

# What Biological Facts Interest High School Sophomores?

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Forty-four girls and twenty-five boys from two biology classes, nearly all sophomores, submitted answers to the following question asked near the close of the work for the first half year: *What topic, subject, or fact has interested you most up to this time in your biology course?* Because of the possible bearing on choice of topic it is noted that the high school is located in a New England town of about 11,000 population, on the Connecticut River about two hundred miles from the seacoast. The surrounding area is one of small farms with some large orchards. Dairying is carried on extensively, as is poultry raising. There are several prosperous industrial plants in the community. Over five hundred pupils attend the high school, one of two serving the immediate vicinity. About a hundred pupils come from outlying districts.

The contributions received, from almost the entire class, were so varied as to be most difficult to classify. Some replied by one or two words, others wrote short paragraphs. A few added reasons for the selection or commented briefly. Five were unsigned but were capable of allocation by sex because of handwriting or other means of recognition. Signing was not compulsory. A few did not hand in a choice and a few were absent. The pupils were asked to leave their contribution in the basket provided for receiving papers; no attempt was made to check upon them to see who did or who did not do so.

It was carefully explained that an honest opinion was desired, that it was

not an exercise which would be graded for averaging with other marks. Time was allowed for considering the matter briefly and sample topics were merely mentioned as illustrative of what was wanted. The instructor was curious to see what particular points, if any, had made general appeal; to see if there was correlation between class discussion emphasis and impression; to find out whether some common prejudices had been overcome; to link topics chosen with individual pupils provided names were signed, and it was expected that nearly all would be; to discover what might be results that could be useful in guiding future treatment of the subject matter. It was expected that a similar procedure would be followed at the close of the year. This was not possible because of the resignation of the instructor to carry on the training of cadet nurses elsewhere.

For the first half year in question thirty-one chapters (499 text pages) were covered in reading assignments, scientific term studies, question problems, laboratory exercises and class discussions. There were some project assignments, and outside readings in supplementary booklets, other texts, magazines, etc. Illustrative material was introduced into class periods and "free reading" in class on special topics was a practice employed from time to time. The broad unit subjects were four:

*The Fundamental Likenesses of All Living Things*

*How Plants Solve the Problems of Life*

*How Invertebrates Solve the Problems of Life*

*Vertebrates Have Life Problems Similar to Those of Lower Animals*

In the last unit birds and mammals had not been treated. Since the dinosaurs offered an excellent opportunity for introducing the study of fossils this topic was taken up in connection with the reptilia. Problems involving man, evolution, heredity, conservation, the history of biology and the future of the field were yet to be considered.

Rough groupings and tabulations can be made although the diversification of answers complicates classification of the facts obtained. Some statements were double in nature, part very comprehensive, others much less so. The results are shown in the accompanying table.

GENERALITY OF ANSWER	BOYS	GIRLS
Facts Broadly Inclusive .....	15	31
Factually Limited .....	10	15
BY KINGDOM		
Animals .....	17	28
Plants .....	3	9
Either .....	5	5
Neither (Chemistry) .....	.....	2
BY BIOLOGICAL SUBDIVISION		
Definitely Morphological .....	3	5
“ Physiological .....	3	13
“ Embryological or Developmental .....	4	2
“ Paleontological (Fossils) .....	2	6
“ Evolutionary .....	1	4
“ Ecological .....	1	1
By Taxonomic Groups .....	8	13
CHRONOLOGICAL		
First Half of Term .....	7	14
Second Half of Term .....	18	30
PARTICULAR ANSWERS OF INTEREST		

**Boys:**

“The development of the ages.”

The relationship of all animals in the way they are formed and in their way of life.

“That a true bug is only one order under the heading of Insecta, and that many insects that I thought were bugs are not.”

“The structure of different animals and how one animal will have its different body organs in a different position than another animal.”

“Where and when fish spawn.”

“Ontogeny recapitulates phylogeny.”

About the age of trees in California and how their age may be told.

“That roots of plants turn toward the moisture in the soil and the leaves turn toward the heat and light of the sun.”

That Mother nature has provided for every one of her children a means of reproduction and living. Also the usefulness of everything to something else, somehow or some way. The ways by which nature accomplishes these things are most interesting such as, pollination, the distribution of seeds for reproduction, etc.

**Girls:**

The chemical experiments with O<sub>2</sub> and CO<sub>2</sub> and the test for starch.

The many ways the amphibia resemble both aquatic and land animals through gills, lungs, webbed feet, limbs, scales (fossil and extinct forms).

“That the tongue of the snake is used for hearing, rather than taste.”

Finding out how really harmless snakes are in comparison to former beliefs.

That so few people in the whole United States die of snakebite.

“I always thought a snake’s skin was wet and slimy but by studying Biology I found out that it is dry.”

“Everything was interesting except the study of cells.”

“The queer (but true) characteristics of Reptiles and certain types of fishes such as the eel.”

“That snakes can eat other animals which are much larger in diameter than their own bodies.”

The chemistry experiments because “I was amazed at the amount of change one solution could make when another solution was added to it.”

“The things we learn about animals and their functions and about ourselves and how we work. Chemistry and that stuff about cells was awful.”

"The study of the frog because its organs are so much like man's."

"That *Euglena* can live both like animal and plant."

"The different ways in which a green leaf is like a factory."

"The orders of insects and all information about them and their relatives."

"That all plants and animals have the three great functions of nutrition, sensitivity, reproduction." (This reply came in several times.)

"The functions and developments of the internal organs of the clam, fish, frog, earth-worm." (Not signed.)

"Reptiles—I thought snakes were the only reptiles, and never dreamed that turtles and crocodiles were included in that class."

Most of the statements of part V have been quoted so as not to spoil the original flavor. A few were condensed and changed for the sake of clarity and brevity. A surprisingly large number of replies were given in good grammatical form. Improvement was shown in the use of technical terms, in phrasing and spelling as compared with papers collected in the early work of the course. It is possible and highly desirable to combine practice in writing sentences and paragraphs with the assimilation of scientific facts and ideas.

There are probably too few cases concerned in this study to arrive at more than tentative conclusions. Some correlation between interest and prospective future occupation was shown. A boy interested in agriculture and forestry selected a fact about the California sequoias and ring growth as a factor in determining the age of trees. When the frog was studied it was pointed out that it is often used as a type example reminiscent of the organ-systems of man, an observation which reached a receptive consciousness evidently. Knowledge of the individual and his characteristics as they had been discovered, or seemed to

have been, was either confirmed, or in some cases contradicted, in a revealing way. A girl who had seemed to be most prosaic and unimaginative remembered the comparison between the chlorophyll-bearing leaf and a factory and was evidently impressed by the imagery involved in likening the plastids to workers, etc.

The most brilliant-minded person in the two classes chose the animal- and plant-like nature of *Euglena* as most appealing. A girl who had been thought to be rather conservative in her thinking seemed converted to the pageant of dinosaur life and rock-strata records. Another, planning for missionary work, with pronounced religious views of so-called reactionary type, handed in "pre-historic animals." A girl of non-intellectual and decidedly athletic interests wrote "flowering and non-flowering plants." Two positively did not like the early work on cells, a point not easy to reconcile with the attempt made to bring out their great variety and beauty of form and function. Perhaps the drill accompanying the exercises of the first few weeks had greater influence in causing dislike than attempts to make those particular topics come alive. Or were they so foreign to the experience of the pupils that they were objectionable?

Definite stress was laid upon metamorphosis in frog and insect, upon the transition of animals from water to land with accompanying adaptations and specializations, and the prejudices commonly held against the reptilia. Replies showed that the time spent here was not wasted. Seventeen girls mentioned reptiles in one way or another, as compared to three boys. Just how was the natural repulsion which is felt toward snakes and their kind overcome? It is hard to say. Perhaps the impassioned plea the instructor made and the picture he painted

of a few ignorant neighbors he had seen in town killing some snakes sunning themselves on the rocks near his home had its desired effect.

Fairly early in the course when the relation of chemistry to life was being considered a number of simple demonstrations were performed in class in illustration of points made. It would almost be expected that a number of boys would have had their imagination or interest kindled by these but such seemed not to have been the case. Four girls touch upon chemistry. To one it was very distasteful, to three highly absorbing. Not a single boy in either class mentioned the subject.

A lad mentioned "marine life" indicating that the picture painted of the rich fauna and flora of the sea had not been in vain, even for one as far inland, to whom it was almost unknown. It may be concluded, perhaps, that the girls were somewhat more specific and detailed than the boys. The better pupils showed greater tendency to write more completely rather than to give a group name such as "invertebrates" or "plants" as their answer. Girls showed great interest in animals but more interest cor-

respondingly than the boys, in plant life. The striking diagnostic characters of the various phyla and large groups were brought out in a progressive and comparative way so that there might be some definite association and means of distinguishing one from the other. If the preponderance of single class or phyla designations is considered the equivalent of these characteristics then morphology is the biological field which possessed greatest interest. The assumption may not be at all warranted, however, because specific anatomical mention is not made in a large number of cases. It is clear, though, that there is a place for the teaching of paleontology in proper manner in present-day secondary school biology. Vertebrates seem more popular with both groups. Great fundamental living processes are generously favored. A very wide range of interest is shown by what might be called a representative, if small, group of youth averaging about fifteen years in a little town not so different from hundreds of others in the eastern states. The wealth of material covered in the first half year of study offered ample opportunity for choice and the pupils availed themselves of it.

## "What a Wonderful Bird the Frog Are!"

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Even to the most squeamish of high school students, there is adventure in each new zoological specimen—the amoeba with its false feet, the starfish with its acrobatic stomach, the shiny cricket with ears upon its elbows, the monsters of detective story fame—the bat and octopus—and all the rest. None, however, arouses their interest as does the common leopard frog, *Rana pipiens pipiens*.

The lowest I.Q. can invariably spout its scientific name without the incentive of an approaching test. Students dissect and draw external views, internal views—spots, webs, spleen, bile duct, fat bodies, . . . Every portion of the ranical anatomy has an enchantment all its own. The tenth "Mine's full of eggs!" causes as much excitement as the first. But the moment of greatest anticipation comes when the stomach is to give up its