LESSONS ON SHELLS,

IN A PESTALOZZIAN SCHOOL,

BY THE

AUTHOR OF "LESSONS ON OBJECTS."

ILLUSTRATED BY TEN PLATES, DRAWN FROM NATURE.

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PREFACE.

Quin ipsis doctoribus hoc esse curæ velim, ut teneras adhuc mentes more nutricum mollius alant, et satiari veluti quodam jucundioris disciplinæ lacte patiantur. Erit illud plenius interim corpus, quod mox adulta ætas adstringat. Hinc spes roboris.

QUINTILIAN.

'LESSONS on Shells' may be considered as a continuation of 'Lessons on Objects;' the principles of teaching illustrated in that little work are here applied to an important and interesting branch of Natural History. It is, like its unpretending predecessor, a transcript of the actual labours of the class-room; and friends who have visited the school, may retrace in the printed work the process of which they were witnesses. The end for which it is now laid before the public is not that it may serve as an instructive and entertaining volume to be placed in the hands of children; this end is sufficiently attained by several works of acknowledged merit, which, in order that the subject may be more familiarly handled and more vividly conceived, represent an imaginary group of pupils conversing and receiving instruction. The object my sister has proposed to herself is to place a volume in the Teacher's hands which shall help him to re-act with his pupils the scenes that are here described. It is not a drama offered for perusal in the closet, but a manager's copy commended to the conductors of other theatres of education, to enable their lilliputian corps dramatiques to assume the same characters, play the same parts and I will not say, "fret their little hour upon the stage," but enjoy the genuine delight of intellectual activity judiciously directed.

A want of order and arrangement in the early part of 'Lessons on Objects,' has been alleged as a blemish in that work; but, in point of fact, its miscellaneous character was a studied feature, as better suited to the intellectual state of the pupils. Their first step should be the examination of objects as nature presents them, or rather as they see them in nature, that is, either as insulated or as associated only by accidental connection. When ideas are formed and correct expressions familiarized, the business of classification commences, the lessons assume a more scientific character, and the pupils are prepared to enter on the province of Natural History. The training, then, which 'Lessons on Objects' will have supplied for commencing 'Lessons on Shells,' will consist principally in the improved faculty of observing natural features, in the possession and command of a small vocabulary of scientific terms, in the habit of classification, and in the practice of giving a written summary of the knowledge required.

Several circumstances concur to recommend conchology as the first branch of Natural History to be studied by younger pupils. Shells are of themselves interesting, from the peculiarity of their forms and the variety of their colours; their characteristics are simple and present themselves readily to the eye, and a variety of interesting information may be given respecting the animals which inhabit them. Added to this, the greater part of the specimens may be procured at little expense, may be easily preserved, and therefore continually reproduced to the class, and besides may, without fear of damage, be committed to the careless hands of the youngest students.

It will however, I know, be objected by stanch anti-reformers in education, that improve the mode of teaching Natural History as you will, you but

teach better that which had better not be taught at all; for that whatever abridges the time given to classical instruction, weakens the nerves and sinews of the mind, and but debases the Corinthian column of ancient lore by introducing the barbarous ornaments of modern science. My answer is, we do not propose to devote a large portion of time to Natural History in ordinary cases, and even this will be taken principally during those early years when very little real progress is made in Greek or Latin. Every age has its intellectual as well as its moral claims, and though the stern discipline of early classical instruction may offer some advantages, still the hours devoted to the abstractions of grammar, and the puzzling out ideas which have no prototype in the child's mind through the dark mist of a language little akin to his maternal tongue, present very meagre food to that understanding they are supposed to strengthen. If the child must lisp in Latin, let him do so; let his first Gradus ad Parnassum be through the quagmires at its base; the few choice spirits that mount the summit may, perhaps, tread it with firmer step, and enjoy the prospect with keener relish; but that step will not be the less firm, nor that relish the less keen, because a daily hour was abstracted for 'Lessons on Objects,' or 'Lessons on Shells.' Not only are the sciences so linked together that each gives each a double charm, but the faculties of the mind are so constituted, as that the vigour of each is promoted by the due development of the rest. And there is a harmony as truly existing in a properly educated mind, as in a well formed and well exercised body, though the harmony of the former may not be so easily discerned as that of the latter.

As years advance, the study of Natural History may be confined to those who manifest a peculiar taste for it, or who exhibit little disposition for clas-

sical pursuits. For, as every age has its intellectual claims, so also has every grade of talent. The schools of the highest reputation have generally been conducted too exclusively to the advantage of the superior class of minds. The fine porcelain has been beautifully moulded and delicately pencilled, but the coarser clay has been almost entirely neglected. Yet many a young man who will never shine in the Senate House or the Schools, may yet pursue Natural History with success, and find in such pursuits improvement for his mind, a refuge from ennui, and a substitute for sensual pleasures. There is much truth as well as benevolence in a remark I once heard from an amiable coadjutor of Pestalozzi; "Tout terrain est bon si l'on sait le cultiver."

Much of the instruction thus communicated, will doubtless fade from the mind; but not with it will pass away all the benefits arising from these studies. In after years they may be recommenced with greater facility, in consequence of the early training, and every incidental reference to these subjects, which conversation or literature may present, will be more readily seized, and more clearly comprehended. And may it not be anticipated, that through the judicious introduction of these branches of education into our schools, the latent powers of genius may be kindled, and talents elicited that shall push forward the limits of science,* and force the Proteus nature to reveal still more of her secret truths?

C. Mayo.

Cheam, June 15, 1832.

* In confirmation of this idea, it may be stated, that a very ingenious improvement of the dissecting microscope, which has merited a reward from the Society of Arts, has been invented by a very young person brought up on these principles. I have the more unmixed pleasure and honest pride in mentioning this fact, as it refers not to a pupil of my own, but to one educated at Stanmore.

In drawing out '*Lessons on Shells*,' the following works have been consulted, and extracts made from them.

Burrows' Elements of Conchology.
Turton's Conchological Dictionary.
Turton's Bivalve Shells of the British Isles.
Mawe's Conchology.
Montagu's Testacea Britannica.
Fleming's Philosophy of Zoology.
Lamark's Histoire Naturelle des animaux sans Vertebres.
The Conchologist's Companion.
Shaw's Nature displayed.
Sowerby's Genera of Recent and Fossil Shells.
Dillwyn's Descriptive Catalogue of Recent Shells.

The plates which illustrate this work have been drawn from specimens actually presented to the class: they are intended as an assistant to the teacher, but not as a substitute for the shells themselves in the instruction of pupils.

LESSONS ON SHELLS.

ON THE MOLLUSCA.

LESSON I.

Teacher. Do you know what these things are which I have brought in as the subject of our lesson to-day?

Child. They are shells.

Teacher. Describe to me what you mean by a shell.

Child. Oh, a shell is that which covers a snail.

Teacher. Very true; a snail has a shell, but in saying this you do not explain to me the nature of a shell. When you attempt to describe any thing, you should give such an account as would instruct a person altogether ignorant on the subject. Try again, and tell me what a shell is.

Child. A shell is a hard covering or house belonging to animals resembling slugs.

Teacher. Of what use do you suppose shells to be?

Child. They must be a defence and protection to the animals which they cover.

Teacher. Yes: shells are the hard coverings of certain animals called mollusca; a name

derived from *mollis*, the Latin for soft; if you call to mind the animals enclosed in these cases, you will not fail to observe how applicable this term is to them. Give me some example to prove that this name is well chosen.

Child. The snail has a very soft fleshy body.

Teacher. Yes, and the mollusca in this respect are all alike. I have brought you some to examine; look at them well, and try and discover the characteristics which distinguish them from other animals. Here are a snail, an oyster, a muscle, a slug.

Child. I am sure that we shall not be able to say much about such animals as these, they are so shapeless and uninteresting in their appearance.

Teacher. Do not form so hasty a judgment. I hope soon to convince you that it is your ignorance alone which causes you to view them with indifference. There is not, indeed, any part of the creation which you can study, that will not repay you for your labour; and when you become better acquainted with the different kingdoms of nature, you will experience an increased pleasure in your walks; and objects that you have hitherto passed heedlessly by, will rivet your attention by the wonders they unfold to you; but my great desire is, that you should trace in all these things, the hand of an almighty and beneficent Creator. When you are struck with the beautiful arrangement in a plant, with the means of defence possessed by one animal, and the sagacity displayed by another, consider

which you ought most to admire, the instrument or Him who so well fitted and prepared the instrument for the work to which it is appointed. Now, suppose that you have yourself made or done any thing very nicely and with great pains for a friend, would you feel satisfied, or think it just, if, while your performance was admired, you were forgotten?

Child. I should consider such conduct very unfair.

Teacher. And what lesson do you suppose that I wish to teach you by drawing your attention to your own feelings when your industry and ingenuity have been thus overlooked?

Child. That when we are struck with the beauty and utility of any of God's works, we should praise him for his wisdom, and thank him for his goodness.

Teacher. It is with such feelings that I wish you to study Natural History, and it would then prove a very delightful and profitable employment.* You must now return to the consideration of the animals before you. Examine them

* It is most important in giving instruction in Natural History, early to accustom children to recognise the God of nature in his works. If God be robbed of his glory, how can we anticipate a blessing on our labours? Has not experience proved, that the study of the wonders of creative wisdom does not lead the natural heart to the Creator? Is it not notorious, that among the followers of science is continually seen the practical, if not the avowed atheist. Let this be a beacon to the Christian instructor, and let it be his careful endeavour to guard against the fatal error of speaking of God's works independently of him. As we are called upon to walk by faith, and not by sight, it is essential to lead children to see God in all things, and to trace Him who is himself invisible in those outward manifestations of his power and goodness, which are within the reach of their observation.

carefully—exercise your different senses upon them—mark the various parts of their bodies—consider to what use each part is likely to be destined—and reflect upon what you know of their habits. By using well your sense and your judgment, you will be able to find out much for yourselves. When you are at the sea-side, or out at sea, you may collect facts illustrative of the history of these animals.

Child. That would be exceedingly interesting.

Teacher. Yes, it would; but you need not wait for such opportunities. Rivers, and even the garden, will afford you specimens for observation: but what have you now to do?

Child. To examine the animals before us, to use our senses upon them as we did in our lessons on objects, to name their parts, and the uses of their parts as far as we know them.

Teacher. Yes; I wish you first to observe these creatures attentively; and that you may discover readily what is peculiar to them, you must in your own minds compare their qualities, parts, and habits, with what you know of other animals. First, however, tell me some qualities that appear to you to be common to all the mollusca.

Child. Their bodies are soft, fleshy, moist, and cold.

Teacher. Yes, you remember their name is given to them from their softness. Observe also the action of a snail when an enemy approaches.

Child. It draws its body into its shell for protection.

Teacher. Yes. The bodies of the mollusca are contractile, that is, have a strong power of contraction, which they exercise by means of muscles. What more do you remark in these creatures?

Child. They have a thick skin, which appears loose in some of them.

Teacher. This skin is called the *sac* or *mantle*; it is peculiar to the molluscous tribe, and is constantly moistened by a slimy exudation. It is also full of pores and glands, of which I shall have occasion to speak in a future lesson. Can you explain the nature of pores and glands?

Child. Pores are very small holes. I do not exactly know what glands are; but we have glands in our throats, are those of the mollusca the same as ours?

Teacher. They are of the same nature, but much smaller than those in our throats. The office of glands is to secrete or separate fluids of various kinds from the general fluid of the substance. All bodies both of the animal and vegetable kingdom are supplied with a great number of glands; tears in animals are an example of secretions formed by means of such organs, so are honey and all other peculiar juices of plants. As the glands form little reservoirs, they often appear like small swellings, perceptible to the sight and touch. To return to the mantle; it sometimes envelops the mollusca like a purse, leaving an opening only where the mouth is situated; in some it extends on the two sides, forming ex-

pansions which perform the part of fins. Sometimes it spreads over the shell itself, which in this case has always a fine polish. Remember I desired you not only to examine the mollusca, but to compare them with other animals. What further peculiarity do you discover in them?

Child. They have no bones, their bodies are only a mass of soft flesh.

Teacher. They have certainly no bones; but in the mollusca which we purpose studying, the shell, by acting as a support to the body, seems in some measure to answer the purpose of bones. What more do any of you discover in these animals?

Child. They do not appear to have any blood.

Teacher. They have not red blood as we have; but are they composed entirely of solid matter?

Child. No, for when a snail is trodden upon, a white fluid issues from it; is this its blood?

Teacher. Yes, it may be considered as a kind of blood. How does it differ from that which circulates through our bodies?

Child. It is white and cold.

Teacher. True; and in consequence some naturalists have not considered it as blood, and have described the mollusca to be exsanguineous; a term signifying without blood, and derived from Latin *ex*, out of, and *sanguine*, blood. As this fluid flows through their bodies in vessels issuing from their hearts, it is now generally called their blood. What are you watching in the snail?

Child. The very quick manner in which it draws in its horns, and shrinks into its shell, if it is touched.

Teacher. What would you determine with respect to the animal from this circumstance?

Child. That it has the sense of feeling.

Teacher. Yes; and which part appears most sensitive?

Child. The horns.

Teacher. And do you observe how the little animal feels about, and tries with these projections which you call horns? They have from thence been termed *Tentacula*, from the Latin, *tentare*, *to* try or feel. How many tentacula have snails?

Child. Four.

Teacher. The tentacula vary in number; many mollusca have only two. The sense of feeling resides in the nerves.

Child. Oh! then the mollusca must have nerves.

Teacher. Yes they have nerves. What other organ of sense besides the *tentacula* do you perceive?

Child. There are black specks on the horns of the snail which appear like eyes.

Teacher. These specks are the organs of sight, of which the mollusca have never more than one pair. The sense of seeing, however, is not universally possessed by this class of animals. The organs of hearing and smelling have never been discovered among them, but they are supposed to possess the latter from the readiness

with which they select suitable food. This circumstance also proves that they possess the sense of taste. You must now recapitulate all that has been said concerning the mollusca. Whence is the name derived?

Child. From *mollis*, the Latin for soft.

Teacher. What kind of body have they?

Child. Cold, slimy, soft, and fleshy.

Teacher. Yes; and another quality you observed when I touched the snail several times.

Child. That its body is contractile.

Teacher. And what enabled it so quickly to contract its body, and retreat into its shelter?

Child. Its being furnished with muscles.

Teacher. When you compare these animals with others, in what respect do they appear deficient?

Child. They have no bones, the shell acting as a support to their bodies, which are attached to it by muscles.

Teacher. What envelops the mollusca?

Child. A sac or mantle.

Teacher. Describe the mantle.

Child. The mantle is full of pores and glands, and is moistened by a slimy exudation—sometimes it quite encloses the animal, having only one opening like a purse, sometimes it has expansions at the side, like fins, and sometimes it spreads over the shell.

Teacher. What are glands?

Child. Small lumps containing fluids, which are separated from the blood.

Teacher. Yes, in animals the glands contain fluids secreted from the blood; but in vegetables from the sap. Have these animals any fluid answering to our blood?

Child. Yes; but it is white and cold.

Teacher. In what respects is it similar to blood?

Child. It circulates through the body in vessels issuing from the heart.

Teacher. What senses are enjoyed by the mollusca?

Child. The senses of feeling, seeing, tasting, and, it is supposed, smelling.

Teacher. In what part of their frames is the sense of feeling most acute?

Child. In the tentacula.

Teacher. Tell me the derivation of that term?

Child. It is derived from the Latin, Tentare, *to* try.

Teacher. But what must they possess in order to be able to feel?

Child. Nerves.

Teacher. I will now read to you a summary of your lesson, and I shall expect you afterwards to write it from recollection.

Teacher. The mollusca have soft, slimy, cold, fleshy, and contractile bodies. They have no bones, but their shell acts as a support to their frame. They have muscles by which they are attached to their shells, and by which they move their bodies. They are enclosed in a skin called the mantle, or sac, which is full of pores and glands. Sometimes the animal is so completely

enveloped in this, as only to present an opening where the mouth is situated, sometimes it spreads over the shell, and sometimes it has external expansions answering the purpose of fins. The mollusca have not warm red blood, but a white cold fluid issues from their hearts and circulates through their frames. They have nerves, and consequently, feeling; and this sense seems most acute in their tentacula. Some have eyes, but others do not enjoy the sense of sight. They appear to have the power of smelling and tasting, but no traces of ears have been discovered.*

LESSON II.

To commence with a repetition of the summary of the former lesson.)

Teacher. Examine these animals again, compare them with insects, and tell me if you observe any deficiency in their construction.

* This little summary of the substance of the lesson may be read over twice to the children, and they should then be required to write it as well as they can from recollection. It would be well also that they should repeat it at the commencement of the succeeding lesson. This process may appear tedious, but the result will be most satisfactory both to the teacher and pupils. The latter should acquire so clear a knowledge of the facts brought before them, and have them so well imprinted on their minds, that they may, through all their progress, be enabled, without confusion or hesitation, to recur to each preceding step. Their information should be like a chain, which is held unbroken in the grasp; and were such the case, a power of mind would be elicited which, independently of the value of the knowledge obtained, would prove its worth when applied to more important subjects.

Child. They have not any limbs.

Teacher. Very true. They have not limbs or joints, as insects, nor are they divided, or moved by means of rings, as worms.

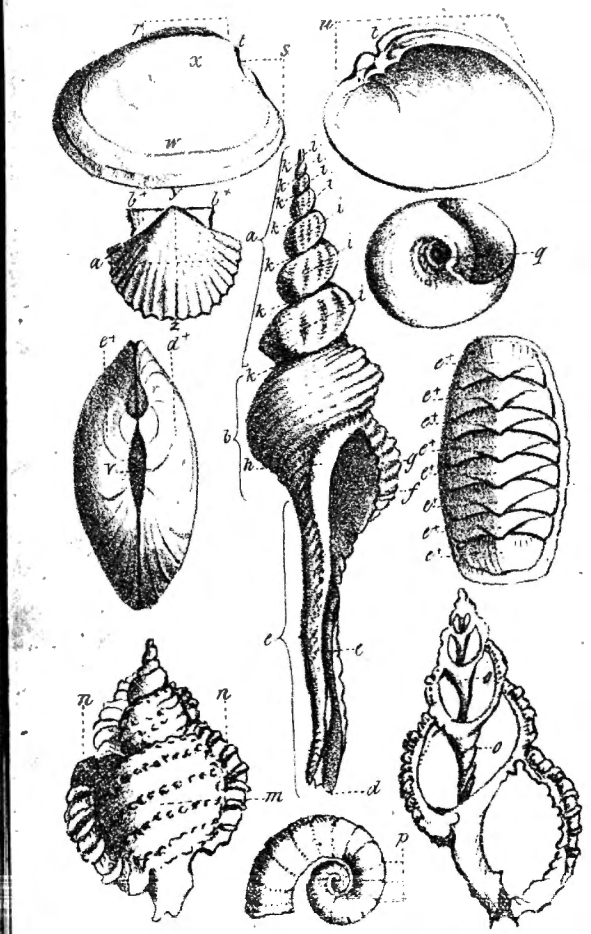
Child. Yet they move about.

Teacher. Yes; the greater part of the mollusca have the power of locomotion; that is, the power of moving from place to place; it is derived from Latin *locus*, a place. We will first examine the organs by means of which it is exercised. In what manner do snails and slugs make their way along the ground?

Child. Their skin seems to expand at the side of the body, and to adhere to the earth, and then they draw themselves on.

Teacher. This fleshy expansion under their bodies is full of muscles, which they dilate and contract at pleasure. It adheres like a sucker, and the animal advances by fixing the fore part to the ground and drawing the remainder after it. This instrument is called a foot. In some species, as the snail, it is attached to the under part of the body by its whole length, but in others it is free at one end, and can be extended or withdrawn at pleasure. When it is free it is called a leg, and is usually tongue-shaped; it is frequently used as an organ of motion, but sometimes the animal employs it as a paw for digging holes in the sand or mud. But consider whether this organ will enable the mollusca to advance in all the situations in which they are placed?

Child. No, not when they are in the water; then they must swim.



EXPLANATION OF THE PLATES.

PLATE I.

a. Spire.
b. Body whorl.
c. Beak.
d. Base.
e. Canal.
f. Aperture.
g. Outer lip.
h. Columellar lip.
i. Whorls.
k. Suture.
. Apex
m. Back.
n. Varices.
o. Columella.
p. Dissepiments.
q. Umbilicus.
r. Area or Anterior slope.
s. Areola or Posterior slope
t. Beaks.
u. Hinge.
v. Ligament.
w. Disk.
x. Umbo.
y. Base.
z. Length.
*a** Breadth.
*b** Auricles.
*c** Left valve.
*d** Right valve.
*e** Valves.

PLATE II.

FIG.

1. Conus *Marmoreus* . . Marbled Cone.
2. Cypræa *Arabica* . . Nutmeg Cowry.
3. The same, *young*.
4. Cypræa *Moneta* . . Money Cowry.
5. Cypræa *Europæa* . . Nun Cowry.
6. Bulla *Lignaria* . . Wood Dipper.
7. Gizzard of *Ditto*.
8. Bulla *Volva* . . . Weaver's Shuttle.
9. Bulla *Fontinalis* . . Stream Dipper.
10. Voluta *Oliva* . . . Olive Volute.
11. Voluta *Episcopalis* . . Bishop's Mitre.