

Science.

STUDY OF A BROOK.

The following notes attempt to present a lesson, or several lessons, on a brook. They are intended to serve as a basis for the reading and appreciation of Tennyson's charming song, "The Brook." Nature study, of course, precedes. After the main facts expressed by the poet are obtained by the pupil from observation, the poem may then be read by the teacher and pupils, the former now pointing out how exactly suitable the author's language is in the delineation of nature. The subject, as thus presented, resolves itself into two parts: (a) The actual study of a creek or brook, and (b) the reading of the poem and the literary expression of the observations.

In any rural section, and most urban ones, there may be found one or more streams which will probably present most of the features of the one outlined in the poem. At the outset the teacher may, by careful questioning, find out just what information the pupils possess. From this he may know what questions to give, to be answered from the pupils' further observations. It is not to be expected that pupils will give the results of their observations in the words of the poem, and no teacher should insist on this. Let the boy or girl present his or her facts in language familiar to themselves.

Selecting any local stream, the teacher may put such questions as the following, without indicating whether the answers received are correct or not. Get first the children's ideas. Ask several pupils their answers to the questions: In what direction does the water of _____ creek flow?

The answers to this question will probably vary, some saying south, others south-east, etc.

Why does the water flow in all these directions?

This question will probably bring the information that obstructions cause the water to turn.

Where does the water flow the fastest? Where slowest?

Answers, from previous knowledge, to these questions may be expected?

Where does the creek water come from?

What do you call the starting point of a creek?

What are usually the sources of creeks?

In all these questions get the pupils' ideas. Do not indicate in any way, at least in any preliminary lessons, whether the answers are right or wrong. If the answers are wrong, the pupils must get the right ones, not from the teacher, else *nature* study is meaningless, but from the object studied. Many answers will conflict as to the facts. If the teacher takes either side he determines for the pupil. Those who are wrong will be put right in the wrong way, and those who are right will lose the triumph of their better observation. Emulation will be destroyed.

After the teacher has obtained all information which the pupils possess, or when he thinks, from their answers, observation work may be profitably undertaken, he may give such problems as the following. If a particular brook is studied (and this is best) the pupils should be expected to say just where on the brook each phenomenon is found. This insures that the pupil has done the work himself and not relied upon others' observations. If this list is too long for one lesson it may be subdivided:

Where does the water chatter? Where bicker?

Where does it babble? Where bubble?

Where and how are eddies produced?

What effect has the water on the bank against which it flows?

What becomes of the water in the brook?

Where does the water sparkle? Where hurry?

If these should prove sufficient facts for the pupils to find out at one time—and the teacher must judge from his knowledge of his pupils and locality—it may be well, after getting the pupils' answers, to tell them he will read to them what Mr. Tennyson found out in answer to these questions. Before doing this, however, the teacher must be again the judge as to whether the pupils' answers are sufficiently clear and accurate to imply correct observation. If so, he may read. Words are italicized merely to indicate the points of contact of the poem with the problems submitted to the pupils:

THE BROOK.

I come from the haunts of coot and hern ;
I make a sudden sally,
And *sparkle* out among the fern,
To *bicker* down a valley.

By thirty hills *I hurry* down,
Or slip between the ridges ;
By twenty thorpes, a little town,
And half a hundred bridges.

Till last by Phillips' farm *I flow*,
To join the brimming river ;
For men may come and men may go,
But *I go on* for ever.

I chatter over stony ways,
In little sharps and trebles ;
I bubble into *eddy*ing bays,
I babble on the pebbles.

With many a curve my banks *I fret*,
By many a field and fallow,
And many a fairy foreland set
With willow-weed and mallow.

Another series of questions may follow this lesson, such as:

What is the prettiest thing you observed on the water? in the water?

Where is the water foamy? Where silvery?

Where does the water *steal* along? Where slide?

Where does the water gloom? Why?

Where does the water linger? Where murmur?

When can the murmur be most distinctly heard?

When correct answers have been obtained to these questions the teacher may read the remainder of the poem; better, of course, if the pupils have the opportunity of reading it for themselves.

I wind about, and in and out,
With here a *blossom* sailing,
And here and there a *lusty trout*,
And here and there a grayling.
And here and there a *foamy flake*
Upon me as *I travel*,
With many a *silvery water break*,
Above the golden gravel.

I steal by lawns and grassy plots ;
I slide by hazel covers ;
I move the sweet forget-me-nots
That grow for happy lovers.

I slip, *I slide*, *I gloom*, *I glance*,
Among my skimming swallows ;
I make the netted sunbeam dance
Against my sandy shallows.

I murmur under moon and stars
In brambly wildernesses ;
I linger by my shingly bars ;
I loiter round my cresses ;

And out again *I curve* and flow
To join the brimming river ;
For men may come and men may go,
But *I go on* forever.

The writer can remember when, as a boy, this beautiful and accurate nature-poem made no further impression upon him than a pleasing sensation, due solely to its rhythm. Its meaning and appropriateness were as foreign to him as a dress-coat to a Hottentot. No attempt was made by the teacher to show any of the appropriateness of diction or accuracy of fact. Surely boys and girls may be made to see that this poem is the product of a master observer, and to hear again in the music of its language the multitudinous notes of the stream along which they have played.

It is in the belief that this previous study of nature often opens the way to the interpretation of literature, that these notes, imperfect as they are, are offered.

CORRESPONDENCE.

J. M. P., Abingdon,—(1) Red phosphorus (small quantity) is put up into an evaporating dish, nitric acid is poured on and the mixture is now gently heated for some time, until red fumes cease to come off. Express the reaction of the equation. (2) Thirty centigrams of iron filings, two of caustic potash, and two of nitre are placed in a test-tube and heated. Express reaction by equation.

ANS.—(1) $P + 34NO_3 = H_3PO_4 + N_2O_3 + NO_2$.
(2) $10Fe + 10KOH + 2KNO_3 = 10FeO + 6K_2O + 2NH_3 + 2H_2$.

TEACHER, Artemesia.—What does the second expression "per sec." mean in the phrase "An acceleration of 2 feet per sec. per sec.?"

ANS.—If a train at the instant of observation has a velocity of 8 feet per sec., and one second afterwards its velocity is 10 feet per sec. its change of velocity is 2 feet per sec. It might have taken 5 minutes to make this change instead of one second. In the former case the acceleration would have been described as 2 feet per sec. per 5 minutes. The second time-phrase denotes the time during which the given change in velocity was being made.

ENQUIRER, Simcoe.—Which way was the water-fowl, mentioned in Bryant's poem, going?

ANS.—For the appreciation of the poem it is immaterial to know. The bird was evidently on either its north or south migration. I am inclined to think the bird was going northward. In the early summer and spring the sun sets far to the northwest, and the sky is frequently rosy at that time in the evening.

F.W.P., Minnedosa.—Will you please solve the first question on the last Senior Leaving paper in Physics?

ANS.—I have not the paper mentioned at hand. Solution will appear in next Science number.

There is a pleasure in the pathless woods,
There is a rapture on the lonely shore ;
There is society where none intrudes
By the deep sea and music in its roar.
I love not man the less but Nature more,
From these our interviews, in which I steal
From all I may be, or have been before,
To mingle with the universe, and feel
What I can ne'er express, yet cannot all conceal.
—Lord Byron.