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About the Institute

The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

Notes on the Lives and Works
of Charles E. Bessey
and
Ernest A. Bessey

Collected by
Ralph W. Lewis



NEBRASKA STATE UNIVERSITY—ACTING CHANCELLOR
BESSEY AT HIS DESK—Photo by U. G. Cornell. *also 1905*

Notes begun on April 16, 1943

The purpose of these notes is to bring together in one book as much information as possible about the lives and works of two outstanding botanists whose life-spans have together almost completely covered the development of the botanical sciences in America.

For the first few years the author intends to pass over information which is already recorded in such a form that it will not be lost to posterity. The time will be spent, rather, in recording those bits of information which now exist only in memory and which will be lost a score of years hence if not soon recorded.

When referring to Ernst A. Bessey I will speak of Dr. Bessey because that is the form of address I use when speaking to him. In referring to Dr. Bessey's father I will speak of Dr. Charles Bessey.

Apr. 16, 1943

Some time ago Dr. Bessey told me of the regular Sunday afternoon walks his father and brothers used to take. It was on these walks that he learned much about plants. Dr. Bessey was about ten years old when one afternoon they stopped by a field of grasses and other plants. Dr. Charles Bessey offered the boys a cent for each kind of smut they could find in the field. Dr. Bessey found eleven (!) different kinds. Together they found over twenty different species. Probably because Dr. Bessey was the only budding botanist of the group, he found more than either of his brothers.

Note: When I handed the above paragraph to Dr. Bessey to read over, he crossed out the word "penny" and wrote in "cent" and explained that his father and he were very careful not to misuse the word "penny" as I had done. He went on to say that one could not even call the modern cent a copper because the war has absorbed all the copper and the latest cents were made of iron.

Apr 27, 1943

Today Dr. B. came down to tell me about the appointment of a committee by Pres W. to look into the matter of compensation for people on part time Exp. the pay roll who will do summer teaching. He wound up by giving me the ff. note on his life.

Graduated from WS in 1892 when 15 $\frac{1}{4}$ yrs old. Took the classical course (largely Latin & Greek) and graduated in 1896 with an AB degree. Most of his electives were taken in science. In 1897 he took another yr. at U. of Neb. studying science. At the end of that year he got the B.Sc. degree. He majored in botany in 1898 and got his AM.

The summer of 1897 was spent in Montana and Yellowstone Park botanizing with Rydberg for the N.Y. Bot. Garden. In the summer of 1898 he worked for the USDA collecting grasses in the mountains of Colorado. During the fall of that year he worked over the collections (at the Univ. of Neb.).

In Mar. ~~1899~~ 1899 he went to the USDA in Washington in the Div. of Vegetable and Phytophy. and Pathology. He was made Actingⁱⁿ Charge of the Office of Seed and Pl. Intro. in Mar. 1901.

He was sent by the USDA in July of 1902 as a plant explorer to Russia and Turkestan.

The fall of 1902 found him in Germany at Halle where he studied under Dr. Klebs at the U. of Halle. At this time he was not on the USDA pay roll.

His father joined him in Germany in the summer of 1903. They went to the Caucasus together where E.A. did exploration work for the USDA.

He went back to Halle in the fall of 1903. For 2 to 3 weeks at Christmas time he went to Russia on a glaucous seed study for the USDA. In the spring of 1904 he was sent by the USDA to Algeria to collect date palm. This trip took 6 weeks.

In June 1904 he finished his thesis and took his doctor's degree at Halle. During June and July he was a guest of Drebel at the U. of Munich. That summer his father joined him and they traveled in Germany, Switzerland, Belgium, France and England.

They came back to the USA in the fall and E.A. entered the USDA in plant pathology work. In Dec., 1905 he was transferred to Miami, Fla. to have charge of the Subtropical Lab. and Plant Culture Garden. He was there till 1908 in Oct. when he became Prof. of Bot. and Bact. at Uni. of La.

The summer of 1910 was spent at Wood Hole. In the fall of 1910 he came to USC "where I have been ever since."

About 1919 Dr. B. started agitation for a new division in the college in which students could

enroll when they did not want to study in the then existing 3 divisions of Ag, Eng. & ?
 Due largely to his work the Sci. & Arts Div. was established. He was chairman of a faculty committee, the other members being Platt & Ryder, which set up this new division. Before being accepted by the board the name was changed to the Applied Sci. Div. This was due to the influence of Kedge, the pres. of the college at that time. Dr. B. was slated for the deanship of this new division, but due to contentious character of the president who could not get along with the legislature a complicated combination of events threw the then president out of his office into the deanship. I believe that Dr. B. was keenly disappointed by this at the time, but now looks back at it with a feeling that events worked themselves out in a manner satisfactory to him.

He was Acting Dean of A.S. Div. in the fall of 1927, and made Dean of the Graduate School in 1930. During the school year of 1939-40 he was visiting professor at the U. of Hawaii.

May 4, 1943.

Today Dr. Barsey told me about his father's teaching laboratory at Nebraska. When C.E.B. went to Neb., the other professors teaching lab courses, chem. + physics, closed their labs at the end of the class period so students could not put extra time in the lab.

C.E. left his lab open all the time, even in the evenings when he was there and the students were allowed to come in anytime to work.

The other professors objected to this in faculty meeting. They said that it did no good to stay in their labs because the students never made use of them anyway. C.E.B. hinted broadly that if they would inspire their students a little they would want to do extra work and wouldn't spend most of their extra

One of the students who made extra use of the botany lab was Oscar Pound.
 Hance time in the bot. lab.

May 9, 1943.

In Seminar last Mon. Dr. Darlington reviewed the life of Asa Gray. At the end of the hour Dr. Bessey told us how his father happened to write his first text of elementary botany.

Bessey Helt and Co. had requested of Gray that he write an elementary text of botany for them to publish. This was about 1878. Gray was very busy with many other things. He said that there was a live-wire young botanist at Ames, Iowa by the name of Bessey (C.E.) who would, ^{probably} like to write a text for them. Bessey was approached and this contact established by Gray resulted the series of texts by C.E.B. and later by joint authorship of C.E. + E.D. Bessey.

C.E.B. had studied under Gray during the ~~summers~~ ^{winters} of '71, '73 + '75 (I may have the years wrong.) and it was from these contacts that above happening was made possible.

July 15, 1943

While checking on a reference in *Zeitschrift für Botanyologie* (Zweite Abteil.) Dr. Benz told me from the Dept. happened to have a complete set of this Journal.

Back in the nineteen twenties an offer came from the publisher offering the first 55(?) volumes at so many marks. Because of the reduced value of the mark the 55 or so volumes cost only sixty dollars. The Dept. had some money on hand that had come from selling of potatoes, etc. Sixty dollars of this was sent to the publisher & the books came in a short while. "That was sixty dollars that the college treasurer never saw."

Jan. 14, 1944

I asked Dr. B. today if he had any routine in his methods of thinking in relation to his mycological taxonomy problems. He said there was no routine; he almost never had his smoke at night, to think on these problems. I suggested that his thinking possibly was "inspired". He ~~came~~ came back so fast that I blinched: "No, deeper inspired."

From the answer to my queries I gathered that most of Dr. B.'s thinking was done at the time of writing and after reading mycological literature.

Jan 24

In response to my inquiries about Dr. B.'s memory processes, Dr. B. told me these interesting things.

Dr. B.'s memory is largely visual. When he describes a fungus life history, he is merely describing the mental pictures of that fungus. He says he can see the complete development of the fungus as he goes over its history. He does not visualize complete pages of print but can ~~see~~ see sentences and pictures in his memory.

The attached sheet bears on it Dr. B.'s notes made while he was talking to me. They are "pictures" of his mental images of rough days, alphabet, months, and numbers. It is peculiar that he visualizes these images

with respect to N, S, E or W [See p. 12]

Apr 19, 1944

Dr. B. stopped in the office today and told a few mushroom stories today. I told him that I had heard C.O. Skinner's version of the stomach pumping story. He said that Mrs. Gleason of Grand Rapids told the story to him years ago as a true story that took place in the home of a member of the elite society of Grand Rapids.

He also told of the Hungarian laborer who brought in a basket of mushrooms to learn if a certain Boletus were edible. Dr. B. said: "yes they were but the others you have here are poisonous." "We've eaten them lots of times in the Old Country." No, not there. There are Amanita ~~retrovaginata~~ ^{retrovaginata} and are poison. What you ate in Europe was A. muscaria which is not poison. This is called A. muscaria by most people, but is not the true muscaria. It grows only in the West Coast in the S. "The laborer left the Amanitas on the lab table where Dr. B. spread them out to dry. The next morning there was ring of dead flies around each mushroom

May 17, 1944

In a half hour chat with Dr. B. this morning I questioned him on the possibilities of finding ways and means of determining the survival value of the various characteristics of organisms. He had no answer for this, but offered other facts and ideas. He talked of the causes of variation, variation over at the limits of the range of a plant, internal and external environmental causes of variation, and other things. He gave me a new idea. He spoke of each new individual, in fact, each new potential individual as an experiment of nature to learn if it were well fitted to survive and reproduce. He stressed the fact that there is never, not even in the most homogeneous of varieties or strains, a duplication of organisms. Not only is each ~~new~~ organism an experiment, but it is a completely new experiment.

20 Aug 1946

While getting references on *Neuraptera* Dr. B. told me a few things about his father.

Dr. C.E.B. produced some outstanding students in zoology as well as in botany. Osborn, entomologist at Ohio State, started his work in biology under C.E.B. at Ames and was sent to Harvard by him for graduate work.

Howarday came to C.E.B. at Ames for the sole purpose of learning how to stuff animals. He later collected for Ward's Biol. Supply House, then became Dir. of Zool. Garden, Wash. D.C., then Dir. of N.Y. Zool. Garden.

Dr. C.E.B. studied zoology under Cook at M.S.C.

Visualization of numbers,
letters, months by R.H. Bussey.
Written 1942?

→

A B C D E F G H I J K L N O P Q R S T U V W X Y Z

S

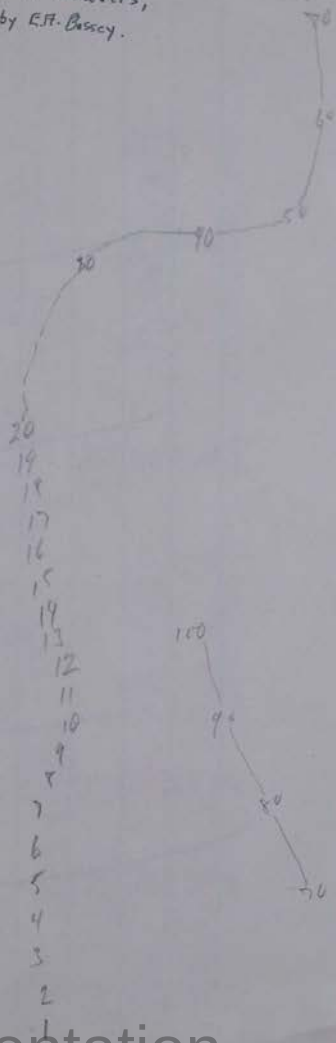
X

N

N

(Jan)

W



28-3-55

13.

1. Orange Judd Farmer

a farm weekly paper.

2. Breeders Gazette

3. Mich. Farmer

Dr. E. A. Bessey published many popular articles in the above three journals, mostly in the last one. Dr. Bessey's father wrote many for the first two. Names of authors are attached to the papers.

Dr. E. A. Bessey first to see motile sperm in ~~Elodea~~ actually swimming. See Science NS 13: 285 (1901).

28-3-55

14.

Dr. C. A. Bessey, grad. 1896, M.B. degree,
(1917 BSc, M.A. 1919). Summer 1917

Dr. B. went with Rydberg collecting in Montana
& Yellowstone Nat. Park. Full set of pts. sent to
W. B. Barden. Camped out for 77 days.
First B. & Shaw in Yelo. Park on this trip.
[met]

[The following was copied from a 3x5 card that was loose in my Bessey notebook. I think I made this note one day when Dr. Bessey (Ernst) was sorting out some boxes of letters and notes of his father's that had been stored under the landing just inside the north door of what was then the Botany Building. The water had dripped through the landing floor into the boxes. Most of the papers were destroyed. Among these papers were the exchange of letters which dealt with wording of the Hatch Act. C. Bessey wanted the Hatch Act to support fundamental science as well as applied agricultural science. I believe it was the following words in the Hatch Act that were written by C. Bessey: "... and to promote scientific investigation and experiment respecting the principles and applications of agricultural science, ..." From what E. Bessey told me, I believe that C. Bessey inserted the words "the principles and".

The note is on the next page: copied and original.

[This page of notes made 20 Dec. 1968.]

Hatch Act - C. E. Benson

14-5-54

An Ag Soc (?) sent to B. a
copy of proposed bill. B. substituted
a P which stated purpose to study
fundamental aspects.

Hatch Act - C. E. Benson

14-8-54

An Ag Soc (?) sent to B. a
copy of proposed bill. B. substituted
a P which stated purpose to study
fundamental aspects.

Notes of 20 Dec. 1968 continued:

At the time E. Bessey was sorting his father's papers from under the landing he gave me some of his ^{father's} lecture notes. As you can see from the copies these notes were invaded by fungi and in these parts are very fragile. (It seems right that the Bessey papers should have been destroyed by fungi rather than by fire.)

Included with these notes are 5 pages that are self explanatory.

One copy of these notes will be sent to Madison Kuhn and one to John Winborne.

8 April 1969. Madison Kuhn said E. Bessey must have made a mistake about the "lecture notes". Madison said that they are more apt to be designs and plans made by C. Bessey for his textbooks. [Kuhn wrote the centennial history of Mich. State University.]

1. Poison my finger
2. Badly, could not give malikating
3. Watch out
4. Amator
- 5.

UNIVERSITY COLLEGE STUDENT AFFAIRS OFFICE

170 Ernst Bessey Hall

Jan. 6, 1969

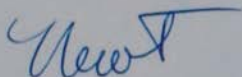
TO: Dr. Ralph Lewis, Dept. Nat. Sci.

FROM: John H. Winburne

SUBJECT: Bessey Materials

Thanks so much for sending me the Bessey materials. I have not had a chance as yet to read all the way through them, but I have read enough to know that they are very valuable.

Thanks again, Ralph,

A handwritten signature in blue ink, appearing to read "John H. Winburne", with a stylized flourish at the end.

17/10/75

Ralph!

Thanks for sending
the notes on Charles E. E. E.
Berry, who should make
them a part of our
collection.

Donna

[Note above on the attached pp.]

CHARLES EDWIN BESSEY

Born May 21, 1845 in a log house on a farm in Wayne Co., Ohio, about 15 miles from Wooster. Ancestry, on both father's and mother's side, French and German.

Father had two years of college training before the family migrated in 1835 from eastern Pennsylvania to Ohio. In Ohio he was a school teacher and surveyor until his father's ill health made it necessary to take over the farm.

Charles E. Bessey attended country school and later went to academy. On the death of his father in 1863 he had to take over the farm to settle the estate as his father left no will. This he did for two years while still attending academy, teaching country school in addition. When the estate was settled in 1865 he came to Michigan as a surveyor in timber lands in the northern wilds (mainly Midland, Gratiot, Montcalm Counties). His job finished he entered Michigan Agricultural College in June 1866 graduating with the degree B. S. in November 1869. The winter vacations of 1865, 1866, 1867 and 1868 he taught three months country schools. At graduation he was appointed assistant in the Department of Botany but resigned this before College opened in February, to become Instructor in Botany and Horticulture at Iowa State Agricultural College at Ames, Iowa. He became Professor of Botany and Zoology (including Entomology) about 1873, upon the appointment of a good politician as Professor of Horticulture. In the winters of 1872 and 1875 he studied under Asa Gray at Harvard. He was married Dec. 25, 1873 to Lucy Athearn, of West Tisbury, Mass., with whom he became acquainted when she was a teacher of music in the old Lansing Academy of Music, in 1868.

Herbert

At Ames he introduced the laboratory method of teaching botany in 1870. In his first class was Joseph C. Arthur, who became later the foremost uredinologist of this country. Another prominent botanist later was A. S. Hitchcock, the outstanding authority on grasses. ~~Henry~~ Osborn, an entomologist of note, had his training under C. E. Bessey as did William Hornaday, late Director of the New York Zoological Garden.

In 1884 he accepted the position as Professor of Botany and Dean of the Industrial School of the University of Nebraska at Lincoln. (The "Industrial School" corresponds to the two divisions here of Agriculture and Applied Science). 1888-1891 and at other interregnum periods he was Acting-Chancellor, but steadfastly refused to become Chancellor. The Sem. Bot. was organized in 1886 by Pound, Webber, and others. He died February 25, 1915 after four weeks illness.

In 1879 the book publisher, Henry Holt started the publication of a series of scientific text-books and asked Asa Gray to contribute the book on botany. He refused and recommended C. E. Bessey. The first edition appeared in 1880 and was followed by several other editions. In 1884 a series of Briefer Course

Note by Ralph W Lewis: These two pages are the abstract of a seminar report given by Ernst A Bessey on 7 June 1943 to the Michigan State College Botany Department Seminar. The abstract was prepared by E A Bessey.

textbooks was inaugurated and the "Essentials of Botany" went through eight editions, the last, in 1914, being under joint authorship with Ernst A. Bessey. The first edition in 1880 was greatly influenced by Julius Sachs, the leading German botanist of that time. This book literally overturned the teaching of botany in this country, being the first to advocate laboratory work and to break away from the idea that Systematic Botany was the main part of the science. From the appearance of this book dates the renaissance of botany in the United States.

The Besseyan system of plants began to take shape in his writing in the late '80's and '90's of last century. Prior to that time the classification of higher plants was mainly the Bentham and Hooker system, as exemplified in the Gray's Manual of those days. Later this was succeeded in Gray's and other manuals by the Engler and Prantl classification. The Besseyan system clings closer to the Bentham and Hooker system.

Among the students who took their botany at Nebraska may be mentioned Roscoe Pound, Herbert J. Webber, Albert F. Woods, Cornelius L. Sheer, Per Axel Rydberg, Homer L. Shantz, C. W. Edgerton, R. A. Emerson, L. L. Harter, H. W. Barre, Frederic E. Clements, Edith S. Clements, G. G. Hedgcock, W. T. Harns, Conway MacMillan, Haven Metcalf, George T. Miles, E. G. Montgomery, R. J. Pool, R. E. Stone, J. J. Thornber, Elda Rena Walker, Leva B. Walker, G. F. Warren, F. A. Wolf, John L. Sheldon, etc.

Notes on Seminar report by Dr. E. A. Berry 7 June 1943
by Ralph W. Lewis

First Berry came to U.S. 1710 (about). Name was
Jakob Wisner. Moravians, settled at Salina, N.C.
out hunting one day, village sacked & all
killed. Walked to Bucks Co. Pa. & married there.

His granddaughter married E.A.'s great grandfather.
Jacob Berry came to US 1750 from Eng. His mother
came from Alsace; de Bessé came to Eng. 1650(?).

Descendant of this Berry married a Wisner.
Bros. of J. Berry were Tories in N.Y. In
Revolution they moved to Canada. J. Berry
supported the Revolution, fought in Fr. & Ind.
wars. Deserted from British army when his co.
went to

Adna B., grandfather, born in Bucks Co.
Went to school & the academy. Read Gr. Lat.,
Hebrew; also math. for pleasure. Moved to
Wayne Co., Ohio, near Wooster, with his brothers, a
meat & changed farmer.

Adna married ———? Bro. died.
Went to his farm to run it. Adna fell off wagon
& broke his back. Both E.A.'s grandfathers
married same year, etc. etc.

C.E. had to run farm + go to academy + teach in country school. Aldert of 9 children. Neighbor, a surveyor, got C.E. a job surveying in Eastern Co. Mich. Taught school in St. Louis, Mich. that winter, surveyed next summer. Wanted to learn more about surveying so was advised to go to M.A.C.

First day walked from Lansing to E.L. noticed the rock with a $\frac{1}{2}$ in dia. cherry, predicted the rock would be split by the tree.

Made up work looking from June to Nov. 1866, 67, 68 taught country school in winters while going to college.

Pres Abbott talked to him. Prentice, bot. prof., said C.E. should be a botanist. C.E. said he wanted to be a surveyor. Abbott said to think it over. C.E. thought it over + went back to Abbott + said that of all the subjects he had studied bot. was the most interesting so he decided to ff. Abbott's advice. Abbott said: "Good - - -" modified the course so C.E. could study more bot.

Acting Chancellor of Univ. of Neb. for 3 yrs. Lured Confield to fill
the job. Confield later went to Ohio St Univ., Lakeside High
Library. The father of Dorothy Confield, the author.

For a while there were more Neb. students in USDA
than from any other school. Due to C.E.'s influence.

1890's offered Prof. of Bot. job at Cornell.

1896 " " " " at Calif. Refused.

Traveled + talked to lots of farmers.

Pres of AAAS 1913

Hatch Act: Before congress as a bill stating the duties
of Expt. Sta. etc.?

Botany
in
the



Common
Schools.

Two objects

1. Cultivation of Observation
2. Knowledge.

¹¹
I.

In this begin with no books.

Better to begin below,
and go up.

But if impossible, begin
anywhere.

Be particular.

Require notes & drawings

Always study things.

Let Structure precede terms.

Avoid technicality.

II.

For "Knowledge" - use com-
pendious books.

Illustrate by examples.

Proceed from simple to
complex.

Do not attempt technic-
al classification until
after the general outline.

Study habits as well as
structure. [2]

Botany



IN THE

Common Schools.



— M —
Gus. E. Bessey.

I. Science in the Public Schools.

- (a) If the benefits of science are to be enjoyed by the people, science must go into the common schools.
- (b) Of the 200,000 pupils in the schools of Nebraska not more than 10 per cent will get into the higher schools.
- (c) Not more than 1 per cent will reach the colleges.

(d) What kind of science is beneficial?
That which will enable a man to have some understanding of the world he is in.

Every man has relations to the forces of Nature; to the atoms, molecules, and masses of matter which compose this world; to the plants

about them, and to the
animals.

Shall he go through life ignorant
of these?

Is that teacher doing his whole
duty who does not help his pu-
pil to know more of this world
in which he lives?

(8). Now the sciences which treat of
matter and force, and plants
and animals, are —

Chemistry —

Physics —

Botany —

Zoology —

and I come to you tonight
asking that you, when you become
teachers, will give instruction in
these things to your pupils.

II. Botany in the Common School.

A. Bear in mind that there are two
great objects to be accomplished
viz.

1. The Cultivation of the
of Observation.

2. The increase of Knowledge.

Neither one must be neglected;
neither one must be adopted
to the injury of the other.

However, for learners, let me
stress first the one, and
then the other.

B. In the Cultivation of Observation.

As the habit of observation is acquired by observing.

We learn to observe, we learn how to observe. By observing.

It can not be learned from books.

It can not be learned from lectures.

Listening to lectures will never make an observer.

So in the beginning of the work do not use books. do not depend upon lectures.

(b) Always study things.

It may seem superfluous to insist upon this, after what we have said.

But we are all so "bookish" that we are apt to neglect the "materials" of instruction.

It is often easier to have one's pupils observe an imaginary leaf or fruit, than to take the trouble of securing a supply for the class.

But do'nt do it.

(c) Where shall we begin?

Begin at the beginning.

Begin with simple forms.

Begin with the simplest plants.

But if you cannot do
this - - -

Begin anywhere.

and at anytime.

Had I my full and free choice
I should begin in the summer.

with the simple water plants.

(1) the rusts, mildews and blights

(2) the pondweeds and puff balls.

(3) the mosses -

(4) the ferns -

(5) the flowering plants.

(d) How shall the work be done?

Examine carefully every
part.

Record these observations

Make drawings.

In the record, avoid technical
-ality.

In the drawings, avoid artistic
effect.

Let both be plainly and
strictly truthful.

(E) How study the lower water plants.

Send your pupil for it, if possible.

Have him carefully note its appearance
in the pond or brook.

its shape in mass.

its size in mass

its color " "

its position in the water

etc. etc.

Bring it into the school room -
in a plate, saucer, wash-bowl,
pan - - - -

Have him make out the individ-
ual plants, and describe

shape size color etc -

If the description is discouragingly short

remember that the plants are simple.

(f) How study a higher plant in winter?
Take for example The Box Elder.

I. Gross anatomy (shape, size, color, surface).

(a) Trunk.

(b) Branches.

(c) Twigs.

(d) Buds.

(e) Fruit.

II. Dissect - twigs.

(a) The bark into its parts.

(b) " wood " " "

(c) Make cross sections to show parts, (drawing)

(d) " longitudinal " " " " (")

III. Dissect - - - buds.

(a) Carefully - Then count, draw and describe the scales.

(b) Cross sections to show plan (draw)

(c) Longitudinal " " " " (")

(d) Longitudinal section through bud and twig to show
connection (draw).

IV. Dissect - fruit.

(a) Make sections of wing.

(b) " " body.

(c) Examine contents of fruit.

(d) Study use of fruit-wing.

10
C. in the effort to increase knowledge.

(1) Remember that a knowledge of
Structure and physiology
is more useful
than a knowledge of description.

What plants are.

how they live.

how they grow.

how they get food.

What they do

What their relations are to
other living things.

What their relations are
to us.

(1) Here books are valuable.

They are the record of knowledge.

Here lectures are useful.

Illustrate by examples.

Proceed from simple to
the complex.

Avoid technicality again.

Valuable

A course of illustrated lectures, in English,
outlining the vegetable kingdom.

Select a few typical plants.

Have them before you.

Explain structure.

Explain physiology.

Make drawings -

and so give a bird's-eye view
of Vegetable Kingdom.

(c) Gum Slime (an example).

Go to a gum tree and get a piece of bark covered with Gum Slime.

Give its gross anatomy.

Give its minute anatomy, by blackboard sketches, with colored crayons.

Tell how each little gum ball absorbs

CO_2 and H_2O , and in the sunshine makes

starch out of these. Show the bubbles of Oxygen.

Tell how this starch is afterwards digested.

Tell how they reproduce by cutting themselves in two.

In the foregoing you have the foundation of all of Vegetable Anatomy and Physiology.

(d) What about "analyzing" plants?

As an end — Yes.

As an occasional thing — yes.

Let the naming of a plant be done after it has been studied — just as it is.

Finally, let me close by summarizing a few of the ideas I have advanced.

Let me urge you to regard Botany always as the study of plants. As you go to the plant itself when you want to know its structure, so have your pupils learn to observe the plant and to study its structure. Study plants first. Consult books afterwards.

Let me urge you, also, to bear in mind that all kinds of plants are worthy of study. Do not narrow the study to flowering plants alone. The great biological lessons which you wish to teach can not be perceived when the view is restricted to but one group.

Let the field of study be wide enough to take in every question about every plant. In this way, and in this way only, can Botany be, in fact, what it is in name, the Science of plants.



Science in the Public Schools.

If the objects of science are to be enjoyed by people at large, it must be by carrying science into the lower schools.

Of the 500,000 pupils in the schools of this state, not more than 10 per cent will get into the higher schools.

Not more than 1 per cent will reach the colleges.

What kind of science is beneficial?

That which will enable a man to have some understanding of the world he is in.

Every man has relations to the forces of Nature, to the atoms, molecules, and masses of matter ~~out of~~ which compose this world, to the plants about him, and to the animals.

Shall he go through life ignorant of these?

Is the teacher doing his whole duty who does not help his pupil to know more of this world in which he lives? 1

the material which treat of
matter, force, and plants
and animals, and those which
we have made the basis of Chem-
-istry, Physics, Botany and Zoology,
and I come to you tonight
asking that you teach something
of these to ^{your} ~~the~~ pupils.

And how shall these be taught?
And of each science, what shall
be taught?

Let me answer these questions by
confining the subject to botany.
First, however, insisting that all
~~instruction~~ in science should
be strictly ~~general~~ and non-technic-
al.

What then shall be the na-
-ture of the instruction in botany?
~~Let it be~~

Teach your pupils to see,
and to compare.

...the remaining -
to a green house and
get a flower-pot covered
with Green Slime.

With colored crayons show
on the black board what these
simple plants are like.

Then tell how they ~~live~~
by absorbing water and Car-
bonic acid, and in the sun-
light make starch, which
they afterwards digest.

Tell them how these sim-
ple plants reproduce by cut-
ting themselves in two.

Let this end your first
lesson. Now, send your
pupils out to find Green
Slime for themselves.

In this one plant you
have laid the foundation for
all of Vegetable ^{Respiration and} Physiology.

Next week bring to your
class a bottle of living
Yeast.

With blackboard sketches
explain the structure of the
little Yeast Plants.

They are very much like
the Green Slimes, but they
are not Green.

Explain what this absence
of a green color means.

Plants which are not green
cannot make starch.

Yeast plants do not
make starch; they take
it from the flower of the
yeast.

They digest starch, and
in so doing they evolve
Carbonic acid: ~~the~~ ^{which we}
see in the form of bubbles.

Compare with Green Slime.
Reproduction.

Compare again.

For your next lesson bring
in a dish full of Powd-
scum.

Explain its structure.

Its physiology.

Its reproduction.

Compare in every case.
Send your pupils to get
Powd-scum.

Next take Black
Mould.

Green Felt.

Grape Mildew

Lilac Blight

A Red Seaweed.

A Cup Fungus.

A Puff Ball.

A Dead Stool.

A Moss.

A Fern.

A Pine

A Flowering Plant, as a
Rose, or Buttercup.

There you have an outline
of the Vegetable Kingdom in
15 lectures.

You have outlined
the great groups of plants,
as in Geography we may outline
the great continents.

Always talk from specimens.

Tell where you found your plants.

Read your pupils after specimens afterwards

Cultivate the feeling that all plants are plants, and that all are worthy of study.