

cultivated. And if a habit of observation be not inborn and active in us, will the discipline of literary culture engender it—will dogmatic teaching quicken it into life? No; rather will they foster in us a tendency to substitute reasoning for experiment in the study of nature, to reason from postulates based on ill-observed facts, to generalize from altogether insufficient data. This habit of mind was the very stumbling-block in the way of the ancient Greeks—this was the great obstacle to their progress in science. On every page which preserves the teachings of their philosophers we find physical phenomena taken as starting points, or used as illustrations of profound metaphysical doctrines; but a single misinterpretation of fact made a foundation for deduction, a simple sophistry applied to an observation often led to results which appear to us in the light of modern science most absurd, most monstrous, but which, because no one thought of submitting these results of reasoning to the test of experiment, were then accepted unhesitatingly, and as time passed on were held more and more firmly, until at length it required the genius of a Galileo to suspect that error lurked in them. And how much of error lies in all untrained observation has been well demonstrated by the experiments of Dr. Emile Yung, who found that in more than ninety per cent. of the persons he experimented on, expectation of any proposed sense-impression led to belief in its perception, and it is especially noteworthy that the subjects of his experiments whom he found to be accurate observers were, without exception, men trained in experimental science.

But even if facts are observed correctly, little progress will be made if the mind rests there. We must observe the phenomena under varied circumstances in order to be able to discover their relative importance, and the laws of that relation. The phenomenon which most forcibly strikes the notice of the untrained observer may not be that which is of chief importance, which the experienced student of Science would at once recognize as fundamental; and the ability to discriminate with accuracy and rapidity between the essential and the accidental is to be gained only by systematic and properly directed training. The scientific text-book is good in its place, but that place is at first only a secondary one. It is true that every science tends by a seemingly universal law to become more and more abstract; and, in proportion as it becomes exact, to become mathematical. But it is just as true that all the natural sciences began by observation or experiment, and whatever they may now have developed into, it is necessary in teaching them to go back to their beginnings, and to find a sure foundation for abstract notions in experience and observation. Empedocles was right when he declared that

"Wisdom increases to men according to what they experience."

And again was he right in a certain sense, though not in the sense in which he meant it, when he said—

"Surely by earth we perceive earth, and man knoweth water by water,

By air sees air the divine, by fire sees fire the destructive;
Yea, love comprehends love, and 'tis through strife dismal we know strife."

If the object of education is to help people to help themselves, to teach them how to learn, then we must not merely supply our pupils with the materials for thought, but we must show them how best to use these materials when collected, and how to penetrate from outward phenomena to the universal underlying laws. Let us do this—let us base our teaching on a groundwork of real knowledge, and the after progress of our pupils will rise upon a sure and a stable foundation. Then will science be accorded its rightful place, and scientific discoveries, fraught as they are with innumerable benefits to all God's creatures, will raise higher and higher the scale of civilization, and will hasten the coming of that golden age which poets dream of, as in the dim far distant past, but which assuredly lies in the certain future.

I believe the day is fast approaching when every teacher will recognize the need of a real and living knowledge of the world in which we live, and the laws of it by which we live, and will feel that to impart such a knowledge to his pupils is a sacred duty he owes to himself, to them, and to God. To God, for is it not a duty to Him who has placed us on this beautiful earth, and has given us powers to see, to understand, and to enjoy that earth—it is not a duty of reverence to use those powers to learn aright the lessons He has put before us?

But in all this scientific training of the intellect is there no place for the culture of the feelings and the imagination? is there no room for morality and religion? methinks I hear some one ask.

There is room in abundance, there is ample scope for all these. Science is but a true and full knowledge of nature, and nature is all-embracing. We count a man truly educated in proportion to the dignity of his thoughts, the loftiness of his principles, the nobleness of his actions; and to cultivate such dignity, loftiness and nobility there are no other means equal to a study of nature, for it is no petty, quibbling knowledge that science offers us. To the student of receptive and imaginative mind I would say—Go learn of Dame Nature, and she will show you things more wonderful than the wildest fancies ever dreamed, nobler than the loftiest thoughts ever sung by poet of Hellas.

"To the solid ground

Of Nature trusts the mind which builds for aye."

To the student of morals I would say:

"One impulse from a vernal wood
May teach you more of man,
Of moral evil and of good,
Than all the sages can."

Too often the eye of the moralist can see but evil, but misery and pain; to him all is vanity, there is naught but a terrible struggle for existence. Not so.

"For pleasure is spread through the earth
In stray gifts, to be claimed by whoever shall find.
Thus a rich loving-kindness, redundantly kind,
Moves all nature to gladness and mirth.

The showers of the spring

Rouse the birds and they sing;

If the wind do but stir for his proper delight.

Each leaf, that and this, his neighbor will kiss;

Each wave, one and t'other, speeds after his brother,

They are happy, for that is their right."

It has been well said by a great master:—"The habit of seeing; the habit of knowing what we see; the habit of discerning differences and likenesses; the habit of classifying accordingly; the habit of searching for hypotheses which shall correct and explain those classified facts; the habit of verifying these hypotheses by applying them to fresh facts; the habit of throwing them away bravely if they will not fit; the habit of general patience, diligence, accuracy, reverence for facts for their own sake, and love of truth for its own sake; in one word, the habit of reverent and implicit obedience to the laws of nature, whatever they may be—these are not merely intellectual but also moral habits, which will stand men in practical good stead in every affair of life, and in every question, even the most awful, which may come before us as rational and social beings."

To him who seeks to purify and ennoble his religious thoughts and feelings, I would say—turn 'o nature, and learn something of the true majesty, might, and glory of Him who reveals himself in His universe, as well in its minuteness as in its unthinkable vastness.

To all men Nature freely gives the invitation she gave to Agassiz, when

"Come wander with me," she said
"Into regions yet untrod,
And read what is still unread
In the manuscript of God."

And he wandered away and away
With Nature, the dear old nurse,
Who sang to him, night and day,
The rhymes of the universe.

And whenever the way seemed long,
Or his heart began to fail,
She would sing a more wonderful song,
Or tell a more marvellous tale."

And truly wonderful are some of those tales. When you look up at the stars to-night, bethink yourselves what and where they are. The light which is just arriving from them, how long ago did it leave them, and what does it now tell? This great earth so solid beneath our feet, seems to us vast indeed, and a heart-throb lasts not a long time, yet light travels so fast that it could six times girdle this mighty orb while your heart beats but once. The sun, apparently so small, is in truth so large, that were our earth stopped in its annual course and hurled against it the blow would cause not much more disturbance on the farther side than an earthquake