THE EDUCATIONAL VALUE IN THE STUDY OF ANIMAL LIFE.

BY ALONZO P. FROTH,

Spokane High School, Washington.

An attempt is made in this article to state in a clear manner what there is in the subject-matter of zoölogy and what mental tendencies the child has that render this work capable of furnishing a certain fundamental discipline that can be obtained only with greater difficulty in other subjects.

In this discussion of the educational value of the study of animal life, I do not wish to show overstatement, nor do I claim for it an occult or exclusive value. I simply wish to state what I am trying to accomplish in teaching the work at the present time. My experience as a science teacher is limited, but not fruitless of results and of convictions. It is necessary to show how the best discipline may be obtained and, in so doing, state briefly yet as clearly as possible the method of teaching.

The pedagogical content of this work may be analyzed into the following eight purposes, or values, which should be held in mind and made to determine the method of presentation, so long as the work is to be taught for an educational value:

First: The work should be so presented that a habit of gathering original information will be formed. This is to be done by placing the pupil in touch with the source from which this "first hand" information is to be obtained. Here we see the mental process of observing predominate. Whenever and wherever this purpose is accomplished, the laboratory method is being used. That with which the teacher works at this stage is the inborn inquisitive disposition of the pupil. This disposition is not so strong when the pupil enters the high school as it was at any earlier age during his school life. Anyone knows that at the earlier age he is on the highroad in acquiring information of the things immediately about him. No subject is too profound for him to ask questions concerning. He can and does establish more connections with the external world in an hour, and understands them in his own way, than the adult either does or can in a much longer time. Both his mind and body are surcharged with a motive power that is asserting itself in many sorts of expressions. This energy expresses itself very differently in different children and to this difference must be given as much time and attention as possible if we, as we should, are

placing a premium on originality and individuality. Does not the teacher do much for the pupil and show his professional value when this inquisitive disposition has been retained by the child until he has reached us in the high school?

It sometimes seems that alertness of mind is lost almost in the inverse ratio to his school life. Certainly there is no more wholesome conception of the teaching process than to regard it as preserving this mental alertness, and it is in the preserving of this that *nature work* has its educational value. This alertness is inherent in the child's birthright and why should it be made less by being smoothed into a conventional type?

Second: A second value of this work is an unequalled opportunity to form a habit of close observation, and thereby obtain clear, distinct and accurate ideas, the only ideas worthy any effort. Such ideas can never be obtained by reading a book. From it one gets an idea of the writer's idea of the thing considered. As Mr. Huxley so happily expressed it when he compared the process of acquiring knowledge to vaccination, the virus used is purposely weakened by first passing it through the tissues of several successive animals until finally it is diluted enough to be robbed of its original violence. If passed through too many tissues it becomes so weakened as to lose all its preventative effects; so knowledge that does not come close from the original source becomes more and more uninteresting, meaningless and formal until it soon loses its vital power to keep the mind healthy and strong amid the many intellectual epidemics of the day.

Third: An excellent opportunity is offered in this work to make stronger and logical the natural tendency of concrete analysis. To anyone who has studied psychology the law is familiar that the mind, whether untrained or trained, perceives an object first, as a vague whole, then at once begins a concrete analysis. An example in which the mind may be directed and strengthened is in the study, say for the first time, of any type as the crayfish, in noting its position, size, shape, color, body segments, appendages and the number of each, and other points of detail analysis both external and internal.

Fourth: An excellent opportunity to make stronger the capacity for abstract thinking. When the boy has studied the anatomy of the grasshopper or butterfly, after having analyzed the whole into its related parts and thinking the part as separated from the whole, he is thinking in the abstract, a training

making more easy the thinking of abstract ideas in his mathematics later on.

Fifth: A fifth value is an excellent opportunity to make accurate and strong his power of discrimination. An ability to clearly and quickly discriminate so as to be able to express wherein a difference lies is rare and seldom possessed. This is a constant and trying feature of this work. The benefit derived is more than simply an ability to recognize a difference between a spotted cow and a butterfly in a field of clover. The nature and method of obtaining results in this particular phase of the work may be seen at a glance by referring to the table of differences.

Sixth: An excellent opportunity is offered to make strong an ability to see resemblances. So closely is this value related to the fifth that they might, with reason, be considered together; yet experience teaches me that pupils naturally recognize differences quite a great deal more readily than they do resemblances and for this reason they should be regarded as separately important. In fact it might be a fine point for psychology to settle and tell us whether we learn anything except by observing resemblances.

Seventh: The method of study used in this work involves a phase of training in which many particulars are incorporated into a general and comprehensive term; a training in the formation of general ideas. This is made obvious by referring to table two.

Eighth: The mind is working along the line in which is involved the method of forming logical conclusions and expressing them each in a clear, accurate definition. The importance of insisting upon accuracy in this particular phase of thinking may be noted on many occasions during the progress of a recitation. A large majority of pupils when asked any question which calls for an answer in the form of a definition, the following as an example, "What is an Isotherm?" will give this, "An Isotherm is *when* places having the same temperature are connected with a line." This defective definition is a type which reveals incorrect and illogical habits of thought. This work offers an unequalled opportunity to teach the pupil that a good definition has the following characteristics:

- (1) The definition must name the idea defined.
- (2) It must classify it by placing it into the smallest known class.

(3) It must state the essential characteristics which set it off from the other individuals of its own class.

It is readily seen how this work is adapted to this kind of training if you will refer to the table of information which the pupil should have worked out for himself before he can reach a logical conclusion and express it in the form of a definition. An example: An insect is an air-breathing arthropod having seventeen body segments which are divided into three body divisions, has a chitinous exoskeleton, one pair of antennae, two compound eyes, breathes by spiracles, three pair of legs, two of wings and moves by flying.

To sum up then the various values that may be made educational in teaching this work:—

(1) To leave the pupil with a trained ability to gather in for himself "first-hand" information.

(2) To inculcate the habit of obtaining clear, accurate ideas.

(3) To train him to think in the abstract.

(4) Concrete analysis, discrimination, comparison, generalization and recognizing logical identity.

Perhaps the instructor of english, of history or latin will be critical of the comprehensive value claimed for this work, but this in no way affects what may be accomplished. Certainly the many phases of training indicated should not be made exhaustive. The pupil, perhaps, should be kept unconscious of the fundamental purpose, or educational value, or end which the instructor should have in mind. It is his opportunity to so direct the work, to guide the pupil's interest, to control his energy, that he will go forth with a more extended knowledge of his own fitness and possibilities.

That it is the mental discipline involved and imparted and not the knowledge of grasshoppers and crayfishes, of beetles and bees which entitles this subject to so great an educational value, will be acknowledged by all. It is the training imparted and not the information acquired, just as the benefit derived from the study of a problem in geometry is not to be found in the information conveyed in the answer that he labors so diligently to obtain, and the value of the study of Latin comes not so much from the knowledge of the historical facts that the pupil learns while reading the language, so the value of the study of this work is not found in the knowledge of frogs and fishes, of birds and beetles, but in the systematically acquired mental ability obtained while gaining this knowledge, and unless this view of the

subject is kept in mind the true value and mission is being wrongly conceived.

To leave the discussion here is to fail to look far enough into the merits of the work to see wherein the benefits derived are carried into active life, enabling the pupil to more accurately and successfully adapt himself to the conditions and requirements in any field of life. When a pupil is required to talk and act upon what he sees to be true and to accept only what he finds to be true, we can see how this element of sureness alone strengthens the will. When he is allowed to spend his energy in the learning process without being required to keep constantly in mind the principle of cause and effect, there is great danger of his losing his orientation as to the forces, influencing his judgments and actions. Fancies and realities become confused, half the truth he will offer for the whole truth; this he reveals in his ambiguous expressions. This lack of clearness and accuracy vitiates his appreciation of the truth. Most strength results when reasons for one's actions are drawn from his own experience, and not from the fact that Washington or Lincoln or some other half mythical person would have done so and so under like conditions.

This method of training will build up a sense of thoughtfulness that the untruthful story of the cherry tree is powerless to effect. The boy is learning and acting from experience and is progressing in the very same way in which all his knowledge later on in life will have to be acquired. He learns what it means to stand alone and does not weaken as soon as he gets out of the schoolroom. He does not lose heart when the problems then present themselves, which no teacher can then illustrate for him with pencil and paper and names attached. He knows what it means and what it costs to get "first hand" the details which are so necessary and so is not so likely to become discouraged when unable to master so many new points in the old original way as he used to be obliged to when the lesson for each succeeding day was "six pages in advance." He learns how much care is needed, the close observation, what repeated verification and logical thinking are required to be unmistakably sure of the simplest fact and as a result he certainly is made less disposed to accept at face value the many pleasant exaggerations of the soulless salesman, the spell-binding politician or the confident real estate man.

One phase of the result of this work is exceedingly difficult to estimate. Formal examination cannot reach it as results may be reached in some other subjects. Throughout the work there is a slow and unconscious preparation made use of later in life in understanding the eternal fitness of things, in understanding nature in a larger way. An interest results leading to a desire to read with something more than mere entertainment such books as Kipling's "Jungle Books," Seton Thompson's "Wild Animals I Have Known," "Lives of the Hunted" and others of similar nature.

Finally no subject offers more opportunity to work with untouched originality and individuality than does this, and when pursued as indicated the tendency will be to send forth boys and girls in whose birthright is retained and strengthened these two genius making qualities; boys who are different from the conventional schoolboy type; boys who will not be mechanical duplicates of one another and who will not be so likely to be possessed with the weakening tendency to imitate but will seek chiefly to further unfold the possibilities of their own nature and follow fearlessly the calling of their own choice, reaching a more genuine enjoyment, a fuller achievement and a more ideal manhood.

Table of Differences

	ARTHROPODS		
	Insecta	Arachnida	Crustacea
Breathing.....	spiracles	spiracles	gills
Body segments.....	seventeen	eighteen	twenty
Body divisions.....	three	two	two
Exoskeleton.....	chitinous	hair	chitinous
Antennae.....	two	none	two
Eyes.....	sim.-comp.	simple	compound
Number of legs.....	six	eight	ten
Wings.....	two?	none	none
Locomotion.....	flying	walking	walking
Habitat.....	air	air	water

Table of Likenesses

ARTHROPODS

Insects	{	Jointed appendages
Arachnida		White blood
Crustaceans		Reproduce by eggs
		Jaws move sidewise
		Compound eyes