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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.

Form.

Sept 23/24.

The two principles of Musical Form are (1) Repetition and (2) Alternation.

Repetition.
1. Literal Repetition.
2. Transposition.
3. Melodic Variation.
4. Inversion.
5. Rhythmic Variation.
6. Shifted Accent.
7. Change of Harmony

Materials of Music.
1. Rhythm (succession of points in time).
2. Melody (succession of pitches.)
3. Harmony (background).

Sept 26. Form in music may in general be analyzed by the tone lines alone but sense of key sometimes determines where we shall relate the end of a section.

Sections may be (1) static (remaining in one key) (2) _____ (going from one key to another) or (3) modulatory (modulating fairly soon from one key to another so that there is no fixed key centre)

Sept 30. Motive in general refers to an idea underlying generative action. (Motives are generators).
A Musical motive is a figure or group of figures having strong character or individuality and used as a basis for thematic development.

Symphonies to be studied.

Haydn: "Surprise" Symphony.

Mozart: Quinn Symphony.
Beethoven: Symphony #7 a Major.
Schubert: Unfinished Symphony. b minor.
Schumann: Pianoforte Concerto A min.
Brahms: Symphony #1
Dvořák: Symphony #5 (From the New World).
Tschaikowsky: Symphony #5 E min.
Franck: Symphony in D minor.
Debussy: Prelude to the Afternoon of a Faun.

Accents.

Dynamic (stronger – rarely weaker)

Agogic (Prolonging).

Oct 3/24

Steps in History of Folk Song

1. Howl.
2. Repetition of phrase.
3. Alternation.
4. Repetition of a figure at intervals separated by phrases of vague character.
5. Sequence and Transposition.
6. Definition of Tonality.
7. Variation.
8. Management of a climax. — application of each of the foregoing to express emotion.

Form. Nov. 21, 1924.

Outline of Sectional Form.

I	C	
II	C-G	
III	G	
IV	G-a	I, III, V, VII--statements of the subject.
V	a	
VI	a-C	II, IV, VI--fragments of subject used sequentially.
VII	C	

Dec. 1924.

Fugue--Structure.
(c min--WTC-v i-#2--used as model)

I. Exposition
Subject--Tonic
Answer--at the Dominant (Subject in canon)
Transition--sequence-- to c min.
Subject--Tonic

II.

Continued

Form. May 29, 1925.

Figure is a word but is static--not long enough alone. A seed.

Motive is that which is used thematically--varied, lengthened, etc.,—but not mutilated into another motive.

Methods of variation.

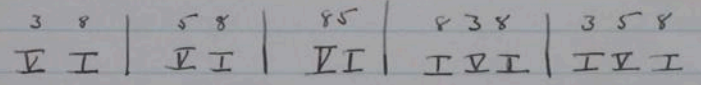
1. Repetition (exact)
2. Transposition (repetition at another pitch)
3. Melodic variation
   a. changing a note
   b. inversion
4. Rhythmic variation
   a. augmentation
   b. diminution
   c. change of rhythmic figure
   d. shifted accent
5. Change of Harmony.

A motive motivates. A motive should have arresting definiteness of melodic outline and rhythmic pattern.

Phrase is a combination of musical figures. A phrase nearly always implies an harmonic scheme. A phrase is a regularity. It usually begins in a definite tonality and always ends in one. The beginning is vaguer than the ending. It ends with a feeling of cadence, usually well marked in the harmony.

Keyboard Harmony.

Sept 29/24.



BOX FILE

The box is a little larger than actual letter size, in order that papers may slide in freely.

The interior contains a set of index sheets, made of Manila paper, which are fastened to the back of the box to keep them in place. The little projection at the right of the sheet on which a letter of the alphabet is printed, is called a tab. This is a very important tool in filing, as the quick finding of a letter depends upon these tabs. This is not only true of this method of filing, but it also applies to other methods.

DISADVANTAGES. The drawer has to be removed from the cabinet when we wish to refer to a letter. When the compressor spring is released and the drawer is slightly tilted, the contents fall out. The Compartments do not fill up evenly, and no provision is made to keep letters of individual firms separate. Records can not be made quickly. When a letter is once removed from the file, much time is consumed in putting it back in its proper place.

VERTICAL FILING

Vertical filing means filing papers on edge in a large drawers.

THE FOLDER. A folder is a sheet of heavy Manila paper folded once in which papers of letter size of smaller are laid like leaves in a book.

Each folder will hold as many as 50 letters. If the letters in the folder are all from one firm, they are filed in order of date; that is, the first letter received is laid in the back of the folder and later letters received are laid above it, so that the last is always in first, they are first arranged alphabetically and then each concern's letters are kept in order of date. When the folder is placed on its side you refer to the contents just as you would turn the leaves of a book, except that the papers are not fastened.

GUIDES. Guides are used as an index in the vertical drawer. Back of guide there are one or more folders. The guide thus points the way to the folder you want. Bothguides and folders are kept in a upright position by a movable wood block called a compressor which runs on a trace in the bottom of the drawer; as the volume of correspondence is increased, this compresser is moved toward the back of the drawer.

INDEXING

Three Methods. Alphabetical, filing by name; geographical, filing by location, that is by town, county, or state; subject, filing by topics of subjects. These represent the standard ways of indexing. In every business the filing system in use embrasses one or a combination of these principles; sometimes it is found convenient to use all of them.

There is also the numerical method, which means filing by number; but this is not a separate or distinct method for the number always represents a name or subject.

ALPHABETICAL FILING.

Let us suppose that we have a number of letters to be filed. They are first arranged in alphabetical order so the file clerk may work in one direction--forward. The papers once arranged, the process of disposing of them is very simple. File back of the "A" guide any letters from correspondents whose names begin with A. If your correspondence is large, many firms will have a separate folder. First determine whether a special folder has been provided for the firm whose letters you are filing. This can be readily ascertained by glancing through the names on the folders. Alphabetical filing consists of twenty-five guides, each bearing a letter of the alphabet. The tabs are arranged diagonally across the drawer so that any letter may be readily found. Behind the guide is a corresponding alphabetical folder in which we file all papers under that particular letter.

When a correspondence with a firm or individual, numbers ten or more letters a special folder is assigned, and is placed in front of the alphabetical folder. Where this is necessary, the name of the firm is written on the right hand tab of the folder, and all subsequent letters accumulate in this receptacle.

GEOGRAPHICAL METHOD OF FILING.

In this method we are concerned primarily with the territorial or geographical divisions such as the town, county or state in which a customer lives; and secondarily with his name.

Advantages of location method.

In this system, the file is divided in convenient units and all information regarding a town, a county, or a state is concentrated under onehead. This enables us to ascertain the business conditions in the various territories in which we sell. For instance, we may receive a large number of inquiries from Cleveland, Ohio regarding our product. If these letters were filed alphabetically we might not notice that they were all from Cleveland. But with the geographical method, they are all files together; and we immediately observe that there is much activity in this portion of the file. We therefor dicide to send a salesman to Cleveland and eventually we may open a branch office there.

On the other hand if the letter from Cleveland become fewer and fewer we are warned by our geographical system that business must be decreasing in this city. So we may decide to advertise in the Cleveland papers in order to stimulate business there. It is evident that if we depend on our correspondence file to furnish information regarding sales conditions in different territories location indexing is more valuable than any other method. Another advantage of this system is that you can add new guides and folders where ever you need them. It is thus a good system for a rapidly growing file.

THE BASIS OF A SYSTEM.

The simplest form of geographical filing consists of a set of state guides with tabs in the center. Back of each guide is a folder for the correspondence of firms located in that state. Naturally there will be letters from several cities in this folder, and they must be classified according to a difinite plan. They are, therefore, arranged alphabetically by towns. These will be placed together in the folder arranged in alphabetical order by names. When there is enough correspondence behind any one state guide to warrant it, you use a set of alphabetical guider for indexing the town. Behind each alphabetical guide is a corresponding alphabetical folder. Thus a letter from Freeman and Co. at Atlanta, Georgia, is filed in the "A" folder back of the A guide in the Georgian division. In filing by this method, three points must be kept clearly in mind; that the first classification of the correspondence is by states, the second by towns, and the third, by names.

NUMERICAL FILING.

The numerical system represents the oldest form of vertical filing. It is not actually an independent method of indexing, for it always depends on another alphabetical of subject index. It is used to sone extent in offices of railroads, in law offices, and where a cross reference is required; guides with pad numbers 10, 20, 30, etc. are used to separate the drawer into convenient divisions. Between these guides are folders arranged in numerical order the name and the number of the correspondent are written on the tab of the folder. In this system you assign a number to each individual or concern with whom you do business, and only the papers from that firm are placed inthe folder bearing that number. Having its own individual place in the drawer, the folder is not likely to find its way into another division if reasonable care is exercised when returning folders.

Because of the large number of correspondents represented in the file, it is not possible to remember all the numbers that are assigned to different firms. In connection with the large drawer, it is necessary to use an alphabetical file index on three by five cards. A card is made out for each correspondent, and the file number entered in the upper left hand corner. It is then filed in the card drawer, alphabetically. You/ see the indexing method is really alphabetical in this instance, because it depends on the alphabetical card index, althoughthe vertical file is arranged by numbers.

PRINCIPLE APPLIED.

John Smith writes us today for the first time. We turn to the card index and we note that the last folder in use is ninety-six. We assign him ninety-seven and enter his name. His number is then written on the letter and folder is made out with his name and number. When you wish to find a letter you must first refer to the card index in order to get the file number.

CROSS REFERENCE INDEXING.

In large concerns where a cross index to the file is necessary, the numerical system is more convenient than any other method.

DISADVANTAGES OF THE NUMERICAL SYSTEM.

One of the objections to this method is that two distinct operations are required in filing and finding papers. You must first refer to the card drawer for the file number and then turn to the vertical drawer. If you have a letter from a new customer, youare obliged to fill out a card and assign a number to the card before you can file the letter. You see the system is indirect.

Another feature that reduces the efficiency of the system is that in the event the firm ceases to do business with you, the number in the file is no longer needed. It would not be advisable to re-assign the number, at least not for a year or more, as the old concer might resume business at any time.

A third objection is that a separate folder must be used for every concern. This means a waste of folders, which fill up the drawer and leave less room for the letters. In order to avoid this, concerns, using the numerical system have generally found it necess ary to have one or more drawers devoted to an alphabetical system, to take care of the small correspondence. Only the correspondence from regular customers is filed by number.

DIRECT NAME SYSTEM.

In our study of alphabetical filing we learned of the simplicity fo the method and the easy way in which letters may be found. We also learned that in case of a large correspondence which necessitates the use of an elaborate set of guides it is very easy to misfile letters. Direct name tuides are made of heavy press boards with celluloided tabs, thus lending strength and durability to the equipment. The tabs, in two positions, make it possible to locate the various combinations on the tab without loss of time. Beginning with "A", the guides are numbered consecutively. In a set of forty guides the numbers run from one to forty.

VALUE OF NUMERICAL FEATURES.

At the left of the drawer, in one position, are the tabs of the alphabetical folders for miscellaneous correspondence. These are printed in red and numbered just the same as the guides in front of them. This means that each folder has its place in the drawer. Direct name folders which are assigned to special correspondence have wide tabs at the right of the drawer. On the tab of each folder is the name and also the number of the correspondent.

How let us see how the numerical feature assisits in filing of the folder. In the first place a great saving of time is effected as it is only necessary to note the numger and place the folder back of the guide bearing that number. The operation is facilitated by the fact that guide tabs with odd numbers are in one row and those with evern numbers are in another. In this operation it has not been necessary to compare the name on the folder with the alphabetical subdivision. The numerical idea also makes the system accurate, because there is little chance of error in comparing the numbers on the folder with the number of the guide. And even if the file clerk does drop a folder in the wrong place, the mistake will be readily detected because of the break in number sequence.

HOW TABS ARE ARRANGED.

In examining the tabs on the alphabetical and direct name folders we notice they are of the same height as the guide tabs. This gives two additional sigh posts. The tabs on the folders occupy first and last positions while the guides appear in second and third position. Thus the guide tabs do not in any way hide the folder tabs, which stand out prominently in the drawer. In many instances, reference is made direct to the folders without consulting the guides; hence the title "Direct Name System".

EXPANSION PROVIDED FOR.

With this system it is possible to use a great many more individual name folders than with the ordinary alphabetical, for the reason that the special names stand out conspicuously. As the system grows, new name folders are assigned and placed back of the guide.

Frequently there are firms whose correspondence will more than fill a separate folder in the course of a year. When such a condition exists a guide with a flat metal label holder is provided, and a label inserted bearing the name of the concern and the number of the alphabetical guide behind which it belongs. Behind this is filed in monthly folders, one folder for each month. Instead of keeping all the correspondence in one folder which would be greatly over-crowed, it is distributed through twelve folders. Each of the monthly folders is numbered to correspond with the guide.

THE RED "OUT" GUIDE.

When a folder containing correspondence is removed from the drawer, the file clerk indicates on the red tabbed "out" guides the date of its removal and also designates the folder and the person to whom it is sent. The guide is then placed where the folder belongs. As soon as the folder is returned, and the "out" guide is removed and the notation is cancelled. If other folders have been called for in the meantime, they are treated in the same manner.

SUBJECT FILING.

Subject filing means the placing together of all papers relating to one subject. They may be placed together in a separate folder, a separate division of the file, a separate drawer, or a separate series of drawers, as the quantities of papers to filed necessitates. To index a subject file so that its contents are accessible is not generally developed.

THE FIELD OF SUBJECT INDEXING.

Subject indexing in vertical filing has a limited field; and is only used, or to be recommended for permanent filing of general correspondence in special cases usually assisted by the cross indexing facilities of the numerical indexing. Large corporations, such as railroads, insurance companies, public service corporations, use subject filing numerically indexed, to advantage.

The most general use, however, found for subject filing is in data files, wherin information is being collected on certain subjects. For example, many attorneys maintain a data file in which newspapers and magazine clippings, notes, copies of briefs etc., are filed away, using a standard index to the field of legal knowledge. Physicians, dentists and other professional men do likewise. The separate departments of large businesses keep files in which matter relating to their particular field of work is accumulated for ready reference. In sales and advertising departments these are especially common. Subject filing is very widely used in purchasing departments for keeping quotations on kindred articles together.

THE METHOD OF INDEXING.

The simplest method of subject indexing in vertical filing is to use a simple set of alphabetical guides--one guide for each letter of the alphabet. The matter to be filed is placed in a vertical folder, the folder tab is marked to indicate its contents and then it is placed behind the correct alphabetical guide. For instance, a physician has a special article on antidotes, which he desires to put into his data file. In a simple system like the first mentioned he would simply write "Antidote" on the tab of the folder behind the "A" guide, and place his clipping therin. As new subjects appear the same proceedure would be followed.

SUBJECT FILING IN PURCHASING DEPARTMENTS.

The purchasing agent in a firm of any magnitude is continually corresponding about various articles for the purpose of purchasing them at the present time, or at some future time, to the best advantage. To that end it is necessary that he have all quotations for information on a certain subject together. Where such a condition exists the direct subject indexing arrangement is of greatest value.

Thus if you were looking for Conway Brothers' quotation of calico, it would be found in the folder bearing that name back of the calico guide. It is to be clearly understood that this mithod is merely for temporarly indexing, that is, while the matter is pending. Just as soon as the matter is closed, the papers are to be re-distributed to the regular and permanent system of filing, be it alphabetical or geographical.

HOW AN EDITOR USES SUBJECT FILING.

This editor publishes a magazine for attorneys and has the coming issues mapped out and advertised several months in advance. He received a great deal of legal data and also manusscripts which he desires to preserve by subject. In as much as the matter could be filed under a well- defined legal index employed in many departments of the firm these direct subjects are placed on guides with tabs running three across. The editor receives newspaper clippings on legal topics form several clipping bureaus and these he desires to index also. Each clipping is mounted on a thim sheet of paper by an assistant who also stamps the mounting sheet with a rubber stamp reading: file under-----main subject-----sub-subject.

THE RELATION OF SUBJECT INDEXING TO ALPHABETICAL INDEXING.

It will be noted that if every instance where subject indexing is correctly used, the principle of alphabetical indexing is back of the whold arrangement, in that the main subjects and sub-subjects under main subjects are arranged as nearly as possible in alphabetical order.

FOLLOW UP SYSTEM.

It is known by various terms. "Tickler jogger, calendar, everyday file, pending file, dates ahead file," are some of the terms commonly applied to it, As generally understood in the business world follow-up means the method by which matters of future consideration can be automatically and unfailingly brought to attention at the proper time.

Probably its greatest use is in sales work or keeping in toudh with prospective purchasers. A prospective buyer in business is termed a prospect and most prospects are followed up. The method employed may vary considerably, and may be operated by a card system or a vertical system, or such a combination of the two as the condition requires. A few other common uses of the follow-up are as follows: incredit departments for collecting delinquent accounts; inpurchasing departments for following up shipments of goods ordered and in general office work for the many incidental things which must be taken care of at a certain time,

Botany
George B. Van Schaack
Jan. 1917.

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I Dictation January 30, 1917.

Composition of living matter

The living part of a plant or animal is made up of the elements carbon hydrogen, oxygen and nitrogen with a very small amount of several other elements which collectively we may call mineral matter. The living part of a plant corresponds closely in chemical composition to the living part of an animal. The sugar found in grains or roots of plants has nearly the same chemical formula as the animal sugar found in the liver of man. The oils of a nut or fruit are of composition closely allied to the fat in the body of an animal. These building materials of a plant or animal may be placed in one of the three following groups of substances: carbohydrates, materials contain a certain proportion of carbon hydrogen and oxygen; fats and oils which contain chiefly carbon and hydrogen with less oxygen; and nitrogenous or proteid substances which contain nitrogen in addition to the above named elements. The above three

kinds of organic materials also form a large part of the foods of all animals and plants.

Foods. We know that if we eat a certain amount of proper foods at regular times we shall be able to go on doing a certain amount of work both manual and mental. We know too that day by day if our health is good we may be adding weight to our bodies and that added weight comes as a result of taking food into the body.

Nutrients. Organic food substances may be classed into a number of groups each of which may be detected by means of its chemical composition. Such groups are called nutrients.

Carbohydrates. Starch and sugar are examples of this group. The former we find in our cereals, bread, cake, and most of our vegetables. Several forms of sugar are commonly used as food, for example cane sugar, beet sugar and grape sugar. Glucose, found as the natural sugar of grapes, honey and fruits is manufactured commercially

by pouring sulphuric acid over starch. It is used as an adulterant for many kinds of foods especially in syrups, honey and candy.

Fats & Oils. Fats and Oils form an important part in the composition of plants and animals. Examples of food in form of fat are butter and cream, the oils in nuts, olives, fruits and fat in animals.

Proteids. Proteids contain the element nitrogen in addition to carbon, hydrogen and oxygen of carbohydrates and fats and oils. They include some of the most complex substances known to the chemist and as we shall see have a chemical composition very near to that of living matter. Examples are white of egg, lean meat, and peas and beans.

Inorganic foods. Water and various salts some of which as lime may be found in drinking water form an important part in the diet of plants and animals. Green plants although they use precisely the same foods as we do take into their bodies the chemical elements which form foods. From these raw food materials organic foods are manufactured in the body of the plant.

Experiment II No 1. Jan. 31, 1917.

-I- Aim.

To show the composition of air and produce nitrogen and show its characteristics

-II- Materials.

A shallow pan nearly filled with water, a cork, a piece of phosphorus, a bell jar and a match.

-III- Operation

The cork is placed on the water with the phosphorus on it. The phosphorus is lighted and the bell jar placed over the cork.

-IV- Observations.

1. As the phosphorus burned the water in the jar rose.

2. When the water had displaced one fifth of the air in the jar the phosphorus went out. The element left in the jar was nitrogen.

3. I conclude that nitrogen is tasteless, colorless, odorless, and will not support combustion. Air is one fifth oxygen and four fifth nitrogen.

Experiment II- No 2. February 2, 1917.

I- Aim.

To produce oxygen and show its characteristics

II- Materials

A test tube, a spirit lamp, a half teaspoonful of chlorate of potash and about the same portion of magnanese and a match.

III- Operation.

The chlorate of potash and magnanese are put in the test tube and shaken. The spirit lamp is lighted and the test tube held over it. As soon as a whitish vapor is seen to arise from the mouth of the test tube a glowing match is inserted in the mouth.

IV- Observations.

1. Vapor arising from the tube.
2. The match flared up and burned with a white flame.
3. Conclusions. I conclude that oxygen is tasteless, odorless, colorless, will support combustion and readily combines with other substances.

Note.

1. Oxidation is the chemical union

of oxygen with an other substance.
2. Slow oxidation is slow union with other substances. An example of this is the rusting of a nail.
3. Oxidation in a match. When the match is struck the friction ignites the phosphorus which ignites the sulphur and finally the wood catches fire.
4. Oxidation gives off heat.

Experiment – II – No 2 February 2, 1917.

I- Aim

To produce carbon and show its characteristics.

II- Materials.

A piece of glass, a match and a glass tray half full of water.

III- Operation

The piece of glass is held over the burning match. The smoke left on the glass is carbon. Some carbon is scraped off into the water.

IV- Observations.

1. Carbon collected on the glass
2. Carbon is black
3. Carbon is tasteless and odorless.
4. Carbon is insoluble
5. Carbon is infusible.
6. Conclusions. I conclude that carbon is black, tasteless, odorless, insoluble, infusible and non-volatile.

Note

1. Carbon is found in a pure state in the diamond.

Experiment II No. 4. Feb. 3, 1917.

I- Aim

To show the characteristics of sulphur.

II Materials.

A shallow glass tray and sulphur

III- Operation

Some sulphur is placed in the tray and lighted. Next some sulphur is put in water

IV- Observations.

1. Sulphur is yellow and tasteless.
2. Sulphur burns with a blue flame and suffocating odor.
3. It is insoluble.

V. Conclusions. I conclude that sulphur is yellow, tasteless, burns with a suffocating odor and ~~get~~ blue flame and is insoluble

Note: 1. A trace of sulphur in eggs, corn and beans.

2. Commercial sulphur is taken from volcano craters.

Experiment III February 4, 1917.

I Aim.

To show oxidation.

II Materials

A spirit lamp, bell jar, and match.

III

The spirit lamp is lighted and the bell jar placed over it.

IV. Observations.

1. The lamp went out quickly.

2. Conclusions. I conclude that oxidation cannot take place with out oxygen.

Note: 1. Oxidation is the chemical union of oxygen with another substance.

2. Slow oxidation is the slow chemical union of oxygen with another substance. An example of this is the rusting of a nail.

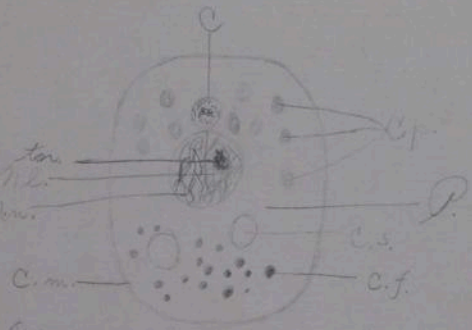
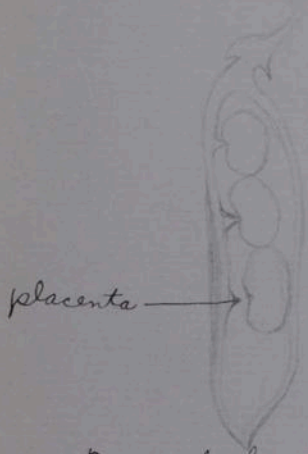
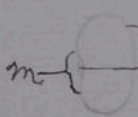


Diagram of cell. The cell protoplasm (P.) contains spaces to hold liquid cell sap (C.v.); just above the nucleus (n.) is a structure called the centrosome (C.) which aids in cell division; within the nucleus are chromosomes (N.n.) which form a network; t.n., nucleolus; C.p., plastids; C.f. lifeless material in cell. C.m. cell membrane.

February 15, 1917.

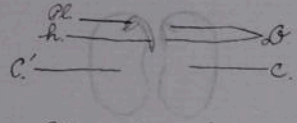




M, micropyle
h, hilum
t, tecta

m, micropyle
h, hilum
r, raphe

Bean pod showing attachment.



Pl. plumule.
h. hypocotyl.
C. C' cotyledons
D. Depressions made by plumule and hypocotyl.

February 23. 1917.

Description of the Bean Seed.

The bean seed is flat and oval with a depression on one side which is called the micropyle. The hilum is the scar which is left on the bean where it was attached to the pod. The ridge on the bean is called the raphe. The testa is the tough outside covering under which is the more delicate covering, the integument. The two halves of the bean are called the cotyledons in which is stored the food which the plant lives on before it can take food from the soil. The rod shaped projection which is seen when the cotyledons are taken apart is called the hypocotyl and forms the root and part of the stem. The first true leaves are folded between the cotyledons and the two together are called the plumule. The plumule also forms the stem.

February 23, 1917.

Experiment -IV- February 21, 1917.

-I- Aim

To show the presence of starch in the bean.

-II- Materials

Bean, glass tray and iodine.

-III- Operation

Soak the bean overnight. Crush it and put it in the tray. Pour iodine over it.

-IV- Observations.

1. I observed the bean turned blue black when iodine was poured over it.
2. Conclusions. I conclude that beans contain starch.

Notes: 1. Starch is used and manufactured by plants.
2. Starch is found in corn beans, potatoes, and bread.
3. Dissolve a little laundry starch in water and pour iodine in it. It will turn blue black.
4. Iodine is the only known substance that will turn starch blue black.

Experiment February 22, 1917.

I- Aim.

To show the presence of proteid in the bean.

II- Materials.

Test tube, bean, nitric acid, ammonia, alcohol lamp and match

III- Operation.

Soak the bean over night. Crush it and put it into the test tube with some nitric acid and heat over the spirit lamp. Next wash the bean and pour in a little ammonia and heat over the spirit lamp.

IV- Observations.

1. The first time the bean was heated it turned lemon yellow.
2. The second time the bean was heated it turned orange.
3. Conclusions. I conclude that the bean contains proteid.

Notes.

1. Proteid is manufactured in plants.
2. Proteid is found in the

white of egg, lean meat, peas, beans, and corn.

3. Proteid contains the elements nitrogen, oxygen, hydrogen, and carbon.

Experiment March 2, 1917.

I. Aim

To show the expansive force of germinating beans.

II. Materials

Glass tumbler full of beans, water piece of light board and a 200 gram weight.

III. Operation.

Place the beans in the tumbler to within about one half inch of the top. Next cover the beans with water. Place the light board on the top of the tumbler and upon this place the 200 gram weight. Leave over night.

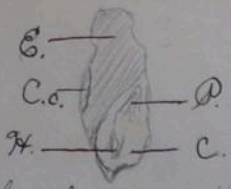
IV. Observations.

1. In the morning the beans had raised the two-hundred gram weight from the top of the glass about a half an inch.

2. The beans were packed in the glass so tight that it was very hard to get them out.

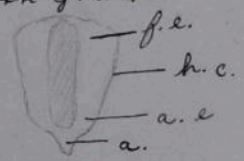
3. Conclusions. I conclude from this experiment that germinating beans ~~seed~~ have great expansive force.

Note. Germinating seeds are the seeds which are beginning to grow.



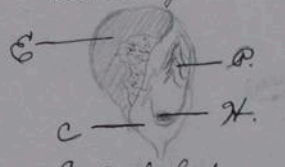
Sweet-corn grain cut perpendicular to the flat side.
E. endosperm
C.c. oily covering.
H. Hypocotyl
P. plumule
C. cotyledon

Corn grain

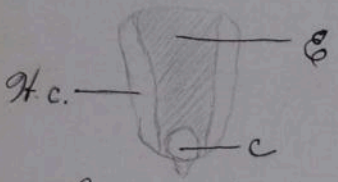


f.e. free end.
h.c. hard covering.
a.e. attached end.
a. attachment.

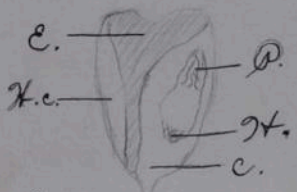
Corn grain cut lengthwise.



C. Cotyledon
E. Endosperm
P. Plumule.
H. Hypocotyl.

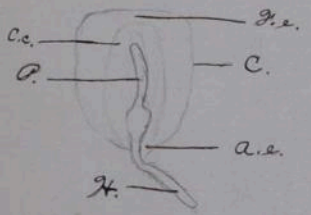


Corn grain cut lengthwise.
E. Endosperm.
C. Cotyledon.
H.c. Hard covering.



Corn grain cut perpendicular to the flat side.
E. endosperm.
H.c Hard covering.
P. plumule
H. Hypocotyl
C. Cotyledon

March 3, 1917.



Germinating corngrain.
C. c. caprnet plumule and hypocotyl
P. Plumule
H. Hypocotyl.
Ae. Attached end.
F. e. Free end.
C. Covering.

March 9, 1917.

Experiment March 6, 1917.

-I- Aim.

To show precence of grape sugar in germinating corn.

-II- Materials.

Germinating corn, Fehlings solution, test tube and alcohol lamp.

-III- Operation.

Cut half a dozen of the corn grains perpendicular to the flat side and put them in the test tube with Fehling's solution. Boil over the alcohol lamp.

-IV- Observations.

1. The part of the endosperm near the embryo turned reddish brown.

2. Conclusions. I conclude that the starch in the corn grain is turned to grape sugar in the germinating corn.

Experiment. March 7, 1917

I- Aim.

To show presence of proteid and starch in corn.

II- Materials. 1. test tube nitric acid ammonia alcohol lamp. 2. tray iodine. Corn grains,

III- Operations.

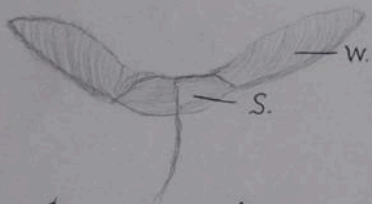
Cut the corn grains perpendicular to the flat side. 1. Put part of them in the test tube and heat over alcohol lamp with nitric acid. Rince the piece and heat with ammonia. 2. Pour iodine over the rest of the corn grains.

IV Observation.

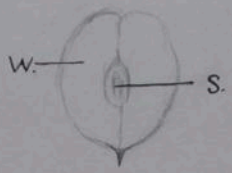
1. A portion of the endosperm turned yellow with nitric acid and orange with ammonia.

2. The endosperm turned black with iodine.

3. Conclusions. I conclude that corn contains proteid and starch.



Maple seed.
W. wing.
S. seed

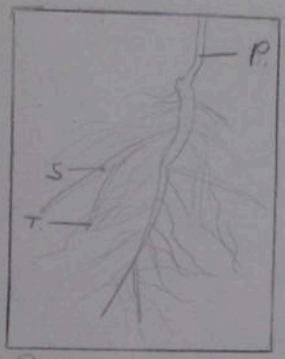


Elm seed
W. Thin membrane which catches the wind and is scattered thereby.
S. seed.

Milk weed seed.
S. seed.
W. Threads which enable the seed to fly by the help of the wind.

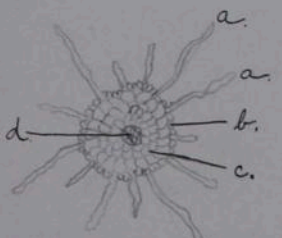
Milk-Weed pod.
S. seeds.
P. pod.
a. attachment.

March 5, 1911.

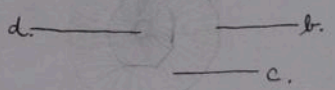


Primary (P), secondary (S) and tertiary (T) roots.

Diagram of cell-life: CM, cell membrane; CS, cell sap; CW, cell wall; P, protoplasm, N, nucleus; S, cell particles.



Cross section of a young taproot.
a, a, root hairs; b, epidermis;
c, cortex; d. woody cylinder.



Cross section through a carrot.
b., epidermis; c., cortex; d., woody
cylinder.

March 13, 1917.

Experiment.

I. Aim.

To show food supply in a tap root (carrot).

II. Materials. 1 tap root (carrot) iodine.

*2. nitric acid, ammonia tap root (carrot) alcohol lamp test tube.

3. tap root, alcohol lamp, test tube, Fehling's solution.

III. Operation

1. Take a slice of the carrot and put it in iodine.

2. Cut a portion of the carrot into small pieces and heat with nitric acid over the spirit lamps. Wash the carrot and repeat with ammonia.

3. Cut a portion of the carrot into small pieces and boil with Fehling's solution over the alcohol lamps.

IV. Observations.

1. The carrot turned blue-black.

2. The pieces of carrot turned yellow with nitric acid and orange with ammonia.

3. The pieces of carrot turned

reddish-brown with Fehling's solution.

4. Conclusions. I conclude that a tap root (carrot) contains 1 starch, 2 proteid, 3 grape sugar.

Note. * Not done in class.

Experiment March 14, 1917.

I- Aim

To show where liquids rise in roots.

II- Materials.

Tap root (carrot) glass jar, red ink solution.

III- Operation.

Put the tap root in the solution and leave for a couple of days. Cut a slice off the top. standing.

IV- Observation.

1. The solution rose between the cortex and the woody part.

2. Conclusions. I conclude that water rises in the root between the cortex and the woody part.

Experiment. March 15, 1917.

I. Aim

To show Osmosis.

II. Materials.

Glass jar the mouth of which will support an egg, glass tube, egg, sealing wax, water, and hat pin.

III. Operation

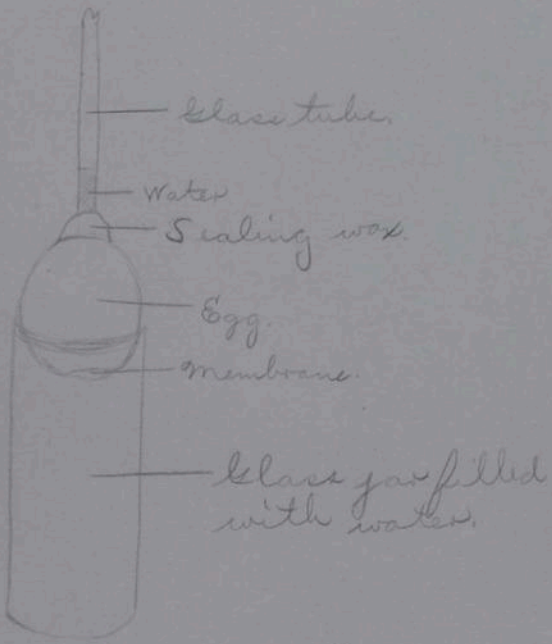
The larger end of the egg is cracked and the shell taken off leaving the membrane. Then the glass tube is put upright on the other end of the egg and held there by sealing wax. Next the hat pin is inserted in the tube and pierces the shell. The egg is put in the mouth of the glass jar and left for eighteen hours.

IV Observations.

1. I observed after eighteen hours that the water had risen in the tube.

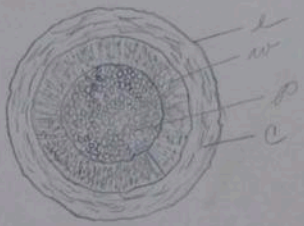
2. Conclusion. I conclude that osmosis is the mingling of two liquids of different densities through a membrane the flow being in the direction of the greater density.

Note. Osmosis takes place in the food tube of animals and the roots of plants. ✓

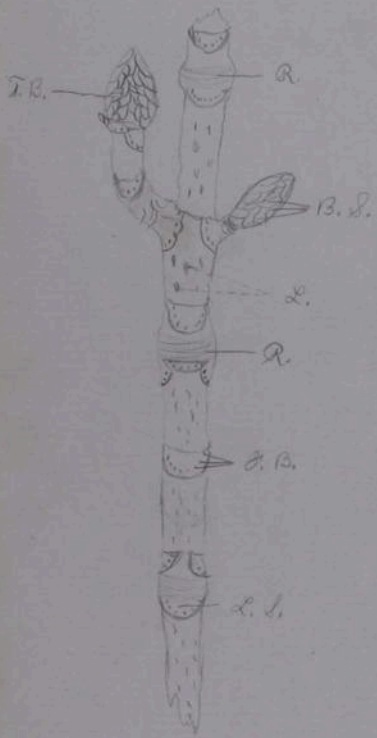


Drawing of Osmosis.

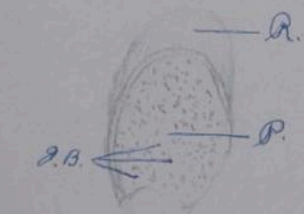
March 10, 1917.



Section across a young twig of box elder, showing the four stem regions: e, epidermis, represented by the heavy bounding line; c, cortex; w, wood; p, pith. ✓ (From Coulter, Plant Relations.)



Drawing of Hoveschad nut branch.



Cross section of corn stalk.
R.
F. B. Fibrovascular bundles.
P. Pith.

Longitudinal section of corn stalk.
R.
F. B. Fibrovascular bundles.
P. Pith
N. Nodes

April 18, 1917.

Study of Stems (Dictation
Underground Stems (Root-stocks)
Stems which lie namely or fully under
ground are of frequent occurence
and of many kinds. In the simplest
form of root stock such as is found
in many grasses and sedges the real
nature of the creeping underground stem
is shown by the presence upon its
surface of many scales which are
reduced leaves. 1. Root-stocks of this
sort extend for long distances as in
the case of grasses like the sea rye
grass which roots itself firmly and
thrives in shifting sand dunes; 2.
In the stouter root-stocks like that
of iris and calladium, this stem-like
character is less evident. The potato
is an excellent example of the short and
much thickened underground stem called
a tuber. Potatoes are not borne on true
roots but only on subterranean branches
which are stouter and more cylind-
rical than most of the roots. The
eyes which they bear are rudimentary
leaves and buds. 3. Bulbs whether
coated like those of the onion or
hyacith or scaly like the lily are

merely very short and stout underground stems covered by closely crowded scales or layers which represent leaves or bases of leaves.

Variously modified forms of underground stems just discussed illustrate the story of nourishment in winter or rainless season, to secure rapid growth in active season. It is interesting to notice that nearly all of the early flowering plants in temperate climates like crocus, snowdrop, spring beauty, skunk cabbage owe their early blooming habit to richly stored underground stems of some kind or to fleshy roots.

(1) Study of Leaves. (Dictation) (Introduction)

Work performed by leaves.

There are several kinds of work (functions) performed by leaves. 1. Transpiration or the giving off of water. 2. Photosynthesis or the making of sugar and starch. 3. Respiration or the energizing of the plant. 4. Digestion or the preparation and transformation of food. 5. Assimilation or the making of new living matter and the repair of waste. Several of these functions are carried on by all parts of the plant but especially by leaves except in those plants so modified that some other part of the plant has taken on the work of the leaf.

(2) Study of Leaves.

Plants destitute of chlorophyl are not starch makers.

Experiment May 7, 1917.

I- Aim

To show that the green color in the leaf is chorophyl.

II Materials.

Leaf, wood alcohol glass jar and a cover.

III - Operation.

Place the leaf in the jar and pour the alcohol over it. Cover and leave for several days.

IV - Observation.

After several days the alcohol had taken the chorophyl from the leaf which had turned white and the alcohol turned green.

Conclusion: That the green coloring matter in a leaf is Chlorophyl.

George B. Van Schaack

V

Experiment. April 9, 1917.

I Aim To show that light is necessary for starch making.

II - Materials.

Iodine, two china saucers, wood alcohol plant dark room and wine glass.

III - Operation.

Keep the plant in the dark room for several days. Take a leaf from it and extract the chlorophyl as follows: Put the wood alcohol in the wine glass, place the leaf in this, cover and leave for several days. Test the leaf for starch by pouring iodine over it.

IV. Observations.

1. The leaf did not turn black with iodine showing it contained no starch.

2. Conclusion. I conclude that light is necessary for starchmaking.

Experiment May 8. 1917.

I. Aim.

To show the transpiration of a leaf.

II Materials.

A leaf with a long petiole, a glass jar, a piece of cardboard, water and a glass tumbler.

III. Operation

Cut a small hole in the cardboard and insert the petiole of the leaf. Thoroughly wipe the glass tumbler. Fill the glass jar with water. Place the cardboard over the glass jar with the leaf upright. Over the leaf place the glass tumbler. Leave in the sun for a couple of days.

IV. Observation.

After two days drops of water will appear on the inside of the glass tumbler showing transpiration took place.

Conclusion. I conclude that transpiration takes place in the leaf.

George B. Van Schoack.

Experiment. May 13, 1911

I. Aim.

To show response of leaves to light.

II. Materials

Plant and sunlight.

III. Leave the plant in the sunlight a couple of days and then turn around and leave for a couple more days.

IV. Observations.

1. At the end of the fourth day all the leaves had turned back to the light.

2. Conclusion. I conclude that leaves respond to light.

Experiment April 9, 1911.

I- Aim.

To show that a gas is given off in the process of starch making.

II- Materials

Glass jar water and leaf.

III. Operation

Fill the glass jar with water, put the leaf in and leave in the sun for a couple of days.

IV- Observation.

1 Bubbles appeared on the under-side of the leaf and if they were tested to see if they were oxygen it would be found so.

2 Conclusion. I conclude that oxygen is given off as a by product of starch making (photo synthesis).

Experiment XI No. 5. May 16, 1911

I Aim.

To show air is necessary for starch making.

II. Materials.

Plant, vaseline, dish, sunlight, and iodine

III. Operation.

Cover one of the leaves of the plant with vaseline. Leave in the sunlight for several days. Take the leaf that is vaselined, remove the vaseline and extract the chlorophyl as described in Experiment XI No. 3. Test for starch by pouring iodine over it.

IV. Observations

1. The leaf did not turn black as it should if it contained starch but assumed the brown of the iodine.

2. Conclusion. I conclude that air is necessary for the manufacture of starch.

✓

George Ford

L

Resolved, That, gov. ownership and control of railroads is undesirable, unnecessary and unwise.

The railroad systems of the U. S are valued at 15½ billion dollars. If the government were to buy them, it would incur an immense debt which it could not stand.

Such purchase and control would be a usurpation of power which our gov. does not stand for. The vested rights of the people of the U. S. should be preserved but they could not if such a purchase was to be made

By such a purchase and control the Railroads ~~the~~ would be made a dangerous factor in politics. As to electing railroad men as other officers are elected, it would be impossible. A railroad man cannot be elected and put in an important place at once but

must be trained and must "know the ropes." Politics of course means changes and no railroad can stand these. Gov. ownership would give the gov. a chance to hire only men of the party then in power.

If there were no individuals with capital in a railroad there would be no interest to promote better means of travel.

It is a mistake to expect lower rates and better facilities from the gov. than from private companies. The state is more apt to tax industry than to foster it and when it attempts to tax industry it is even less responsible than a private company. Federal management is more costly than private management. If the railroads do not pay at 3¢ a mile how could they at ⅓ of a mile as some have sug-

gested the gov. would do.

The railroad systems of the U. S. if united would form an immense industry which the gov could not manage safely and judiciously.

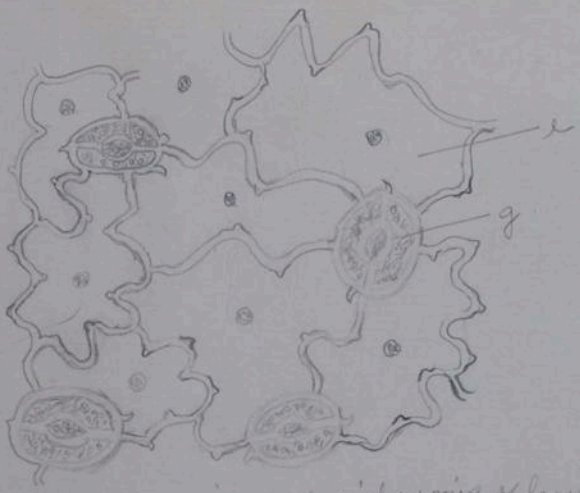
Some one has compared the P. O. dept. to the railroads and said if the government could succeed with the P. O. dept they could with the railroads. The truth is they have not succeeded with the P. O. dept. From 1903-12 the deficit of this dept averages over 8 millions per year.

Where gov. ownership and control of railroads has been tried it has failed. Here in our own country in the last few months gov. control has failed. While wages have been increased the rate has also but still the government finds itself with a deficit of 136 millions.

If my opponents have found any defects in private ownership remedy them but there are better ways of doing so than by government ownership and control.

From these arguments it can be seen that gov. ownership and control of railroads, is undesirable unnecessary and unwise.

Section of a leaf;
e, epidermis; c, cells
containing chlorophyl
bodies.

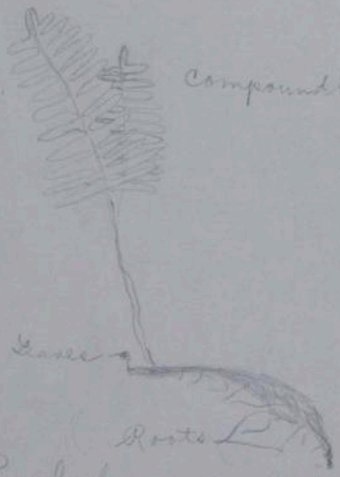


Surface view of epidermis of lower surface of a leaf; e, ordinary epidermal cell; g, guard cell. — Tschirch.

April 20, 1917.

Diagrams of a stoma: a, surface view of an open stoma; b, same stoma closed (after Haberlandt); c, diagram of a transverse section through a stoma—dotted lines indicate the closed position of the guard cells, the heavy lines the open condition. (after Lavendenet.)

April 27, 1917.

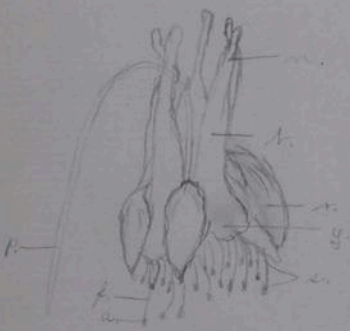


Rock fern, polypody.

asporangiums.

May 29, 1917.

George Vanderbeck



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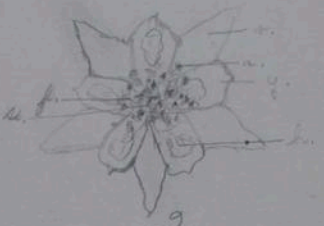

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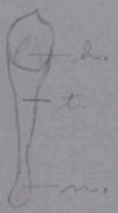

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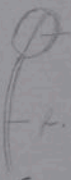
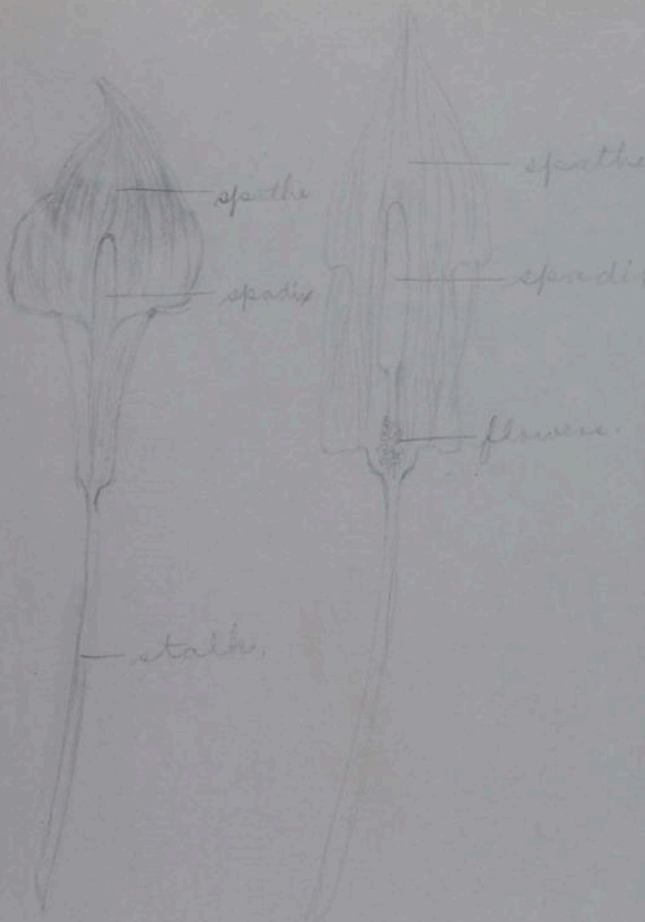


5.

6.

Drawings of Columbine.

Fig 1. Side view.
Fig 2. Front view.
Fig. 3 Single red petal
Fig. 4. Single red antiglous petal with nectar appendage.
Fig 5. Single stamen
Fig 6. Single pistil.
Figures 1, 2, 3, 4, 5 and 6. p. petiole; n. nectar appendage; r. red petal (6); y. yellow and red petal (5); f. filament; a. anther; s. stamen; t. tube leading to nectar appendage; ss. stamens; b. hole opening into tube; b. blade; att. attachment; o. ovary



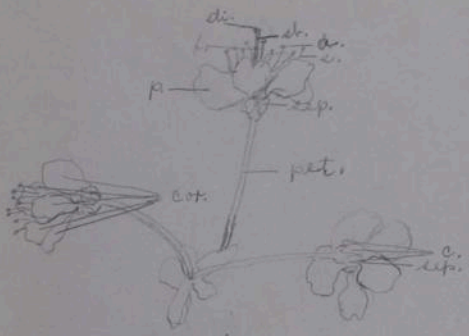
Drawings of Jack-in-the-Pulpit.

May 29, 1917.

George [illegible]

Simple parallel veined leaf. (Lily of Valley)
B. Blade. M. Midvein. V. Veins.

April 30, 1917.



1.

2.

3.

Fig. 1. Cluster of wild cherry blossoms.
Fig. 2. Front view of wild cherry blossom.
Fig. 3. Single stamen
Fig. 4. Single pistil.
Fig. 5. Leaf.
Figures 1 and 2. sti., stigma; st., style; a., anther; f., filament; c., stamen; p., petal; sep., sepal; pet., petiole; cor., corolla; c., calyx.
Fig 3. a., anther., s., ridge; f., filament.
Fig 4. sti., stigma; st., style; o., ovary.
Fig 5.

May 14, 1917.

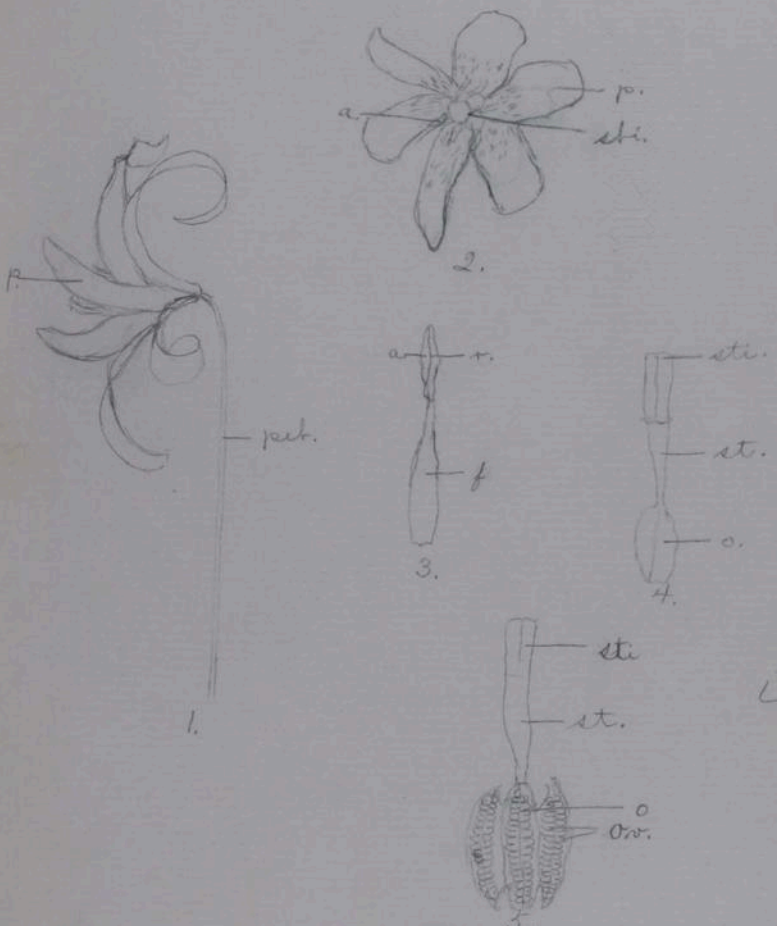
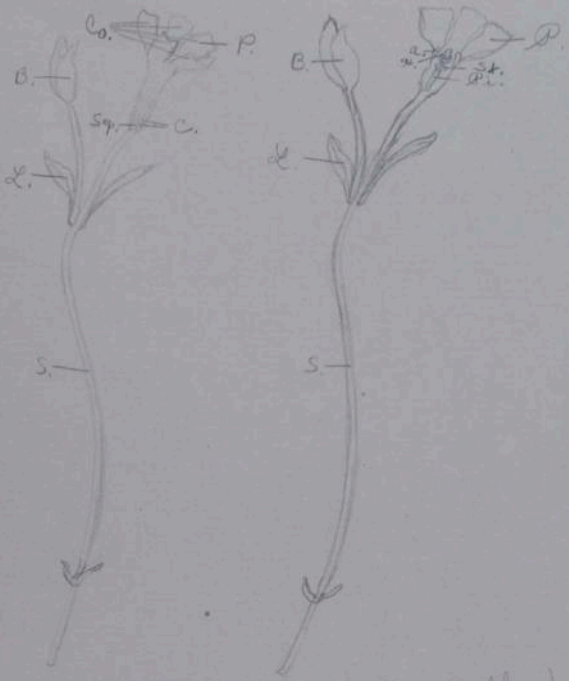


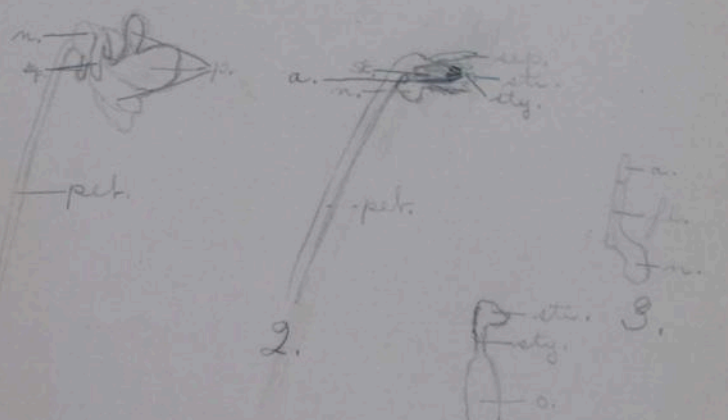
Fig 1. Side view. p., petal. (s); pet., petiole.
Fig 2. Front view. sti., stigma; a., anther (s)
p., petal
Fig 3. Single stamen. a., anther; x, ridge
f. filament.
Fig 4. & 5. Single pistil and same cut open. sti,
st., style; o. ovary; ov., ovules.

May 15, 1917.



Drawing of Periwinkle (Myrtle)
P. Petal (5); Co. Corolla; B. Bud; C. Calyx;
Sep. Sepal (5); L. Leaf; S. Stem; St. Stigma

April 9, 1917.



Drawings of Violet.

Fig 1. Side view; n., nectar appendages; sep., sepals (5); pet., petiole; p., petals (5).

Fig 2. Side view petals removed; st., stamens (5); sep., sepals (5); sti., stigma; sty., style; a., anthers (5); n. nectar appendages (2); pet., petiole.

Fig 3. Single stamen with nectar appendage; a., anther; fi., filamentin., nectar appendage.

Fig 4. Single pistil; sti, stigma; sty., style; o. ovary.

May 16, 1917.

George VanDeraack.

93

Physiology.
George B. Van Schaack
Coxsackie High School
1916.

ENGLISH COMPOSITION

Contents

Experiment I No 1

I- Aim

The aim of this experiment is to produce nitrogen and show its characteristics or to show the composition of the air.

II- Materials.

The materials needed are a shallow pan nearly filled with water, a cork, a piece of phosphorus, and a bell jar.

III- Operation.

The cork is placed on the water with the phosphorus on it. The phosphorus is lighted and the bell jar placed over it.

IV- Observations.

1. As the ~~water~~ phosphorus burns the water in the jar rises.
2. When the water has displaced one fifth of the air in the jar the phosphorus goes out. The ~~air~~ element left in the jar is nitrogen
3. Conclusions. I conclude from this experiment that nitrogen is tasteless, colorless, and odorless and will not support combustion.

air is 1/5 oxygen and 4/5 nitrogen

Note: Nitrogen is colorless, tasteless and odorless and will not support combustion. This is conclusion

A-

Experiment -I- No 2.

I Aim.

The aim of this experiment is to produce oxygen and show its characteristics.

-II- Materials.

The materials needed are: a test tube, a spirit lamp, a half teaspoonful of chlorate of potash and about its bulk of black oxide of manganese.

-III- Operation. The chlorate of potash and manganese are put in the test tube and well shaken. The spirit lamp is lighted and the test tube held over it. As soon as a whitish vapor is seen to arise from the mouth of the test tube a glowing match is inserted in the mouth of the tube. It will flare up in a whitish flame.

IV Observations

1. The vapor arising from the tube.
2. The match burns with a blue flame.
3. Conclusions: I conclude from this experiment that oxygen is tasteless, colorless, odorless, will support combustion and mixes with other substances readily.

Note: Oxidation is the chemical union of oxegen with another substance.
Slow oxidation is the slow chemical union of oxegen with another substance.
Oxidation in a match: When the match is struck the phosphorus ignites and it in turn ignites the sulphur and it in turn ignites the wood of the match and oxidation takes place.
Oxidation gives off heat.

A

Experiment I: No. 3

I- Aim

To show the characteristics of sulphur.

II- Materials

The materials needed are a shallow glass tray and some sulphur.

III- Operation.

Some sulphur is placed in the tray and lighted. Next some sulphur is put in water

IV Observations 1: Sulphur is of a yellow color and is tasteless.

2: Sulphur burns with a blue flame.

3: Sulphur burns with a suffocating odor.

4: It is insoluable.

5: Conclusions. I conclude from this experiment that sulphur is yellow, tasteless, burns with a suffocating odor, and is insoluable.

Note: A trace of sulphur is found in eggs, corn, and beans. Commercial sulphur is taken from the inside of volcano craters.

A

Experiment I No 4.

I Aim.

To produce carbon and show its characteristics.

II Materials

The materials needed are: A piece of glass, a match and a glass tray half full of water.

III Operation.

The piece of glass is held over the burning match. The smoke left on the glass is carbon. Some carbon is scraped off into the water.

IV Observations. 1: Carbon is black in color.

2: Carbon is tasteless and odorless

3: Carbon is insoluable.

4: Carbon will not burn.

5: Conclusions. I include from this experiment that carbon is black, odorless, tasteless, insoluable and will not burn.

A

Note:

Carbon is found in a pure state in the diamond.

Iron (Dictation) - I Noo

Iron is one of the most abundant metals as well as the most useful. It is found in practically all rocks and soils and both animals and plants have traces of it in their tissues. Chemically pure iron exists only in the the laboratory as it combines readily with many other minerals. Carbon is one of its commonest impurities. The difference in cast iron, wrought iron, and steel being primarily the amount of carbon combined with the iron.

Plant ash contains iron which the plant gathers from the soil. Most water contains a trace of iron and some water contains enough iron to leave a rusty stain on objects over which it flows

Experiment II

I Aim.

The aim of this experiment is to show oxidation.

II- Materials.

The materials needed are a spirit lamp, bell jar and a match.

III- Operation.

The spirit lamp is lighted and the bell jar placed over it.

IV- Observations.

1: I observed that the lamp went out quickly.

2: Conclusions. I conclude from this experiment that oxidation can not go on with out oxygen because when the light went out it showed that the oxygen was used up.

Note.

1: Oxidation is the chemical union of oxygen with another substance.

2: Slow oxidation is the slow chemical union of oxygen with another substance. The rusting of a nail is an example of this.

A

Experiment III

I. Aim.

The aim of this experiment is to show osmosis.

II. Glass jar the mouth of which is slightly ~~than~~ smaller than the largest diameter of an egg, glass tube, egg, sealing wax, and hat pin.

III Operation.

The larger end of the egg is cracked and the shell taken off leaving the membrane. Then the glass tube is put upright on the other end and held there with sealing wax. Then the hat pin is put down through the tube and pierces the shell. Then the egg is put in the mouth of the glass jar which is filled with water and left for eighteen hours.

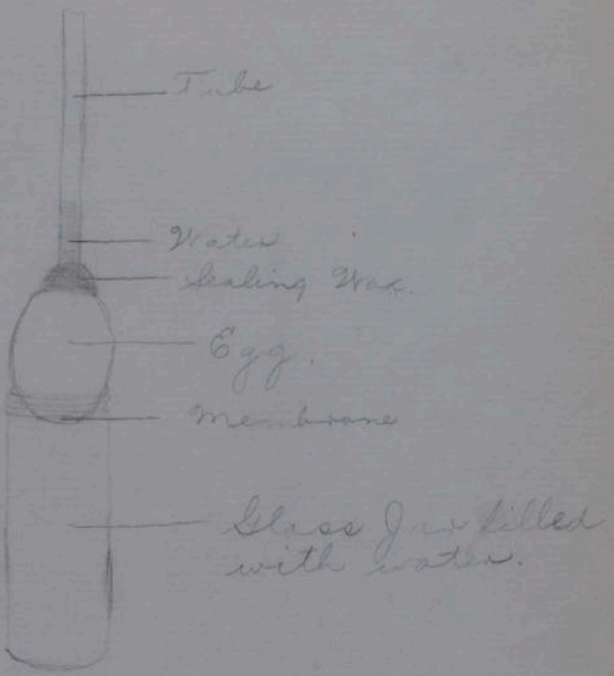
IV Observations.

1. I observed after eighteen hours that the water had risen in the tube and the white of egg had gone into the water

2. Conclusions. I conclude from ~~the~~ this experiment that osmosis is the mingling of two liquids of different density through a membrane. Flow is greater in which direction?

A

Note. Osmosis takes place in the food tube of animals and also takes place in the roots of plants.



Drawing for Experiment -VI-

A

Experiment IV

I Aim.

To show the presence of starch.

II Materials

A bean, a potatoe, iodine, and two glass trays.

III Operation

Slice the potatoe in one tray and the bean in the other. Pour iodine over each.

IV Observations.

1. I observed that the iodine which was red turned the bean and potatoe black.
2. I conclude from this experiment that beans and potatoes contain starch.

Note. Starch is used and manufactured by plants. Starch is found in corn beans, potatoes and bread.

A.

1. The bean seed is flat and oval with a depression on one side which is called the micropyle. 2. The tough outside covering is called the testa. 3. The scar left on the bean where it was attached to the pod is called the hilum. 4. The thin skin underneath the testa is called the integument. 5. The ridge on the bean is called the raphe. 6. The two halves of the bean are called the cotyledons. 7. The rod shaped projection is called the hypocotyle which forms the root and part of the stem. 8. The first true leaves are folded between the cotyledons and the two together are called the plumule which also forms the stem.

Experiment V

I Aim.

To show the presence of proteids.

II Materials.

A bean, a kernel of corn, two glass trays, nitric acid, and ammonia.

III Operation.

The corn and bean are soaked over night. Then the bean is peeled and sliced into one dish. Next the corn is sliced into the other dish. Then nitric acid is poured over each and left for a few minutes after which the bean and corn are rinsed. Then ammonia is poured over them.

IV Observations.

1. I observed that the nitric acid turned the corn and beans yellow
2. I observed the ammonia turned the beans orange.
3. Conclusions. I conclude from this experiment that nitric juice acid and ammonia are the

tests for proteids ~~and~~ corn and beans contain proteids.

Note

1. Proteid is manufactured in plants.
2. Proteids contain the elements carbon hydrogen, nitrogen and oxygen.
3. Proteid is found in the white of egg, in lean meat and in peas beans and corn.

a.

Experiment VI

I Aim

To show the presence of grape sugar.

II Materials

Test tube, *grape sugar, alcohol lamp, match, and Fehling's solution.

III Operation

The grape sugar is put in the test tube and some Fehling's solution poured on it. The spirit lamp is lighted and the test tube held over it. When the contents boils it is takenaway.

IV Observations

1: I observed when the contents boiled that it turned a reddish brown.

2: Conclucions. I conclude from this experiment that any substance containing grape sugar will turn reddish brown when it is boiled with Fehling's solution.

Note.

*1: This experiment may be made with glucose instead of grape sugar.

2: Fehling's solution* is the test for grape sugar.

Experiment - VII

I. Aim

To show the presence of fats and oils.

II. Materials

A piece of unglazed paper, a match, a spirit lamp ~~and~~ a match, and a bean

III. ~~Observations~~ Operation

The bean is chopped fine and put on the paper which is held over the spirit lamp. In a few minutes grease will appear and the experiment is performed.

IV Observations.

1. I observed as the bean was heated that grease spots appeared.

2. Conclusions. I conclude from this experiment that beans contain fat.

Notes.

1. Fats and oils release a great deal of energy.

2. Fats and oils comprise a good deal of the body.

Experiment. -VIII-

I- Aim

To show the use of the tongue the teeth and the cheeks.

II- Materials.

A piece of bread and myself.

III- Operation.

Put the bread in my mouth and chew and swallow in the usual way.

IV- Observations.

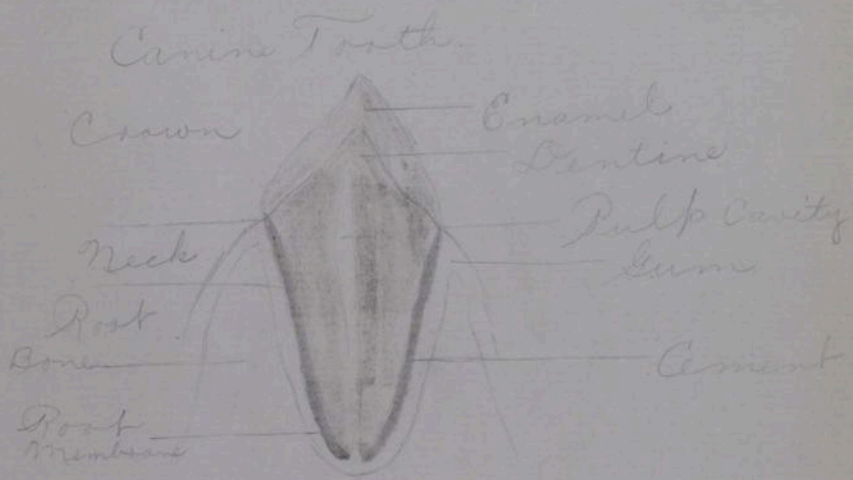
1. I observed the teeth chewed the bread

2. I observed the tongue rolled the bread around so it might get the saliva.

3. I observed that the cheeks kept the food in the mouth

4. Conclusions. I conclude from this experiment that the teeth chew the food, the tongue rolls it around, and the cheeks keep it in the mouth.

Tongue also for taste



a

Experiment IX-

I- Aim

To show the digestion of starch.

II- Materials.

A test tube, saliva, a spirit lamp, ~~and~~ Fehling's solution and starch.

III- Operation

The saliva and starch are put into the test tube and left for a few minutes. The the starch and saliva are tested with Fehling's solution. The Fehling solution is put with the substance in the test tube and boiled over the spirit lamp.

IV- Observations.

1. I observed that when the substance in the test tube was tested with Fehling's solution it turned orange.

2. Conclusions. I conclude that saliva turns starch to grape sugar.

Note.

Saliva is secreted by glands and given to the body to aid in digestion.

A

Experiment X-

I- Aim.

To show the digestion of proteids.

II- Materials

Four test tubes, cooked white of egg, water, pepsin, and hydrochloric acid.

III- Operation

Mince the white of egg and put a portion into each test tube. In the first test tube put water. In the second tube put water and pepsin. In the third tube put water and hydrochloric acid. In the fourth tube put water, pepsin and hydrochloric acid. Let the test tubes all stand a few minutes.

IV- Observations.

1. In the first three tubes nothing took place.

2. In the fourth tube the egg was dissolved and the substance assumed a soapy appearance.

3. I conclude from this experiment that water, pepsin and hydrochloric acid are needed in the digestion of proteids. A

Experiment ~~XI~~

I- Aim

To show the digestion of fats and oils.

II- Materials.

Two test tubes, water and olive oil and caustic soda.

III- Operation.

In first test tube put water and oil. In second put water oil and caustic soda. Shake both good and let stand a few minutes.

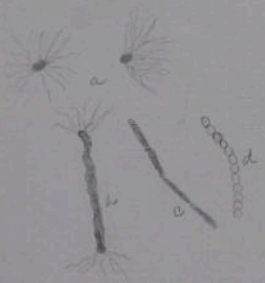
IV- Observations.

1. I observed in the first tube that the water and oil separated.

2. I observed in the second tube that the substance assumed a soapy appearance.

3. Conclusions. I conclude that an alkali (caustic soda) is needed in the digestion of fats and oils.

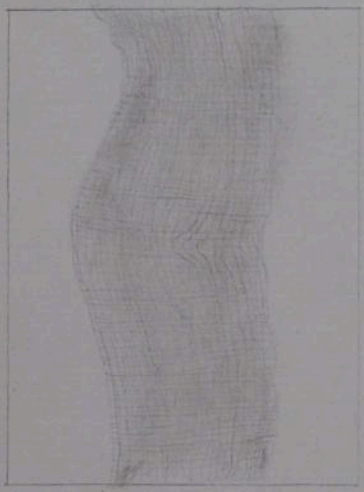
O



Bacteria highly magnified
a, The germ of typical form.
b, a spiral shaped form
c, a rod shaped form in chains
d, a spherical form.

a

Name of Nutrient	Test	Use	Foods containing Nutrient
Proteid	Turns orange by nitric acid and ammonia	Manufacture of protoplasm. When oxidized produces energy	Vegetable foods, eggs meat and milk.
Fats and Oils	Grease spots on paper when heated.	Produce heat and form body fat.	Animal foods (especially pork, butter and cheese) nuts, cocoa and chocolate.
Mineral Matters.	Left as ash after burning	To make bone and aid in digestion	Vegetable and animal foods, common salt and water.
Starch	Turns blue black by iodine	Transformed into fat, keeps the body warm and produces energy	Vegetable foods (especially cereals)
Sugar	Fehling's solution turns orange when boiled with grape sugar	Transformed into fat and produces energy.	Vegetable foods (especially fruits) and milk



A bit of voluntary muscle fibre, showing the cross striations as seen under the microscope (highly magnified.)

a

Diagram of a section of the skin. (highly magnified)

a

Experiment XVIII

I Aim

To show normal pulse and pulse after running.

II Material

A watch and myself.

III Operation

Take your first two fingers and count your pulse. An artery may be found in the wrist. Then run up and down stairs three or four times. Then count your pulse again.

IV Observations

1. After sitting awhile my pulse was 80 per minute.
2. After running my pulse was 120 per minute.

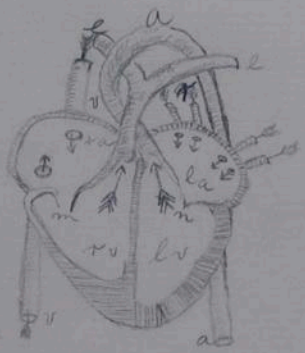


Diagram showing the front half of the heart cut away: a, aorta; l, arteries to the lungs; la, left auricle; lv, left ventricle; m, tricuspid valve open; m, bicuspid or mitral valve closed; p and p, veins from the lungs; ra, right auricle; rv, right ventricle; v, vena cava. Arrows show direction of circulation.

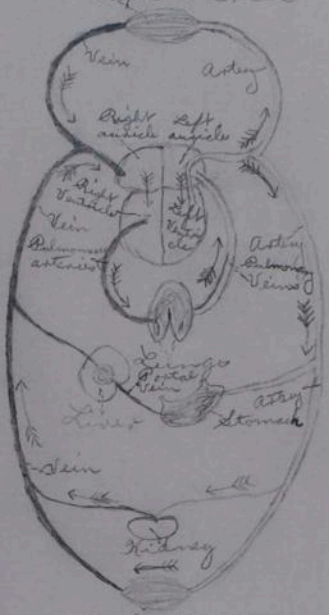
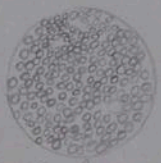
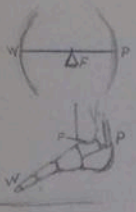


Diagram of the circulation of blood in a mammal.

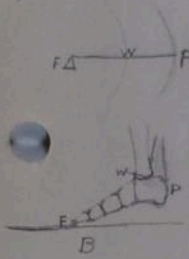


a drop of human blood as seen under the compound microscope showing the red corpuscles and a Colorless corpuscle at the right.

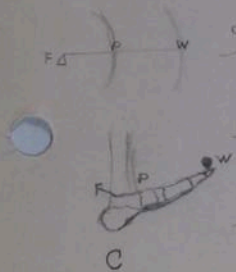
Levers



This is a lever of the first class. An example of it is the nodding of the head. The fulcrum is one of the vertebra called the atlas; the power is the muscles of the neck; and the weight is the front of the head. In the lever of the first class the fulcrum is between the weight and power.



This is a lever of the second class. The weight is between the fulcrum and the ~~pa~~ power. An example of this is when we raise on our toes. The floor is the fulcrum in this case.



This is a lever of the third class. The power is ~~bet~~ between the fulcrum and the weight. An example of this is when we raise on our heels.

Experiment XXIII

I Aim.

To show the composition of bone.

II Materials.

Pieces of bone, glass jar and water and hydrochloric acid.

III Operation.

Put two parts water to one part hydrochloric or muriatic acid in the glass jar. Place a piece of bone in the solution and leave at least a day. Have one of the pupils take a piece of the bone, and bake it at home and bring it to ~~the~~ school.

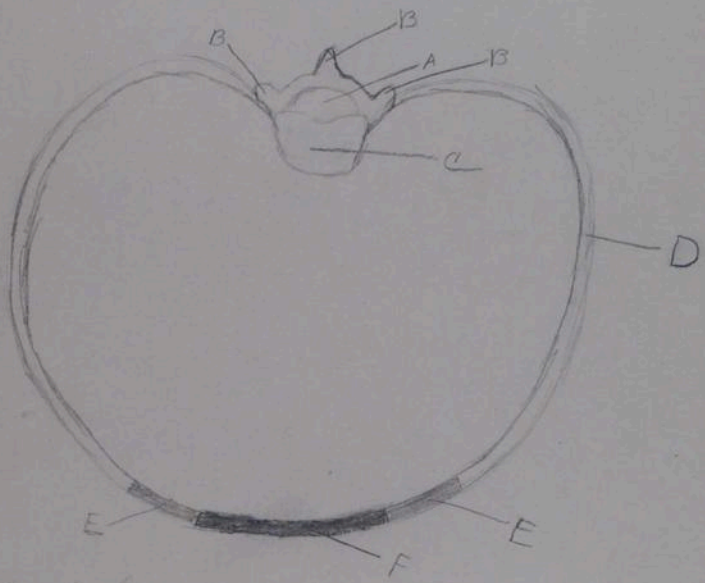
IV Observations

1. I observed after a day the bone in the solution could be easily bent showing that the mineral matter had been eaten away and the animal portion left.

2. I observed that the bone that was baked was a hard shell full of tiny holes. This should the ~~same~~ animal matter baked out and the

mineral matter left.

3. Conclusion. I conclude that bone is composed of mineral matter and animal matter.



A. Hole for spinal cord
B. Projections
C. Centrum
D. Rib
E. Cartilage
F. Sternum.

Air passages in the human lungs: a, larynx; b, trachea (or windpipe); c, d, bronchi; e, bronchial tubes; f, cluster of air cells.

Experiment XXVI

I- Aim

To show the use of the ribs and diaphram in breathing.

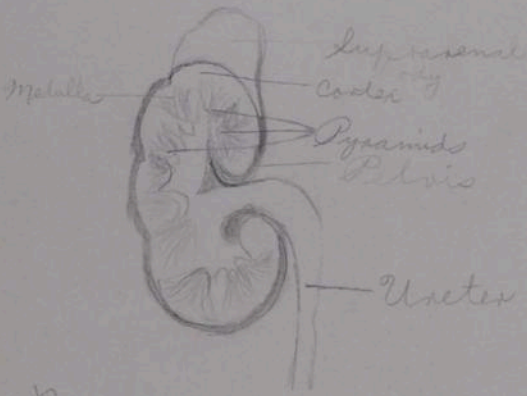
II- Operation.

Take in a long breath and expell the air.

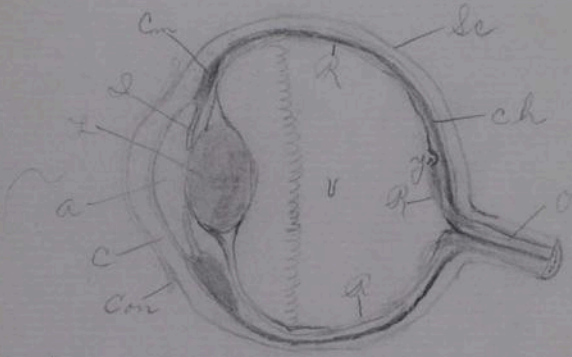
III- Conclusion.

I conclude that when I take air into my lungs the diaphram ~~mose~~ moves outward and the ribs move outward and upward.

I conclude when I expell the air from my lungs the muscles of the diaphram relax and the ribs fall back into place.



Longitudinal section of Kidney.



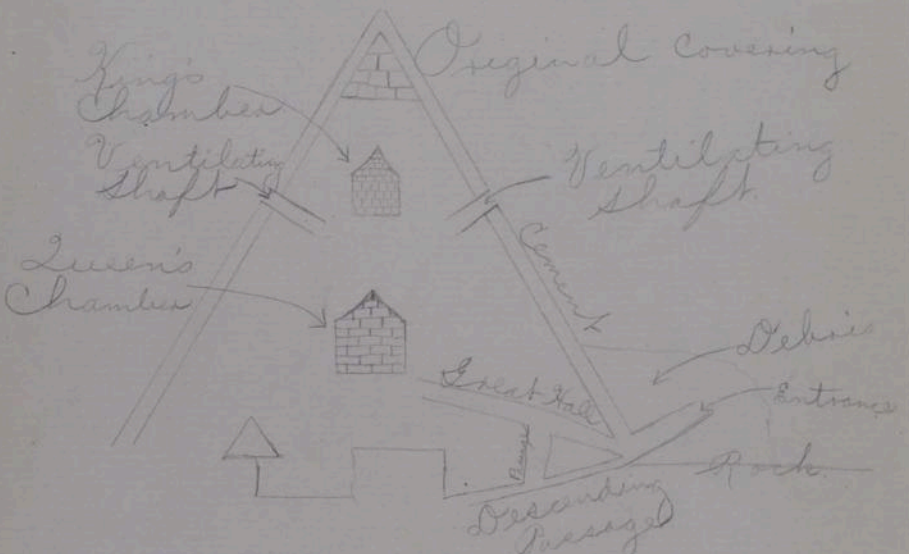
Longitudinal section through the eye; Sc, sclerotic coat; Ch, choroid; O, optic nerve; C, cornea; I, iris; Con, conjunctiva; R, retina; Y, yellow spot; L, lens; a, anterior chamber filled with aqueous humor; V posterior chamber, filled with vitreous humor.

Egypt.

I- Country
1. Importance of the Nile
2. Irrigation made possible by overflow of the Nile.
3. Deserts.
4. Pyramids.

II- Religion
1. Belief in three fold personality
2. Resurrection = the immortal life.
3. Worship of the Sun.
The Sun (Horus) was the son of the father (Osiris) and the mother (Hathor).

III- Emblems of Worship.
1. Lotus flower.
2. Winged sun disk.
3. Papyrus.
4. Scarab.



Pyramid
480 ft. high. Covers 36 Acres.

Description of Karnac

Built 30 centuries ago.

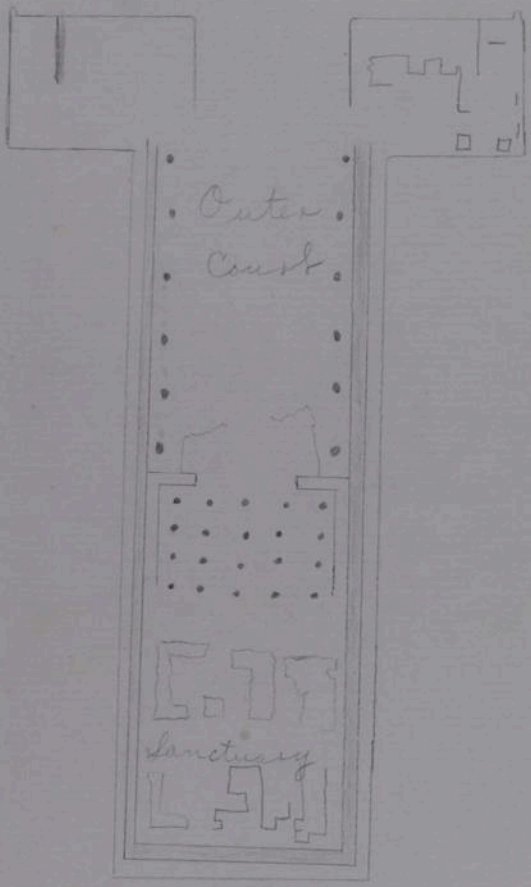
Pylon
- 142 ft high
- 372 ft wide
- Walls 16 ft. Thick.

Procession Roadway
- Sphinxes to Nile
- Temples to Nile

Lighted
- Poorly
- Openings above

Doors or Entrances
- Very few
- Sometimes only two

Architecture
- Too long for width.
- Too low for width and length.



Egyptian Temple