's laboratory, would give the children live problems for solution instead of dead ones. The children would learn to investigate—to put questions to themselves and to find answers. Readiness to see problems in what confronts one, to state conditions clearly, with emphasis on the essentials, to see the questions involved in these conditions, underlie thinking; and this power is not gained by sitting in one's seat and reading what others have said about these things. . . . Studying what writers say with laboratory work to establish its correctness is the imitative method. It does not train in thinking; and failure to learn to think is failure in education."

The successive chapter headings are: Efficient Teaching, "Getting Results," Progress in Learning, Economy in Learning, Habit in Learning and Achievement, New Demands on the School. There is appended an extensive list of references for further reading. It is an exceedingly good book, for the lay reader. The specialist in education will know it all. The average teacher or parent will profit by it greatly.

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A new edition of the Naturalists' Directory has just been published by S. E Cassino, Salem, Mass. This directory is invaluable to naturalists since it is the means of bringing together students and collectors in all parts of the world through correspondence. The directory contains an alphabetical list of English speaking professional and amateur naturalists in all parts of the world, also a list of Scientific Societies and Periodicals. The price of the Directory is $2.50 in Cloth Binding and $2.00 in Paper Binding. Sent postpaid. As only a limited edition has been printed it is advisable for any one wishing a copy to order at once.

PRESS OF W. F. HUMPHREY, GENEVA, N. Y

The Nature-Study Review,
Ithaca, N. Y.

Gentlemen:

Enclosed find....for which please enter my name as subscriber to.........................and The Nature-Study Review for one year.

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The Nature-Study Review,
Ithaca, N. Y.

Gentlemen:

Enclosed find $1.25 for which please enter my name as a member both of the School Garden Association of America and the American Nature Study Society (including the Nature-Study Review).

Signed................................,

......................Street,

.................City,...................State.

Date....................................

## Special Number on the Organization of Nature-Study


# NATURE-STUDY REVIEW

Devoted Primarily to all Scientific Studies of Nature
in Elementary Schools

Vol. 10 No 9
Whole No. 87

OFFICIAL ORGAN OF THE
AMERICAN NATURE STUDY SOCIETY

DECEMBER
1914




CONTENTS


The Annual Meeting and Election of Officers.... 333

The Program .................. 334

Editor's Note.................. 335

Editorial, the Nature-Study Course 335
C. F. Hodge

The Nature-Study Course of the School of Observation and Practice, Philadelphia Normal School for Girls .................... 337
Furnished by Adeline F. Schively

The Nature-Study Course of the Elementary School, the School of Education, the University of Chicago.................... 358
Furnished by Otis W. Caldwell

The Oregon Course of Study in Nature-Study................ 368
Furnished by J. A. Churchill

News and Notes............... 374

Book Reviews ................ 77

Index......................... 81



Published Monthly except June, July and August at Ithaca, N. Y.

$1.00 a VOLUME (9 Nos.)

Elliot R. Downing, Editor
The University of Chicago The School of Education
Chicago, Ill

15 Cents copy

Entered as second-class matter at the Postoffice at Ithaca, N. Y., under the Act of March 3, 1879.

# THE NATURE-STUDY REVIEW

DEVOTED PRIMARILY TO ALL SCIENTIFIC STUDIES OF NATURE IN ELEMENTARY SCHOOLS

**Important** Please note date of expiration of your subscription on the label of the wrapper. Subscriptions must be paid in advance to comply with postal requirements. Subscriptions and advertisements should be sent to *The Comstock Publishing Co., Ithaca, N. Y.* Manuscripts for Publication and Books to be Reviewed should be sent to the Editor.

Vol. 10 | December, 1914 | No. 9


## The Annual Meeting and Election of Officers

The sixth meeting of the American Nature-Study Society will be held in Philadelphia, Penn., December 30 and 31, in connection with the meetings of the American Association for the Advancement of Science and affiliated societies, during the week December 28–January 2.

The Council has made the nominations for the officers to be elected at this meeting as follows:

*President*, L. H. Bailey, N. Y.

*Vice-Presidents*, M. A. Bigelow, N. Y., Otis W. Caldwell, Ill., B. M. Davis, Ohio, F. L. Holtz, N. Y., C. F. Hodge, Ore., S. B. McCready, Ont., C. H. Robison, N. J., C. A. Stebbins, Cal. *Vote for five.*

*Directors*, E. E. Balcomb, N. C., A. B. Comstock, N. Y., John Dearness, Ont., Lewis M. Dongan, Mo., Jas. G. Needham, N. Y., A. J. Patterson, Ill., W. A. Slingerland, N. Y., C. A. Stebbins, Cal., *Vote for five.*

*Sec.-Editor*, Elliot R. Downing, Ill.

The retiring vice-presidents are: M. A. Bigelow, Otis W. Caldwell, C. A. Stebbins, B. M. Davis, S. B. McCready.

The retiring directors are: E. E. Balcomb, Ora M. Carrel, Mich., Anna Clark, N. Y., John A. Dearness, Alice J. Patterson.

All subscribers to this magazine are members of the Society and are entitled to vote. Mail your vote to the Secretary, Elliot R. Downing, The University of Chicago, The School of Education, before December 20, 1914. Mark the envelope "For Officers, 1915."

## PROGRAM

### Wednesday, December 30

*Morning, 9 o'clock*

The President's Address—"The Growth and Influence of the Nature-Study Idea," - - Mrs. Anna B. Comstock

"The Relation of Nature-Study to the Proposed Courses in General Science," - - - - Edward F. Bigelow

Discussion led by C. H. Robison.

Report of the Secretary-Treasurer.

Election of Officers.

*Afternoon, 2:30*

Joint Meeting with the School Garden Association.

"The Recent Work of the U. S. Government in Connection with School Gardens," Dr. P. P. Claxton (or representative)

"The Plan of Nature-Study in the Gary, Ind., Schools," Margaret Aherne

"A Sixth Sense in Birds and Animals" G. O. Shields, Pres. League of Am. Sportsmen.

"How the School Garden Clubs of America Might Further School Gardens," Mrs. J. Willis Martin.

### Thursday, December 31

*Morning, 9 o'clock*

The Organization of the Nature-Study Course.

General Discussion based on the Outline in the December Number of the Nature-Study Review.

F. L. Holtz, N. Y., Laura F. Woodward, N. J., John A. Dearness, Ontario.

The discussion will be open to all and it is hoped some principles of organization may be reached sufficiently explicit to be tentatively adopted.

*Afternoon*

Excursion to the Philadelphia Normal School for Girls to see equipment for Nature-Study and Display of Work. The Normal

School is located at 13th and Spring Garden Streets and is best reached by 13th St. cars.

The Nature-Study group will meet at the usual meeting place at 1:30 P. M., and go to the Normal together. Any who wish to go to the Normal School direct will find us in the lecture room of the Nature-Study Department at 2:30 P. M., where we shall hear a paper; "The Local Nature-Study Situation," ADELINE F. SCHIVELY.

After this the buildings and Nature-Study Equipment will be inspected under the direction of Mrs. L. L. W. Wilson.

## Editor's Note

This number is devoted to a presentation of several outlines of Nature-Study. More of them will appear in coming numbers. Nature-Study has apparently reached the stage at which it demands organization. Without premonition the editor has been bombarded with demands for organization and plans for organization. Inquiry has elicited more of the same. Apparently everywhere the more or less indefinite and incoherent Nature-Study efforts are crystallizing into definite form. So important is the issue that one session of our coming meeting at Philadelphia is to be devoted to a discussion of the principles involved. Can we formulate them now in sufficiently definite shape to recommend them to all who are planning nature-study work? Read the outlines that follow and come to Philadelphia prepared to give us the benefit of your counsel.

## Editorial

### THE NATURE-STUDY COURSE

C. F. HODGE

University of Oregon, Eugene, Ore.

Surely no one who has followed the growth of nature-study for the past ten years can find ground for anything but encouragement. Of course, as with the introduction of any new matter into an always "overburdened curriculum," there has been of necessity keen discussion and sharp differences of view, but all this has made for progress. The most encouraging feature in the whole situation, as I see it, is that teachers everywhere are beginning to realize clearly that nature-study is essentially different from all the other book work of the schools and that it, along with manual training, domestic science and industrial instruction generally, to which nature-study is so closely allied, supplies a vitalizing leaven of reality and that this real, active problem-solving is absolutely essential to the best moral and educational life of the child in every school grade from kindergarten up to and, most certainly, through the high school. This sentiment finds strong expression in the recent Portland School Survey as follows:

"A practical, concrete course in nature-study, based not on books, but on the phenomena of nature themselves, ought to form a part of every elementary school curriculum, from the lowest to the highest grade. Such a course, correlated with language, literature, physiology and geography, and efficiently carried out, would do something to modify Portland's present predominantly abstract and bookish courses."

The Portland schools do not stand alone in this lack of a practical, concrete course of nature-study—to relieve from bookishness, to develop powers of reasoning, thinking and observing to discover natural aptitudes of the child and bring him into harmony with the laws and forces of nature and enable the schools to meet the charge of general apartness from life and futility so persistently urged against them.

"A course in nature-study?" What school has worked out a "practical, concrete course in nature-study"? What does such a course do for the pupils and teachers, for the parents and the community? Is not the time ripe, and can the REVIEW do better service than by stressing during the year the matter of a consistent, orderly, a "practical, concrete course in nature-study," a course that shall grip all the pupils, inspire all the teachers and enthuse all the parents with the idea that it is worth while to send their children to school to study and learn it? Who will come forward with such a course, give us complete outlines, describe it and tell us all about it? While I confess that I have never seen anything very closely approximating such a course in operation throughout a town or city I still have faith enough in the resources of nature to satisfy the needs of the growing child so that I believe such a course is possible. The mere effort to organize and reasonably order the course will help us to winnow off the chaff from the wheat, save the educationally vital and throw out the trifling in the great mass of suggestions and "lessons" that have been brought before us in the past ten years. Have we not gone far enough in accumulating materials and can we not profitably bend our energies to fitting together, constructing, building up a consistent, progressive, practical, concrete course of nature-study?

Nothing is farther from my meaning than a "cut and dried" course in nature-study. No two communities should have the same course. Different sections of the same city must have different courses to fit the needs. Still any group of teachers should be able to take a general grade-plan in nature-study and fit it to the conditions and needs of their pupils and their communities.

In the back of my book, *Nature-Study and Life*, is printed a grade plan which attempts to organize the topics as suggested above. While I am responsible for the idea, the practical work was done by a voluntary committee of teachers in the active work of the schools. In this committee were teachers from the grades and a number of principals so that we had expert suggestions as to which garden problems, which trees and wild flowers, insects, birds, domestic animals, health problems, and so on, to put into each grade. My present feeling is that this grade plan should be considerably simplified, the garden problems and those of plant and animal industry, which now so often pass under the name of elementary agriculture, should be strongly emphasized.

## The Nature-Study Course of the School of Observation and Practice

(By Courtesy of the Teacher)

ADELINE F. SCHIVELY
Philadelphia Normal School for Girls

### GENERAL STATEMENTS

(*a*) This course has been planned for the classes, second to eighth years, inclusive. No definite assignments have been made for first year. It seemed best to leave the selection of subjects for this year to the teachers themselves.

(*b*) In all grades, as far as possible, certain fundamental thoughts have been borne in mind.

1. Selection of subjects under group headings—Plant Life; Animal Life; Minerals (4–5–6); Experimental (mainly chemistry and physics); Earth Study; Miscellaneous (stars, moon, etc.).

2. Correlation with the geography (general or physical) assigned to that year, and occasionally with the physiology.

3. The assignment of certain special examples under a subject to avoid repetition; to facilitate review; for example, definite seeds for germination study; leaves of certain trees, etc.

4. There is no division into A and B work; seasonal conditions determine the plan of procedure.

FIG. 1. The Butterfly Game.

5. The encouraging of garden work mainly at home; our school plots are small, and have only recently been acquired. One cent seed packages are used.

6. The course for each year has been made quite comprehensive, rather full. It is not always possible to complete the work as scheduled. Sometimes desired material cannot be obtained; sometimes unexpected material arrives and is used wherever possible.

7. There has been consideration for those pupils who pass entirely through the school. While there is a close relation in many of the subjects chosen, there is also actual advance in information and increase in complexity of subjects, demanding a recall of former knowledge.

## SECOND YEAR

### September, October, November

#### *Plant Life*

Talks upon some of the plants whose seeds are grown by children when in the first year: nasturtium, corn, pumpkin.

Fig. 2. Cloud Study

These talks should be illustrated by all parts of the plant possible. Children should be encouraged to speak of their special plants and to bring any products which they may have.

Recognition of wild flowers. Talks upon any of the flowers: aster, thistle, and wild carrot particularly good.

Recognition of common garden flowers.

Lessons to emphasize the relationship between fruit and flower; apple, morning glory, and Jamestown weed are all good.

Seed distribution, well illustrated.

The parts of the plant and the uses of these; emphasis should be laid upon the variety in forms of roots, also leaves.

Comparison of different nuts and the way they grow; chestnut, acorn, hickory, walnut, horsechestnut, English walnut, peanut, almond, Brazil or cream nut.

Planting of bulbs for the class, in pots—by children.

Trees: names of principal ones found on street as shade trees; forest trees; fruit trees. The latter should be considered according to the popular idea, then attention given to the fact that nuts are fruits also.

### *Animal Life*

Turtle, crayfish, snail or slug.

Recognition of some insects: grasshopper, cricket, dragon-fly, honey bee, bumble lee, moth, butterfly.

Talsk about these, dealing principally with habits.

Squirrel, rabbit, and beaver; also any animal which may be in the school.

## December, January, February

### *Plant Life*

Preparation of plants for winter. Effects of frost upon plants.

Simple talks upon evergreens (spruce and pine) and some deciduous trees.

Study of the flowering bulb.

### *Animal Life*

Preparation of animals for winter. Study of the canary, chicken, duck, the eagle, and owl.

Nests of birds: emphasize size, where made, material, etc.

N. B.—It will be necessary to use pictures with some of this work. Avoid too much detailed observation.

The dog: kinds, habits, adaptations, food, enemies, special senses, usefulness, harmfulness, relatives.

Any animals which may be in school.

### *Experimental*

Evaporation, condensation. These subjects should be illustrated with simple experiments.

Clouds, various forms.

Snow, observation of the flakes.

### *Miscellaneous*

Rocks. Stars. Sun. Moon. Attention should be called to the phases of the moon. Reference to the Great Dipper may be made.

Supposed visit to the seashore, mentioning such interesting objects as crabs, sea weed, star-fish, shells.

Sheep, leading to the study of wool.

FIG. 3. Little Rainmakers.

## MARCH, APRIL, MAY, JUNE

### *Plant Life*

Recognition of wild flowers. Lessons on special flowers; the dandelion, violet, and cherry or apple blossoms are particularly good.

Recognition of common garden flower.

Study of germinating pea; home germination and classwork. Peas may be grown on netting over a glass of water; also in saw-dust.

This work should be begun during April.

Buds and branches, several kinds, should be used, kept in the classroom, development noticed from time to time, and lessons given accordingly.

Trees: study and associate

Leaf of Carolina poplar and its flower (catkin).

Leaf of oak and its fruit (acorn).

Leaf of chestnut and its fruit (chestnut).

Leaf of horsechestnut and its fruit (horsechestnut).

Home garden work—planting of seeds in pots or boxes indoors; also later out of doors in garden.

### *Animal Life*

Some common spring birds: robin, blue bird, crow, meadowlark, woodpecker or flicker, swallow, chimney swift. Humming bird may be mentioned.

N. B.—It will be necessary to use pictures to some extent in these lessons. Avoid too much detailed observation.

Silk worm. Also life history of some moth or butterfly.

Review of insects taught in the fall.

Earthworm, its habits and uses.

N. B.—Use any other subjects which occur to you, either as following necessarily upon these lessons or as being convenient on account of material available.

## THIRD YEAR

### September, October, November

### *Plant Life*

Recognition of wild flowers, also cultivated flowers. Lessons on special flowers when desired.

Review relation of fruit and flower taught in second year.

Corn: the parts of the plant and their uses to man; kinds; preparation of corn for food. Corn legends, also history.

Pumpkin: the plant with leaves, tendrils, flowers and fruit. Mention other fruits related to the pumpkin, using expression "pumpkin family."

Some common vegetables and the parts that are used for food.

Bulb planting for the class, in pots, by the children.

Chestnuts and chestnut burrs.

Review leaves of trees taught in lower grades—Carolina poplar (mention catkin), oak, chestnut, horsechestnut (associate fruit with each).

FIG. 4. Feeding a Butterfly.

### *Animal Life*

Chestnut worm. Review insects taught in second year. Add house fly and cicada.

Rabbit (reviewed from second year). Add habits, also relatives.

### December, January, February

#### *Earth Study*

The wind: kinds, velocity, direction; associate winds and weather.

Show compass; explain its use. Keep a board record (made by class) of the wind for a month.

Give pupils an idea of relation between seasons and the kind of weather which prevails.

#### *Miscellaneous*

Corn and other grains used in bread-making.

Bread: the usual ingredients; kinds.

#### *Experimental*

Teach terms "liquid" and "solid".

Heat experiments.

1. How produced: (*a*) friction; (*b*) striking. How fire was produced in old times.

Talk about matches.

2. Effects of heat on solids: (*a*) become red hot; (*b*) soften; (*c*) melt, become liquids.

3. Effects of heat on liquids: (*a*) causes boiling; steam results; causes disappearance in time.

Study of the thermometer; ability to read correctly.

Crystals: (*a*) Various minerals, giving idea of size, shape and color of crystals; these are natural forms. (*b*) Review of snow (second year); ice and frost compared with snow. (*c*) Rock candy. (*d*) Salt, sugar, small crystals made from solutions dropped on pieces of glass; these crystals made by man.

Forms of water; freezing and its results.

#### *Plant Life*

The study of the flowering bulb.

The cocoanut and how it grows. The Brazil nut and how it grows.

Germination of wheat, rye, oats, barley. (Class work.)

*Animal Life*

Camel, horse and mule. Comparisons made from observation of last mentioned animals. Animals related to the horse: donkey and zebra. Use expression "horse family."

The horse: disposition, habits, uses, kinds.

FIG. 5. Peering Into a Robin's Nest.

MARCH, APRIL, MAY, JINE

*Plant Life*

Corn is to be given to each child for home germination in sawdust, netting over water, or between blotting paper and the side of a glass. This work should be given in April. Germinating corn is to be kept also in the classroom.

Recognition of wild flowers; garden flowers. Lessons on special flowers as desired.

Parts of the flower: calyx (note sepals); corolla (petals); stamens (mention pollen); seed-box.

Buds and branches of Carolina poplar and maple. These should be kept in the classroom and the development observed.

Trees. Review of the September list. Add white maple and Norway maple.

Fruit of these. Germinating maples and young plants observed.

Lessons calling attention to variety of leaves: size, shape, margin, etc.

### *Animal Life*

History and development of moth or butterfly (reviewed from second year); clothes moth.

Recognition of spider; centipede; beetle.

Frog or toad spawn, if possible.

Toad. Animal kept in classroom for a few days.

By means of one or two talks, illustrated by pictures, teach the names of some common spring birds, and excite interest in observation out of doors.

A visit to the Zoological Garden or the Academy of Natural Sciences for the purpose of studying these and other birds.

N. B.—Other subjects may be chosen according to special objects of interest in the excursion taken to the Park or suburbs.

## FOURTH YEAR

### SEPTEMBER, OCTOBER, NOVEMBER

### *Plant Life*

Recognition of wild flowers. Recognition of garden flowers.

Grasses: peculiarities of plant; great variety of flower-cluster arrangement; related plants—corn, sugar-cane, bamboo. This series should give a good idea of the "grass family."

Bulb planting in water and sand or stones—individual work at home.

Leaves of trees: Carolina poplar, chestnut, horsechestnut, oak, white maple, Norway maple.

### *Animal Life*

Codling moth. Review apple blossom sufficiently to make clear the structure of the fruit. Life history of moth studied in connection with wormy apples. What may be done to destroy the enemy of the apple.

Turtle or tortoise. Animals kept in classroom.

Preparation of animals for winter; migration; hibernation.

### *Miscellaneous*

Moon: daily observation by the pupils; classroom record kept on board for a month. Study of the phases. This work should be associated with talks about the moon—its distance, size, motions, etc. Myths may be read in connection with the work.

Sun: daily observations by the pupils. This study should be accompanied with talks about the sun—distance, size, light, heat, etc.

Stars: Great Dipper; North Star; Orion.

Diagrams giving idea of arrangement of these stars should be shown to class.

## December, January, February

### *Plant Life*

Evergreen trees: pine, hemlock, spruce, fir. Recognition of species and uses.

Study of the flowering bulb.

### *Experimental*

Electricity: simple conversations, with experiments.

Heat experiments (see third grade).

(*a*) Effects on solids—expansion.
(*b*) Effects on liquids—expansion.
(*c*) Relation between heat and electricity.

### *Minerals*

Common building stones: sandstone, marble, slate, serpentine, granite and gneiss. All these are to be examined, peculiarities noticed, and all stones recognized.

While studying marble, attention is to be given to the fact that it is a form of limestone. Other forms of limestone may be shown and tested with acid. Limestone when burned gives us lime; uses of this.

While studying granite and gneiss, quartz, feldspar and mica will be learned. Emphasize fact that gneiss is found in neighborhood of Philadelphia.

Coal: kinds; formation.

Distinction between minerals and metals.

Ores: iron, copper, lead, silver, gold. Examination of these; comparison; manner of mining; any important facts.

N. B.—Avoid spending too much time on coal mining and preparation of iron for commerical purposes.

Other minerals: graphite (lead pencil); rock salt.

In studying minerals there should be conversations emphasizing characteristics, but recognition is the most important point to be gained.

## March, April, May, June

### *Plant Life*

Recognition of wild flowers. Recognition of garden flowers. Lessons on special flowers as desired; dandelion, violet and pansy make excellent series.

Parts of the flower thoroughly taught: calyx, sepals; corolla, petals; stamens (upper part—pollen-box); pistil (lower part—seed-box).

Review of leaves taught in lower grades (September work). Add tulip and beech. Study carefully buds of tulip tree.

Study of germinating pumpkin seed; home work and classroom work. Seeds are to be planted in sawdust or cotton over a tumbler of water. This work should be given in April.

Home gardens: use of one cent packages; planting out of doors in the garden.

### *Minerals*

The work of previous period will probably be continued into March.

### *Animal Life*

One or two talks about birds may be given. Books and pictures may be used to familiarize the pupils with names and appearance of these. Encourage observation by pupils.

Frog, also snake, to be kept in classroom.

Insect-galls.

N. B.—Other subjects may be chosen according to the objects of interest which may be seen during excursion to Park or suburbs.

One or two lessons with magnifying glasses may be given during the term.

## FIFTH YEAR

### SEPTEMBER, OCTOBER, NOVEMBER

#### *Plant Life*

Review of parts of a flower. Recognition of wild and cultivated flowers.

Fruits: dry and pulpy, their names, means of distribution.

Children will make their own collections, bring them to school, and study them.

Bulb planting in garden plot.

Bulb planting by individuals at home; learning how to force bulbs.

Leaves of tree: recognition. Review of these from lower grades: Carolina poplar, chestnut, horsechestnut, oak, silver maple, tulip, beech.

Leaf coloration and leaf fall. Notice buds; fallen leaves; autumn bonfires; value of ashes.

#### *Animal Life*

Insect enemies of the trees: tussock moth and caterpillar, basket worm, web worm. Select any one which is convenient. Remedies for these insects.

#### *Earth Study*

Evaporation, condensation, individual experiments at home and experiments in school.

Study of smoke; of steam; comparison. Study of clouds; four principal forms. Relation between clouds and weather.

Study of the wind and its direction; board record kept in the winter and again in the late spring.

Study of the rain; how rainfall is estimated; use of a simple rain-gauge.

### DECEMBER, JANUARY, FEBRUARY

#### *Plant Life*

Review of evergreen trees taught in fourth year; add cedar and arbor-vitæ.

Use of these trees. Deciduous and evergreen trees contrasted. Use terms "hardwood" and "coniferous" trees.

Mistletoe.

Study of flowering bulb—usually daffodil.

Orange and its relatives.

### *Minerals*

Building stones of fourth year reviewed. Add schist; compare with granite and gneiss.

Limestone: review what was learned in fourth year. Different forms of limestone; test these. Story of the formation of limestone. Mention fossils.

Soil: kinds, color, formation, composition, relative value for agricultural purposes.

Pebbles and what they teach us.

### *Experimental*

Magnetism: mariner's compass should be studied.

Some few chemical experiments, such as—

(*a*) Washing dirty hands with soap.
(*b*) Slaking lime.
(*c*) Suplhur discoloration of spoon.
(*d*) Iron rusting.

## March, April, May, June

### *Minerals*

Forms of quartz: clear, milky, rose, amethyst, agate, flint. Recognition is important. Interesting facts may be given.

Exercises in recognition of minerals learned in fourth year.

### *Plant Life*

Recognition of wild and cultivated flowers.

Lessons on special flowers as desired. Skunk cabbage, wistaria, Jack-in-the-pulpit form excellent lessons.

Study of branches of developing horse-chestnut. Keep branches in classroom, watch development; take lessons when convenient.

Leaves of trees: review those mentioned in September list, add linden, elm, sycamore or buttonwood.

Planting in garden plot; home gardens. One cent packages of seeds are used.

The life of the tree: parts and their uses, portion of tree where growth takes place; study of wood and bark. Study small, thin stems and also sections of thick ones. Call attention to the different kinds of wood and their appearance.

Simple talks concerning forestry.

(*a*) Importance of the forest in improving the soil.

(*b*) Some things which harm the forest.

Arbor Day.

FIG. 6. An Ideal Class Room.

Germination of lima bean. Home work and class work. Bean should be grown in sawdust or wet blotting paper (cylinder in tumbler).

How to raise a plant from an ivy cutting.

### *Animal Life*

Birds: Audubon leaflets, general talks about these birds; pictures, etc.; encourage observation out of doors.

Development of the silkworm.

N. B.—One-half day excursion in the Park. Objects of interest found there may be used for lessons in classroom.

One or two lessons with magnifying glasses may be given during the term.

## SIXTH YEAR

### September, October, November

#### *Plant Life*

Recognition of wild flowers, also common garden flowers.

Review of leaves taught in lower grades—Carolina poplar, chestnut, horsechestnut, oak, white maple, Norway maple, tulip, beech, elm, linden, sycamore. Study of trees where possible.

Bulb planting: study of garden catalogues; home planting.

#### *Animal Life*

Insects: grasshopper or locust, fly, dragonfly, moth, butterfly. Pupils should gain a clear notion of "an insect" from the study of the grasshopper. They should know the life history of the grasshopper, dragon-fly, moth.

The development of the silkworm should be reviewed and completed.

Honey bee: study of observation hive; reference to the bumble bee.

### December, January, February

#### *Animal Life*

The oyster: study of shells, exterior and interior; the animal studied from fresh opened oysters. This work should be accompanied by drawings made by pupils.

The life history of the oyster; natural and artificial beds; the location of the most important of these; work of the United States Fish Commission.

Pearls: fresh and salt water forms.

Comparison of other shells with oyster shells; names of common shells found on the Atlantic coast—clam, scallop, razor clam, mussel, ark, gold and silver shells, boat shells.

Teeth of various animals.

#### *Experimental*

Starch: foods containing this substance; test.

Oil: foods containing this substance; test.

Proteids or nitrogenous substances: foods containing these; test.

### *Minerals*

Review of those studied in lower grades.

Building stones: marble, granite, serpentine, slate, sandstone, gneiss, schist.

Other minerals: quartz, (several forms) rock salt, graphite, felspar, mica.

Ores: iron, copper, lead, silver, gold.

Add kaolin (white clay); refer to other kinds; discuss uses, especially the pottery industry.

Minerals should be studied somewhat more systematically—reference to hardness, structure, lustre, streak, etc.

## March, April, May, June

### *Minerals*

Study of these will probably be continued into this period.

### *Plant Life*

Recognition of wild flowers; recognition of common garden flowers; lessons on special flowers.

Recognition of flowerless plants—ferns, mosses, lichens, mushrooms, tree fungi.

Review of leaves studied in the fall; add locust and ailanthus.

Home gardens: use of one cent packages of seeds; planting in school garden.

Propagation of begonia from a cutting; care of the same.

Talks on forestry; review fifth year work; add (*a*) how the forests affect the water supply, (*b*) how a person who owns a forest should take care of his trees.

### *Animal Life*

Study of the frog or toad spawn (if possible).

Study of the hen's egg.

Fish: study of the living animal by means of the gold fish in aquaria. Pupils should gain some knowledge of variety in form, appearance of fish, also arrangement of fins.

Study fish heads to gain notion of appearance of gills, teeth, etc. Propose visits to market. Names of fish living in salt and fresh water. Use of fish as food. Life history of shad or salmon. Work of United States Fish Commission.

Birds: talks on bird observation. Study of Prang's Chart No. 1; Audubon leaflets.

N. B.—Additional subjects may be chosen according to what objects of interest may be seen during excursion—one-half day—park or country.

One or two lessons with magnifying glasses or microscope may be given during term.

## SEVENTH YEAR

### September, October, November

#### *Plant Life*

Recognition of flowers, both wild and cultivated.

Review of leaves taught in the lower grades—Carolina poplar, chestnut, horsechestnut, buckeye, oak, white maple, Norway maple, tulip, beech, elm, linden, sycamore, locust, ailanthus. Study of trees where possible.

Bulb planting: study of garden catalogues; home planting.

#### *Animal Life*

Parsley worm or other caterpillar: development; formation of chrysalis; appearance of butterfly. Compare this history with that of the silkworm. Study of other caterpillars if possible.

The life history of mosquito and cicada. The reasons for desiring the destruction of both of these insects.

The crayfish, studied from the living animal. The crab compared with the crayfish. Various kinds of crabs—fiddler, mole, spider, hermit, king, etc.

### December, January, February

#### *Animal Life*

Termites.

Wasps: social and solitary.

Birds: plumage, forms of beaks, forms of feet, comparison of the skeleton with that of other vertebrates.

Corals: the peculiarities of the animal; formation of coral islands.

Animal coverings: fur, wool, hair, bristles, scales, feathers. Compare these with the human hair; manner of growth, etc.

### *Minerals*

Review some of those taught in lower grades. Kaolin and its uses.

Add asbestos and its uses. Cryolite and the preparation of aluminum.

### *Experimental*

Heat: how heat is transferred from one portion of matter to another—conduction, convection, radiation. The facts should be illustrated with many experiments. Refer to experiments in third, fourth and fifth years.

## MARCH, APRIL, MAY, JUNE

### *Plant Life*

Recognition of wild flowers; recognition of garden flowers.

Endeavor to group related forms—various fruit blossoms, clovers, etc. Lessons on special plants.

Buds: many kinds to show variety in arrangement of folding, etc.

Home gardens: use of one cent packages of seed. Planting in school garden.

Propagation of slips: cuttings of geranium or coleus; how to care for the same.

Review of leaves studied in fall; instruction in the use of Miss Keeler's book, "Our Native Trees"; study of trees where possible.

Recognition of common weeds: common plantain, English plantain, wood sorrel, thistle, shepherd's purse.

Forestry: review work of fifth and sixth years. Add (*a*) how the soil is held in place by forests, (*b*) floods which follow the removal of forests and their results.

### *Animal Life*

Observations upon the earth worm; its structure; its usefulness.

Spiders: their webs; structure compared with insects and crabs peculiar spiders; relatives of spiders.

Talks upon bird observation. Study of Prang's Bird Charts 1 and 2; Audubon leaflets; instruction in the use of Chapman's "Bird Life".

N. B.—Additional subjects may be chosen according to what objects of interest may be seen during the excursion—one-half day —in park or country.

One or two lessons with magnifying glasses or the microscope may be given during the term.

## EIGHTH YEAR

### SEPTEMBER, OCTOBER, NOVEMBER

*Plant Life*

Flowers: recognition of wild flowers; also garden flowers.

Parts of a flower reviewed; parts of stamen and pistils are added here.

Special attention given to composite flowers, wild and cultivated; the expression "composite family" is used.

Fruits: structure; classes; means of dispersal.

Bulbs: study of an onion; examination of a garden catalogue; bulb planting at home and in our school garden plot.

Flowerless plants: ferns, mosses, sea weeds, lichens, moulds, mushrooms, tree fungi. Pupils should recognize these (taught in lower grades). General idea of structure, appearance, places of growth, method of reproduction.

### DECEMBER, JANUARY, FEBRUARY

*Plant Life*

Evergreens: recognition; rather careful study of pine and its products.

Plants which are seen in streets or windows at Christmas.

Citrus family.

*Experimental Work*

(Associated with Physical Geography)

1. Laws of precipitation. Series of questions reviewing evaporation and condensation; experiments performed at home or in class. Discussion concerning dew, clouds, fog, rain, snow, ice (glaciers and icebergs). Experiments where possible.

2. Thermometer reviewed: Fahrenheit—freezing point, boiling point of water, blood heat, zero, minus temperatures.

3. Air pressure: experimental work; making a barometer.

4. Review of seventh year (experimental work)—transference of heat (conduction, convection, radiation); application to study of winds.

5. References to work or Weather Bureau; examination of weather maps.

6. Sound: simple experiments wherever possible.
   (*a*) Nature of sound.
   (*b*) Wave motion; transmission.
   (*c*) Media carrying sound.
   (*d*) Velocity.
   (*e*) Reflection.
   (*f*) Pitch.

This series is correlated with the study of the ear and larynx (physiology).

7. Light: simple experiments wherever possible.
   (*a*) Luminous and non-luminous bodies.
   (*b*) Transparent, translucent, opaque.
   (*c*) Traveling in straight lines; rays.
   (*d*) Velocity.
   (*e*) Reflection.
   (*f*) Refraction.
   (*g*) Prism-light broken into colors.
   (*h*) Lenses and focussing; references to optical instruments.

This series is correlated with the study of the eye (physiology). Dissection of a bullock's eye is very helpful.

N. B.—It is not usually possible to give both the series on light and sound.

### March, April, May, June

#### *Experimental Work*

Often continued into March.

#### *Bird Study*

By means of Audubon leaflets and charts; encourage observation out of doors.

#### *Plant Life*

Recognition of wild flowers, trees, garden flowers.
Lily family: by means of flowering bulbs.
Amaryllis family: by means of flowering bulbs.

Jack-in-the-pulpit family: Skunk cabbage, calla, Jack-in-the-pulpit.

Pea family: by means of wistaria or locust.

Rose family: by means of fruit blossoms.

Horsechestnut branch reviewed; other branches in classroom.

Structure of a tree stem; a bit of poplar stem; cross sections of a tree trunk; examination of wood cut in various ways; what is meant by "grain" of wood.

Arbor Day: review of forestry problems studied in lower grades.

Seed planting in home gardens; one cent packages; propagation of plants by cuttings; a little discussion of what is meant by grafting; pollination of flowers; Burbank and his work.

N. B.—One excursion in the country or park—half day. Use observations there for lessons in school.

One or more lessons with magnifying glasses or microscope may be given during the term.

## The Nature-Study Course of the Elementary School

Presented by Otis W. Caldwell

The School of Education, The University of Chicago

This outline is the result of several years of experiment, during which many changes have been made in the content of the course, the methods of work, the grades in which certain topics are used, in the correlations of this work with other subjects, and in the unification of the work through the different grades. A good many teachers and several supervisors have made contributions to the organization of the course, hence the course cannot be regarded as the work of any one person. That the course will undergo further changes, is expected by all who are following the effort to develop the course by means of the relatively slow process of persistent trial in the classroom.

It is recognized that pupils in the lower grades respond most readily to nature studies which permit them to develop a wide acquaintance with nature. They are not interested in intensive studies and cannot be held profitably for long periods by such studies, but will learn to know a large number of common things if allowed concrete contact with them. In the intermediate grades pupils want to know more of the detailed and coherent facts which relate to nature's processes such as are associated with the life-round of insects, birds, frogs, plants, rivers, valleys, hills, etc. Consequently during this period fewer topics but more intensive studies are used. In the sixth grade a considerable portion of the work attempts to focus previous and present studies upon personal, community and civic hygiene, since this seems to be the period of development when such studies may have the largest effect in

FIG. 7. Grade Children on a Tramp Through Good Tree Country.

establishing and rationalizing individual habits. Following the sixth grade, the studies relate to the processes and materials of the industrial, economic and social environment. This more intensive study requires still further reduction in the number of topics studied.

It is recognized throughout that the course in nature-study must be based upon concrete contact with the nature materials, and that the work cannot have the subject-matter coherence and exactions which are requisite in any well-organized science.

It must also be recognized that there must be underlying purpose in the work, gradation and progressive nature of materials, and a coherence in method of teaching which develop the spirit of inquiry, the ability and habit of securing solutions to nature inquiries, and give a usable fund of concrete nature experiences.

In the following condensed synopsis, the "Projects" are types of those which are expected to cover all the work. The lists of topics are not intended to show order of treatment, but the content of the course.

## First Grade

### *Purposes*

Keep interest alive and extend it; give acquaintance with as many common things as possible, attempting little extended work with any one topic. Keep living materials in class-room. Develop keen observation and thoughtful inquiry.

### *Projects*

Care of one or two pets; care of an aquarium; window boxes and outdoor gardens for entire grade; boxes of earth for earthworms and toads; keep insect-cage; begin an "outdoor book" to be continued in second grade; cooking as it relates to elementary science.

### *Materials*

*Plants*—Collection of leaves of common trees—elms, oaks, maples, willow, sycamore, pine, spruce, poplar; collect leaves showing different colors and forms. Learn names of above trees. Plants of window boxes—geranium, coleus, sweet alyssum, etc. Garden plants—cabbage, lettuce, tomato, etc. Wild sunflower, goldenrod, aster, trillium, hepatica, dandelion, violet, buttercup, plantain, milkweed, burdock, other common plants.

*Animals*—Earthworms, toads, home animals (cats, dog, pigeon, horse), ants, bees, crickets, grasshoppers, goldfish. Common birds—robin, bluebird, bluejay, flicker, crow, sparrows, grackle, woodpecker, tanager, oriole; keep canaries or ring doves in room if possible during nesting period.

*Physical Materials*—Collect stones of various forms and appearance: help fix boxes and aquaria for animals and plants; make toys—pinwheel, figures from paper and clay; place arrow and vane in wind and test strength and direction of wind; make kite and learn to fly it; make balloon, compare with purchased balloon;

roll rough and smooth stones and compare; roll round stones and tennis balls and see which rolls faster. Play with magnets and various metal objects.

## Second Grade

### *Purposes*

Same as in first grade.

### *Projects*

Stock and keep several aquaria in which are snails, dragon-fly nymphs, algae and Elodea; an insect cage with grasshoppers fed by the children until they disappear, then placed in basement and in spring brought to room, the earth sowed in oats, and kept moist until young grasshoppers appear; collect garden seeds for spring planting in the grade's garden; collection of seeds of wild plants and preparation of seed charts; start garden plants in boxes in school room; keep a pair of ring doves secured in middle of winter and kept through nesting period; make and keep ant's next in room; make toys as balances, pulleys, and pendulum; make a collection of common stones and learn their names.

### *Material*

*Plants*—Algæ, Elodea, garden-seeds, wild plant seeds; common plants of window boxes; autumn and spring flowering plants about the school, reviewing and adding to the list given for first grade; add to tree list the following—ash, catalpa, locust, linden, birch, cottonwood, and other common trees. Garden plants will include radish, sweet and Irish potato, pansies, geranium, sweet alyssum, etc. Indoor work will include easily grown bulbs as Chinese lily and paper-white narcissus.

*Animals*—Dragon fly nymphs, tadpoles, crayfish, fish in aquaria, ants, snails; ring doves, blue-birds, cat-bird, black and white warbler, brown thrasher, sap-sucker chewink, red-wing blackbird, sandpiper, gulls, junco, wild geese, ducks; caterpillars and cocoons of any available forms.

*Physical Materials*—Observations involved in making a weather chart; making pasteboard boxes in which collections of stones are kept; sandstone, limestone, quartz, chert, conglomerate, mica, granite, shale, greenstone, coal, coral, slag; fossils, shells; material for making and using balances, pulleys and pendulum.

## Third Grade

### *Purposes*

Those already stated plus that of allowing more prolonged study of fewer topics, under more careful control and better record of results, with more individual effort.

### *Projects*

Keep aquaria with same living things as in second grade plus any available new forms; if possible use same aquaria as used in second grade; in connection with cooking study evaporation from fruits and from water; individual gardens or subdivided group gardens; care of the currant bushes; grow silk moth through life cycle and prepare illustration of life round; grow cecropia moth and cabbage butterfly through life round; grow bulbous plants and make special study of them.

### *Materials*

*Plants*—Collect garden seeds from last spring's garden; fruits for experiments in evaporation; review and add new trees; learn to know common weeds; bulbs of narcissus, daffodils, tulip, crocus, scilla, freesia, amaryllis, these bulbs planted in pots out-of-doors, those indoors used as basis of experiments in time and rate of growth under various conditions; amount of plant material produced; this grade emphasizes bulb work all fall and winter.

*Animals*—Birds—gold finch, oriole, scarlet tanager, song sparrow, indigo bunting, brown creeper, nuthatch, rose-breasted grosbeak, kingfisher, cow bird; silk moth life cycle, also cecropia and cabbage butterfly; learn to know several common butterflies and moths from museum specimens.

*Physical Materials*—Soil studies in connection with evaporation and also in connection with bulbous plants; measure gardens and determine amount and distribution of material to be planted; blue prints of leaves of common trees—this serving as a review of trees.

## Fourth Grade

### *Purposes*

As the third grade work deals more largely with life-round processes in plants and a few insects, the fourth grade deals with less easily studied insects and other animals, and with individual gardens. The economic aspects of insects is given some attention but is subordinate. Family characteristics of animals are studied in this grade.

*Projects*

An individual garden for each pupil; Aquaria in abundance for water insects, fish and salamanders; insect cages in which insects

FIG. 8.
The Brook. Source of Supply of Minnows, Crayfish and Water Insects.

and spiders are grown, and in which spiders' webs are made a topic of special study; special field trips to study preparation of animals for winter; one bird's nest studied in detail.

*Materials*

*Plants*—Collect seeds from garden; plan individual gardens and make drawings to scale to show how planting is to be done; relation of plants to insects, which live upon them; plan garden so as to use plants that give garden individuality—grow but one thing or grow several artistically arranged; learn to know any unknown garden weeds including butterprint, pigweed, ragweed, cocklebur, prickly lettuce, shepherd's purse, pepper grass, thistle, purslane; while collecting insects learn any common unknown flowering plants.

*Animals*—Spiders collected on a field trip by class or by individual pupils; study spiders as to their homes, habits, kinds of webs, use of webs, swimming, economic values; by use of close observations (hand lens) study parts of spider and make drawings; include house spiders, grass, spider, or funnel-web spider, orb weaver, balloon spider, crab spider and trap door spider, running spider, jumping spider; read about butterflies and moths and discuss their relation to other living things; discuss silk industry; study such water insects as back-swimmers, water boatmen, whirligig beetles, etc.; learn distinguishing characters of each; crickets; plant lice; household insects as fly, moth, ants, mosquito, cock roaches; crayfish; salamanders; fish; keep up acquaintance with birds, and study in detail the nesting habits of one kind.

*Physical Materials*—Make chalk drawings or clay models of insects studied; soil of the garden; study soil to determine its composition.

## Fifth Grade

### *Purposes*

In this grade attention is focussed more upon economic aspects of nature than is done in preceding grades, and special topics used utilize preceding topics to that end. This point of view relates to the geography and history work of this grade.

### *Projects*

Determine the physical nature of the soils and of the surrounding region; grow plants for the garden from cuttings and runners; determine the relation of bird life to garden, orchard and farm; and make bird food charts; study corn or wheat historically to determine its relation to industry.

*Plants*—Plants for propagation—geranium, coleus, bryophyllum, strawberry, begonia, carnation, grape, etc.; study underground parts of Solomon's seal, golden rod, Jack-in-the-puplit; try home experiments with currants, gooseberries, raspberries, etc. Corn as a type of industrial plant—studythe plant itself; its ear; enemies of corn; uses of corn; corn industries; history of corn.

*Animals*—Birds as economic factors; the structure and food habits of common birds; charts showing the relation of common birds to weeds, insects, and to man.

*Physical Materials*—Soils—including determination of gross and dry weight of garden soil, amount of gravel, sand, and silt; clay; water holding power of soil; lifting power of soil; soil makers; temperature; erosion by water and wind; conditions for plant

FIG. 9. Art and Nature-Study. Modelling the Rabbit.

growth; build cold frames for winter and early spring work with plants.

### SIXTH GRADE

#### *Purposes*

A more intensive study of problems of living things; garden seeds are collected and number of seeds produced by one plant estimated, this being used for an introduction to the struggle for existence; the pupils may thus learn that more forms begin life than may mature and may see some of the factors which limit them; this study gathers up what has previously been learned about plants and animals and makes a good starting point for personal studies through hygiene; during the latter half of the autumn and the winter quarters hygiene is studied to enable pupils to see their own bodies as machines which must be treated in proper ways for the best results; toward the close of the year simple experiments in magnetism and electricity are studied in order to introduce pupils to some of the simpler phenomena of physics.

*Projects*

What are the possibilities of overproduction of plants and animals? How are human bodies in their work alike or different from those of plant and animals previously studied? How does a magnet work? Construct a push button for use in the home. Devise apparatus for illustrating electrical phenomena.

*Materials*

*Plants*—Garden plants used as basis of calculations on struggle for existence. Weeds and trees used similarly; in hygiene studies bacteria and molds are studied; also disease carrying insects in their relation to bacteria.

*Animals*—Some common animals—birds, rabbits, frogs, etc., used as basis of calculations on struggle for existence; animals referred to constantly in connection with work on human hygiene; insects which carry disease germs, as the fly and mosquito; dairy cattle and dairying in relation to milk supply. The food problem for man and animals; teeth; mastication and digestion; stimulants; the blood; ventilation; respiration; personal hygiene—hearing, eyesight, sleep, cleanliness, athletics and exercise; city hygiene—playgrounds, baths, milk supply, water and ice supply. stores; contagious diseases—tuberculosis, typhoid, diphtheria; healthful homes.

*Physical Materials*—Soil and water in connection with struggle for existence. The lodestone; bar magnets, horse shoe magnet, magnetism; compass; electricity—electric bell, battery cell, push buttons, burglar alarm bell, wiring houses for bells, storage cells, votlaic cells, galvanoscope.

## Seventh and Eighth Grades

*Purposes*

To use constructive ability and investigative attitude in a study of physical processes which are related to common home, school and community use of physical materials; topics studied are those related to everyday experiences of pupils; it is thought that this study contributes to a real scientific interest and ability in thinking about common domestic and industrial affairs.

*Projects*

Construction of machines and apparatus by means of which to study physical phenomena; glass tubing, glass dishes and rubber tubing are used in making apparatus for use in studying boiling, evaporation, distillation, the siphon; a thermometer is constructed, also a barometer; a pin-hole camera is made; a wooden "sounding box" is constructed.

*Materials*

*Physical Materials*—Electricity reviewed and continued (begun here if not taken up in 6th grade); static or frictional electricity; electroscope; conductors and non-conductors; lightning; ampere, volt and ohm, and devices for measuring electricity; what electric currents will do; electro-magnet; telephone induction coil and spark coil; electric lights; electro-plating; trolley cars; wireless telegraphy. Heat—boiling point, steam, evaporation, condensation and distillation, heat and solids; conduction; convection; radiation; combustion—a burning candle; evaporation and temperature; thermometers. Levers—crowbar, wheel and axle and windlass, pulleys. Steam engine—a heat machine; friction; work, loss of energy. Pendulum. Solids, liquids and gases; study crystal formation. Gravity and stability. Atmosphere—elasticity, pressure, barometer, pumps, fountains, siphon, breathing, carbon dioxide and oxygen, coal gas, ammonia gas, water; nature, pressure, buoyancy. Photography and light—make and use a pinhole camera.

NOTE—There is no eighth grade in the Elementary School. Pupils go from the seventh grade to the freshman class of the High School.

## Nature-Study

J. A. Churchill, State Superintendent

(From the Course of Study for the Elementary Schools of Oregon)

Mottoes: "*Teach the child, not the subject.*" (*Churchill*). "*Study nature, not books.*" (*Agassi›*). "*In nature-study, telling is not teaching.*" (*Trafton*). "*A practical, concrete course in nature-study, based not on books, but on the phenomena of nature themselves, ought to from a part of every elementary school curriculum, from lhe lowest to the highest grade.*" (*Report of the Portland School Survey, p. 111*).

Teachers and parents should unite in working out the best possible courses in nature-study for the particular school district. No attempt should be made to develop uniform, cut and dried courses in this infinitely varied subject. Teach the child what he most needs to learn about the nature immediately surrounding his own home. The subject matter of such a course of nature-study as is indicated in the above quotation from the Portland Survey, is therefore, not the lions and elephants of Africa, nor the stars and comets, but first of all the pets and domestic animals belonging to the home, the birds, frogs and toads, gophers, moles, rats and mice, the insects, injurious and beneficial common in the neighborhood, then the common plants, the garden vegetables and flowers, weeds and wild flowers, fruits, nut, ornamental and forest trees, vines and shrubs: the things that make for the beauty, comfort and profit of home-life and for the love of home.

The bane and distress of so much of our school life is the foolish and impossible notion that a teacher ought to "know it all", ought to be able to answer every question about everything. In nature-study we have a subject that instantly shatters this deadening fallacy and gives us comfortable, vital honesty between teacher and pupil. That is, as long as a teacher is afraid to say, "I do not know," he will be afraid to even try to teach nature; because nature is infinite in every direction and man is finite. The first question a child may ask—outside the limits of a book lesson—is likely to be one, the answer to which no man on earth knows.

Louis Agassiz is often called the greatest nature teacher this country has ever known. "His magic," we are told, "was not far to seek, he was so human." He never "stuffed" his pupils. His secret of success consisted in telling them something he did *not* know and in asking them to go to work and find out and tell him. This is the finest inspiration any teacher can give to his pupils, and nature-study offers daily opportunity for this best kind of teaching. If we utilize these opportunities, we have one subject that will vitalize and humanize and leaven the whole lump of our public school education.

Be human. Keep the course close to the really vital, human interests of the home life of your community. By selecting the right human-interest subject matter we can make every intelligent parent feel like saying, "I never had a chance to learn these things in school, I wish you would learn all you can about them and come home and tell us."

The topics suggested in the following grade plan are treated in *Nature-Study and Life* (Hodge) and, most of them, in Stevens, Burkett and Hill, Elementary Agriculture. Teachers can also find the best up-to-date information on problems of local interest in bulletins of the United States Department of Agriculture or the Oregon Agricultural College, and they should cultivate the habit of writing freely to these institutions and encourage their advanced pupils to do the same.

The course itself is given in the following Grade Plan, the purpose of which is to enable grade teachers to avoid confusion and repetition of the same lessons year after year, to co-ordinate related topics and especially to fit the subject matter into a progressive course adapted to the maturing interests and powers of the growing child. It also limits and defines the lessons of each grade and thus greatly simplifies the problem of the teacher. It is hardly to be expected that every teacher should attempt to do everything suggested for his grade, especially the first year; but each teacher can begin by selecting the topics in his grade with which he is most familiar. In ungraded schools the topics may be distributed according to advancement and age of pupils, the idea being to get each boy and girl to doing as much active, practical, out-door work, away from their books, and with the gardens, flowers, fruits, birds and trees as is reasonably possible.

While methods of studying topics in the grade plan are discussed fully in the books referred to, some general points of view may be briefly outlined as follows:

Animal lessons precede plant lessons as hunting and fishing and animal domestication antedated agriculture in the history of the race. The dog was the first animal tamed by man. Shaler has called this taming of the first animal the greatest step in the human race toward civilization, and it was probably taken by some primitive boy or girl. The pet is, thus, the natural means of introducing children to animal life, and by developing this side strongly in the earlier years we may insure kindly and sympathetic relations to animal life as these lessons deal with the various problems of animal industry in the higher grades. So, too, this idea will dominate much of the work with birds—care and protection of birds about the home, winter feeding at Thanksgiving and Christmas; bird fountains, window bird houses, the great value of birds to agriculture, the bird calendar and bird census—these things should be taught in all the grades. In connection with these lessons we should study state and national laws for protection of insectivorous and game birds and any matters of local interest with reference to bird reservations, and game preserves from the sixth grade on.

The taming of any wild animals out of the ordinary—squirrels, chipmunks, raccoons, bats, turtles, lizards, snakes, toads, frogs, fishes, and even insects (butterflies tamed to come and sip honey from hands), is in line with this sympathetic motive of the race, and the pupils should be encouraged to demonstrate any such specimens they may have. In case of birds, toads and bats, and even salamanders, lizards, turtles, snakes, and even spiders, beetles, dragonflies, etc., feeding tests may prove of not only intense interest but of great practical value as well. (An eight-year-old girl, for example, discovered that her hen bobwhite could eat 1,286 rose slugs in a day.) Humane treatment of animals, particularly horses, along with the laws for prevention of cruelty to animals should be taught in connection with the animal lessons in all grades. Excursions to dairies, model or otherwise, methods of testing milk and of keeping milk records, along with similar egg records for poultry, improvement of flocks and herds by careful selection and breeding, all these yield the end product in practical animal industry.

Local problems of insect control—household and animal parasites, garden, orchard and field pests, and any campaigns that may be afoot for extermination of mosquitoes, flies, ants, roaches, or other pests, should be given right of way in all grades in order to supply the instruction necessary to secure united community effort.

In the garden and plant lessons, again, while the sole object is education of the child, rather than material product or crop, still material results may be our best test or evidence of mental excellence. But if only one plant lesson can be used, let that one be the game of trying to rear some single plant BEST. This lesson always has been and forever will be the central problem of plant industry—to produce the best possible specimen of any particular plant. Then, by proper culture and breeding we may produce a better specimen the next season, and so on. In the preceding tables the plants deemed to be suitable for this game are printed in black face, but any plant may be used, the same one used in all grades, if desired. The method of procedure is simply to distribute seeds at the proper time, and let the pupils see who can raise the most perfect plants. This will be a test of honest effort, patience and perseverance and keen intelligence, compared with which a written examination is insignificant. The best prize plants—record hill of potatoes, record wheat plant of all standard or new varieties, the record plants of corn, oats, alfalfa, barley, rye, etc., should become the property of Oregon, and should be turned over to the specialists in the Agricultural College or University for scientific study and for experiments in plant breeding. (Example: A single hill of Burbank potatoes was raised in a school garden in Puyallup, Washington, that produced 103 tubers, weighing 40 pounds and 12 ounces. This may be the record hill for the world for 1913. Who will excel this record in 1914?)

The garden is essentially the core of interest for the entire course, and out of it flows naturally interest in the insects and weeds and fungi that attack it, and in the birds and bees that protect and help it. Every child ought to be induced or required to have a garden of his very own—at home or at school—purely for the education and moral training it should afford, and the half, or even the whole of his grade or standing in this subject might to advantage be figured from the actual condition of his garden at the close of school in June, the beginning of school in September, and the record of production from the garden for the entire season. The garden records should give accurately, size of plot and list of amount and value of products. And in connection with the garden work, soils, soil fertility and physical condition of soils, conservation of soil moisture and fertility, rotation of crops and utilization of manures and fertilizers should be studied in all grades.

| SUBJECTS | GRADE I | GRADE II | GRADE III | GRADE IV |
|---|---|---|---|---|
| PETS AND DOMESTIC ANIMALS— | Dogs—Stories, children's own stories, care, uses, kinds, traits. | Cats—Care, kinds, control to prevent killing of birds. Stories. | Rabbits—Foods, care, kind. | Pigeons, squab raisin homing pigeons. |
| BIRDS— | Robin, bluebird, chickadee, chipping sparrow, English sparrow, crow, winter Bird feeding. | Bullock's oriole, song sparrow, evening grosbeak, black headed grosbeak, downy woodpecker, gold finch, jay. Bird fountains. | Barn sparrow, nighthawk, humming bird, cedar waxwing, junco meadow lark, flickers, Bird houses, bird protection. | Violet green swallo blackbird, red wi blackbird, mounta and valley qua mourning dove, bo white, Chinese phea ant, Game and bi laws. |
| INSECTS— | Fleas, milkweed butterfly, polyphemus moth. | Grasshopper, cricket, katydid, roaches, ants. | Clothes moths, peacock butterfly, caddis flies, dragon flies. | Codling moth, cank worm, peach tr borer. |
| GARDEN AND PLANT LESSONS— | Radish, **dwarf nasturtium,** pumpkin, plant seed. | **Calliopsis** or best squash or gourd. | **Mimosa** or pansy, carrot or turnip. | **Oat** or lettuce, onion cucumber. |
| FRUITS— | Peach, grape and apple, plant seed. | Prunes or plums. | Cherry, grape. | Peach budding. |
| FLOWERS AND WEEDS— | Trillium, dog-tooth violet, crocus, daisy, dandelion, burdock, milkweed. | Spring beauty, shooting star, China lily, narcissus, yellow dock, a mustard, bull thistle. | Bleeding heart, iris, wild sunflower, daffodils, fur marigold, purse nettle, wild carrot. | Larkspur, violets, bl and white cama wild oats, wild le tuce, wild onion, co cockle. |
| TREES, SHRUBS— | Willows, almond. | Vine and Oregon maples, black walnut. | Poison oak, English walnut. | Fir, oak, hazel, Oreg grape, filbert. |
| MISCELLANEOUS PLANTS— | Common fern. | Mosses and liverworts. | Lichens and algæ. | Edible mushroom deadly amanitas. |
| MISCELLANEOUS ANIMALS, ETC. | Fox, coyote, wolf, turtle, harmless snakes, gold fish. | Wild cat, panther, clams, slugs, snails, trout. | Squirrel, chipmunk, salmon, toad. | Spiders ticks and mit tree frog. |

Under "fruits", the plan is to help each child to acquire in the first grade, if possible, at least one grape vine, a peach and an apple tree, by planting seeds. These plants, alluded to now and then, will form the materials for the best possible lessons in the third, fourth and fifth grades; and it is to be hoped that the pupils will be encouraged by both teachers and parents to acquire all the fruits in the list as part of his nature-study property.

Flower and vegetable seeds and bulbs should be taught in all grades; a blackboard calendar of wild flowers is indicated for grades II to V, with collection and study of locally important weed

| GRADE V | GRADE VI | GRADE VII | GRADE VIII | GRADE IX |
|---|---|---|---|---|
| ickens, poultry raising. | Care, feeding and improvement of stock, pigs. | Care, feeding and improvement of stock, cows. | Care, feeding and improvement of stock, horses. | Egg and milk records; Pig-feeding contests. |
| ıg fisher, chewink, parrow hawk, sap ucker, Alaska robin, uffed grouse. | Crossbill, woodpewee, house wren, winter wren, yellow warbler, western tanager, sharp tailed and sooty grouse. | White crown sparrow, ruby crowned kinglet, golden crowned kinglet, Audubon's warbler, hermit thrush, russet backed thrush, sage-hen. | Red headed woodpecker, kildeer, spotted sandpiper, purple finch, ducks, geese, swans. Game bird laws, State and national. | Sparrows, warblers, thrushes, pigeons, grouse, gulls, terns, herons, pelicans, loons, hawks, owls, snipes. |
| nt lice and lady bird, at fleas, mosquitoes, abbage butterflies nd their parasites. | Galls, oak, willow, rose; cut worms, army worms, sphynxes. | House flies, bot flies, stable flies, horn flies. | Wasps, ants, honey bees, bumble bees, chinch bugs. | Scale insects, San Jose scale; honey bee and cross pollination of fruits; sprays for rust. |
| **ley,** cabbage. kale or auliflower. | **Field, sweet or pop corn** musk melons. | **Alfalfa,** water melons. | **Record hill of potatoes, Wheat,** celery. | **Record hill of potatoes,** tomatoes or peppers. |
| ɔles. | Pears, quinces, grafting. | Logan or phenomenal berries. | Raspberries, blackberries; keep record of plot. | Currants, gooseberries, strawberries; keep record of plot. |
| nulus, cat ears, tiger ly, mayweed, redɔot, mullein, tar eed. | Hillside pink, sundial, Solomon's seal, chickweed, filover, dog fennel, lamb's quarters. | Mission bells, Indian paint brush, fox glove, foxtail grass, couch grass, vile grass, Canada thistle, goat weed, St. John's wort. | Columbine, golden rod, asters, mallow. Seed testing, weed seeds in grains, clovers, grass and garden seeds. | Lady slipper, orchids, grasses in bloom, grass seed. |
| , cottonwood, red edar, maple, Port rford cedar, chestut. | Pine, dogwood, alder, crabapple. | Salal, red or blue elder, yew. | Grafting and budding. | Grafting and budding. |
| ulds and yeasts, rown rot of fruit. | Apple scab, peach leaf curl, rose mildew. | Root bacteria, grain smuts, fruit moulds grape mildew. | Bacteria, pear and apple blight, sprays for fungi. | Bacteria, tuberculosis, typhoid, diphtheria, intelligent cleanliness board of health bulletins, preserving. |
| s and mice destrucveness and trapping lation to plague; ıll frog. | Pocket gopher, moles, diggers. earth worms, newts, salamanders. | Jack rabbit, cotton tail, weasel, State Fish and Game Commission, fish hatcheries, state laws for food and game fishes. | Mink, raccoon, otter, beaver, muskrat, skunk. | Fur farming. |

seeds in grades VI to IX. Focus interest on improvement of varieties by seed selection and plant breeding in grades VIII and IX.

Under "trees", call attention to forest fire laws in all grades. Notice season of blooming of tree and of ripening of seed; make a school collection of flowers and seeds, and study methods of storing and planting the seeds. Develop interest especially in planting nut trees. As the American chestnut is being quite possibly exterminated from eastern North America by the chestnut blight, it would be well if quantities of seed, safely free from spores of the fungus, could be planted along the Pacific Coast. In this way the species might be saved to the continent.

The study of the moulds, rusts, rots, smuts and blights of vegetables, flowers, grains and fruits leads naturally to the general theory of prevention of human disease by intelligent cleanliness. These topics also afford excellent opportunities for impressing the need of organized co-operation in dealing with these powerful and destructive enemies.

In the grade plan omit from consideration any bird, flower, tree or type of any kind that does not occur in your own section of Oregon. Possibly, in another year, grade plans in nature-study may be worked out which shall fit all the different sections of the State more perfectly. Schools organized on the plan of eight grades can select topics from grade IX at discretion of teachers.

### Agriculture

A course in Agriculture is issued in a separate pamphlet and may be secured from the County Superintendent or the Superintendent of Public Instruction.

## News and Notes

The Rockford, Ill., Branch of the American Nature-Study Society is active. Witness the following:

It has long been the desire of the Nature-Study Society of Rockford to take part in a state or country-wide campaign for closer protection of our native birds, such as has not been touched upon by the Weeks-McLane Bill. To this end an educational campaign is now on foot to interest our city fathers to license the cat in order to diminish loss among birds in that direction, this being but one phase of conservation. Our cat license campaign has been started for some time. The Society has appointed a "Cat License Publicity Committee" to take care of the educational side of the question. At present we are inserting one article a week in the evening papers, (each Saturday evening). Each article goes to make up a part of a "continued story," as it might be called, having the general title "The Status of the Cat in Rockford." We do not plan to bring the question to a vote in the city council before March of next year.

The Society has also felt that possibly, thru the co-operation of other friends of the birds and true hunters, it would be able to have enacted a state law which would bar any foreigner, *not naturalized American citizen*, from procuring a hunting license until he becomes naturalized, which, under the present laws, requires that he must live in this country for five consecutive years which should enable him to get sufficiently acquainted with our laws pertaining to killing of song birds.

We find Italians the worst offenders but there are others as well. We do not know whether such a law would be constitutional, but we are anxious to start a campaign to see what can be done to take care of this phase of bird protection.

The Nature-Study Society of Rockford will probably have incorporation papers filed this month. We much regret the loss of Dr. Ruth Marshall who is now teaching in Chicago. If our plan to establish a Museum of Natural History, meets with the approval of the Park Board at their next meeting, October 20, the Society will have the use of Mandeville House in Mandeville Park. Under such conditions we expect a gift of a collection of about four thousand specimens, mostly Indian Relics and geological specimens. Other collections amounting to about two thousand specimens will probably be available for special exhibits. Perhaps, in a short time I will have an illustrated article on this much sought-for museum.

I am including the year's program and a list of the officers and chairmen of the committees.

## Officers of the Nature-Study Society of Rockford

President, Paul B. Riis, 301 Shaw St.; secretary-treasurer, Norman E. Nelson, 1020 N. Main St.; Advisory Board, Mrs. C. Albin Nelson, chairman, 1020 N. Main St., Mrs. A. S. T. Ogilby, Myrtle M. Irons, Sarah E. Long, Chas. C. Stowell, Paul B. Riis, Norman E. Nelson, *ex-officio*.

*Chairmen of Committees*—Tree and Shrub Committee, Agnes Brown, 1203 W. State st.; Geology Committee, Chas. C. Stowell, 328 N. 4th st.; Entomology Committee, Ralph Hersey, 528 Ferman st.; Bird Committee, Edith P. Sovereign, 1708 E. State st.; Wild Flower Committee, Anna M. Connelly, Rockford College; Refreshment Committee, Mrs. M. E. Fraley, 409 Peach st.; Membership

Committee, Eunice A. Beatson, 614 Fisher Ave.; Cat License Publicity Committee, A. C. Norris, 110 Stanley st.

October 17, 1914. NORMAN E. NELSON, Secretary.

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GARDEN CITY, N. Y., October 24th, 1914.

The officers of our Association for this next year are as follows: Ellen Eddy Shaw, Brooklyn Botanic Garden and The Garden Magazine, president; Miss Katherine Bevier, Principle P. S. 43, Manhattan, vice-president; Miss Letta Burns, Nature-Study Department, Jamaica Training School, secretary and treasurer. The Executive Committee is composed of the above officers and Dr. Jean Broadhurst, Teachers' College and Miss Grace Lyman, New York City Training School.

The New York section meets three times a year and endeavors to place before its members the discussion of some practical subject in teaching nature-study. The meetings are held in the fall, winter and early summer. This last meeting is usually an outdoor one. At the present fall meeting, our National President, Mrs. Anna B. Comstock, spoke. Yours sincerely,

LETTA BURNS SEC.

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The American Genetic Association is offering two prizes of $100 for two photographs—one of the largest tree of a nut-bearing variety in the United States, and one of the largest broad-leaf tree which does not bear edible seeds. In the first class, for example, are included trees such as chestnut, oak, walnut, butternut, and pecan; and in the second, trees such as elm, birch, maple, cottonwood, and tulip poplar. No photographs of cone-bearing trees are wanted, since it is definitely known that the California big trees have no rivals among conifers. At a later time the association may take up the same question as between the various kinds of conifers, as pines, spruces, firs, cedars, and cypresses.

The purpose of the competition, as stated by the association, is to find out in what regions the native trees attain their largest growth, and under what conditions they thrive best. When these large trees are located and the measurements authenticated, the association hopes that it may be possible to secure seeds, cuttings, or grafting wood from thrifty trees in the region where they grow, to see whether finer specimens may be propagated in other parts of the country.

Here are a few good nature articles in November magazines:

*Educational Bimonthly* (Chicago)—Nature-Study at the Van Vlissinger School (Chicago). George A. Brennan.

*Harper's Monthly*—The Harvest of the Wild Places. Walter Prichard Eaton.

*Outing*—Wild Animal Photography. C. W. Aeppler and M. M. Stierle.

*Popular Science Monthly*—Phenomena of Inheritance, E. G. Conklin.

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Over eighteen hundred teachers were in attendance at the Northern Illinois Teachers Association held at Elgin, Ill., November 6 and 7. There were several excellent papers presented on nature-study and these were given not by specialists acting as promoters but by teachers really doing excellent things in grade work. It was a most encouraging situation.

## Book Reviews

WATER REPTILES OF THE PAST AND PRESENT. Samuel W. Williston. pp. vii + 251. The University of Chicago Press. $3.00.

Dr. Williston is known as one of the best paleontologists of the present time, and the group under discussion is his specialty. It is needless to say, therefore, that it is a book that the scientist interested in this particular line will welcome with pleasure. Dr. Williston has the happy faculty of presenting scientific data in a most interesting way, so that even the lay reader will enjoy the volume.

It is admirably illustrated and many of the illustrations of the reptiles of the early ages are as strange as if drawn from the gifted imagination of some teller of fairy tales. Truth is evidently stranger than fiction even in reptilian affairs.

The following excerpt is particularly interesting just at present and gives one some idea of the facile style of the author. The canon referred to was Dr. Goddin.

"But the canon was ultimately despoiled of his ill-gotten treasure. At the siege of Maestricht in 1795, the famous skull to which Hofmann had devoted so much anxious thought and labor, fell into the hands of the French and was carried off as one of the spoils of war. So widely celebrated had the specimen become during the fifteen years which had elapsed since its discovery, through the writings of several noted scientific men, that the Frencn general commanded his artillerists to spare the house in which it was known to be. The canon, however, shrewdly suspecting that such an unexpected and extraordinary mark of favor was not for his own sake but rather for the sake of the famous fossil, had it removed and carefully hidden in a house in the city. After the capitulation of Maestricht the eagerly sought for fossil was not to be found, and the offer of a reward of six hundred bottles of wine, so the story goes, was made for its recovery. So tempting was the offer that, ere long, it was brought in triumph to the house of St. Faujas de Fond, by a half-dozen grenadiers, whence it was later transferred to Paris, where it now is."

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PHYSICS OF THE HOUSEHOLD. C. J. Lynde. pp. xi + 313. The Macmillan Co. $1.25.

This book will be of interest to teachers of nature-study because of the wealth of illustrative material suggested that can be drawn from the home and common environment. The arrangement of the book is the arrangement of any ordinary book on Physics, taking up in successive chapters such subjects as mechanics, heat, electricity, light, sound, but the applications are to the commonplace things of life and not to laboratory apparatus. Thus levers of the second class are illustrated by the can opener, nut cracker, lemon squeezer, and fruit press, diagrams of which are given to show the position of fulcrum, weight arm, and power arm. Previous text books on physics have cited many of these household objects illustrative of the principle involved, but have not given so conspicuous a place to them nor provided such abundant illustrations of their construction and operation.

The book, of course, is not intended for use in the grades, yet it might well be added to the grade library and utilized by the teacher especially of the upper grades.

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THE CHILDHOOD OF THE WORLD. Edward Clodd. pp. xiii + 240. $1.25.

This book, as the subtitle indicates, is a simple account of man's origin and early history. It will be of interest to the teacher in many ways. It will give her a fairly clear notion of the sorts of activities that engaged early man and in his crude writings, his games and music, she will recognize the sort of thing that she encounters in school. Several chapters will particularly interest the nature teacher, those concerning the myths about the earth and man, about the sun and moon, about the stars, and the chapter of some twenty-five pages on nature worship. The later chapters of the book deal with the development of some of man's beliefs such as his idea about the soul and future life, his belief in one God, and there is a simple yet interesting chapter on various sacred books. There is also given at the end of the book a list of selected books on the subjects treated which will enable anyone to obtain library facilities to follow up the particular phase that interests him most.

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THE NEXT GENERATION, A STUDY IN THE PHYSIOLOGY OF INHERITANCE. Frances Gulick Jewett. Pp. xi + 235. Ginn & Co. $.75.

Of all the books that have come to the author's attention, aimed at giving instruction in sex hygiene and eugenics, this is by all means the best for young people. The author's aptitude for popularizing hygiene instruction has already been demonstrated in the Gulick Hygiene Series. This is an eminently readable book —more than that it is an excellent simple presentation of the scientific knowledge that we have regarding inheritance, in so far as that is needed for practical instruction intended for young people, and this is the undertaking of the book. The facts are stated clearly and simply, and the reader is left largely to draw his own conclusions. There is no attempt to present a repulsive lot of data regarding sex perversion and social impurity so that the presentation is from the positive rather than from the negative side.

There are some statements in the book that need slight alteration: the first paragraph on page 63 gives the impression that Darwin was the originator of the idea of evolution, and on page 66 the first paragraph seems to indicate that he was also the author of the idea that evolution has come about through use and disuse. Of course the idea of evolution is much older than Darwin and Lamarck is an earlier conspicuous champion of the notion of evolution through use and disuse. In the chart, page 124, the months at the top of the charts are out of order and paragraph two of the explanation should be omitted.

The author has evidently settled in her own mind that Darwin's theory of the origin of species deserves an important place along side of evolution by mutation, and the book presents evolution from that combined point of view. The first five chapters discuss the lines of inheritance; the next nine present evolution as explained through Darwin's five factors, mutation, and isolation. Chapters fifteen and sixteen discuss fertilization and development. The next gives data to prove that germ cells and therefore offspring are damaged by use of alcohol. Chapter eighteen attempts to acquaint the adolescent with himself. Chapter nineteen demonstrates the injurious effect of tobacco and twenty, of alcohol as a beverage. Chapter twenty-two is on family responsibility and the remaining chapters give suggestions for protecting the stream of life from various types of pollution.

The concluding pages of the book give a number of questions for each chapter which may help the inexperienced teacher in using the book as a text. There is a short bibliography of some of the best books on the various subjects treated.

PRESS OF W. F. HUMPHREY, GENEVA, N. Y

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Gentlemen:

Enclosed find $1.25 for which please enter my name as a member both of the School Garden Association of America and the American Nature Study Society (including the Nature-Study Review).

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..................City,...................State

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