

Bio 112 Handout for Plants 1

This handout contains:

- Today's iClicker Questions
- Handout for today's lecture
- Suggestions for the Phylogenetic Collection Lab

iClicker Question #11A - before lecture

Which of the following is(are) true?

- (A) Gametes are always made by meiosis.
- (B) All cells in eukaryotes are diploid with the exception of eggs and sperm.
- (C) Only fungi have spores.
- (D) All of the above.
- (E) None of the above.

iClicker Question #10B - after lecture

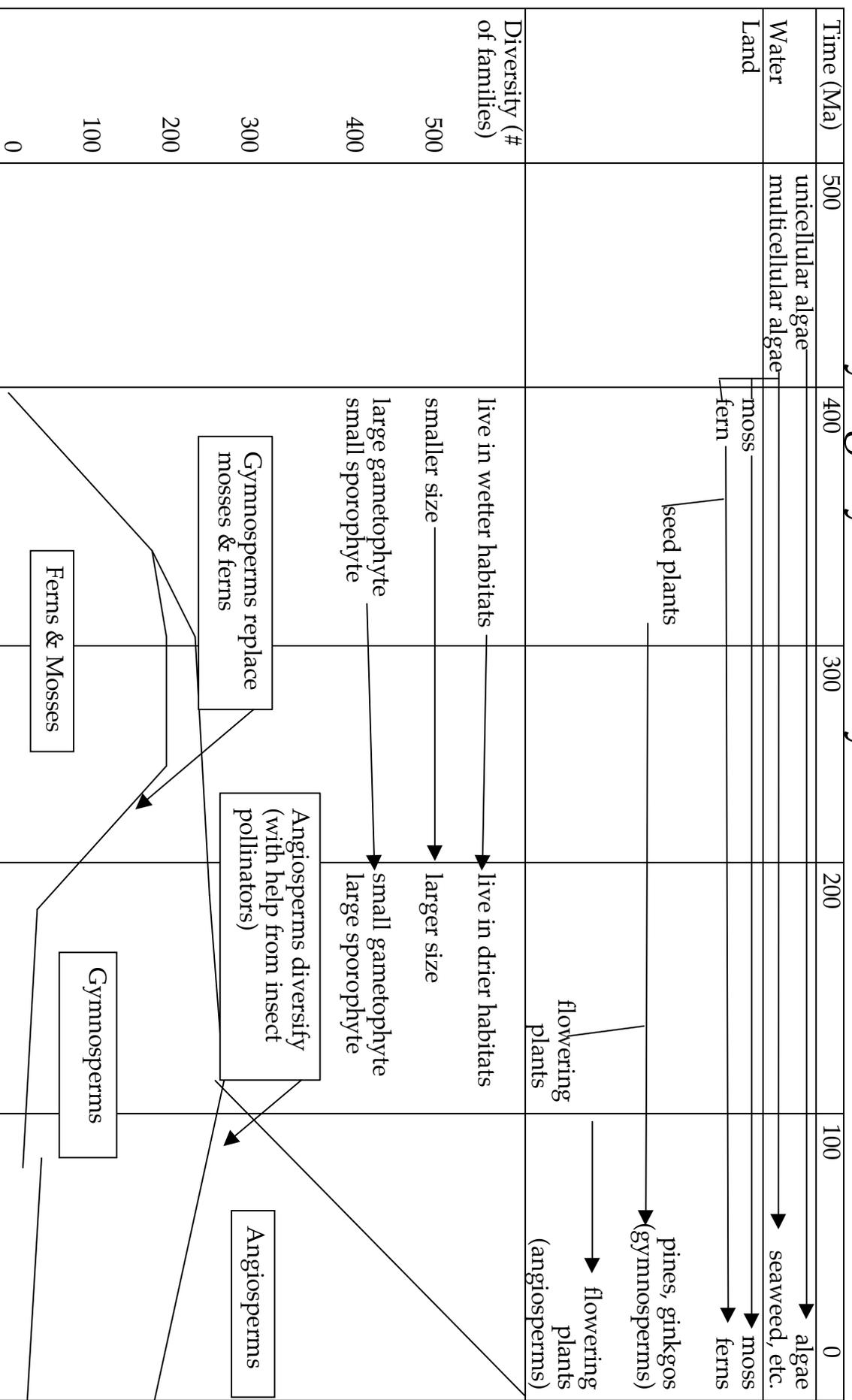
Which of the following is(are) true?

- (A) In plants, gametes are haploid.
- (B) Spores are produced by meiosis.
- (C) In plants, gametes are produced by mitosis.
- (D) All of the above.
- (E) None of the above.

Beaming in your answers

1. Figure out your answer and select the appropriate letter (A-E).
2. Turn on your iClicker by pressing the "ON/OFF" button; the blue "POWER" light should come on. If the red "LOW BATTERY" light comes on, you should replace your batteries soon.
3. Transmit your answer as follows:
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Bio 112 Plant Phylogeny & History



Plants 1 - 2

Bio 112: Hints for the Phylogenetic Collection Lab

Now that you have started working on your collections, I want to give you some useful hints and reminders.

Why is getting 16 phyla so hard? This is not easy, but the difficulties help to illustrate some important issues in biology.

- *Finding different phyla.* Most of the organisms that people notice are members of phylum chordata or angiosperms. It is important to know that the world is more diverse than just these two groups.
- *Finding out which phylum an organism belongs to.* This involves looking closely and thinking carefully about the characteristics of living organisms - another important scientific skill.
- *Dealing with the complexities of classification.* Classification, like many parts of science, is "messy" - there are several different classification schemes out there each with similarities and differences both in terminology (eg. some call flowering plants "angiospermae" and others call them "anthophyta") and organization (eg. some call crustaceans a sub-phylum and others call it a phylum). It is important to know that science is not always completely clear-cut.

Where do I get a list of "official" phyla? Since there is disagreement in the literature and on the web, we will use only one list - the only "official Bio 112" lists can be found at either:

- **Campbell** - this lists almost all the phyla and has a good description of each.

- **The course website** - see picture at right, it was taken from the On-Line Lab Manual for the Phylogenetic Collection Lab. Each of the phylum and genus names on these pages is a link to Google that term so you can search more easily for organisms in that group. These names are the same as in Campbell and have page references to Campbell; some phyla are included here that are not found in Campbell.

Lab 04: <ul style="list-style-type: none">• Phylogenetic Collection• Diversity Survey II	<ul style="list-style-type: none">• Diversity Survey II• Links to help you find organisms:<ul style="list-style-type: none">◦ A list of Animal Phyla with links.◦ A list of Bacterial Phyla with links.◦ A list of Fungal Phyla with links.◦ A list of Plant Phyla with links.◦ A list of Protist Phyla with links.
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No other source is "official" - you may only use phyla named in the sources above.

Important mistakes people often make:

- *Classification terms that are not phyla.* You may only use terms from the lists described above. There are many examples of this kind of confusion:
 - Seed plants are called "embryophytes"; this group includes several different phyla of plants.
 - "Mammalia" is a group, but it is not a phylum. All mammals are members of the phylum chordata. Similarly, all members of the group crustacea are part of phylum arthropoda.
- *Mis-named organisms.* The common names of organisms can be misleading.
 - There are two kinds of "kiwi": the bird (chordata) and the fruit (angiosperm); don't mix them up.
 - There are three kinds of "sponge": cellulose sponges (not really an organism), loofah sponges - about the same size and shape as your forearm (angiosperm), and natural sponges (porifera); be careful about which one you have.
 - A starfish is not a fish (chordata), it is a member of phylum echinodermata.

Plants 1 - 4

Bio 112 Handout for Plants 2

This handout contains:

- Today's iClicker Questions
- Handouts for today's lecture

iClicker Question #12A - before lecture

Which is correct?

- A. Sporophytes are diploid; gametophytes are diploid.
- B. Sporophytes are diploid; gametophytes are haploid.
- C. Sporophytes are haploid; gametophytes are diploid.
- D. Sporophytes are haploid; gametophytes are haploid.
- E. None of the above.

iClicker Question #12B - after lecture

Which is correct?

- | | <u>majority of moss plant</u> | <u>majority of fern plant</u> |
|-----|-------------------------------|-------------------------------|
| (A) | haploid | haploid |
| (B) | haploid | diploid |
| (C) | diploid | haploid |
| (D) | diploid | diploid |
| (E) | None of the above. | |

Beaming in your answers

1. Figure out your answer and select the appropriate letter (A-E).
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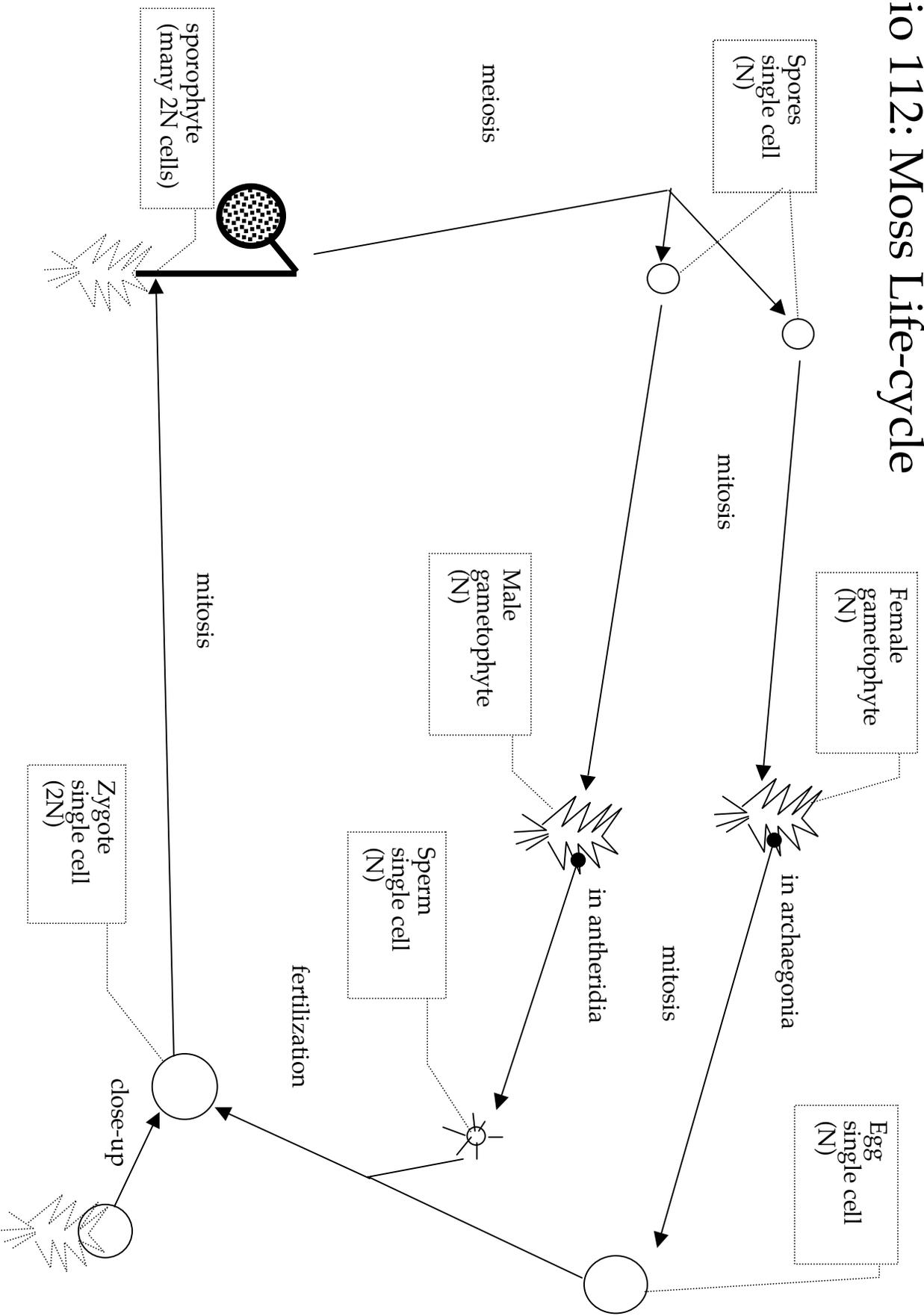
To view the animations from lecture at home:

Go to <http://intro.bio.umb.edu/111-112/112s99Lect/life-cycles.html>

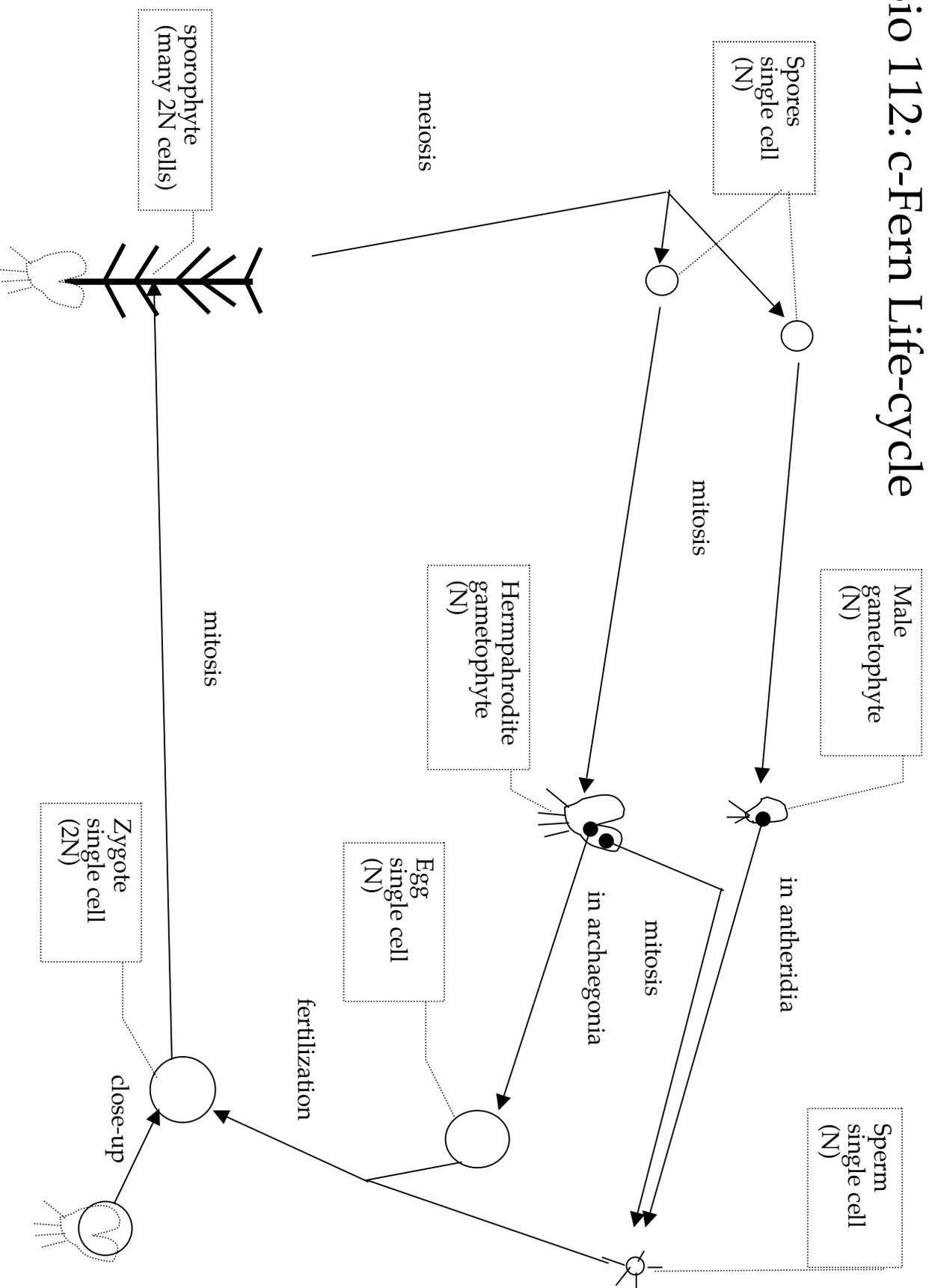
Or, step-by-step:

- (1) go to <http://intro.bio.umb.edu>
- (2) click on the link: "Click here to go the General Biology (Bio 111 & 112) web site."
- (3) scroll down to the link: "Click here for various resources from lecture." and click it
- (4) Scroll down to the "Plants 2" lecture & click on the link "Animations of plant life cycles".

Bio 112: Moss Life-cycle



Bio 112: c-Fern Life-cycle



Bio 112 Handout for Plants 3

This handout contains:

- Today's iClicker Questions
- Handout for today's lecture

iClicker Question #13A - before lecture

Which of the following is true?

- A. All plants disperse themselves by seeds.
- B. All plants disperse themselves by spores.
- C. All plants have flowers.
- D. All of the above.
- E. None of the above.

iClicker Question #13B - after lecture

Which of the following parts of a pine tree contain **haploid** cells?

- (1) pine needles
- (2) tree trunk
- (3) pine pollen
- (4) roots
- (5) all of the above

Beaming in your answers

1. Figure out your answer and select the appropriate letter (A-E).
2. Turn on your iClicker by pressing the "ON/OFF" button; the blue "POWER" light should come on. If the red "LOW BATTERY" light comes on, you should replace your batteries soon.
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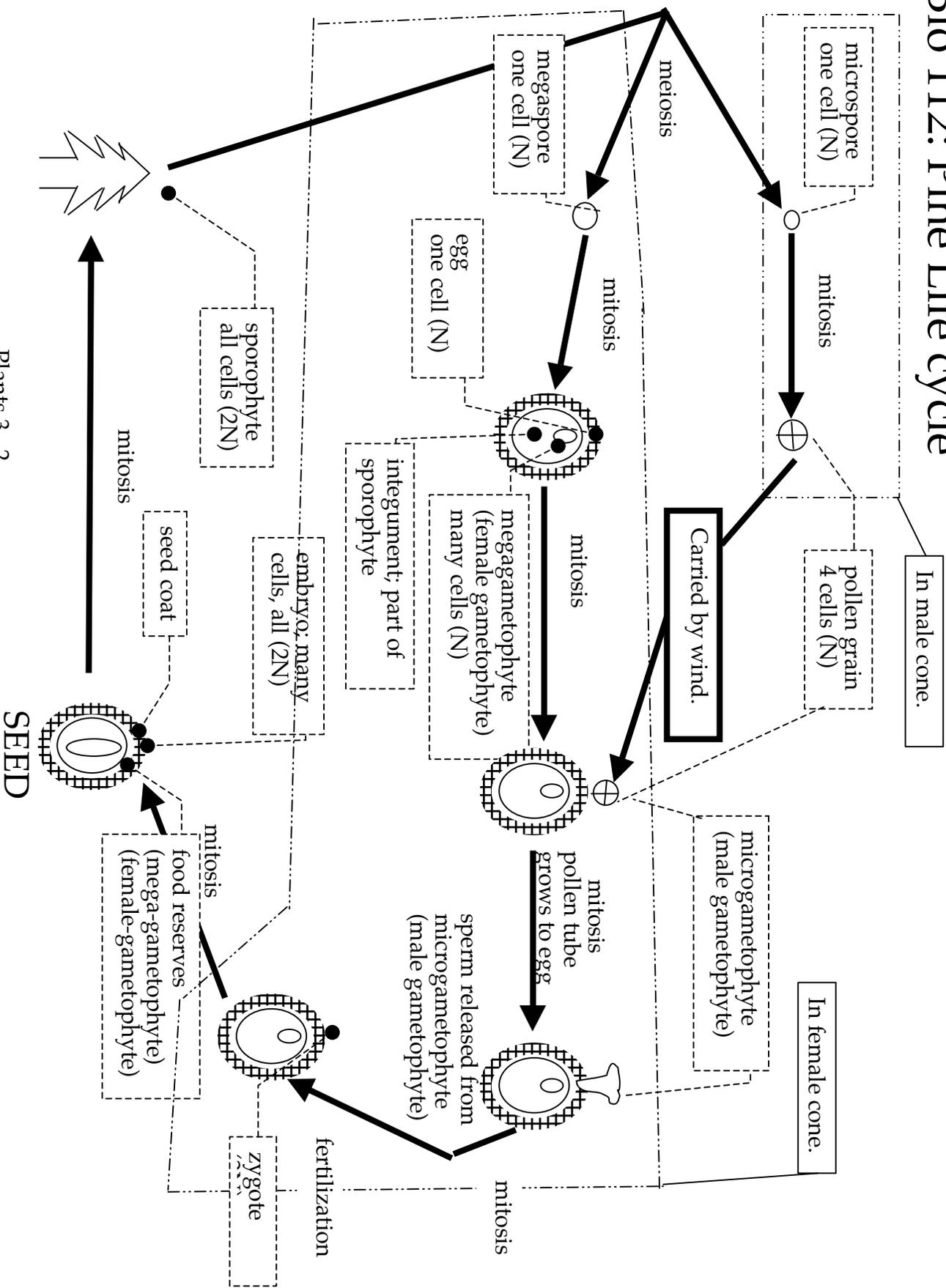
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Go to <http://intro.bio.umb.edu/111-112/112s99Lect/life-cycles.html>

Or, step-by-step:

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- (3) scroll down to the link: "Click here for various resources from lecture." and click it
- (4) Scroll down to the "Plants 2" lecture & click on the link "Animations of plant life cycles".

Bio 112: Pine Life cycle



Bio 112 Handout for Plants 4

This handout contains:

- Today's iClicker Questions
- Handout for today's lecture

iClicker Question #14A - before lecture

Which of the following is true?

- A. The part of an apple that you eat is derived from the flower of the apple tree.
- B. The skin of an apple is genetically identical to the tree that it is growing on.
- C. If you take a seed from an apple and grow it into a tree, the fruit that results from the new tree can look different from the original apple.
- D. All of the above.
- E. None of the above.

iClicker Question #14B - after lecture

Which of the following parts of a flower contain **haploid** cells?

- A. stem
- B. petals
- C. pistil
- D. pollen
- E. none of the above

Beaming in your answers

1. Figure out your answer and select the appropriate letter (A-E).
2. Turn on your iClicker by pressing the "ON/OFF" button; the blue "POWER" light should come on. If the red "LOW BATTERY" light comes on, you should replace your batteries soon.
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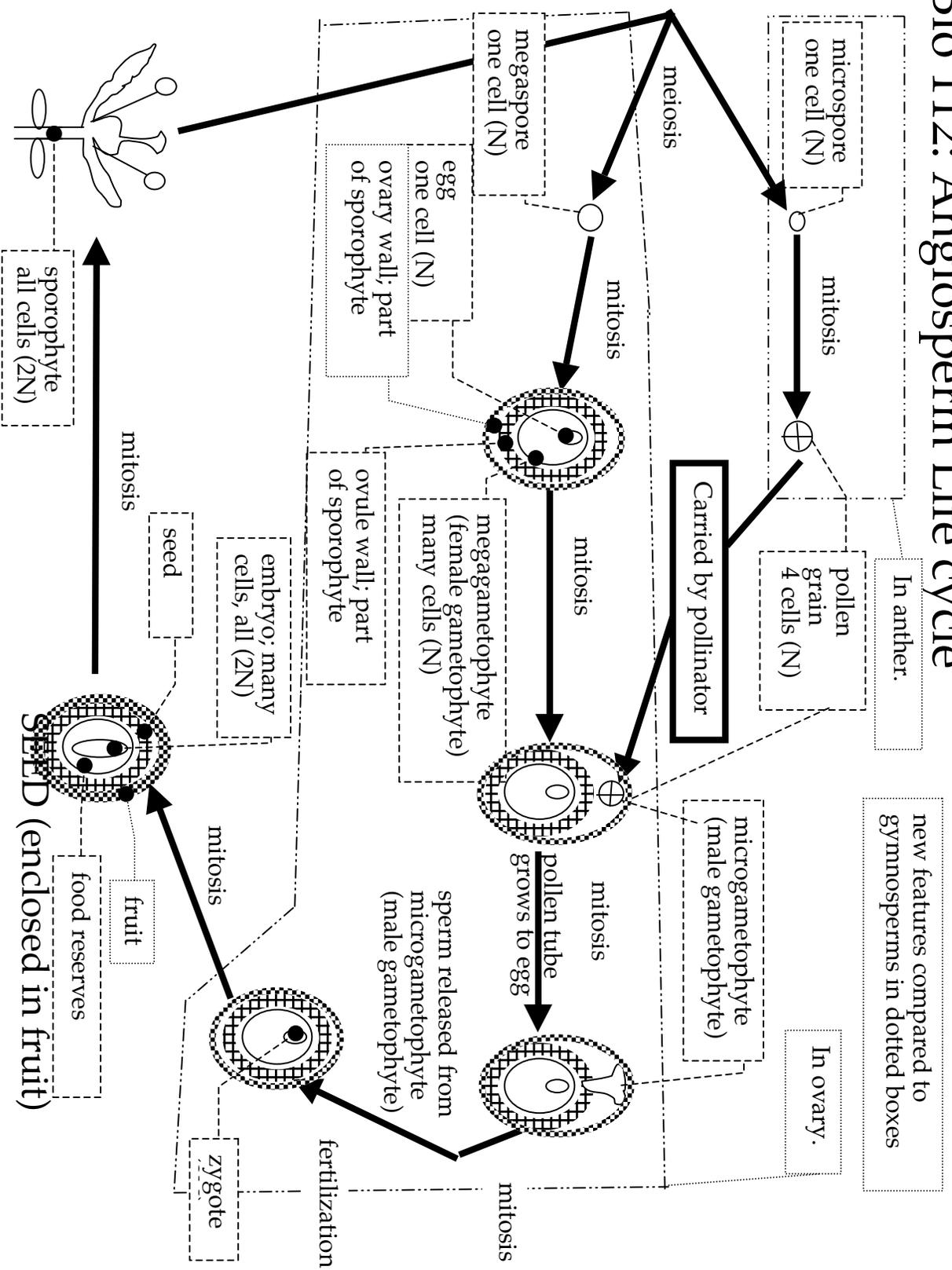
To view the animations from lecture at home:

Go to <http://intro.bio.umb.edu/111-112/112s99Lect/life-cycles.html>

Or, step-by-step:

- (1) go to <http://intro.bio.umb.edu>
- (2) click on the link: "Click here to go the General Biology (Bio 111 & 112) web site."
- (3) scroll down to the link: "Click here for various resources from lecture." and click it
- (4) Scroll down to the "Plants 2" lecture & click on the link "Animations of plant life cycles".

Bio 112: Angiosperm Life cycle



Bio 112 Handout for Plants 5

This handout contains:

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- Handouts for today's lecture

iClicker Question #15A - before lecture

Scientifically speaking, which of the following are fruits?

- A. tomato
- B. cucumber
- C. potato
- D. carrot
- E. more than one of the above

iClicker Question #15B - after lecture

Remember the peanut we looked at during the last class? What type of plant was it?

- (A) gymnosperm
- (B) monocot angiosperm
- (C) dicot angiosperm
- (D) fern
- (F) none of the above

Beaming in your answers

1. Figure out your answer and select the appropriate letter (A-E).
2. Turn on your iClicker by pressing the "ON/OFF" button; the blue "POWER" light should come on. If the red "LOW BATTERY" light comes on, you should replace your batteries soon.
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Bio 112: The US Supreme Court rules that a tomato is a vegetable.

NIX v. HEDDEN, 149 U.S. 304 (1893)

149 U.S. 304

NIX et al. v. HEDDEN, Collector.

No. 137.

May 10, 1893

At law. Action by John Nix, John W. Nix, George W. Nix, and Frank W. Nix against Edward L. Hedden, collector of the port of New York, to recover back duties paid under protest.

Judgment on verdict directed for defendant. 39 Fed. Rep. 109. Plaintiffs bring error. Affirmed.

Statement by Mr. Justice GRAY: [149 U.S. 304, 305] This was an action brought February 4, 1887, against the collector of the port of New York to recover back duties paid under protest on tomatoes imported by the plaintiff from the West Indies in the spring of 1886, which the collector assessed under 'Schedule G.-Provisions,' of the tariff act of March 3, 1883, (chapter 121,) imposing a duty on 'vegetables in their natural state, or in salt or brine, not specially enumerated or provided for in this act, ten per centum ad valorem;' and which the plaintiffs contended came within the clause in the free list of the same act, 'Fruits, green, ripe, or dried, not specially enumerated or provided for in this act.' 22 Stat. 504, 519.

At the trial the plaintiff's counsel, after reading in evidence definitions of the words 'fruit' and 'vegetables' from Webster's Dictionary, Worcester's Dictionary, and the Imperial Dictionary, called two witnesses, who had been for 30 years in the business of selling fruit and vegetables, and asked them, after hearing these definitions, to say whether these words had 'any special meaning in trade or commerce, different from those read.'

One of the witnesses answered as follows: 'Well, it does not classify all things there, but they are correct as far as they go. It does not take all kinds of fruit or vegetables; it takes a portion of them. I think the words 'fruit' and 'vegetable' have the same meaning in trade to-day that they had on March 1, 1883. I understand that the term 'fruit' is applied in trade only to such plants or parts of plants as contain the seeds. There are more vegetables than those in the enumeration given in Webster's Dictionary under the term 'vegetable,' as 'cabbage, cauliflower, turnips, potatoes, peas, beans, and the like,' probably covered by the words 'and the like.'

The other witness testified: 'I don't think the term 'fruit' or the term 'vegetables' had, in March, 1883, and prior thereto, any special meaning in trade and commerce in this country different from that which I have read here from the dictionaries.'

The plaintiff's counsel then read in evidence from the same dictionaries the definitions of the word 'tomato.' [149 U.S. 304, 306] The defendant's counsel then read in evidence from Webster's Dictionary the definitions of the words 'pea,' 'egg plant,' 'cucumber,' 'squash,' and 'pepper.'

The plaintiff then read in evidence from Webster's and Worcester's dictionaries the definitions of 'potato,' 'turnip,' 'parsnip,' 'cauliflower,' 'cabbage,' 'carrot,' and 'bean.'

No other evidence was offered by either party. The court, upon the defendant's motion, directed a verdict for him, which was returned, and judgment rendered thereon. 39 Fed. Rep. 109. The plaintiffs duly excepted to the instruction, and sued out this writ of error.

Edwin B. Smith, for plaintiffs in error.

Asst. Atty. Gen. Maury, for defendant in error.

Mr. Justice GRAY, after stating the facts in the foregoing language, delivered the opinion of the court.

The single question in this case is whether tomatoes, considered as provisions, are to be classed as 'vegetables' or as 'fruit,' within the meaning of the tariff act of 1883.

The only witnesses called at the trial testified that neither 'vegetables' nor 'fruit' had any special meaning in trade or commerce different from that given in the dictionaries, and that they had the same meaning in trade to-day that they had in March, 1883.

The passages cited from the dictionaries define the word 'fruit' as the seed of plants, or that part of plants which contains the seed, and especially the juicy, pulpy products of certain plants, covering and containing the seed. These definitions have no tendency to show that tomatoes are 'fruit,' as distinguished from 'vegetables,' in common speech, or within the meaning of the tariff act.

There being no evidence that the words 'fruit' and 'vegetables' have acquired any special meaning in trade or commerce, they must receive their ordinary meaning. Of that [149 U.S. 304, 307] meaning the court is bound to take judicial notice, as it does in regard to all words in our own tongue; and upon such a question dictionaries are admitted, not as evidence, but only as aids to the memory and understanding of the court. *Brown v. Piper*, 91 U.S. 37, 42; *Jones v. U. S.*, 137 U.S. 202, 216, 11 S. Sup. Ct. Rep. 80; *Nelson v. Cushing*, 2 Cush. 519, 532, 533; *Page v. Fawcett*, 1 Leon. 242; *Taylor v. Taylor*, 8th Ed. 16, 21.

Botanically speaking, tomatoes are the fruit of a vine, just as are cucumbers, squashes, beans, and peas. But in the common language of the people, whether sellers or consumers of provisions, all these are vegetables which are grown in kitchen gardens, and which, whether eaten cooked or raw, are, like potatoes, carrots, parsnips, turnips, beets, cauliflower, cabbage, celery, and lettuce, usually served at dinner in, with, or after the soup, fish, or meats which constitute the principal part of the repast, and not, like fruits generally, as dessert.

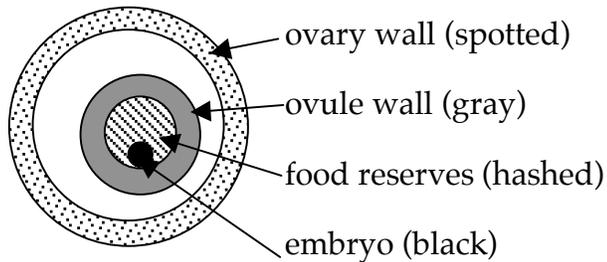
The attempt to class tomatoes as fruit is not unlike a recent attempt to class beans as seeds, of which Mr. Justice Bradley, speaking for this court, said: 'We do not see why they should be classified as seeds, any more than walnuts should be so classified. Both are seeds, in the language of botany or natural history, but not in commerce nor in common parlance. On the other hand in speaking generally of provisions, beans may well be included under the term 'vegetables.' As an article of food on our tables, whether baked or boiled, or forming the basis of soup, they are used as a vegetable, as well when ripe as when green. This is the principal use to which they are put. Beyond the common knowledge which we have on this subject, very little evidence is necessary, or can be produced.' *Robertson v. Salomon*, 130 U.S. 412, 414, 9 S. Sup. Ct. Rep. 559.

Judgment affirmed.

Fruit Development

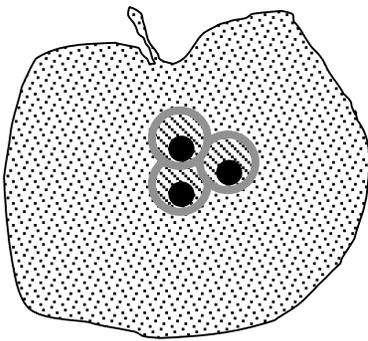
All fruits have the following components that began with structures in the flower. These have adapted in various ways in different fruit-bearing plants. This is shown below:

All begin from the ovary after fertilization and a little embryonic development has occurred:

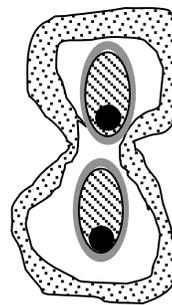


Here are some example 'fruits' (not drawn to scale):

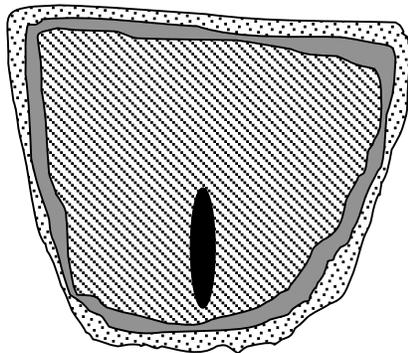
Apple



Peanut



Corn (one kernel)



Pine Nut - not a fruit (it's a gymnosperm)
(therefore no OVARY-derived structures)

