

# The Five Best Remembered Plant Facts

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Autumn school weeks were speeding away as lesson plans called for a change of topic. During October we had been considering plant life. In our chemistry laboratory where biology classes were held pending the erection of a long-awaited new building with its enticing facilities for science projects and procedures, we had looked at many specimens gathered from garden and field.

About once every week or ten days, in order to show what we had talked over and read about in the chapters on the flowering plants as described in MOON AND MANN'S and CURTIS, CALDWELL, AND SHERMAN'S texts, I carried much actual material to class. It included leaves, stems to illustrate branching, bud types, root systems, flowers and their inflorescences, attractive fruits and vegetables such as a well-supplied, garden-conscious neighborhood, including my own productions at Victory Valley Farm, would afford.

The array was distributed on the chemistry locker unit tops with just enough space provided for the students in my large sections of forty and over to stand side by side and examine them. For the first time, I found, not a few learned facts they had scarcely realized before. How little, as well as how much, certain members knew of practical gardening was revealed by incidental remarks and comments. One girl had planted green snap beans in quart berry baskets early in the spring for summer transplanting. Whether she had her reward in a crop earlier than her neighbors I did not find. Everyone

was victory gardening that year with illuminating experiences.

Textbooks figures and descriptions were compared with actualities, and records were encouraged by means of blackboard questions and outlines. The pupils enjoyed these exercises, made enquiries about the work as it went along, and showed excellent interest in spite of crowded quarters and other limitations.

At the close of the study, about November tenth, I wished to find out something concerning what the classes had remembered and what, if anything, had made the greatest impression. My proposal was intentionally planned as a surprise so that there might be no more than the usual review and preparation. The two classes, College Preparatory and General, followed each other for the sixth and seventh or final periods of the day. Little concern was shown when I assured them that this was in the nature of an exploration test not to be graded severely for marks of standing. They wrote willingly and interestedly on the topic "The Five Facts which I Remember Best about Plant Life."

There was little opportunity to see more than the flowering plants and their organs although some demonstrations with the compound microscope were arranged for observation. Text material on the spore-formers was not as plentiful as for the seed-bearers. Some time had been spent on economic values and certain plant functions had been presented with but a minimum of experimentation.

PLANT FACT TABULATION BY TOPICS AND IDEAS  
College Preparatory Division (*40 Pupils*)

I. Plant Classification, Groupings	Flowering, flowerless	19
	Algae, fungi	11
	Dependent, independent	11
	Seed and spore-bearers	11
	Chlorophyll, non-chlorophyll bearers	2
	Flowerless Plant examples	10
	Relative importance flowering and flowerless	1
	Monocotyledons, dicotyledons	1
		<hr/>
		66
II. Photosynthesis, Chlorophyll, Food-making	Raw materials, products	14
	Chlorophyll occurrence, general	9
	"    importance,    "	4
	"    as food-maker	3
	"    as green coloring matter	2
	Intake of CO <sub>2</sub> , outgo of O <sub>2</sub>	1
	Oxygen as products vital to animals	1
	Foods and materials through roots and leaves	1
		<hr/>
		35
III. Pollination, Reproduction, Seed Dispersal	Pollination, modes	9
	Reproduction, "	5
	Self and cross-pollination	3
	Dispersal, modes	3
	Color attraction	2
	Gametic union	1
	Germination	1
	Fern spore formation	1
	<hr/>	
	25	
IV. Flower Structure	Flower parts	9
	Completeness	4
	Petal number	2
	Perfect condition	1
	<hr/>	
	16	
V. Broadly General	Plants helpful to man	8
	Mushrooms, care in use, nature of	3
	Reproduction as a plant process	2
	Plants as much alive as animals	1
	<hr/>	
	14	
VI. Nutrition, Respiration, Growth, Life Duration	Fermentation change	7
	Parasitism	3
	Saprophytism	1
	Plant functions comparable to man's	1
	Growth Process	1
	CO <sub>2</sub> given off	1
	Annuals, biennials, perennials	3
	<hr/>	
	17	
VII. Structure	Root Systems	3
	Fruit Types	2
	Plant Organs and Tissues	4
	Leaf Parts	1
	<hr/>	
	10	

VIII. Bacteria	Types	3
	Uses	2
		<hr/> 5
IX. Fitness, Survival, Response	General	4
	Tropisms (Heliotropism, Geotropism)	2
		<hr/> 6
X. Unclassifiable	Grossly Incorrect	17
	Confused, not clearly stated	10
		<hr/> 27

## COMMENTS AND NOTATIONS

In illustration of Group X two pupils said that in photosynthesis starch is changed to sugar. Two pupils listed 5 and 8 brief topics, not distinguishing between the same and statements of fact. One made no enumeration but wrote in essay form. One wrote an outline using as headings, photosynthesis, calyx, corolla, seed distribution, and kinds of fruits. One listed the topics of roots, stems, photosynthesis, fermentation, and geotropism, then made statements of fact about them. Three wrote partly in topical, partly in statement form.

Much effort was made throughout the teaching period to have terms used exactly and grammatically. It is interesting to note that three used the term "bacteria" with the verb "are"; one used it with "is". Sixteen used the plurals "fungi" and "algae" with "are", four used them with "is".

## STATEMENT SUMMARY BY NUMBER

Pupils	Statements
2	8
2	7
3	6
2	4
3	3
28	5

## STATEMENT SUMMARY BY GRADING

Pupils	Grade
21	Very good
12	Good
6	Fair
1	Unacceptable

In a number of cases though the writer had listed the fact as only one, actually there were two ideas incorporated therefore a little duplication occurs and the main groupings include the extra thoughts expressed. Four simple diagrams appear in this division as illustrations of statements made.

## GENERAL COURSE STUDENTS

Tabulation and analysis of data obtained from the General Course students proved to be a harder task. The facts chosen did not lend themselves, because of generality and indefiniteness, to easy classification and organization into topical form. Thoughts were not expressed clearly and were less specific—a result not at all unexpected for marked differences had already appeared to distinguish the groups. The teaching approach had been a little different, with less emphasis placed on exact informational data. Principles and practical applications had been kept in mind. The study amply supports the wisdom of sectioning according to abilities, future needs, and capacity for performance. The textbooks used were different although essentially the same ground was covered. There could not be too great departure from a common plan, therefore the following list of groups conforms largely to the classification of part one.

## COMMENTS AND NOTATIONS

When errors were made in this group they were rather startling. One said "The green coloring in plants is the

PLANT FACT TABULATION BY TOPICS AND IDEAS  
General Course Division (*42 Pupils*)

I. Plant Classification, Grouping	Flowering, flowerless	4
	Algae, fungi	6
	Dependent, independent	3
	Seed and spore-bearers	2
	Mono-, di-, and polycotyledons	3
	Annuals, perennials	4
		<hr/> 22
II. Photosynthesis, Chlorophyll, Food-making	Chlorophyll occurrence, general	10
	Food-making function	10
	Photosynthesis in green plants	7
	CO <sub>2</sub> intake	2
	Photosynthesis involving light	1
	The plant as a "scientist"	2
	"    "    "    " factory	1
	Plant remaining green all year	1
	Color change in autumn	2
	<hr/> 36	
III. Pollination, Reproduction, Fertilization, Seed Dispersal	Self and cross-fertilization	7
	Need for reproduction	1
	Fertilization	1
	Male, female flowers	1
	Need for pollination	1
	Seed Production	2
	Need for seed distribution	1
	Mode of dispersal	2
	Mosses and spore production	1
	Life continuation	1
	<hr/> 18	
IV. Flower Structure	Flower parts listed	6
	Completeness	1
	Perfect condition	1
	<hr/> 8	
V. Broadly General	Plants, helpful, harmful	6
	Mushrooms, precaution in use	7
	All plants reproduce	1
	Plants are alive	2
	Plants edible, inedible	2
	Edible fruits	1
	Plants needed by man	1
	Cycle of decay	1
	Ferns are plants	1
	Tiniest plants seen by microscope	1
	Habitat of plants in the ocean	1
	Different structures of plants	1
	Biology—the study of living things	1
	Growth	1
	<hr/> 27	
VI. Nutrition	Sugar, starches as food	2
	Ferments	1
	<hr/> 3	
VII. Structure	Root systems	2
	Fruits, kinds, numbers	1

	Plant organs, list	3
	Leaf in general	2
	Leaf similar to a house	1
	Fern rhizome	2
	Root location	1
	Vascular bundles	2
	Annual rings	1
		<hr/>
		15
VIII. Bacteria, Fungi	Examples of fungi	4
	Small size	3
	Bacteria as plants	1
	Dependence, chlorophyll lack	4
	Large size of mushrooms	1
	Habitat	1
	Mycelium and hypha	1
	As parasites	1
		<hr/>
		16
IX. Environment	Factors needed	13
	N replacement in soil	1
		<hr/>
		14
X. Osmosis, Conduction	Moisture passage through cells	1
	Phloem conduction	5
	Soil water absorption	2
	Root uses	1
		<hr/>
		9
XI. Miscellaneous	Ferns higher than liverworts-evolution	1
	Spermatophyte defined	1
	Plants used for fuel	1
	Plants in decorations	1
	Opposite leaf arrangement	1
	Sunflower a composite type	1
		<hr/>
		6
XII. Unclassifiable	Grossly Incorrect	20
	Confused, not clearly stated	17
		<hr/>
		37

xylon"; another that "The spirogyra plants are ferns and mosses." Some examples of confused and mixed statements are:

"The environment depends upon their growth," "All plants contain the process of photosynthesis," "The raw materials of fermentation are ferments," "The ovary is one of the divisions of the stigma," "The anther is the pollen," "The stigma is a group of organs," "All green plants are algae and all fungi is absent of green color."

Study of the chlorophyll-bearers had created the impression that they were

the only plant types, as witness the following:

"All plants are independent," "All plants make their own food."

The vascular plants made an impression on one who wrote "All plants have a vascular system and a pith," and another "All plants have roots and stems." One mis-stated the difference between annuals and perennials, reversing the situation.

Five in this group wrote topically, one of these only partly so, however. There were no diagrams. Six used "fungi" and "algae" with the correct verb form,

seven used them and "bacteria" incorrectly.

## STATEMENT SUMMARY BY NUMBER

Pupils	Statements
1	10
2	7
2	6
8	4
1	3
2	2
27	5 (as required)

## STATEMENT SUMMARY BY GRADING

Pupils	Grade
7	Very Good
14	Good
16	Fair
5	Poor and Unacceptable

In conclusion may it not be said that we teach, in part, that information may be gained and a generous percentage kept? Does a pattern of retention evolve which would hold for an entire group year in and year out? The wide variety of facts which these eighty-two youth recalled concerning plants indicates that there was considerable catholicity of interest. Yet some uniformity emerges.

An association had been made by contrast. Plants either were or were not, did or didn't, had or hadn't certain likeness, abilities, features. Nor was it wholly the facts that were seen which made an impression. Processes of food-making, reproduction and nutrition stand high in the listings along with anatomical characters, if they do not actually over-shadow them. The importance to the world of plant life was stressed as it was believed a subject otherwise of lesser appeal might gain attention from that approach. Once the role of photosynthesis and chlorophyll was visualized it was not lost from consciousness. And it is very likely that

an appreciation and understanding of the place of plants in the world was, for these particular young people, somewhat enhanced.

## BOOKS

MITCHELL, PHILIP H. *A Textbook of General Physiology*. 4th ed. McGraw-Hill Book Company, New York. 927 pp. illus. 1948. \$7.50.

This rather detailed review of a well-known text will be welcomed by the many friends of the previous editions. The basic plan and the attitudes of the book remain as they were. It still builds up to and around human physiology as the central area of emphasis. The chemical foundation of physiology, both general and human, has been given an even larger place than before. The book starts with the fundamentals of life reactions and reacting systems, then treats the chemical and physical features of protoplasm and of organisms, follows with discussions of diffusion, osmosis and the changes depending largely on these, and finally, treats digestion, circulation and the other body functions. As in the previous editions reproduction has been omitted except for incidental mention here and there.

There are twenty-six chapters, which fit into each other so as to give the book unusual continuity without making actual references from one chapter to another. The illustrations and tables are carefully done and well selected. The index is comprehensive and so arranged that almost any topic or technical term is easy to find. The reference lists at the ends of the chapters are more extensive than is usual in a textbook. The paper, typography and arrangement make for ready reading. All in all, this is an excellent book for the high school or college teacher, the college student, and the unusually able or especially interested high school student. It should be available on the library shelves wherever biology is taught.

NESBIT, PAUL W. and JEWELL W. NESBIT. *Instructive Nature Games*. Published by the author, Estes Park, Colorado. 36 pp. illus. 1947. 75¢.